LDC 2018 PROGRAM

April 24, Tue. Room 301

[LDC1] 9:00 - 10:45 LDC Plenary
Chairs: Kazuo Kuroda, Utsunomiya University, Japan
Hiroshi Murata, Osaka University, Japan

LDC1-1 9:15 Plenary
Recent Researches and Activities of Korean 3D Display Society
Byoungho Lee, Seoul National University, Korea
I introduce the latest research trends of 3D displays in Korea including super multi-view display and holographic display based on GIGA KOREA project. Also introduced are researches on augmented reality.

LDC1-2 10:00 Plenary
IR/R/G/B Laser Diodes for Multi-Wavelength Applications
Hidenori Kawanishi, Sharp Corporation, Japan
This paper describes the history of Sharp laser diode development and recent progress in offering a wide wavelength portfolio as a one stop laser supplier for multi-wavelength applications.

10:45-11:00 Break

[LDC2] 11:00 - 12:00 Scanning Systems
Chairs: Masafumi Ide, Magic Leap, Japan
Fergal Shevlin, DYOPTYKA, Ireland

LDC2-1 11:00 Invited
Laser Holographic Head Up Displays
Jamieson Christmas, Envisics Ltd., UK

LDC2-2 11:30 MEMS-Driven Laser Beam Scanning LiDAR: The Future of Variable Spatial Resolution Sensing and Foveated Ranging
Jari O. Honkanen, P. Selvan Viswanathan, MicroVision, Inc., USA
This paper explores why LBS technology is especially well suited for LiDAR applications, and how MEMS-driven LBS LiDAR systems offer compelling advantages such as dynamic variable spatial resolution and foveated depth sensing.

LDC2-3 11:45 Multi-purpose IoT Station Using Scanning Visible Laser Diodes Common to Smart Lighting and LiDAR
Masato Ishino1, Toshiyuki Kitamura2, Akira Takamori3, Masahide Okazaki3, Hiroshi Murata4, Junichi Kinoshita3, Noboru Hasegawa3, Masaharu Nishikino2, Kazuhisa Yamamoto3
1) Osaka University, Japan, 2) National Institute for Quantum and Radiological Science and Technology, Japan, 3) Screen Holdings Co., ltd, Japan, 4) Graduate School of Engineering Science, Osaka University, Japan
A new concept of IoT station using visible LD-scan technology common to smart lighting
and LiDAR-sensing is proposed. The feasibility of this system is verified using a simply-configured prototype system.

12:00-13:00 Lunch

[LDC3] 13:00 - 16:30 Special Session: Hyper-Realistic Displays 2018

Chairs: Hirotsugu Yamamoto, Utsunomiya University, Japan
Daisuke Miyazaki, Osaka City University, Japan

LDC3-1 13:00 Invited
Introductory Talk: 3D Displays from PyeongChang to Tokyo
Hirotsugu Yamamoto\textsuperscript{1, 2}
1) Utsunomiya University, Japan, 2) JST, ACCEL, Japan
This talk gives an overview of the hyper-realistic displays in 2018. One of the most significant topics is the application of 3D displays for PyeongChang 2018 Olympics. In Japan, aerial displays are becoming popular.

LDC3-2 13:15 Invited
Development of Digital Holographic Display Technology in Giga KOREA Project
HOPTECH
Minsik Park, Chi-Sun Hwang, Jinwoong Kim
Electronics and Telecommunications Research Institute, Korea
We will discuss the technology development of table-top digital holographic display that enables user to consume the realistic 3D media for tele-experience service in Giga KOREA Project.

LDC3-3 13:45 Invited
HOPTECH: Hologram Printing Technology and Applications
Ryutaro Oi, Koki Wakunami, Boaz Jackin, Yasuyuki Ichihashi, Makoto Okui, Kenji Yamamoto
National Institute of Information and Communications Technology, Japan
Wavefront printer is useful to make an optical elements. A hologram printing method that includes holographic optical elements fabrication, duplication of holograms and overlap printing method for better view of holograms is described.

LDC3-4 14:15 Invited
Possibilities and Problems of Super-Multiview 3D Display
Sung Kyu Kim, Min-Koo Kang, Yong-Jun Kwon, Ki-Hyuk Yoon
Korea Institute of Science and Technology, Korea
SMV 3D display aims for the characteristics of the horizontal parallax only electro-holographic 3D display. But achieving high quality 3D image and human friendly display performance are significant issues for ideal SMV 3D display.

LDC3-5 14:45
Aerial Protruding DFD Display with AIRR
Yoshiki Terashima\textsuperscript{1}, Ryosuke Kujime\textsuperscript{1, 2}, Shiro Suyama\textsuperscript{3}, Hirotsugu Yamamoto\textsuperscript{1, 2}
1) The University of Utsunomiya, Japan, 2) JST ACCEL, Japan, 3) The University of Tokushima, Japan
This paper proposes a novel aerial 3D display, which is based on the protruding DFD display. We form two-layered aerial images with AIRR. We have successfully realized aerial protruding DFD display.
We are conducting research using multiple display devices to improve the performance of integral 3D images. Each of the research results using direct-view displays and projectors as the display devices will be described in detail.

A distortion-free full-color real image can be displayed in midair using a dihedral corner reflector array. A basis of the dihedral corner reflector array and some applications, such as a floating touch display, are introduced.

Floating three-dimensional (3-D) image formation without any project screen is advantageous for providing interactive operation to the 3-D data directly using fingers or positioning devices. The several studies on aerial 3-D display technologies are described.

In this presentation, the concept of an edible retroreflector is introduced. Japan agar was found to be adequate material to form it. The prototype was successfully applied to a marker for dynamic projection mapping.

High speed projector "DynaFlash" can realize 1000-fps, 8bit depth and 3ms (min) latency based on the Texas Instruments DLP technology and the high-speed control of high-luminance LED.

Spatial-division multiplexing in holographic 3D display using high-speed binary phase-mode spatial light modulator
Experimental demonstration of enlarging viewing zone angle and reconstructed image size of holographic 3D display using a high-speed binary-phase-mode spatial light modulator is presented. In the experiment, three-times enlargement is achieved.

**April 25, Wed. Room 301**

**Wednesday, April 19 AM**

**OPIC Opening and Plenary Session** 9:00-12:10

**Room** 501+502

12:10-13:30 **Lunch**

[IOT-LDC-LEDIA] 13:30 - 17:15 **Joint Session (LEDIA, LDC, and IoT-SNAP)**

**Chairs:** Atsushi Kanno
Technology, Japan
Sunao Kurimura
National Institute of Material Science, Japan
Ryuji Katayama
Osaka University, Japan

**Opening Talk** 13:30 - 13:45
Hiroshi Murata
Osaka University, Japan
Kenichi Kitayama
The Graduate School for the Creation of New Photonics Industries, Japan
Hiroshi Amano
Nagoya University, Japan

**IOT-LDC-LEDIA-1** 13:45 Invited
IoT revolution and business opportunities in emerging market in ASEAN region
Huei Ee Yap, LP-Research Inc., Japan

**IOT-LDC-LEDIA-2** 14:15 Invited
Fiber-optic-based Life Cycle Monitoring of Aerospace Composite Structures: Toward Digitalization of Next Generation Aircraft
Shu Minakuchi, Nobuo Takeda, University of Tokyo, Japan

This talk will overview our recent research activity of composite life cycle monitoring by embedded optical fiber sensors. The detailed information obtained from composite structures can be utilized to build the digital replicas and to predict their life-cycle performance.

14:45 - 15:15 **Break**

**IOT-LDC-LEDIA-3** 15:15 Invited
Laser Diode Based Underwater Optical Wireless Communication
Takao Sawa, Koji Tojo, Naoki Nishimura, Shin Ito
1) JAMSTEC, Japan, 2) Shimadzu Corp., Japan, 3) SAS Co., Ltd., Japan

We developed an underwater optical wireless communication modem using high power laser diode. 20 Mbps communication speed at 120 m distance, and 32 kbps at 190 m
distance were established through underwater tests.

IOT-LDC-LEDIA-4  15:45  Invited
Recent Progress of Retinal Imaging Laser Technology
Mitsuru Sugawara, QD Laser, Japan

IOT-LDC-LEDIA-5  16:15  Invited
III-nitride Semiconductor Light Emitting Transistors
Kazuhide Kumakura, Junichi Nishinaka, Hideki Yamamoto
NTT Basic Research Laboratories, NTT Corporation, Japan

IOT-LDC-LEDIA-6  16:45  Invited
High Photosensitivity HFET-type Nitride Based Photosensors
Motoaki Iwaya¹, Tetsuya Takeuchi², Satoshi Kamiyama³, Isamu Akasaki¹, ²
1) Meijo University, Japan, 2) Nagoya University, Japan

Reception  InterContinental Ballroom
18:00-20:00  *complimentary for OPIC/LDC2018 attendees

April 26, Thur.  Room 301

[LDC5] 9:00 - 10:30
Special Session: Visible Lasers Connecting Automotive and Human
Chairs: Josef Schug, Lumileds Germany GmbH, Germany
Shigeto Iwamoto, Honda Motor Co., Ltd., Japan

LDC5-1  9:00  Invited
The Future of Automotive Lighting with Laser Technology
Philipp Ansorg, Wolfgang Huhn, AUDI AG, Germany
Laser light sources for car headlamps entered series production and will be improved in performance and safety. New systems combine laser light with a MOEMS mirror scanner, DMD or LCoS to realise new light functionality.

LDC5-2  9:30  Invited
Laser Scanning Headlamp
Takuya Kitazono, Yasushi Kita, Shinya Hoshino, Taiki Mori, Shuichi Harata, Takao Saito, Yasushi Yatsuda, Stanley Electric co., ltd., Japan
The high-resolution Adaptive Driving Beam by the laser scanning headlamp is effective for the reduction of the night traffic fatal accidents. We demonstrated improvement of the visibility and to guide the driver's eyes.

LDC5-3  10:00  Invited
Application of Laser to Headlamps and Thermal Design
Takashi Inoue, Yosuke Ohashi, Takashi Ito, KOITO MANUFACTURING CO.,LTD, Japan
This paper describes how laser diodes can be used for headlamps and their potential as light sources, focusing on headlamp functionality and thermal design.
10:30-10:45 Break

LDC5 10:45 – 12:15

Special Session: Visible Lasers Connecting Automotive and Human -2-

Chairs: Philipp Ansorg, Lumileds, Audi AG, Germany
        Masaru Kuramoto, Stanley Electric Co., Ltd., Japan

LDC5-4 10:45 Invited
Dynamic Laser-based Lighting for Automotive Headlamps
Josef Schug, Ulrich Hechtfischer, Roman Hohn, Steffen Zozgornik
Lumileds Germany GmbH, Germany
Laser-based lighting finds its application in car headlighting, particularly in the high beam. First implementations use a single static source. Dynamic beam pattern can be either realized with discrete segmented sources or in an advanced way with a laser scanner. The paper reports results.

LDC5-5 11:15 Invited
Laser light technology for Automotive Applications
Paul Rudy, Troy Trottier, Eric Goutain, James Raring, SoraaLaser, USA
Conventional sources such as HID, halogen lamps and LEDs have limitations in reliability, size and luminance. We present an overview of laser light, a new solid-state technology featuring the highest luminance demonstrated commercially.

LDC5-6 11:45 Invited
GaN-based Laser Diodes for Automotive applications
Takashi Miyoshi, Shingo Masui, Shin-ichi Nagahama, Nichia Corporation, Japan
GaN-based single mode blue and green laser diodes (LDs) were fabricated on c-plane GaN substrates. The wall plug efficiency were 26.5% in 453nm and 12.3% in 515nm, respectively.

12:15-13:30 Lunch

LDC6 13:30 - 15:00 Speckle/Color

Chairs: Young-Joo Kim, Yonsei University, Korea
        Shigeo Kubota, Oxide Corp., Japan

LDC6-1 13:30 Invited
The Development of Speckle Reduction Technologies in Our Group for Laser Projection Displays: a Short Summary
Zhaomin Tong, Shanxi University, China
In this paper, speckle reduction methods developed in our group are reviewed. The methods include polarization diversity, binary phase diffuser, MEMS scanning mirror, and non-sequential technique.

LDC6-2 14:00
Image Resolution of Raster-scan Laser Mobile Projectors Considering Color Speckle Effects
Junichi Kinoshita1), Akira Takamori1), Kazuhisa Yamamoto1), Kazuo Kuroda2), Koji Suzuki3)
1) Osaka University, Japan, 2) Utsunomiya University, Japan, 3) Oxide Corporation, Japan
Image resolution of raster-scan laser mobile projectors was analyzed considering color
speckle using a high-speed speckle measurement device. Color speckle has an effect of widening the chromaticity range of various color shifting behaviour.

LDC6-3 14:15
Light source coherence and the impact of diffusers on the image quality of a holographic display system
Yuanbo Deng, Daping Chu, University of Cambridge, UK
We show the relationship between the spatial and temporal coherences of the light source and the image sharpness and speckle in a linear holographic display system and the change due to adding a diffuser.

LDC6-4 14:30
Theoretical Analysis of Angular Dependency of Speckle Contrast
Makio Kurashige, Kazutoshi Ishida, Dai Nippon Printing Co., Ltd., Japan
Angular characteristics of speckle contrast under the moving diffuser condition was analyzed based on the speckle reduction theory. The result was well matched with the theoretical assumption in this report.

LDC6-5 14:45
Measurement of Chromaticity and Photometric Quantity of Laser Displays by the Discrete Centroid Wavelength Method
Keisuke Hieda, Tomoyuki Maruyama, Tomohiro Takesako, Fumio Narusawa
HIOKI E.E. CORPORATION, Japan
The discrete centroid wavelength method can simultaneously measure the centroid wavelength and radiometric quantity of three-color lasers. The accuracy of this new method was experimentally verified by comparing with an optical spectrum analyzer and Si-photodiode.

15:00-15:30 Break

[LD7] 15:30 - 17:45 Lasers and Light Sources
Chairs: Lung-Han Peng, National Taiwan University, Taiwan
Tetsuya Yagi, Mitsubishi Electric Corp., Japan
LDC7-1 15:30 Invited
Watt-class Green and Blue Laser Diodes
Masahiro Murayama, Yusuke Nakayama, Yukio Hoshina, Hideki Watanabe, Noriyuki Fuutagawa, Hidekazu Kawanishi, Toshiya Uemura, Hironobu Narui
1) Sony Corporation, Japan, 2) Toyota Gosei Co., Ltd., Japan
Watt-class green and blue laser diodes were successfully fabricated on semipolar {20-21} plane and c-plane GaN substrates, respectively. These lasers are promising light sources that meet the ITU-R Recommendation BT.2020 for future laser display applications.

LDC7-2 16:00 Invited
Development of RGB Light Source for Head-Up Display at Automobile
Nan Ei Yu
Gwangju Institute of Science and Technology, Korea
Fiber-based RGB laser light source module is presented. A set of laser diodes are coupled with optical fiber and merged into single output with optical fiber combiner device.
LDC7-3 16:30 Invited
Progress in self-frequency doubling crystal green modes and its potential application for laser display
JiYang Wang, Haohai Yu, Huaijin Zhang, Shandong University, China
SFD crystals and lasers have gained renewed attention and Nd:RECa4O(BO3)3 (RE = Y or Gd) crystals, with SFD lasers becoming commercial products. The promising application of SFD green laser in laser displays was discussed.

LDC7-4 17:00
Utilizing the unique properties of ceramic fluorescent converters for laser pumped phosphor light-engines in digital projection.
Volker Hagemann1), Albrecht Seidl1), Kazuyuki Inoguchi2)
1) SCHOTT AG, Germany, 2) SCHOTT Nippon K.K., Japan
Laser pumped phosphors are widely used in solid state based light-engines for digital projection. We compare the properties of ceramic converters to other solutions and present results for irradiance levels up to 230W/mm² and beyond.

LDC7-5 17:15
Highly-Reliable Operation under High Case Temperature in 638-nm BA-LD
Kyousuke Kuramoto, Shinji Abe, Motoharu Miyashita, Masatugu Kusunoki, Takehiro Nishida, Tetsuya Yagi
Mitsubishi Electric Corp., Japan
638-nm dual-emitter LD with total emitter width of 150-um showed better characteristics compared with the triple-emitter of 180-um under 55 deg. C, pulse. The LD had MTTF around 26K hours, 1.9 times of the triple.

LDC7-6 17:30
Spectral Study of a Side-Emitting Laser-Pumped Phosphor Layer
Masamichi Ohta, Ichiro Fujieda, Ritsumeikan University, Japan
A side-emitting configuration can utilize the photoluminescence photons trapped in a laser-pumped phosphor layer. Shorter-wavelength photons are lost during lateral light propagation due to self-absorption, leading to an angle-dependent spectrum.

April 27, Fri. Room 301

[LDC8] 9:00 - 9:45 Modules/Sensors
Chairs: Ray-Hua Horng, National Chiao Tung University, Taiwan
Tomoyuki Miyamoto, Tokyo Institute of Technology, Japan
LDC8-1 9:00
High-efficient Light Detection with Double-side Mirror Reflectors for Light Scattering-type Particle Sensor
Kenya Nakai, Nozoami Enoki, Shota Nakahara, Takashi Fujiwara, Masaaki Shimada, Nobuo Takeshita, Mitsubishi Electric Corp., Japan
Double-side mirror reflectors structure to detect a scattered light efficiently from small particles for an optical particulate matter sensor is studied in simulation. It enables a light-collection efficiency to increase and an optical detection area to expand.
Importance of Three-color Simultaneous Measurement of RGB Laser Diode Modules
Keisuke Hieda, Tomoyuki Maruyama, Fumio Narusawa, HIIOKI E.E. CORPORATION, Japan
Simultaneous measurement of RGB lasers is important for an accurate evaluation of the optical characteristics of RGB laser diode modules. It is difficult to precisely evaluate their performance if each laser is measured separately.

Correlation between Human Perception and Computer-Predicted Daylight Metrics in an Auditorium Building
Aishanura Handina, Nurul Mukarromah, Rizki A. Mangkuto, R. Triyogo Atmodipoero
Institut Teknologi Bandung, Indonesia
Assessments to correlate human perception and computer-predicted metrics of indoor daylighting were conducted in an auditorium in Bandung, Indonesia. The closest relation is found for subjective partially daylit area and the area enclosed with DA150,50%:

Poster Short Presentation Room301
Chairs: Sunao Kurimura, NIMS, Japan
Tetsuya Yagi, Mitsubishi Electric Corp., Japan

Fiber-Coupled High-Power RGB Laser Module for Underwater Optical Wireless Communication
Ryosuke Nishi1, Koji Tojo1, Naoki Nishimura1, Takao Sawa2
1) Shimadzu Corp., Japan, 2) JAMSTEC, Japan
We developed fiber-coupled high-power RGB laser module for underwater optical wireless communication. The RGB laser module provides over 3.5-W laser output for each wavelength range of red, green, and blue.

Experiment on Colour Mixing Using Tunable Red-Green-Blue Light-Emitting Diode Against Flux Luminous and Chromaticity Coordinates Values
Revantino1,2, Rizki Armanto Mangkuto1, Abdul Rachman Sanjaya1, Jaka Kelana Putra1, F.X. Nugroho Soelami1
1) Institut Teknologi Bandung, Indonesia, 2) Ministry of Industry of Republic of Indonesia, Indonesia
Experiment was conducted using light-emitting diode with tunability in red-green-blue components. Light intensity of each component was set by microcontroller within variation steps. Results showed variation of green component affected flux luminous and chromaticity values.

Optically tunable liquid crystal broadband linear-polarization rotator
Ko-Ting Cheng1, Cheng-Kai Liu1, Chian-Yu Chiu1, Stephen M. Morris2, Min-Cheng Tsai1, Chii-Chang Chen1
1)
A linear-polarization rotator based on the optically tunable pitch of chiral-azobenzene-doped liquid crystals has been investigated. The rotation angle is dependent on the pitch and the number of turns of the cholesteric LC helix.

LDCp9-4
Proposal of protective filter adjustment for RGB lasers
Yoshihisa Ishiba, Shinya Kajiri, Yamamoto kogaku co., ltd., Japan
We have reported on the details of protection filter which can adjust optical axis for RGB laser.

LDCp9-5
Portable camera based 3D imaging with structured light
Ting-Yi Huang, Wei Min Cheng, Fan Tim, J. Andrew Yeh, Yuan Luo
1) National Tsing Hua University, Taiwan, 2) National Taiwan University, Taiwan
Three-dimensional (3D) image reconstruction has been developed for various applications. Here, we proposed a smart phone combined with structured light source to experimentally demonstrate 3D reconstructed images.

LDCp9-6
Utilization of Nanocellulose From Bagasse as Carbon Source on Bcno Synthesis / SiO2 for White Led Lamp
I Putu Darma Ruswara, Dafi Adinegoro, Bambang Sunendar, Ahmad Nuruddin
Institut Teknologi Bandung, Indonesia
White LED can be made by transmitting UV light source through phosphor material. Phosphor BCNO Silica is made of nanocellulose from bagasse using sol-gel method and calcination at 600° C and used for LED film.

LDCp9-7
Effect of Luminance and Contrast on Psycho-physiological Response of Dentist in General Examination Room of a Dental Hospital
Damarwulan Eka Agustina, Fariza Ardelia Alifah, Rizki A. Mangkuto, Suprijanto
Institut Teknologi Bandung, Indonesia
Three variables yield significant effect on subjective error percentage: maximum face luminance, maximum ambient luminance, and contrast of oral-mannequin. The following values are suggested: Lf, max < 3.42 cd/m², La, max > 2.24 cd/m², Cm-f < 9.66.

LDCp9-8
Parametric Design for Optimising Dimensions and Specularity of Light Shelves
Rialdi Eka Putra, Fathurrahman Feradi, Rizki Armanto Mangkuto, R. Triyogo Atmodipoero, Institut Teknologi Bandung, Indonesia
This study aims to optimise the design parameters of light shelves in an open-plan space, to maximise daylight availability and minimise glare risk, using parametric design with genetic algorithm optimisation.

LDCp9-9
Secure Transmission and analysis of Optical Scanned Holographic Images for Efficient Communication
A new approach for the secure transmission of optical scanning holographic image is proposed. The optically scanned holographic image is scrambled using different chaotic maps. This image is converted to a quick response code.

Development of portable light therapy apparatus using LED for improvement of sleep and wakefulness
Tomonori Yuasa\textsuperscript{1), Jun Miura\textsuperscript{2), Yasumori Sugai\textsuperscript{3), Yousuke Ito\textsuperscript{3), Yoshihisa Aizu\textsuperscript{1)}}
1) Muroran Institute of Technology, Japan, 2) Hokkaido Pharmaceutical University, Japan, 3) DENSEI COMMUNICATION Inc., Japan
We have developed a portable light therapy apparatus for improvement of sleep quality and wakefulness and performed some preliminary experiments. The experimental results demonstrate usefulness of developed portable light therapy apparatus.

Understanding the Exposure-time Effect on Speckle Contrast Measurement for Laser Projection with Rotating Diffuser
Koji Suzuki, Shigeo Kubota, Oxide Corporation, Japan
We measured speckle contrast for laser projection with a rotating diffuser. The exposure-time effect was observed at slow surface velocity. The exposure time won't affect speckle contrast of laser displays if temporally-averaging speed is fast.

Improvement of Image Blurring for Aerial Image formed by Dihedral Corner Reflector Array using Optimization Processing
Daisuke Miyazaki, Shinji Onoda, Osaka City University, Japan
A method to improve blurring in an aerial image formed by a micro mirror array imaging element is proposed. A displayed image is optimized to minimize image blur using simulated annealing algorithm.

Forming a thermal aerial image with AIRR
Kengo Fujii\textsuperscript{1), Ryosuke Kujime\textsuperscript{1), 2), Hirotsugu Yamamoto\textsuperscript{1), 2)}}
1) Utsunomiya University, Japan, 2) JST ACCEL, Japan
This paper shows the possibility of forming a thermal aerial image with aerial imaging by retro-reflection (AIRR). Although far-infrared rays are absorbed by polymers, near-infrared lights can be retro-reflected and transmit through a beam splitter.

Aerial Imaging in a Cylindrical Water Tank with Omnidirectional
Erina Abe\textsuperscript{1), Sho Onose\textsuperscript{1), Hirotsugu Yamamoto\textsuperscript{1), 2)}}
1) Utsunomiya University, Japan, 2) JST ACCEL, Japan
This paper utilizes aerial imaging by retro-reflection (AIRR) for an omnidirectional aerial display. The omnidirectional aerial screen is formed inside a cylindrical water tank, which is aimed for experiments on fish by showing images.
LDCp9-PDP1
The Advantage of Centroid Wavelengths for Precise Evaluation of Laser Displays
Keisuke Hieda, T. Maruyama, F. Narusawa, HIOKI E.E. CORPORATION, Japan
The accuracy of a measurement method for the chromaticity and photometric quantity of laser displays using centroid wavelengths was experimentally verified.

12:00-13:00 Lunch

[LDC10] 13:00 - 14:30 Emerging Displays
Chairs: Jan Heller, JENOPTIK Polymer Systems GmbH, Germany
        Makio Kurashige, Dai Nippon Printing Co., Ltd., Japan
LDC10-1  13:00 Invited
Holographic Accessed Volumetric Displays
Kota Kumagai and Yoshio Hayasaki, Utsunomiya University, Japan
Volumetric displays with parallel two- and multi-photon excitations using a computer generated hologram displayed on a liquid crystal spatial light modulator are demonstrated.

LDC10-2  13:30 Invited
Dynamic Illumination for Spatio-temporal Integration of Unwanted Interference in Holographic Displays
Fergal Shevlin, DYOPTYKA, Ireland
The quality of holographic display imagery is improved using a compact, reliable, optically efficient deformable mirror. So-called subjective speckle that can render text and symbols illegible at viewing distances of several meters, is reduced significantly.

LDC10-3  14:00
Holographic real-time image projection with data compression
Paula Adrianna Kochańska, Michał Makowski, Izabela Ducin, Karol Kakarenko, Jarosław Suszek, Marcin Bieda, Adam Kowalczyk
Warsaw University of Technology, Poland
New approach to holographic data compression in real-time holographic transmission with on-the-fly data compression and projection in color between Poland and Japan is presented. Data compression algorithm used in transmission is based on bitplanes extraction.

LDC10-4  14:15
Optical Addressing of Phase-Modulating Materials for Holographic Projection of Images
Joanna Starobrat, Michał Makowski, Piotr Lesiak
Warsaw University of Technology, Poland
The efficiency of real-time holography projection is limited by the SLM pixel density. We propose solutions for purely optical addressing: magneto-optical modulation and implementing LC doped with GNP. Holographic writing for both methods is compared.

14:30-14:45 Break

[LDCC11] 14:45 - 16:00 Optical Components
Chairs: Nan Ei Yu, Gwangju Institute of Science and Technology, Korea
        Junichi Kinoshita, Osaka University, Japan
LDC11-1  14:45  Invited
Optimized Algorithm for Freeform Optics
Matthew E. Brand, Mitsubishi Electric Research Laboratory, USA

LDC11-2  15:15  Invited
Capabilities in production of Components and Sub-Assemblies for LIDAR
Jan Heller, JENOPTIK Polymer Systems GmbH, Germany
The challenges in the production of components and sub-modules for LIDAR applications.

LDC11-3  15:45
High-Speed Multi-Diffraction-Type Electro-Optic Deflector Using Polarization-Reversed Structures
Yuta Hayashi\(^1\), Hiroshi Murata\(^1\), Atsushi Sanada\(^1\), Masahide Okazaki\(^2\), Masato Ishino\(^1\), Kazuhisa Yamamoto\(^1\)
1) Osaka University, Japan, 2) SCREEN Holdings Co., Ltd., Japan
We have proposed a new multi-diffraction-type electro-optic deflector using polarization-reversed structures, which can deflect visible laser beams with a high speed. The operational principle, design, and experimental results of the proposed deflector are reported.

[LDC12]  16:00 - 16:30  Post Deadline
Chairs: Sunao Kurimura, NIMS, Japan
Tetsuya Yagi, Mitsubishi Electric Corp., Japan
LDC12-1  16:00
Evaluation of key influence factors to luminance lifetime for laser projection TV
Ruhai Guo, Weidong Liu, Xianrong Liu, Houjian Zhou
Hisense Group limited company, China
Nowadays, the luminance lifetime of laser projection TV is often defined by its laser source lifetime, such as 25000hr because the specification of semiconductor laser diode.

LDC12-2  16:10
Applicability of CIELAB volume metric to the latest electronic display with eye adaptation at medium grey scale or with white boosting
Hidefumi Yoshida\(^1\), Keita Hirai\(^2\), Yoko Mizokami\(^2\)
1) Sharp Corporation, Japan, 2) Chiba University, Japan
We found that it is appropriate to adopt CIELAB for checking if the emissive display replicates the original source precisely, but not appropriate if the adaptation point of eyes is at a medium grey scale.

LDC12-3  16:20
Design and simulation of a diffractive diffuser for optimizing speckle contrast in a laser MEMS scanning Head-Up Displays
Giang Nam Nguyen, Ryo Kajiura, Axel Torschmied
Visteon Electronics Germany, Germany
A Diffractive Optical Element is designed as a spot array generator, taking into account the profile and pitch of the laser scanning beam, resulting in a diffusing pattern with low speckle contrast.
[**Award and Closing**] 16:30 - 16:45
Chairs: Sunao Kurimura, NIMS, Japan
       Tetsuya Yagi, Mitsubishi Electric Corp., Japan
16:30 Award Ceremony
16:40 Closing Talk   Hiroshi Murata  Osaka University, Japan