

Laser Display Conference'13

LDC'13

CONFERENCE CHAIR

Kazuo Kuroda (Utsunomiya Univ.)

Chikara Tanioka (Toshiba Corp.)

Masashi Wada (Yamaju Ceramics Co., Ltd.)

STEERING COMMITTEE

Co-Chairs

Akira Okada (Corning Holding Japan G.K.)

Kazuhisa Yamamoto (Osaka Univ.)

Members

Jun Akedo (National Institute of Advanced Industrial Science and Technology)

Kazuo Fujiura (NTT Advanced Technology Corp.)

Tatsuo Fukui (Oxide Corp.)

Takaaki Ishigure (Keio Univ.)

Shunji Kamijima (Seiko Epson Corp.)

Hideyuki Kanayama (Panasonic Corp.)

Muneharu Kuwata (Mitsubishi Electric Corp.)

Osamu Matoba (Kobe Univ.)

Tomoyuki Miyamoto (Tokyo Inst. Tech.)

Ryuji Morita (Hokkaido Univ.)

Kenji Nagashima (Funai Electric Co., Ltd.)

Takao Nakamura (Sumitomo Electric Industries, Ltd.)

Norihiro Ohse (Sony Corp.)

Satoshi Ouchi (Hitachi Ltd.)

Shin-ichi Shikii (Panasonic Corp.)

Tsutomu Shimura (Univ. of Tokyo)

Shigeru Shinzawa (MicroVision, Inc.)

Tsuyoshi Suzudo (Ricoh Co., Ltd.)

Akihiro Tagaya (Keio Univ.)

Takunori Taira (National Institutes of Natural Sciences)

PROGRAM COMMITTEE

Co-Chairs

Takashige Omatsu (Chiba Univ.)

Brian Schowengerdt (Univ. of Washington)

Co-Vice Chairs

Tatsuo Ito (Panasonic Corp.)

Sunao Kurimura (National Institute for Materials Science)

Members

Adrian Avramescu (Osram AG)

Vikram Bhatia (Corning Inc.)

Corin Gawith (Covesion Ltd.)

Masafumi Ide (Citizen Holdings Co., Ltd.)

Jae Kwon (LG Electronics)

Hiroshi Murata (Osaka Univ.)

Shing-Chung Wang (National Chiao Tung Univ.)

Mitsuyoshi Watanabe (Brother Industries, Ltd.)

Tetsuya Yagi (Mitsubishi Electric Corp.)

Advisory Members

Yasuhiro Koike (Keio Univ.)

Shigeo Kubota (Oxide Corp.)

Hiroaki Sugiura (Mitsubishi Electric Corp.)

Toshiaki Suhara (Osaka Univ.)

SECRETARIAT

Yuko Tsutsumi (Univ. of Tokyo)

Sponsored by
The Japan Society of Applied Physics (JSAP)

Organized by
Laser Display Technology Group (LDT),
Optical Society of Japan (OSJ), The Japan
Society of Applied Physics (JSAP)

Kazuo Kuroda
Conference Chair
(Utsunomiya Univ.)

Tuesday, April 23

9:30-10:00

Opening Remarks of OPIC'13

Room 301,302

10:00-11:55

Keynote Lectures of OPIC'13

Room 301,302

(See page 7)

---- Lunch Break (11:55-13:20) ----

13:20-15:20

Joint Plenary Sessions of OPIC'13

Room 301,302,303

(See Page 7)

---- Break (15:20-15:45) ----

15:45-18:00

LDC-LIC Joint Session (Laser Display and Laser Ignition)

Room 301,302

Co-Chairs: T. Omatsu, *Program Committee Co-Chair of LDC'13, Chiba Univ., Japan*,
T. Taira, *General Chair of LIC'13, Institute for Molecular Science, Japan*

Joint Session Opening Remarks

15:45 T. Omatsu
Chiba Univ., Japan

LDC/LIC1-1 (Plenary) Nonlinear Optics for Displays and Combustion Measurements (Tentative)

15:50 M. Fejer
Stanford Univ., USA

LDC/LIC1-2 (Invited) Ultrafast Thin Disk Lasers and Their Potential for High Power RGB Frequency Generation

16:30 T. Sudmeyer
Univ. de Neuchâtel, Switzerland

LDC/LIC1-3 (Invited) High Repetition Rate MW Peak Power Green Microchip Laser

17:00 R. Bhandari, T. Taira
Institute for Molecular Science, Japan

LDC/LIC1-4 (Invited) Optical MEMS Scanners and Color Filters for Image Display Applications

17:30 H. Toshiyoshi
Univ. Tokyo, Japan

18:30- 20:30

Conference Reception

Room 501,502

Wednesday, April 24

9:00-9:10

Opening Remarks of LDC'13

Room 301

9:00 K. Kuroda, *Conference Chair of LDC'13*
Utsunomiya Univ., Japan

9:10-10:30

LDC2: Plenary Session

Room 301

Chair: K. Kuroda, *Conference Chair of LDC'13*,
Utsunomiya Univ., Japan

LDC2-1 (Plenary) The Status of High-Brightness Laser Projectors

9:10 P. Janssens
Barco Entertainment Division, Belgium

LDC2-2 (Plenary) Watt-Class AlInGaN Blue and Green Laser Diodes

9:50 S. Nagahama, S. Masui, T. Miyoshi, D. Kasahara,
E. Okahisa, T. Hirao, T. Yanamoto
Nichia Corp., Japan

----- Break (10:30-10:45) -----

10:45-12:15

LDC3: Scanning Display Technology

Room 301

Chair: B. Schowengerdt, *Program Committee Co-Chair of LDC'13*, *Univ. Washington., USA*

LDC3-1 (Invited) The World's First-Vehicle Head-up Laser Display

10:45 A. Kurosawa, O. Utsuboya, T. Shimizu
Pioneer Corp., Japan

LDC3-2 (Invited) Scanning Laser Display Based on Biaxial Polysilicon MEMS Mirrors

11:15 U. Hofmann, J. Janes, V. Stenchly, F. Senger, C. Mallas, T. v. Wantoch, W. Benecke
Fraunhofer Institute for Silicon Technology ISIT, Germany

LDC3-3 RGB Laser Pico-Projection System Using a Fiber Bundle Combiner

11:45 S. Fukaya, T. Nozaki, M. Ide
Citizen Holdings Co., Ltd, Japan

LDC3-4 Beam-steering in Hollow ZrO₂/SiO₂ DBR Waveguides for 1D RGB Imaging

12:00 X. Gu, M. Nakahama, F. Koyama
Tokyo Institute of Technology, Japan

----- Lunch Break (12:15-13:30) -----

13:30-15:30

LDC4: Poster Session

Exhibition Hall D

LDCp4-1 Fiber Pigtailed Multi-Color Laser Module for Laser Display Applications Using Si-Platform Technology

M. Ide, K. Yoda, S. Fukaya, T. Komiyama, T. Nozaki
Citizen Holdings Co., Ltd., Japan

LDCp4-2 Low Threshold GaN-based Blue High Contrast Grating Surface-emitting Lasers

T. -T. Wu, S. -H. Wu, T. -C. Lu, S. -C. Wang
National Chiao Tung Univ., Taiwan

LDCp4-3 Light Extraction from Plastic Optical Fibers for Laser Backlight Units

K. Yasu, S. Kojima, I. Fujieda
Ritsumeikan Univ., Japan

LDCp4-4 Effect of Number of Pixels of Rectangular Shaped 1D SLM for Lensless Electronic Holography

A. Ueno¹, K. Nitta¹, O. Matoba¹, K. Fukue², M. Sasada², K. Ueta²
¹Kobe Univ., Japan, ²Dainippon Screen Mfg. Co., Ltd., Japan

LDCp4-5 Efficient Reduction of Speckle Contrast Ratio in Scanning Laser Projectors

P. -C. Yeh¹, J. -H. Hong¹, Y. -T. Wang¹, Y. -M. Lin¹, J. -H. Lee¹, H. -Y. Lin¹, L. -H. Peng¹, C. -M. Lai², C. -C. Tu³, C. -H. Lin³
¹National Taiwan Univ., Taiwan, ²Ming Chuan

Univ., Taiwan, ³Touch Micro-System Technology, Taiwan

- LDCp4-6 **Verification of Speckle Contrast Measurement Interrelation with Observation Distance**
K. Suzuki, T. Fukui, S. Kubota, Y. Furukawa
Oxide Corp., Japan
- LDCp4-7 **Modification of Multiple Phase Modulations for Electronic Holography**
A. Nakagawa, T. Wakizaka, K. Nitta, O. Matoba
Kobe Univ., Japan
- LDCp4-8 **A Study of Optical Design of Extreme High Contrast Laser Projector with Liquid Crystal Elements**
W. -T. Li, Y. -C. Fang
National Kaohsiung First Univ. of Science and Technology, Taiwan
- LDCp4-9 **Laser-LCOS Projector: Design and Verification**
B. Na, L. Bao, W. Wang
East China Normal Univ., China
- LDCp4-10 **Interactive Projection System that Follows User's View Using Laser Pico-Projector and RGB-D Cameras**
J. Imai, S. Takihara
Chiba Institute of Technology, Japan
- LDCp4-11 **Research on Measuring Luminosity & Chromaticity Performance for Laser Display**
W. Wang¹, H. Liu^{1,2}
¹East China Normal Univ., China, ²Shanghai Dianji Univ., China

15:30-17:00

LDC5: High Power Visible Lasers

Room 301

Chair: S. Kurimura, Program Committee Co-Vice Chair of LDC'13, National Institute for Materials Science, Japan

- LDC5-1 **(Invited) Development of Multi-Watt CW Lasers with Switchable Output Across Green, Yellow and Red Wavelengths**
15:30 A. Lee
Macquarie Univ., Australia
- LDC5-2 **(Invited) Compact Low-Cost Green Lasers for Laser Display Applications**
16:00 C. -Q. Xu, J. Sun, Y. Gan
McMaster Univ., Canada
- LDC5-3 **Continuous-wave Frequency-doubled Planar Waveguide Nd:YVO₄ Laser Operated at 543 nm**
16:30 Y. Akino, F. Shoda, H. Fukahori, K. Kuramoto, T. Yanagisawa, Y. Hirano
Mitsubishi Electric Corp., Japan
- LDC5-4 **Study on Thermal Lensing Effect for High Power Green SHG Laser**
16:45 H. H. Lim¹, S. Kurimura¹, K. Noguchi^{1,2}, W. Nagashima^{1,2}, I. Shoji²
¹National Institute for Materials Science, Japan, ²Chuo Univ., Japan

----- Break (17:00-17:15) -----

17:15-18:45

LDC6: Special Session (Standard for Laser Displays)

Room 301

Chair: P. Janssens, Barco Entertainment Division, Belgium

- LDC6-1 **(Invited) Wide-Gamut UHDTV System Colorimetry**
17:15 K. Masaoka
NHK Science & Technology Research Lab., Japan
- LDC6-2 **(Invited) Laser Display and Standardization in IEC**
17:45 Y. Hisatake
Japan Electronics & Information Technology Industries Association (JEITA), Japan
- LDC6-3 **(Invited) Safety Aspects of Modern Laser-based Displays**
18:15 E. Buckley
Pixtronix Inc., USA

Thursday, April 25

9:00-10:15

LDC7: Speckle Management 1

Room 301

Chair: C. -Q. Xu, McMaster Univ., Canada

- LDC7-1 **(Invited) Standardized Speckle Measurement Method Matched to Human Speckle Perception in Laser Projection Systems**
9:00 S. Roelandt¹, Y. Meuret¹, G. Verschaffelt¹, P. Janssens², H. Thienpont¹
¹Vrije Universiteit Brussel, Belgium, ²Barco - Entertainment Division, Belgium
- LDC7-2 **Speckle Reduction with Multiple Laser Pulses**
9:30 F. Shevlin
DYOPTYKA, Ireland
- LDC7-3 **An Investigation of Speckle Reduction Effect of a Moving Diffuser Sheet in a Laser Backlight System**
9:45 K. Sakuma¹, T. Arai², A. Tagaya¹, Y. Koike¹
¹Keio Univ., Japan, ²Enplas Corp., Japan
- LDC7-4 **Speckle Contrast Measurement of Spectrum-Broaden Laser Beam from Semiconductor Laser with Direct Modulation at Microwave Frequency**
10:00 H. Murata, K. Shibasaki, K. Yamamoto, Y. Okamura
Osaka Univ., Japan

----- Break (10:15-10:30) -----

10:30-11:45

LDC8: Speckle Management 2

Room 301

Chair: H. Murata, Program Committee Member of LDC'13,

Osaka Univ., Japan

LDC8-1 (Invited) Evaluation of Speckle Contrast with Holographic Illumination System

10:30 M. Kurashige, K. Ishida, O. Iwata, K. Nakatsugawa, Y. Ohyagi, M. Watanabe
Dai Nippon Printing Co., Ltd., Japan

LDC8-2 Nonuniform intensity Distribution of the Scattered Light by the Moving Diffuser Across the Projection Lens Pupil and its Influence in Speckle Reduction

11:00 Y. Tomita, K. Suzuki, T. Fukui, H. Tokita, S. Kubota
Oxide Corp., Japan

LDC8-3 8-Level Computer Generated Hologram as a Light Diffuser for Laser Display

11:15 O. Iwata, M. Kurashige, T. Takanokura, Y. Taniguchi, Y. Ohyagi, M. Watanabe
Dai Nippon Printing Co., Ltd., Japan

LDC8-4 Color Speckle

11:30 K. Kuroda¹⁾, T. Ishikawa¹⁾, M. Ayama¹⁾, S. Kubota²⁾
¹⁾Utsunomiya Univ., Japan, ²⁾Oxide Corp., Japan

----- Lunch Break (11:45-13:15) -----

13:15-14:30

LDC9: Visible Laser Diodes

Room 301

Chair: T. Yagi, Program Committee Member of LDC'13, Mitsubishi Electric Corp., Japan

LDC9-1 (Invited) High Power InGaN Based Green Laser Diodes on Semipolar GaN Substrates

13:15 M. Ueno¹⁾, S. Takagi¹⁾, Y. Enya¹⁾, T. Kyono¹⁾, M. Adachi¹⁾, Y. Yoshizumi¹⁾, T. Sumitomo¹⁾, Y. Yamanaka¹⁾, T. Kumano¹⁾, S. Tokuyama¹⁾, K. Sumiyoshi¹⁾, N. Saga¹⁾, K. Katayama¹⁾, T. Ikegami¹⁾, T. Nakamura¹⁾, K. Yanashima²⁾, H. Nakajima²⁾, K. Tasai²⁾, K. Naganuma²⁾, N. Fuutagawa²⁾, Y. Takiguchi²⁾, T. Hamaguchi²⁾, M. Ikeda²⁾

¹⁾Sumitomo Electric Industries, Ltd., Japan,
²⁾Sony Corp., Japan

LDC9-2 (Invited) Miniaturized Highly Brilliant Diode Laser Modules for Future Display Applications

13:45 K. Paschke, Chr. Fiebig, G. Blume, A. Sahn, D. Jedrzejczyk, D. Feise, G. Erbert
Ferdinand-Braun-Institut, Germany

LDC9-3 Reliability Study on High Power 638 nm Broad Stripe LD

14:15 H. Mitsuyama, T. Motoda, T. Nishida, N. Shimada, K. Kadoiwa, T. Yagi
Mitsubishi Electric Corp., Japan

----- Break (14:30-14:45) -----

14:45-15:45

LDC10: Advanced Technology for Laser Displays

Room 301

Chair: T. Omatsu, Program Committee Co-Chair of LDC'13, Chiba Univ., Japan

LDC10-1 (Invited) 45,000 Lumens Super High Brightness Laser Projection System

14:45 G. Zheng¹⁾, Y. Bi¹⁾, B. Yan¹⁾, Y. Wang¹⁾, T. Fang¹⁾, H. Cheng¹⁾, B. Wang¹⁾, Y. Qi¹⁾, Y. Zhang²⁾, J. Chen²⁾

¹⁾Chinese Academy of Sciences, China,

²⁾Phoebus Vision Opto-Electronics Technology Ltd., China

LDC10-2 Realistic Reproduction of Surface Highlight by Superposed Laser-scanning Projection Display

15:15 M. Yamaguchi, K. Suzuki, Y. Murakami
Tokyo Institute of Technology, Japan

LDC10-3 Development of the Backlight using the Laser Light Source for LCD

15:30 N. Nakano, E. Niikura, R. Murase, A. Nagase, T. Sasagawa, K. Minami, M. Hanai
Mitsubishi Electric Corp., Japan

----- Break (15:45-16:00) -----

16:00-16:15

LDC11: Post-deadline Session

Room 301

Chair: B. Schowengerdt, Program Committee Co-Chair of LDC'13, Univ. Washington., USA

LDC11-1 6-Chip Stereoscopic Laser Display System using Six Primary Colours (6P)

16:00 A. Simon, K. Rohwer, H. Jorke
Infitec GmbH, Germany

16:15-16:45

Award Ceremony & Closing Remarks

Room 301

Chair: T. Omatsu, Program Committee Co-Chair of LDC'13, Chiba Univ., Japan

Award Ceremony

16:15 K. Kuroda
Utsunomiya Univ., Japan

Closing Remarks

16:40 T. Omatsu
Chiba Univ., Japan