

出國報告（出國類別：國際會議）

參加 LCD2013 研討會

服務機關：國立高雄第一科技大學光電工程研究所

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派赴國家：日本

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摘要

本次參加 Yakohama Laser Display Conference，那是日本光學工業大展中的一部分。主要目的是論文發表，還有吸收日本光學工業大展裡的一些新技術，並與外國學者交流，日本光學工業大展主要包括：光學精密加工、光學量測、光學顯示技術、醫療器材、紅外軍用器材、雷射投影機、雷射掃描系統等多項技術。在 LDC 2013 裡，大部分是討論 Laser Speckle 的問題。

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一、目的：

1.目標:

本次出國的目標主要是發表研究成果，並且與國外學者交流，順便吸收國外的新技術。

2.研討會主題:

LDC 13 Yokohama 國際會議（Laser Display Conference）

3.預期效益或欲達成事項:

第一:發表國際論文一篇

第二:研究日本目前光學工業的發展方向

二、過程：

Yakohama Laser Display Conference，今年舉辦的地點在日本橫濱，時間是 4 月 23 日 - 25 日，是日本的公司和學術團體以及一些協會主辦的，那是日本光學工業大展中的一部分。

這次主要目的是論文發表。發表的研究主要為探討提高雷射投影機投影照明對比的設計。在於投影機的結構設計上，採用遠心光路的設計。用液晶透鏡陣列做為光源的區域調光系統，使投影機成像晶片元件上的對比度達到大幅的提升的目的。

近來，已經有把數位投影機整合到許多系統裡面的趨勢，更可能在未來人人都可以有一個隨身投影機可以隨時做簡報、教學使用、娛樂等用途。投影機有可能因為一些場合的需求，而大幅提升其部分特性。

例如：大幅提高亮度，在開燈的時候也能使用。大幅提高對比度，使畫質更加立體化。或者是縮小體積，可隨身攜帶的微投影機。又或者是降低熱問題等等方面。

而在投影機的光機設計中，主要常常針對「縮小光機體積、提高光效率、提高均勻度、增加對比度」四個方向著手設計，而每一個設計上為了不顧此失彼，也都均有要克服的難題。

我們證明雷射投影機與液晶光學的結合在新開發的光學設計，我們用軟體最佳化整個系統的設計。光學設計部分，達到光均勻度是 86.6%和光能的效率是 40%。局部調光所產生的液晶光學元件，將顯著地提高投影機對比度，高達 70%。

我們也在現場與一些外國學者討論我們的研究成果，從討論的過程中，發現了還有可以嘗試的可能，不過我們的成果，是受到肯定的。

除了發表我們的成果，參加 LDC' 13 還有吸收日本光學工業大展裡的一些新技術，並與外國學者交流，增加彼此的想法。

比起去年的會議，以前的會議有非常多的新產品，但是今年的新產品，實在有點少，而且沒有看到實物，只有簡單的介紹。

日本光學工業大展主要包括：光學精密加工、光學量測、光學顯示技術、醫療器材、紅外軍用器材、雷射投影機、雷射掃描系統等多項技術。

雷射顯示技術正在顯著和穩定的進步。正在開發新類型的系統和高性能的光源，每一年出現其中一些在市場上。在 LDC 2013 裡，大部分是討論 Laser Speckle 的問題。

三、心得：

近年來，日本光學工業衰微甚多，比起以前的會議，以前的會議有非常多的新產品，但是今年的新產品，幾乎舉不出例子來，頂多就是Pioneer的雷射掃描後照鏡，還有中國大陸報導的雷射投影機，但沒有看到實物，只有簡單的介紹。

四、建議事項：

建議方面，未來的光學工業應會以雷射及紅外光系統為重點項目，我建議可以加強這方面的研究。

附錄

大會議程表：

Laser Display Conference'13 LDC'13

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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 page7)

— Lunch Break (11:55-13:20) —

13:20-15:20

Joint Plenary Sessions of OPIC'13

Room 301,302,303

(See Page7)

— 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. Miyochi, D. Kazahara,
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. Janaz, V. Stenchi, 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. Kajima, 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. Sasada³⁾, K. Ueta⁴⁾
¹⁾Kobe Univ., Japan, ²⁾Dainippon 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⁾
¹⁾National Taiwan Univ., Taiwan, ²⁾Ming Chuan

- Univ., Taiwan, ³⁾Touch 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)}
¹⁾East China Normal Univ., China, ²⁾Shanghai 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
A. Lee
Macquarie Univ., Australia
- LDC5-2** (Invited) Compact Low-Cost Green Lasers for Laser Display Applications
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
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
H. H. Lim¹⁾, S. Kurimura¹⁾, K. Noguchi^{1),2)}, W. Nagashima^{1),2)}, I. Shoji²⁾
¹⁾National Institute for Materials Science, Japan, ²⁾Chuo 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
K. Masaoka
NHK Science & Technology Research Lab., Japan
- LDC6-2** (Invited) Laser Display and Standardization in IEC
Y. Hisatake
Japan Electronics & Information Technology Industries Association (JEITA), Japan
- LDC6-3** (Invited) Safety Aspects of Modern Laser-based Displays
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
S. Roelandt¹⁾, Y. Meurer¹⁾, G. Verschaffel¹⁾, P. Janssens²⁾, H. Thierpont¹⁾
¹⁾Vrije Universiteit Brussel, Belgium, ²⁾Barco – Entertainment Division, Belgium
- LDC7-2** Speckle Reduction with Multiple Laser Pulses
F. Shevlin
DIOPTIKA, Ireland
- LDC7-3** An Investigation of Speckle Reduction Effect of a Moving Diffuser Sheet in a Laser Backlight System
K. Sakuma¹⁾, T. Arai²⁾, A. Tagaya¹⁾, Y. Koike¹⁾
¹⁾Keio Univ., Japan, ²⁾Enplas Corp., Japan
- LDC7-4** Speckle Contrast Measurement of Spectrum-Broaden Laser Beam from Semiconductor Laser with Direct Modulation at Microwave Frequency
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. Awata, 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. Awata, 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. Kusanagi¹⁾, S. Tokuyama¹⁾, K. Sumiyochi¹⁾, N. Saga¹⁾, K. Katayama¹⁾, T. Ikegami¹⁾, T. Nakamura¹⁾, K. Yanashima¹⁾, H. Nakajima²⁾, K. Tazai²⁾, K. Naganuma²⁾, N. Funayagawa²⁾, 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. Sahm, D. Jedrzycki, D. Feise, G. Erbert
Ferdinand-Braun-Institut, Germany
- LDC9-3** Reliability Study on High Power 638 nm Broad Stripe LD
14:15 H. Mitsuqama, 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⁾Phoenix 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. Niihara, R. Murase, A. Nagase, T. Sazagawa, 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. Rohrer, H. Jorke
Hyttac 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