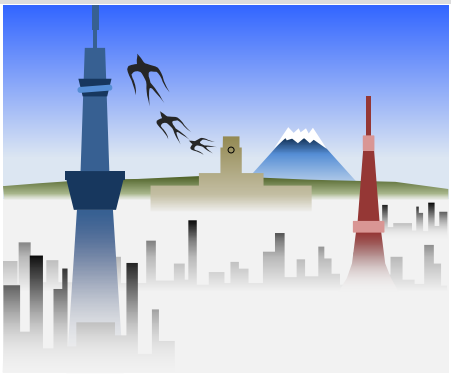
ADVANCE PROGRAM



MOC '13

18th MICROOPTICS CONFERENCE

held as ICO Topical Meeting

http://www.comemoc.com/moc13/

Sponsored by the Japan Society of Applied Physics (JSAP)
Operated by Microoptics Group, Optical Society of Japan, JSAP

Technically co-sponsored by

- IEEE Photonics Society

In cooperation with

- International Commission for Optics
- The International Union of Pure and Applied Physics
- Tokyo Institute of Technology
- The Optical Society
- IEICE Electronics Society
- The Chemical Society of Japan
- The Society of Polymer Science, Japan
- The Laser Society of Japan
- Optoelectronic Industry and Technology Development Association
- Japan Optoelectro-Mechanics Association
- JSPS / The 125th Committee
- JSPS / The 130th Committee

Oct. 27 (Sun.)-Oct. 30 (Wed.), 2013

Tokyo Institute of Technology

Tokyo, Japan

MOC ’13 Agenda At-A-Glance

October 27 (Sun.)		October 28 (Mon.)	
8:30		8:30	*Registration Open*
9:00		9:00	**Opening**
9:30		9:30	**A: Plenary**
10:00		10:00	
10:30		10:30	
			Break
11:00		11:00	**B: Transmission Technologies and Devices**
11:30		11:30	
12:00		12:00	
12:30		12:30	
13:00	*Registration Open*	13:00	*Lunch*
13:30		13:30	
14:00	**Microoptics Review 1**	14:00	**C: VCSELs**
14:30		14:30	
	Break		
15:00	**Microoptics Review 2**	15:00	
15:30		15:30	*Break*
	Break		**D: Display and Illumination**
16:00	**Microoptics Review 3**	16:00	
16:30		16:30	
	Break		
17:00	**Get Together**	17:00	
17:30		17:30	*Break*
18:00		18:00	**E: Special Session**
18:30		18:30	
19:00		19:00	
19:30		19:30	
20:00		20:00	
20:30		20:30	

MOC '13 Agenda At-A-Glance

October 29 (Tue.)		October 30 (Wed.)	
8:30	*Registration Open*	8:30	*Registration Open*
9:00	**F: Optical Switches**	9:00	**J: Interconnection**
9:30		9:30	
10:00		10:00	
10:30	*Break*	10:30	
	G: Functional Devices		*Break*
11:00		11:00	**K: Sensing**
11:30		11:30	
12:00		12:00	
12:30		12:30	
13:00	*Lunch*	13:00	*Lunch*
13:30		13:30	
14:00	**H: Poster**	14:00	**L: Imaging**
14:30		14:30	
15:00		15:00	
15:30		15:30	
			Break
16:00		16:00	**PD: Post Deadline**
16:30	*Break*	16:30	**Award/Closing**
17:00	**Micro Concert**	17:00	
17:30		17:30	
18:00	**Conference Party**	18:00	
18:30		18:30	
19:00		19:00	
19:30		19:30	
20:00		20:00	
20:30		20:30	

Technical Program

The 18th Microoptics Conference (MOC '13) will be held at Tokyo Institute of Technology, Tokyo, Japan on October 27 - October 30, 2013. This conference is sponsored by the Japan Society of Applied Physics (JSAP) and organized by Microoptics Group, the Optical Society of Japan (OSJ), JSAP and in cooperation with several academic societies and associations. The MOC '13 will be held as ICO Topical Meeting.

The MOC '13 is intended to provide a central forum for an update and review of scientific and technical information covering a wide range of microoptics field from fundamental researches to systems and applications.

The latest information will be available on the following web site:

http://www.comemoc.com/moc13/

Microoptics Review

Important topical fields of microoptics are lectured as microoptics review to be held in Royal Blue Hall on Sunday, 27 October. Students are free to attend this tutorial without the registration.

"History and Future of Ultra-high Capacity Optical Communications"

Y. Kokubun, *Yokohama National Univ., Japan*

"Nonlinear Effects in Optical Fiber"

K. Kuroda, *Utsunomiya Univ., Japan*

"Interferometers in Microoptics"

H. Nakajima, *Waseda Univ., Japan*

Plenary Session

Plenary session will be held in Kuramae Hall on Monday, 28 October. The following papers are invited as the plenary talks.

"Microoptical systems for consumer's hands "

A. Bräuer, *Fraunhofer IOF, Germany*

"Silicon photonic advanced modulation format transceivers"

C. Doerr, *Acacia Communications Inc., USA*

"Exa-bit optical communication exploring by 3M scheme"

M. Nakazawa, *Tohoku Univ., Japan*

ICO Special Talk

In session G: Functional Devices on Tuesday, 29 October.

"Recent developments in gradient index optics"

D. T. Moore, *ICO President, Univ. Rochester, USA*

Franklin Award Memorial Lecture

In session C: VCSELs on Monday, 28 October.

"VCSEL –Its conception, development, and future–"

K. Iga, *Tokyo Inst. Tech., Japan*

Special Session

A special session will be held on Monday, 28 October, which focuses on "Green Photonics". In this session, researches on energy conservation of display and lighting by new solid light sources, new concept of plant factory, energy conversion from sunlight to laser light, energy conservation in switches and routers are discussed. It is expected that these technologies will contribute to new global environmental issues in the future.

Organizers

K. Hamamoto, *Kyushu Univ., Japan*
K. Yamamoto, *Osaka Univ., Japan*

Special Invited Talk

"Laser application on plant factory"

H. Murase, *Osaka Prefecture Univ., Japan*

Invited Talks

"Highly efficient OLED lighting for eco-solution"

Y. Matsuhisa, *Panasonic Corp., Japan*

"Development of laser backlight LCD TV"

N. Nakano, *Mitsubishi Electric Corp., Japan*

"Development of efficient solar-pumped laser for renewable energy creation"

T. Ogawa, *Riken, Japan*

"Novel 3D die-stacked opto-electronic transceiver ICs that allow for wafer-scale fabrication: application in switches and routers"

H. J. S. Dorren, *Eindhoven Univ. Tech., The Netherlands*

Oral Presentation

Oral session is to be held in Kuramae Hall. The presentation time (including discussion) will be 30 minutes for invited papers, 15 minutes for regular papers, and 10 minutes for post deadline papers. All the speakers are requested to present the paper with a data projector. Prior to the starting time of the session, the speakers are asked to contact the session chairs and to confirm the connection between their computer and the projector.

Poster Session

Poster session will be held in Royal Blue Hall and Gallery in the afternoon of Tuesday, 29 October. For the convenience of the participants, this session will be divided into two parts. The first half (14:00-15:15) is for authors with the paper of odd-number (H1, H3, …) and the second half (15:15-16:30) is for authors with the paper of even-number (H2, H4, …). Authors should stay by turns in the vicinity of the bulletin board for discussion. Each author is requested to display materials on a 110 cm wide and 165 cm high bulletin board.

Post Deadline Papers

A limited number of post deadline papers will be accepted for the post deadline oral session or the poster session. Latest significant results obtained after the regular deadline are most welcome. Post deadline papers should be submitted electronically. A detailed instruction as well as the paper template is available from the following Web site:

http://www.comemoc.com/moc13/

The deadline for submission is **September 30, 2013**.

Special Issue

A special issue on Microoptics of the Japanese Journal of Applied Physics (JJAP) is scheduled for publication in Aug. 2014. Authors of papers for MOC '13 are encouraged to submit original papers to the special issue. The instructions for preparation of manuscript will be given to the authors. The deadline for submission of manuscripts is 15 January, 2014. Submitted papers will be reviewed based on the JJAP standard.

Official Language

The official language of MOC ’13 is English.

Photograph

No photograph is permitted during the oral and poster sessions.

Social Events & Exhibition

Get Together

“Get Together” will be held in Foyer in the evening of Sunday, 27 October. All the attendees of MOC ’13 are cordially invited.

MOC Award Ceremony

MOC Award Ceremony will be held in Kuramae Hall at 16:30, Wednesday, 30 October.

Micro Concert

“Micro Concert” will be performed by Machida Philharmony Baroque Ensemble (MPB) in Multi-Purpose Digital Hall, 17:00-18:00 Tuesday 29, October. All the attendees of MOC '13 and their accompanying family are invited to the concert.

Conference Party

In the evening of Tuesday, 29 October, Conference Party starts at 18:00 right after the concert at Kuramae Hall. Participants who want to attend the party are requested to make registration. The party registration fee is ¥3,000 per person.

Technical Exhibition

Table-top technical exhibition is planned during MOC '13. Take this opportunity to see the latest products and technologies in relation to microoptics. Exhibition will be held in Gallery. For information about exhibiting at this conference, please contact:

MOC'13 Registration Desk
Event & Convention House, Inc.
Shuwa-Okachimachi Bldg. 8F
4-27-5, Taito, Taito-ku, Tokyo 110-0016, Japan
Phone: +81-3-3831-2601
Fax: +81-3-5807-3019
E-mail: regdesk@moc2013.com

Technical Sessions

Sunday, 27 October

Royal Blue Hall

14:00-16:50 Microoptics Review (Tutorial)

TU1 14:00 **History and future of ultra-high capacity optical communications**
Y. Kokubun, *Yokohama National Univ.*

Break (14:50-15:00)

TU2 15:00 **Nonlinear effects in optical fiber**
K. Kuroda, *Utsunomiya Univ*.

Break (15:50-16:00)

TU3 16:00 **Interferometers in microoptics**
H. Nakajima, *Waseda Univ*.

Foyer

17:00-18:00 Get Together

MOC '13

October 27 - October 30, 2013
Tokyo Institute of Technology
Tokyo, Japan

Important Deadlines

Early Registration:	September 30, 2013
Hotel Accommodations:	September 26, 2013
Post Deadline Papers:	September 30, 2013

Technical Sessions

Monday, 28 October

Kuramae Hall

9:00-9:15 Opening Remarks
Conference Co-chairs:
S. Ozawa, *Furukawa Electric Co., Ltd.*
T. Miyamoto, *Tokyo Inst. Tech.*

9:15-10:45 Session A: Plenary
Chairs: S. Ozawa, *Furukawa Electric Co., Ltd.*
T. Miyamoto, *Tokyo Inst. Tech.*

A1 9:15 **Microoptical systems for consumer's hands** (Plenary)
A. Bräuer, *Fraunhofer IOF*

A2 9:45 **Silicon photonic advanced modulation format transceivers** (Plenary)
C. Doerr, *Acacia Communications Inc.*

A3 10:15 **Exa-bit optical communication exploring by 3M scheme** (Plenary and Japan Academy Prize Talk)
M. Nakazawa, *Tohoku Univ.*

Break (10:45-11:00)

11:00-12:45 Session B: Transmission Technologies and Devices
Chairs: J. E. Batubara, *Bina Nusantara Univ.*
H. Oohashi, *NTT Corp.*

B1 11:00 **Tbit/s optical communications using orbital angular momentum** (Invited)
A. E. Willner, *Univ. Southern California*

B2 11:30 **Single-stripe tunable laser with chirped sampled gratings fabricated by nanoimprint lithography**
H. Yoshinaga[1], M. Yanagisawa[1], T. Kaneko[1], K. Akiyama[2], M. Tajima[1], D. Shoji[2], T. Fujii[2], and H. Shoji[1], *[1]Sumitomo Electric Industries, Ltd., [2]Sumitomo Electric Device Innovations, Inc.*

B3 11:45 **Direct optical coupling to a SMF array with a multi-channel lens-integrated surface-emitting DFB laser for a low-cost optical module**
K. Adachi, A. Takei, T. Suzuki, and S. Tanaka, *Hitachi, Ltd.*

B4 12:00 **Bit-error-performance of 10-Gb/s silicon Mach-Zehnder modulator module in 100-km optical-fiber transmission**
H. Ishihara[1], K. Oda[1], T. Ori[1], K. Goi[1], K. Ogawa[1],T.-Y. Liow[2], X. Tu[2], G.-Q. Lo[2], and D.-L. Kwong[2], *[1]Fujikura Ltd, [2]A*STAR*

B5 12:15 **Low driving power push-pull modulator for multi-wavelength modulation and 4×4 switch using silicon microring resonator loaded Mach-Zehnder interferometers by thermo-optic effect**
R. Gautam, S. Ishihara, H. Kaneshige, T. Arakawa, and Y. Kokubun, *Yokohama National Univ.*

B6 12:30 **Silica planar lightwave circuit collimator with UV-cured resin as integrated multilayered lenses**
N. A. Idris[1], K. Sorimoto[1], H. Tsuda[1], and H. Uetsuka[2], *[1]Keio Univ., [2]AIST*

Lunch (12:45-14:00)

14:00-15:30 Session C: VCSELs
Chairs: V. Bardinal, *LAAS-CNRS*
Y. Ando, *Fujikura Ltd.*

Technical Sessions

Monday, 28 October

C1 14:00 **VCSEL - Its conception, development, and future -** (Franklin Award Memorial Lecture)
K. Iga, *Tokyo Inst. Tech.*

C2 14:15 **High-speed and low-voltage operation of compact Bragg reflector waveguide modulator**
X. Gu, S. Shimizu, T. Shimada, A. Matsutani, and F. Koyama, *Tokyo Inst. Tech.*

C3 14:30 **Wavelength tuning and controlled temperature dependence of MEMS VCSELs with thermally and electrostatically actuated micromachined mirror**
M. Nakahama, H. Sano, S. Inoue, T. Sakaguchi, A. Matsutani, and F. Koyama, *Tokyo Inst. Tech.*

C4 14:45 **Modulation response enhancement of transverse-coupled cavity VCSELs for radio over fiber applications**
H. Dalir and F. Koyama, *Tokyo Inst. Tech.*

C5 15:00 **Three-dimensional integrated optical interconnect with laser and photodetector on SOI substrate**
P.-K. Shen, C.-T. Chen, S.-L. Li, C.-H. Chang, S.-H. Lin, C.-C. Chang, H.-C. Lan, and M.-L. Wu, *National Central Univ.*

C6 15:15 **1 x 2 vertically optical splitter with 10-Gbps transmission rate for chip-level optical interconnects**
C.-T. Chen[1], P.-K Shen[1], T.-Z. Zhu[1], T.-Y. Huan[1], C.-C. Chang[1], H.-L. Hsiao[2], H.-C. Lan[1], Y.-C. Lee[2], Y.-S. Lin[1], and M.-L. Wu[1], *[1]National Central Univ., [2]Centera Photonics Inc.*

Break (15:30-15:45)

15:45-17:30 Session D: Display and Illumination
Chairs: Y.-J. Kim, *Yonsei Univ.*
T. Yamazaki, *Olympus Corp.*

D1 15:45 **Micro-optics for intelligent displays** (Invited)
H.-P. D. Shieh, *National Chiao Tung Univ.*

D2 16:15 **Wide luminance angular distribution and low color shift liquid crystal displays with surface diffusing system**
N. Munemura, D. Sekine, A. Tagaya, and Y. Koike, *Keio Univ.*

D3 16:30 **A highly polarized laser backlight for liquid crystal displays**
K. Sakuma[1], T. Kurashima[1], T. Arai[2], A. Tagaya[1], and Y. Koike[1], *[1]Keio Univ., [2]Enplas Inc.*

D4 16:45 **Design and fabrication of semi-transparent screen using micro patterns and metal coating for head-up display**
J.-Y. Lee, H.-G. Hong, and Y.-J. Kim, *Yonsei Univ.*

D5 17:00 **Photo-luminescence of rare earth complexes in the molecular films** (Invited)
M. Hasegawa, *Aoyama Gakuin Univ.*

Break (17:30-18:00)

18:00-20:40 Session E: Special Session "Green Photonics"
Chairs: K. Hamamoto, *Kyushu Univ.*
K. Yamamoto, *Osaka Univ.*

E1 18:00 **Laser application on plant factory** (Special Invited)
H. Murase, *Osaka Prefecture Univ.*

E2 18:40 **Highly efficient OLED lighting for eco-solution** (Invited)
Y. Matsuhisa, *Panasonic Corp.*

E3 19:10 **Development of laser backlight LCD TV** (Invited)
N. Nakano, *Mitsubishi Electric Corp.*

E4 19:40 **Development of efficient solar-pumped laser for renewable energy creation** (Invited)
T. Ogawa, S. Wada, and M. Higuchi, *Riken*

E5 20:10 **Novel 3D die-stacked opto-electronic transceiver ICs that allow for wafer-scale fabrication: application in switches and routers** (Invited)
P. Duan, O. Raz, and H. J. S. Dorren, *Eindhoven Univ. Tech.*

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Technical Sessions

Tuesday, 29 October

Kuramae Hall

9:00-10:30 Session F: Optical Switches
Chairs: C. Doerr, *Acacia Communications Inc.*
H. Kanamori, *Sumitomo Electric Ind., Ltd.*

F1 9:00 Colorless optical add/drop using small matrix switch and cyclic AWG
T. Watanabe, S. Sohma, and S. Kamei, *NTT Corp.*

F2 9:15 Wavelength selective switch with high angular dispersion element based on Bragg reflector waveguide
X. Gu[1], K. Seno[2], H. Tanobe[2], and F. Koyama[1], *[1]Tokyo Inst. Tech., [2]NTT Corp.*

F3 9:30 Compact 5×5 wavelength-selective cross connect using integrated 2-D MEMS mirror arrays
K. Sorimoto[1], H. Uetsuka[2], M. Tachikura[2], H. Kawashima[2], M. Mori[2], T. Hasama[2], H. Ishikawa[2], N. A. Idris[1], and H. Tsuda[1], *[1]Keio Univ., [2]AIST*

F4 9:45 High-speed, hybrid integrated, 1x2 wavelength selective switch using PLZT optical switches and silica planar lightwave circuits
H. Asakura[1], K. Nashimoto[2], D. Kudzuma[2], H. Kawashima[3], and H. Tsuda[1], *[1]Keio Univ., [2]EpiPhotonics Corp., [3]AIST*

F5 10:00 Design and fabrication of low loss 1×8 silica-based phased array switch with low power consumption
S. Katayose, Y. Hashizume, A. Mori, and M. Itoh, *NTT Corp.*

F6 10:15 Low-loss silicon partial-rib waveguide polarization rotator
K. Goi[1], A. Oka[1], H. Kusaka[1], K. Ogawa[1], T.-Y. Liow[2], X. Tu[2], G.-Q. Lo[2], and D.-L. Kwong[2], *[1]Fujikura Ltd., [2]A*STAR*

Break (10:30-10:45)

10:45-12:45 Session G: Functional Devices
Chairs: A. G. Mignani, *CNR-IFAC*
S. Yasuda, *Fuji Xerox Co., Ltd.*

G1 10:45 Novel ballpoint pen interconnection for high speed graded index plastic optical fiber network
K. Makino[1], S. Mine[2], A. Mitsui[2], T. Torikai[3], H. Takizuka[1], H. Suzuki[2], and Y. Koike[1], *[1]Keio Univ., [2]Mitsubishi Pencil Co., Ltd., [3]Iron City Micro Display, Inc.*

G2 11:00 Supercontinuum generation in all solid photonic crystal fiber with flat all-normal dispersion
R. Buczynski[1,2], B. Siwicki[1,2], M. Klimczak[2], D. Pysz[2], T. Martynkien[3], P. Skibinski[4], C. Radzewicz[1], and R. Stępień[2], *[1]Univ. Warsaw, [2]Inst. Electronic Materials Tech., [3]Wroclaw Univ. Tech., [4]Polish Academy Sciences*

G3 11:15 Turnkey, high power dissipative soliton all fiber laser using a hybrid modelocking mechanism
B. Xu[1], A. Martinez[1], S. Y. Set[2], C. S. Goh[2], and S. Yamashita[1], *[1]Univ. Tokyo, [2]Alnair Labs Corp.*

G4 11:30 All optical flip-flop and inverter using adjacent lasing wavelengths emitting from semiconductor microring laser
T. Miyamoto, S. Umehara, H. Kobayashi, R. Taniguchi, R. Katouf, T. Arakawa, and Y. Kokubun, *Yokohama National Univ.*

G5 11:45 **Timing detector using cross gain modulation in semiconductor optical amplifier for adaptive all-optical signal processing**
D. Hisano, A. Maruta, and K. Kitayama, *Osaka Univ.*

G6 12:00 **Electro-optic polarization conversion type modulator for short-wavelength light using periodically poled $MgO:LiNbO_3$**
T. Inoue and T. Suhara, *Osaka Univ.*

G7 12:15 **Recent developments in gradient index optics**
(ICO Special Talk)
D. T. Moore, *ICO President, Univ. Rochester*

Lunch (12:45-14:00)

Royal Blue Hall & Gallery

14:00-16:30 Session H: Poster Session
Chairs: R. Katayama, *Fukuoka Inst. Tech.*
M. Itoh, *NTT Corp.*

(14:00-15:15) Odd numbers: 1st half
(15:15-16:30) Even numbers: 2nd half

H1 **Proposal of optical mode switch configuration for four modes**
R. Takakura, A. Fujino, T. Tanaka, and K. Hamamoto, *Kyushu Univ.*

H2 **Design of polymer waveguide couplers for mode-division-multiplexing applications**
J. Dong and K. S. Chiang, *City Univ. Hong Kong*

H3 **Characterization and analysis of the roughness induced double-dip spectrum of SOI micro-ring resonator**
C.-Y. Chen[1], C.-W. Tsai[1], C.-W. Tseng[1,2], C.-Y. Wang[1], H.-T. Lin[1], and Y.-J. Chen[1], *[1]National Sun Yat-sen Univ., [2]National Tsing Hua Univ.*

H4 **On realizing bipolar optical access codecs with Walsh-coded liquid crystal modulators**
C.-T. Yen[1], J.-F. Huang[2], and P.-E. Chih[2], *[1]National Formosa Univ., [2]National Cheng Kung Univ.*

H5 **Noise tolerance in QPSK label recognition with optical passive waveguide circuits**
Y. Makimoto[1,2], N. Goto[1], and S. Yanagiya[1], *[1]Univ. Tokushima, [2]Shikoku Electric Power Co., Inc.*

H6 **Polymeric wavelength division multiplexing coupler with fiber guide and filter trench fabricated by one-step replication process for bi-directional communication**
O. Sugihara and T. Kaino, *Tohoku Univ.*

H7 **Design, fabrication, and characterization of hybrid structure**
T. Saastamoinen[1], J. Väyrynen[2], A. Partanen[1], H. Tuovinen[1], J. Mutanen[1], K. Mönkkönen[2], and M. Kuittinen[1], *[1]Univ. Eastern Finland, [2]Karelia Univ. Applied Sciences*

H8 **Optical mode converter using multi-mode interference structure**
Y. Chaen, R. Tanaka, and K. Hamamoto**,** *Kyushu Univ.*

Technical Sessions

Tuesday, 29 October

H9 **Spatial mode multiplexer/demultiplexer based on tapered hollow waveguide with lateral optical confinement structure**
H. Yamakawa, M. Sadamitsu, T. Sakaguchi, and F. Koyama, *Tokyo Inst. Tech.*

H10 **Polymer wavelength-selective filter using high-mesa structure directly-coupled double micro-ring resonators**
Y. Takei[1], A. Matsumoto[1], A. Matsushita[1], K. Akahane[2], Y. Matsushima[1], and K. Utaka[1], *[1]Waseda Univ., [2]NICT*

H11 **Integrated silicon grating waveguides with ferroelectric liquid crystal cladding for optical tunable wavelength filters**
A. Kato, K. Nakatsuhara, and Y. Hayama, *Kanagawa Inst. Tech.*

H12 **Mach-Zehnder filter using multiple Si waveguide structure sections with polarization independence or splitter function attained by custom-made interference conditions**
H. Okayama[1,2,3], Y. Onawa[1,2,3], D. Shimura[3], S. Miyamura[3], H. Takahashi[1,2,3], H. Yaegashi[1,2,3], and H. Sasaki[3], *[1]PECST, [2]PETRA, [3]Oki Electric Industry Co., Ltd.*

H13 **Tolerance to phase and amplitude deviations in optical waveguide circuit for recognition of 16QAM codes**
K. Inoshita, N. Goto, and S. Yanagiya, *Univ. Tokushima*

H14 **SIngle-mode optical waveguide of polysilane irradiated by ultra-violet light**
S. Kawai[1], S. Oishi[2], and L. ChuanXin[3], *[1]Opto-eCollege Corp., [2]National Kibi-Kogen Vocational Rehabilitation Center, [3]Trichemical Lab. Inc.*

H15 **High extinction-ratio characteristics over 60 dB Mach-Zehnder modulator with asymmetric power splitting Y-branches on X-cut Ti:$LiNbO_3$**
Y. Yamaguchi[1], S. Nakajima[2], A. Kanno[2], T. Kawanishi[2], M. Izutsu[1], and H. Nakajima[1], *[1]Waseda Univ., [2]NICT*

H16 **Effectiveness of double phase conjugate mirror for optical inter-satellite communication with large shift tolerance**
K. Nishimaki[1], A. Okamoto[1], A. Tomita[1], Y. Takayama[2], and M. Bunsen[3], *[1]Hokkaido Univ., [2]NICT, [3]Fukuoka Univ.*

H17 **First demonstration of high intrinsic modulation bandwidth (26.4 GHz) in active multimode interferometer laser diode by using split pumping configuration**
M. N. Uddin[1], T. Kizu[1], Y. Hinokuma[1], K. Tanabe[1], A. Tajima[2], K. Kato[1], and K. Hamamoto[1], *[1]Kyushu Univ., [2]NEC Corp.*

H18 **Fundamental characteristics of 1550nm-band 20-layer-stacked QD-SOA grown on InP(311)B substrate for all-optical logic gate device**
A. Matsumoto[1], Y. Takei[1], A. Matsushita[1], K. Akahane[2], Y. Matsushima[1], and K. Utaka[1], *[1]Waseda Univ., [2]NICT*

H19 **Acceleration of wavelength switching for tunable distributed amplification (TDA-) DFB lasers**
H. Onji[1], S. Takeuchi[1], N. Nunoya[2], M. Shimokozono[2], H. Ishii[2], and K. Kato[1], *[1]Kyushu Univ., [2]NTT Corp.*

H20 **Wavelength stabilization of tunable lasers based on thermal-drift canceler**
S. Takeuchi[1], H. Onji[1], N. Nunoya[2], M. Shimokozono[2], H. Ishii[2], and K. Kato[1], *[1]Kyushu Univ., [2]NTT Corp.*

H21 **All-optical gain control scheme for a remotely pumped multicore erbium-doped fiber amplifier**
K. Kitamura, H Tanaka, K. Tayama, and H. Masuda, *Shimane Univ.*

H22 **Noise reducing effect of negative feedback optical amplifier using an optical triode**
M. S. Azmi, Y. Fujikawa, S. A. Azizan, H. Tanimoto, and Y. Maeda, *Kinki Univ.*

H23 **Propagation characteristics in free-space laser communications with error correction**
M. Sakamoto and K. Ogawa, *Japan Women's Univ.*

H24 **10-Gbit/s QPSK×single-channel Fourier-encoded synchronous OCDM transmission over 50-km SMF**
Y. Okamura[1], O. Iijima[1], S. Shimizu[2], N. Wada[2], and M. Hanawa[1], *[1]Yamanashi Univ., [2]NICT*

H25 **HCG reflectivity characteristics for a small-sized beam spot**
A. Kikuchi, D. Nakagawa, and T. Miyamoto, *Tokyo Inst. Tech.*

H26 **Electro-optic polymer waveguides fabrication using thermal imprint lithography technology**
F. Tan, T. Hirata, O. Sugihara, and T. Kaino, *Tohoku Univ.*

H27 **Beam propagation in all-glass nanostructured gradient index microlenses**
R. Buczyński[1,2], A. J. Waddie[3], J. Nowosielski[2,3], A. Filipkowski[1,3], I. Kujawa[1], D. Pysz[1], R. Stępień[1], and M. R. Taghizadeh[3], *[1]Inst. Electronic Materials Tech., [2]Univ. Warsaw, [3]Heriot-Watt Univ.*

H28 **Conversion of two polarizations into different order single polarization modes using slanted sidewall silicon wire waveguide and its application to polarization independent wavelength filtering**
H. Okayama[1,2,4], H. Yaegashi[1,2,4], H. Sasaki[4], H. Nishi[1,2,3], and K. Yamada[1,2,3], *[1]PECST, [2]PETRA, [3]NTT Corp., [4]Oki Electric Industry Co., Ltd.*

H29 **Aberration multiplexing in microholographic recording**
R. Katayama, *Fukuoka Inst. Tech.*

H30 **Angle-multiplexing recording of multi-context for optically reconfigurable gate array in holographic memory using liquid crystal composites**
A. Ogiwara[1], H. Maekawa[1], M. Watanabe[2], and R. Moriwaki[2], *[1]Kobe City College Tech., [2]Shizuoka Univ.*

H31 **Performance evaluation of holographic data storage system with phase-shift embedded SQAM datapages**
S. Umetsu[1], M. Bunsen[1], M. Takabayashi[2], and A. Okamoto[3], *[1]Fukuoka Univ., [2]Kyushu Inst. Tech., [3]Hokkaido Univ.*

H32 **Statistical properties of the electromagnetic field at blackbody cavity opening and in its far zone**
A. T. Friberg, T. Setälä, J. Tervo, and J. Turunen, *Univ. Eastern Finland*

Technical Sessions

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H33 **Probing substrate influence on graphene by fitting Raman signals with Voigt profile**
Y.-M. Liu[1], C.-W Huang[1], B.-J. Lin[1], H.-Y. Lin[2], C.-H. Huang[2], F.-Y. Shih[3], W.-H. Wang[3], C.-Y. Liu[1], and H.-C. Chui[1], *[1]National Cheng Kung Univ., [2]National Chung Cheng Univ., [3]Inst. Atomic and Molecular Sciences*

H34 **Structural dependence of the switching characteristics of 2×2 InAlGaAs/InAlAs Mach-Zehnder-type optical switch**
S. Kawasaki[1], H. Koketsu[1], N. Koyama[1], A. Takei[2], T. Taniguchi[2], Y. Matsushima[1], and K. Utaka[1], *[1]Waseda Univ., [2]Hitachi Ltd.*

H35 **Coherent random laser fluid of nematic liquid crystal emulsions**
K. Kajikawa, Y. Nagai, and R. Fujimura, *Tokyo Inst. Tech.*

H36 **Capability of intensity-correlation spectral-domain optical coherence tomography**
T. Shirai[1] and A. T. Friberg[2], *[1]AIST, [2]Univ. Eastern Finland*

H37 **Construction of metal-enhanced evanescent-wave microcavity and air-gap control**
T. Wakamatsu, *Ibaraki National College Tech.*

H38 **Refractive index sensing with high temperature nano-coated electric arc-induced long-period gratings working at dispersion turning point**
M. Śmietana[1], A. K. Dębowska[1], P. Mikulic[2], and W. J. Bock[2], *[1]Warsaw Univ. Tech., [2]Univ. Québec Outaouais*

H39 **Hot embossing technology for development of glass microoptics with broadband transmission in visible and mid infrared ranges**
R. Buczyński[1,2], R. Kasztelanic[1], I. Kujawa[2], A. J. Waddie[3], M. R. Taghizadeh[3], and R. Stępień[2], *[1]Univ. Warsaw, [2]Inst. Electronic Materials Tech., [3]Heriot-Watt Univ.*

H40 **Nano-imprint method for metal-assisted guided mode resonance biosensor**
S.-F. Lin, S.-W. Zheng, and J.-Y. Chang, *National Central Univ.*

H41 **Enhancement of luminescence with resonance waveguide gratings**
A. Partanen, I. Koshevoy, T. Saastamoinen, J. Mutanen, H. Lajunen, and M. Kuittinen, *Univ. Eastern Finland*

H42 **Sensing distance elongation in BOTDR scheme using optical frequency comb**
H. Sawaguchi, K. Kashiwagi, Y. Tanaka, and T. Kurokawa, *Tokyo Univ. Agriculture Tech.*

H43 **Evaluation of Brillouin scattering properties in plastic optical fibers for wide-range temperature sensing**
K. Minakawa, N. Hayashi, Y. Shinohara, M. Tahara, H. Hosoda, Y. Mizuno, and K. Nakamura, *Tokyo Inst. Tech.*

H44 **First demonstration of liquid concentration measurement by using silica high-mesa waveguide**
H. Hokazono, J. Chen, M. Tsujino, and K. Hamamoto, *Kyushu Univ.*

H45 Brillouin scattering in erbium-doped optical fibers: fundamental properties and pumping effect
M. Ding, N. Hayashi, Y. Mizuno, and K. Nakamura, *Tokyo Inst. Tech.*

H46 Optical fiber in-line Mach-Zehnder interferometer based on dual internal mirrors formed by a hollow sphere pair
T. Y. Hu and D. N. Wang, *Hong Kong Polytechnic Univ.*

H47 Image resolution improvement in digital holographic microscope with image restoration and PSF upscaling
D.-H. Kim, N.-C. Park, H. Yang, K.-S. Park, and Y.-P. Park, *Yonsei Univ.*

H48 Hybrid digital holography that combines simultaneous and temporal phase-shifting interferometric techniques
Y. Fukagawa and M. Bunsen, *Fukuoka Univ.*

H49 Optical inspection and thickness measurement of nanostructures with optical coherence tomography based on single channel acquisition
W.-C. Yin, F.-Y. Chang, H. Lee, and M.-T. Tsai, *Chang Gung Univ.*

H50 Differential processing using an optical pulse synthesizer and its application to chirp measurement
S. Seki[1], W. Qiao[1], K. Kashiwagi[1], H. Tsuda[2], H. Takenouchi[3], and T. Kurokawa[1], *[1]Tokyo Univ. Agriculture Tech., [2]Keio Univ., [3]NTT Corp.*

H51 Optical waveguide resonator for one-port refractive index sensing
N. Fujiwara[1], H. Okayama[1,2], H. Irikawa[1], T. Ooka[1], M. Tsutsui[1], and H. Nakajima[1], *[1]Waseda Univ., [2]Oki Electric Industry Co., Ltd.*

H52 A wavelength insensitive, non-contact and highly efficient fiber optic connector using up-tapered multimode optical fibers
T. Yoshihiro, Y. Ono, and T. Kasamatsu, *FUJIFILM Corp.*

H53 Proposal of multiple slot silica high-mesa waveguide for infrared absorption
J. Chen, H. Hokazono, M. Tsujino, D. Nakashima, and K. Hamamoto, *Kyushu Univ.*

H54 Fabrication of long-period fiber-gratings by low-pressure mercury lamp – effect of grating length
T. Mizunami and T. Fujiyoshi, *Kyushu Inst. Tech.*

H55 Polymer waveguide-type Kretschmann-structure surface plasmon sensor at 1550nm wavelength range
N. Hidaka, Y. Kuroda, Y. Matsushima, and K. Utaka, *Waseda Univ.*

H56 Data reconfiguration based on polarization switching in a self-modulation
D.-L. Cheng[1], J.-W. Huang[2], K.-Y. Lin[1], S.-Y. Cheng[1], K.-S. Kao[1], and Y.-C. Fang[2], *[1]SHU-TE Univ., [2]National Kaohsiung First Univ. Science Tech.*

H57 Optical amplifier assisted cavity ring down spectroscopy (CRDS) method for compact infrared sensing
M. Tsujino, H. Hokazono, J. Chen, and K. Hamamoto, *Kyushu Univ.*

Technical Sessions

Tuesday, 29 October

H58 **Proposal and design of hybrid light guide plate for large-area LED display to improve illuminance and color uniformity**
M.-H. Shin, H.-R. Moon, J.-Y. Lee, and Y.-J. Kim, *Yonsei Univ.*

H59 **Solution processed organic light-emitting diodes and photodiodes utilizing poly (alkylfluorene) derivatives**
Y. Ohmori, T. Yamamoto, H. Ohmori, and H. Kajii, *Osaka Univ.*

H60 **Temperature stabilization of high-power LED chips using low-cost passive heat sinks**
E. Balvís[1], R. Bendaña[2], H. Michinel[3], and P. F. Córdoba[2], *[1]Innebo Lugar Penedo, [2]Univ. Vigo, [3]Univ. Politècnica València*

H61 **Nonpolar GaN two dimensional photonic crystal H2 high quality factor nanocavities**
T.-C. Lu, T.-T. Wu, S.-Y. Lo, C.-W. Tsao, H.-M. Huang, C.-Y. Chang, and S.-C. Wang, *National Chiao Tung Univ.*

H62 **Optical characteristics of UV-LED with subwavelength grating**
Y. Takashima, R. Shimizu, M. Haraguchi, and Y. Naoi, *Univ. Tokushima*

H63 **Design of efficient surface plasmon polariton modulator using graphene**
J. F. Ho, S. Iwamoto, and Y. Arakawa, *Univ. Tokyo*

H64 **Effect of light incidence angle on optical absorption characteristics of bulk heterojunction organic solar cells**
K.-Y. Lee, S.-J. Park, D.-H. Kim, and Y.-J. Kim, *Yonsei Univ.*

H65 **Micro-Alvarez lenses for a variable dynamic range Shack-Hartmann wavefront sensor**
E. Acosta[1] and J. Sasian[2], *[1]Univ. Santiago Compostela, [2]Univ. Arizona*

H66 **Coherence changes in partially coherent beams transmitted by metal gratings**
H. Lajunen and T. Saastamoinen, *Univ. Eastern Finland*

H67 **Multiple excitation of localized surface plasmon using metallic nano-particle array based sharp ridge nanoaperture**
W.-S. Lee, S.-M. Kang, T. Kim, G. Lim, G.-J. Choi, K.-S. Park, Y.-P. Park, and N.-C. Park, *Yonsei Univ.*

H68 **Fabrication of MgO:$LiNbO_3$ thin film ridge waveguide by surface-activated bonding and ion slicing**
K. Tanaka and T. Suhara, *Osaka Univ.*

H69 **Thermal control of diffraction wavelength in holographic polymer dispersed liquid crystal by using different grating structure**
A. Ogiwara[1], H. Shichi[1], H. Kakiuchida[2], and K. Yoshimura[2], *[1]Kobe City College Tech., [2]AIST*

H70 **Noninvasive observation of vascular leakage induced by focused ultrasound with optical coherence tomography**
F.-Y. Chang, K.-M. Lin, Y.-X. Lin, H.-L. Liu, and M.-T. Tsai, *Chang Gung Univ.*

H71 **Dielectric function dependence on temperature for noble metal**
Y.-J. Chen, M.-C. Lee, and C.-M. Wang, *National Dong Hwa Univ.*

H72 **Characterization of fractional photothermolysis and visualization of microthermal zone with optical coherence tomography**
H. Lee[1], F.-Y. Chang[1], W.-C. Yin[1], C.-H. Yang[1,2], S.-C. Shen[1,2], and M.-T. Tsai[1], *[1]Chang Gung Univ., [2]Chang Gung Memorial Hospital*

H73 **OCT-based measurement of Rayleigh-wave velocity in soft materials**
Y. Kato[1], Y. Wada[2], Y. Mizuno[1], and K. Nakamura[1], *[1]Tokyo Inst. Tech., [2]Seikei Univ.*

Digital Hall, West Bldg. 9

17:00-18:00 **Micro Concert**

Kuramae Hall

18:00-20:00 **Conference Party**

MOC '13
October 27 - October 30, 2013
Tokyo Institute of Technology
Tokyo, Japan

Important Deadlines
Early Registration: September 30, 2013
Hotel Accommodations: September 26, 2013
Post Deadline Papers: September 30, 2013

Technical Sessions

Wednesday, 30 October

Kuramae Hall

9:00-10:45 Session J: Interconnection
Chairs: H. J. S. Dorren, *Eindhoven Univ. Tech.*
S. Ura, *Kyoto Inst. Tech.*

J1 **Polymer micro-optics for VCSEL beam control** (Invited)
9:00 V. Bardinal, *LAAS-CNRS*

J2 **10-Gbit/s on-chip optical interconnect module using**
9:30 **silicon-based 45° micro-reflectors terminated polymer waveguides**
M.-Y. Zeng[1], C.-T. Chen[1], P.-K. Shen[1], K. Liang[1], C.-C. Chang[1], H.-L. Hsiao[2], H.-C. Lan[1], Y.-C. Lee[2], Y.-S. Lin[1], and M.-L. Wu[1], *[1]National Central Univ., [2]Centera Photonics Inc.*

J3 **Asymmetrical slit Si waveguide TE-TM mode converter**
9:45 A. Fujie, Y. Shoji, and T. Mizumoto, *Tokyo Inst. Tech.*

J4 **A wavelength-selective switch based on microring**
10:00 **resonators and Mach-Zehnder interferometer switches**
K. Miura, Y. Shoji, and T. Mizumoto, *Tokyo Inst. Tech.*

J5 **A proposal of novel optical interface to transmit**
10:15 **8K-UHDTV for consumer applications**
H. Takizuka[1], T. Torikai[2], A. Mitsui[3], H. Suzuki[3], Y. Watanabe[4], T. Toma[1], and Y. Koike[1], *[1]Keio Univ., [2]Iron City Micro Display, Inc., [3]Mitsubishi Pencil Co., Ltd., [4]Asahi Glass Co., Ltd.*

J6 **SOI-based vertically-splitting optical waveguides for**
10:30 **optical interconnects**
C.-C. Yu, P.-K. Shen, C.-L. Li, C.-T. Chen, and M.-L. Wu, *National Central Univ.*

Break (10:45-11:00)

11:00-12:45 Session K: Sensing
Chairs: E. Acosta, *Univ. Santiago de Compostela*
M. Naya, *FUJIFILM Corp.*

K1 **Spectroscopy as a "green" technique for food quality**
11:00 **and safety applications** (Invited)
A. G. Mignani[1], L. Ciaccheri[1], A. A. Mencaglia[1], H. Ottevaere[2], and H. Thienpont[2], *[1]CNR-IFAC, [2]Vrije Univ. Brussel*

K2 **Infrared thermometry for detecting flaws in large-core**
11:30 **polymer optical fibers**
N. Hayashi, Y. Mizuno, and K. Nakamura, *Tokyo Inst. Tech.*

K3 **Speckle noise reduction by focal plane wave-front**
11:45 **sensing in high contrast imaging optics**
K. Sato[1], J. Nishikawa[2,3], M. Ohya[4,2], M. Horie[4,2], Y. Tanaka[1], S. Kumagai[4], T. Kurokawa[1], and N. Murakami[5], *[1]Tokyo Univ. Agriculture Tech., [2]National Astronomical Observatory Japan, [3]Univ. Advanced Studies, [4]Nihon Univ., [5]Hokkaido Univ.*

K4 **Rigorous surface-plasmon polaritons at a lossy**
12:00 **interface**
A. Norrman, *Univ. Eastern Finland*

K5 **Terahertz transmission through few nanometer-wide**
12:15 **slits** (Invited)
D.-S. Kim, *Seoul National Univ.*

Lunch (12:45-14:00)

14:00-15:45 Session L: Imaging
Chairs: A. Bräuer, *Fraunhofer IOF*
N. Arai, *Konica Minolta, Inc.*

L1 Plenoptic microscope camera (Invited)
14:00 C. Perwass, *Raytrix GmbH*

L2 Array masters for UV-replication used in imaging
14:30 **applications**
F. C. Wippermann, J. D. A. Reimann, A. Brückner, and A. Bräuer, *Fraunhofer IOF*

L3 Recording light fields with microoptical systems
14:45 A. Oberdörster[1], A. Brückner[1], and H. P. A. Lensch[2], *[1]Fraunhofer IOF, [2]Eberhard Karls Univ.*

L4 Optical focus with high aperture lens based on high
15:00 **contrast gratings**
A. B. Klemm[1], D. Stellinga[1], E. R. Martins[2], L. Lewis[3], G. Huyet[3], L. O'Faolain[2], and T. F. Krauss[1,2], *[1]Univ. York, [2]Univ. St Andrews, [3]Tyndall National Inst.*

L5 Wafer-level optics for computational cameras (Invited)
15:15 M. Rossi, *Heptagon Advanced Micro-Optics Ltd.*

Break (15:45-16:00)

16:00-16:30 Session PD: Post Deadline Papers
Chairs: R. Katayama, *Fukuoka Inst. Tech.*
M. Itoh, *NTT Corp.*

16:30-16:45 MOC Award Ceremony

16:45-17:00 Closing Remarks
Program Co-chairs:
R. Katayama, *Fukuoka Inst. Tech.*
M. Itoh, *NTT Corp.*

Registration

Registration Fees

	Before/On Sept. 30, 2013	After Oct. 1, 2013
Conference (General)	¥42, 000	¥47, 000
(Student, Retiree)	¥12, 000	¥15, 000
Extra Copy of Digest	¥6, 000	¥6, 000
Conference Party	¥3, 000	¥3, 000

The conference fee includes admission to MOC '13 and a copy of Technical Digest.

MOC '13 Organizing Committee entrusts **Event & Convention House, Inc.** with a part of the management.

Those who wish to attend MOC '13 should register online at
http://www.comemoc.com/moc13/

If you have any questions, please contact
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All payment should be made in Japanese yen by one of the following methods:

1. Bank transfer
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Bank Name: Bank of Tokyo-Mitsubishi UFJ
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2. Credit card
Master Card, VISA, American Express, JCB, and Diners Club are available. Personal checks are NOT accepted.

Pre-registration, by **September 30, 2013**, is encouraged and will be entitled to reduced fees. Upon receipt of registration information and payment, MOC '13 Registration Desk will send an e-mail of confirmation which should be printed and presented at the Conference Registration Desk.

REGISTRATION CANCELLATION POLICY

No refunds of the registration fee will be made for any reasons whatever. In the event of registrant unable to attend the conference, a copy of Technical Digest will be sent after the conference.

Hotel Accommodations

Kintetsu International Co., Ltd. will be the official agent for hotel accommodations and other travel arrangements.

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Reservation should be made online no later than **September 26, 2013** at http://www.comemoc.com/moc13/. Method of payment is via credit card. (Master Card, VISA, American Express, JCB, and Diners Club are available.) Balance of room charge will be charged after September 27, 2013, together with handling charge (¥500 per room).

Hotel Name	Code	Room Type	Room Charge	Hotel Location
Shibuya Tokyu Inn	1S	Single Twin	¥18,000 ¥26,000	2 minute walk from JR or Tokyu Shibuya Station
Hotel Unizo Shibuya	2S	Single Twin	¥15,000 ¥25,000	7 minute walk from JR or Tokyu Shibuya Station
Via Inn Tokyo Oimachi	3S	Single Twin	¥10,000 ¥18,000	2 minute walk from JR Oimachi Station 5 minute walk from Tokyu Oimachi Station

The above rates are per room, including breakfast, service charge and consumption tax. Handling charge is not included. Please refer to http://www.comemoc.com/moc13/ for hotel location information.

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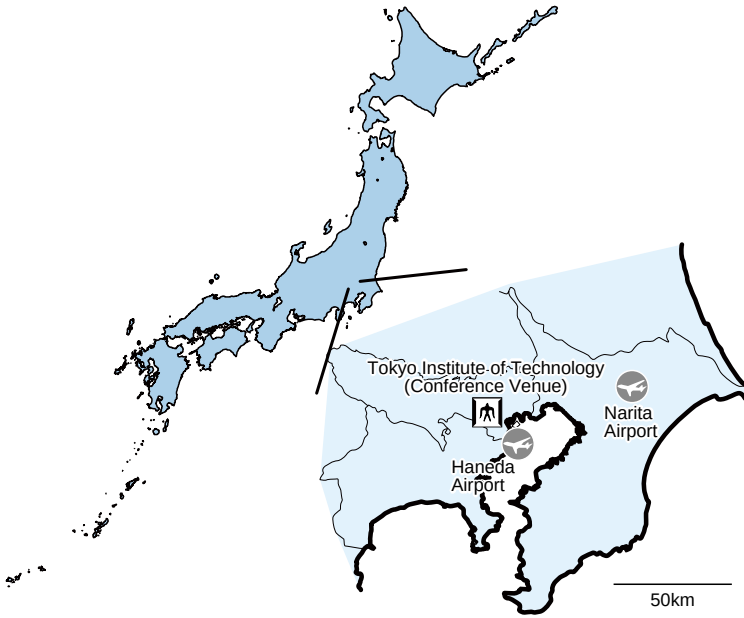
Any kind of cancellation or reservation change must be submitted in writing to MOC '13 Accommodation Desk, Kintetsu International Co., Ltd. If you cancel the reservation, Kintetsu International Co., Ltd. will refund the accommodation fee after deducting the following cancellation fee. Please note that the handling charge will not be refunded.

* Up to 14 days prior to the check-in date:
  No cancellation charge
* 13 - 2 days prior to the check-in date:
  20% of one night accommodation fee
* 1 day prior to the check-in date:
  80% of one night accommodation fee
* On the day of occupancy or no notice given:
  100% of one night accommodation fee

CONFERENCE VENUE

The MOC '13 will take place at Ookayama campus of Tokyo Institute of Technology, which is the largest national university of science and technology in Japan founded in 1881. The campus is located close to the downtown Tokyo. All sessions will be held at TOKYO TECH FRONT, which is an alumni-club building just in front of Ookayama Station.



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1. Take Skyliner to Nippori or Narita Express to Shinagawa.
2. Change to JR Yamanote Line (Outer Loop).
3. Get off at Meguro and transfer to Tokyu Meguro Line to Ookayama.

From Haneda Airport

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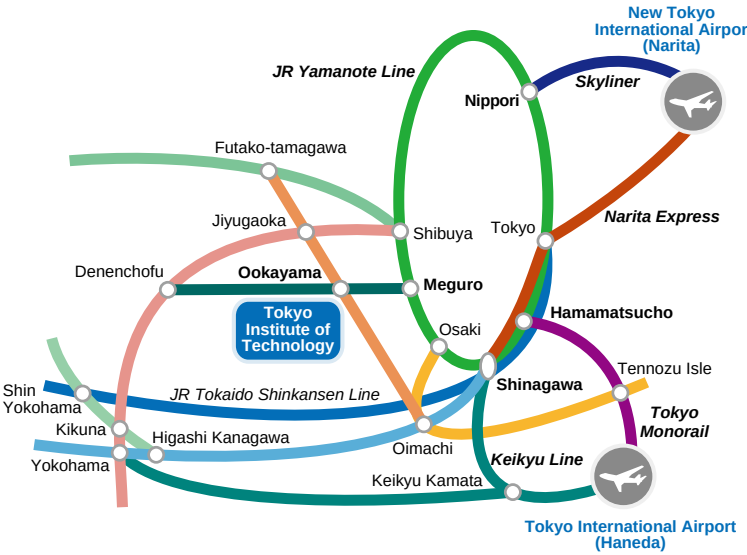
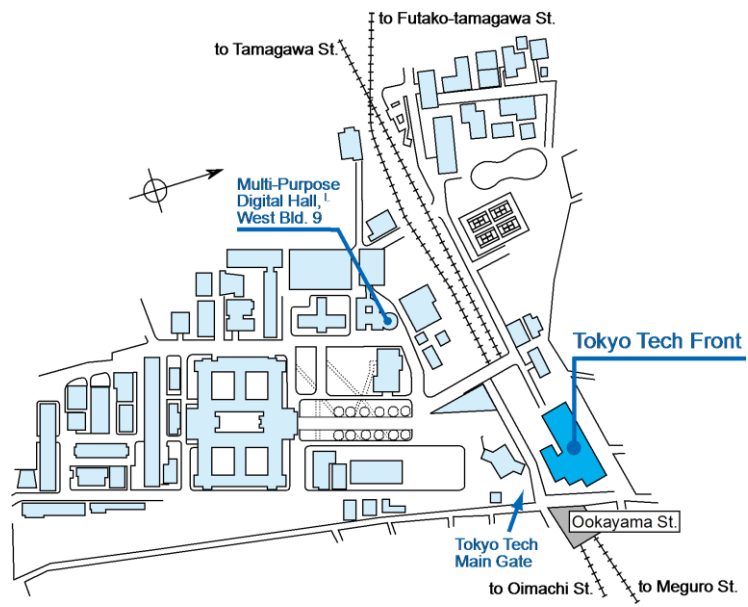


CAMPUS MAP



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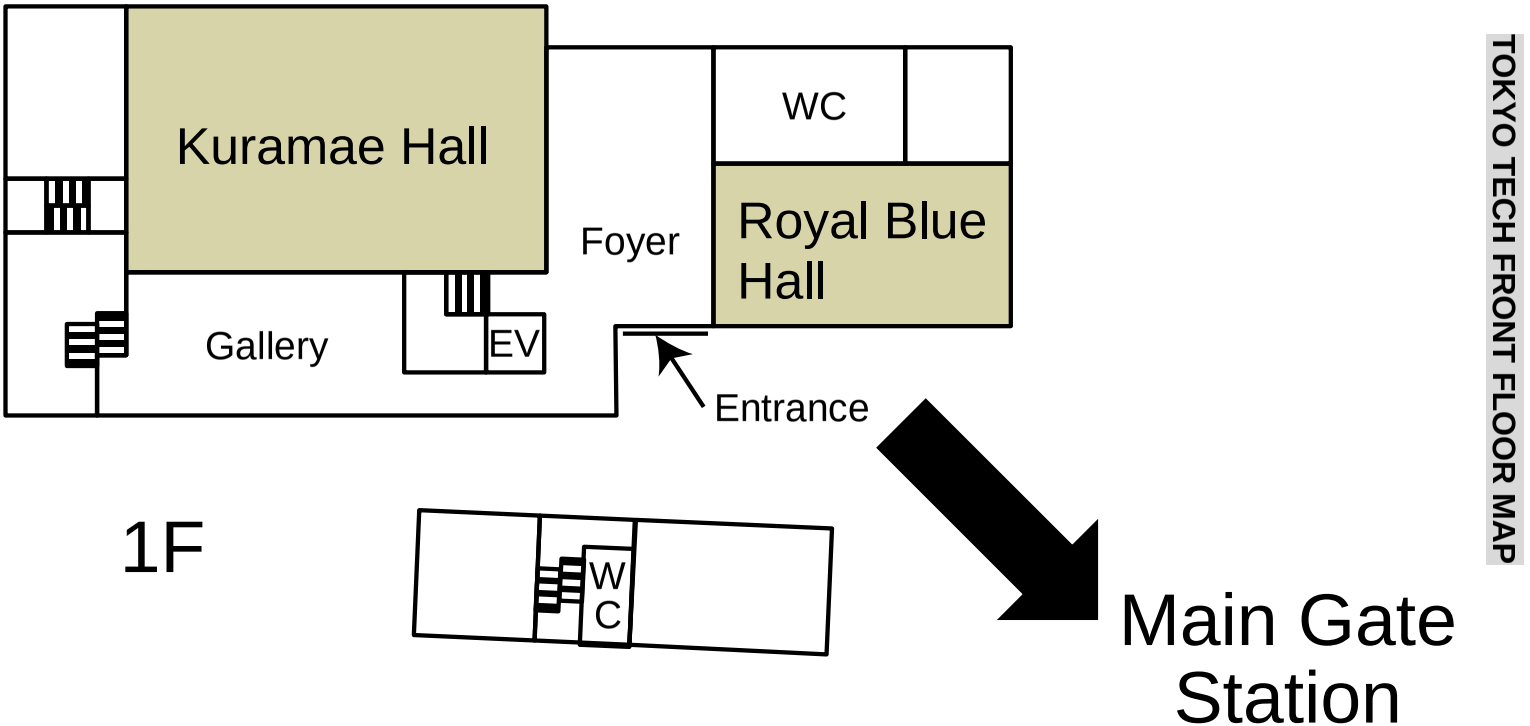
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Entrance
1F
W C
Main Gate Station
TOKYO TECH FRONT FLOOR MAP

General Information

Free Circulation of Scientist

To secure IUPAP sponsorship, the organizers have provided assurance that MOC '13 will be conducted in accordance with IUPAP principles as stated in the ICSU-Document "Universality of Science" (sixth edition, 1989) regarding the free circulation of scientists for international purposes. In particular, no bona fide scientist will be excluded from participation on the grounds of national origin, nationality, or political considerations unrelated to science.

Visa

Visitors from countries whose citizens must have visas should apply to a Japanese consular office or diplomatic mission in their respective country. For details, please contact your travel agent or the local consular office in your country.

Climate

The weather in Tokyo during the period of the conference is typically sunny with temperature ranges between 11 °C and 21 °C.

Currency Exchange

Only Japanese yen (JPY, ¥) is acceptable at regular stores and restaurants. Certain foreign currencies may be accepted at a limited number of hotels, restaurants and souvenir shops. You can exchange your currency with Japanese yen at foreign exchange banks and other authorized money exchangers on presentation of your passport.

Traveler's Checks and Credit Cards

Traveler's checks are accepted only by leading banks and major hotels in principal cities, and the use of traveler's checks in Japan is not as popular as in some other countries. VISA, Master Card, Diners Club, and American Express are widely accepted at hotels, department stores, shops, restaurants and nightclubs.

Tipping

In Japan, tips are not necessary anywhere, even at hotels and restaurants.

Electrical Appliances

Japan operates on 100 volts for electrical appliances. The frequency is 50 Hz in eastern Japan including Tokyo, and 60 Hz in western Japan.

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