Report on OPTICS & PHOTONICS International Congress 2018 (OPIC2018)

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1. Introduction

OPTICS & PHOTONICS International Congress (OPIC) has been held annually since 2012 at Yokohama as an international forum to present and discuss the most up-dated R & D activities in optics and photonics over the world. The state-of-art technologies and products in optics and photonics are demonstrated at the co-located and jointly organized OPIE (OPTICS & PHOTONICS International Exhibition).

OPIC2018 was held in April 23-27, 2018 at Pacifico Yokohama Congress Center with Congress Co-Chairs: Christopher P. J. Barty (University of California Irvine, USA), Reinhart Poprawe (Fraunhofer Institute for Laser Technology, Germany), Sadao Nakai (Osaka University, Japan), and Ruxin Li (Shanghai Institute of Optics and Fine Mechanics, China) (Fig. 1).

Fig. 1 Congress Co-Chairs of OPIC2018:
Christopher P. J. Barty, Reinhart Poprawe, Sadao Nakai, and Ruxin Li (from left to right)

OPIC2018 was organized by OPTICS and PHOTONICS International Council, with the support of five Ministries of Japanese Government and Japan Business Foundation, and in cooperation with many research institutes and academic societies in Japan and foreign countries, as shown in Table 1.

Table 1. Organization of OPIC2018

OPTICS & PHOTONICS International Congress 2018 (OPIC2018)
Co-located with OPTICS & PHOTONICS International Exhibition 2018 (OPIE2018) Organized by OPTICS & PHOTONICS International Council
Specialized International Conferences were organized by
The Laser Society of Japan / SPIE – The International Society for Optics and Photonics/ Institute for Nano Quantum Information Electronics, The University of Tokyo / The Graduate School for the Creation of New Photonics Industries / The Optical Society of Japan / Akasaki Research Center (ARC), Nagoya University / The Micro Solid-State Photonics Group of The Laser Society of Japan / High Energy Accelerator Research Organization (KEK) / Institute of Laser Engineering, Osaka University / The Executive Committee of Laser Solution for Space and the Earth / SIOM Chinese Academy of Science / Japan Laser Processing Society / RIKEN SPring-8 Center / Research Center for Ultra-Precision Science & Technology, Osaka University
Supporting agencies of OPIC2018
Ministry of Education, Culture, Sports, Science and Technology (MEXT) / Ministry of Economy, Trade and Industry (METI) /Ministry of Agriculture, Forestry and Fisheries of Japan (MAFF) / Ministry of Health, Labour and Welfare (MHLW) / Ministry of Land, Infrastructure, Transport and Tourism (MLIT) / KEIDANREN (Japan Business Federation) / Japan Science and Technology Agency (JST) / Japan Tourism Agency (JTA)
Cooperating agencies of OPIC2018
AESJ - Atomic Energy Society of Japan / AIST - The National Institute of Advanced Industrial Science and Technology / Fraunhofer Institute for Laser Technology ILT (Germany) / ILT - Institute for Laser Technology / JPC - Japan Photonics Council / JSPF - The Japan Society of Plasma Science and Nuclear Fusion Research / NEDO - New Energy and Industrial Technology Development Organization / OITDA - Optoelectronic Industry and Technology Development Association / OSA - The Optical Society (USA) / Photonics Media (USA) / PIDA - The Photonics Industry & Technology Development Association (Taiwan) / QST - National Institutes for Quantum for Quantum and Radiological Science and Technology / RIKEN.

OPIC is composed of Specialized International Conferences covering broad-ranged fields in optics and photonics. Each Specialized International Conference is planned and operated by the Conference Chair and his consortium of scientists, based on their own initiatives to strengthen and advance the research in each specific field. This approach helps Conference Chairs to organize attractive conferences with timely topics and up-dated speakers, and also to broaden the research networks by continuing to hold the conferences over many years.

2. OPIC2018 with 14 Specialized International Conferences

OPIC2018 was composed of 14 Specialized International Conferences, the largest number since the beginning of OPIC, owing to joining of a new Conferences: IoT Enabling Sensing/Network/AI and Photonics (IoT-SNAP2018). These 14 Specialized International Conferences and the Conference Chairs are shown below.

■ ALPS 2018 - The 7th Advanced Lasers and Photon Sources

Chair: H. Yoneda (University of Electro-Communications)

- BISC 2018 - The 4th Biomedical Imaging and Sensing Conference
  Chair: T. Yatagai (Utsunomiya University)
- HEDS 2018 - The 7th High Energy Density Sciences
  Chair: T. Hosokai (Osaka University)
- ICNN 2018 - International Conference on Nano-photonics and Nano- optoelectronics
  Chair: Y. Arakawa (The University of Tokyo)
- IoT-SNAP 2018 - IoT Enabling Sensing/Network/AI and Photonics Conference
  Chairs: N. Hagita (ATR), R. Freund (Fraunhofer Heinrich Hertz Inst.)
- LDC 2018 - The 7th Laser Display and Lighting Conference
  Chairs: K. Kuroda (Utsunomiya University), H. Murata (Osaka University)
- LEDIA 2018 - The 6th International Conference on Light-Emitting Devices and Their Industrial Applications
  Chair: H. Amano (Nagoya University)
- LIC 2018 - The 6th Light Ignition Conference
  Chair: T. Taira (Institute for Molecular Science)
- LSC 2018 - Conference on Laser and Synchrotron Radiation Combination Experiment
  Chair: N. Sarukura (Osaka University)
- LSSE 2018 - The 3rd Laser Solutions for Space and the Earth
  Chair: T. Ebisuzaki (RIKEN)
- OMC 2018 - Optical Manipulation and Structured Materials Conference
  Chair: T. Omatsu (Chiba University)
- PLD 2018 - Pacific Rim Laser Damage Conference
  Chair: T. Jitsuno (Osaka University)
- SLPC 2018 - The 3rd Smart Laser Processing Conference
  Chairs: M. Tsukamoto (Osaka University), R. Poprawe (Fraunhofer ILT)
- XOPT 2018 - International Conference on X-ray Optics and Applications
  Chairs: T. Ishikawa(RIKEN), K. Yamauchi (Osaka University)

The overall schedule of OPIC2018 is shown in Fig. 2. The OPIC Plenary Session, open to public, was held in the morning of April 25th, Wednesday. The Specialized International Conferences were held in parallel during 23-27 (Monday-Friday), with exception of Joint Sessions in the afternoon of 25th. The Posters were presented at the Exhibition Hall to stimulate interaction between OPIC and OPIE participants. The OPIC Get-Together was held in the evening of 23rd Monday, and the OPIC Reception in the evening of 25th.

Statistics of OPIC and Specialized International Conferences during 2012-2018 are summarized in Table 2. Some of the Specialized Conferences have been organized with different titles and some Conferences were held in other countries, as shown in italics in Table 2.

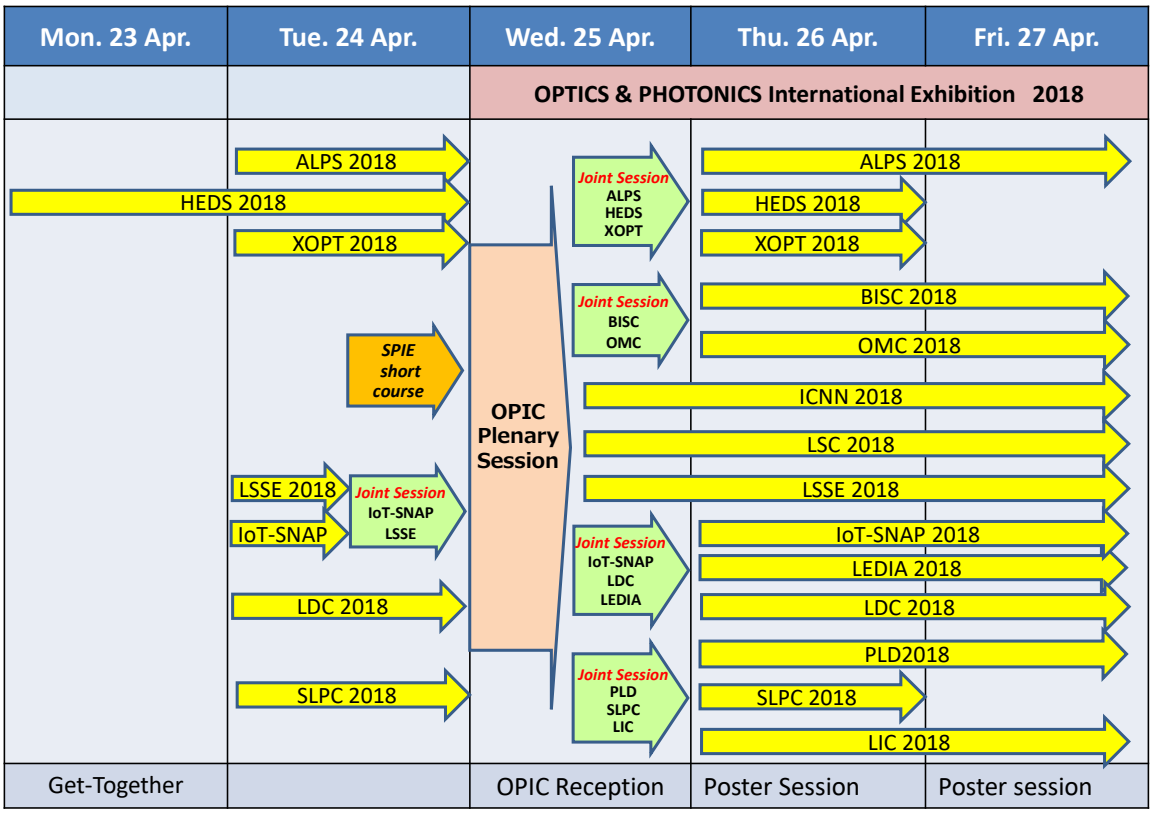

Fig. 2 Overall schedule of OPIC2018.

Table 2 shows that OPIC has been growing steadily as the international conference, as seen from the number of specialized conferences (14), the number of participants (1185) and its fraction of foreign participants (40 %), and the number of countries (47). The top 10 countries, in order of the number of participants (shown in the parentheses), are Japan (715), P. R. China (109), Germany (58), Korea (56), Taiwan (47), USA (39), France (25), Russia (17), UK (13) and India (12). (Here "country" refers to the place where participant's affiliation is located.) These statistics show that OPIC is an international forum with broad scientific scopes, attended by the international communities in Asia, north America, Europe and Russia. The Specialized International Conferences held continuously over many years are now firm-footed with attendance of many participants who are looking forward to discussing the most-updated progress of their fields and meeting with long-term friends at OPIC.

The co-located OPIE2018 was held during April 25-27 by participation of 372 companies and organizations (9 % increase from 2017), including direct overseas exhibitions by 11 countries and 54 companies. Total number of the participants to OPIE2018 over 3 days was 16,103. Various activities were organized at OPIE including technical exhibitions, product demonstrations, and technical seminars. Also the Award Ceremony of the 2018 Industrial Award by The Laser Society of Japan was held at the Exhibition Hall, and awards were presented to 5 companies and 1 University in 3

categories.

Table 2 Records of OPIC and Specialized International Conferences during 2012-2018.

(Specialized International Conferences held previously and at other countries are shown in italics.)

Year	OPIC2012	OPIC2013	OPIC2014	OPIC2015	OPIC2016	OPIC2017	OPIC2018
Date	April 25-27	April 23-26	April 22-25	April 22-24	May 17-20	April 18-21	April 23-27
Congress Chairs	K. Shimoda R. Byer	K. Shimoda R. Byer	K. Iga R. Byer A. Ostendorf	K. Iga C. Barty A. Ostendorf	K. Iga C. Barty A. Ostendorf	C. Barty R. Poprawe S. Nakai	C. Barty R. Poprawe R. Li S. Nakai
Number of Specialized Conferences	6	10	9	7	11	12	14
Papers presented	296	411	570	478	736	729	837
Participants	519	677	782	732	1028	1012	1185
Foreign participants (%)	24%	18%	27%	25%	32%	37%	40%
Participants / Conference	86.5	67.7	86.9	104.6	93.5	84.3	84.6
Number of Countries	23	23	28	26	31	32	47
Specialized International Conferences	Conf. Chair	Conf. Chair	Conf. Chair	Conf. Chair	Conf. Chair	Conf. Chair	Conf. Chair
ALPS (Advanced Lasers and Photon Sources)	K. Midorikawa	K. Midorikawa	F. Kannari	N. Miyanaga	H. Yoneda	H. Yoneda	H. Yoneda
SeTBio (Sens. Tech. for Biomater., Food, & Agri.)		N. Kondo					
BISC (Biomedical Imaging & Sensing Conf.)			T. Yatagai		T. Yatagai	T. Yatagai	T. Yatagai
APBP (Asian & Pacific-Rim Symp. Biophoton.)				T. Iwai			
CLSM (Conf. on Laser Surgery and Medicine)	M. Kikuchi	M. Kikuchi					
CIFE (Conf. on Inertial Fusion Energy)	H. Azechi						
LANSA (Laser & Accler. Neutron Sourc. & Appli.)		H. Azechi					
CLE (Conf. on Laser Energetics)				H. Azechi			
CLES (Conf. on Laser Energy Science)					H. Azechi		
CLES/LASNA (Laser Energy Sci. & Neutron Sources)						H. Nishimura, R. Hanayama	
HEDS (Int. Conf. on High Energy Density Sci.)	R. Kodama	R. Kodama	R. Kodama	R. Kodama	R. Kodama	R. Kodama	T. Hosokai
ICNN (Int. Conf. on Nanophot. & Nanooptoelectr.)						Y. Arakawa	Y. Arakawa
IP (Information Photonics)						Y. Hayasaki	
IoT-SNAP (IoT Enabling Sensing/Network/AI and Photonics Conf.)							N. Hagita R. Freund
LDC (Laser Display & Lighting Conf.)	K. Kuroda	K. Kuroda	*(in Taiwan)*	K. Kuroda	*(in Germany)*	K. Kuroda	K. Kuroda H. Murata
LEDIA (Int. Conf. on Light-Emitting Devices and Their Industrial Applications)		H. Amano	H. Amano	H. Amano	H. Amano	H. Amano	H. Amano
LIC (Laser Ignition Conf.)		T. Taira	T. Taira	*(in US)*	T. Taira		T. Taira
LSC (Laser & Synch. Rad. Combin. Exper.)			H. Azechi				N. Sarukura
LNPC (Light Driven Nucl.-Particle Phys. & Cosmology)						K. Homma, O. Tesileanu	
LANE (Laser Appl. on Nuclear Engin.)		H. Horiike					
LSSE (Laser Solution for Space & Earth)					T. Ebisuzaki	T. Ebisuzaki	T. Ebisuzaki
OMC (Optical Manipulation Conf.)			T. Omatsu	T. Omatsu	T. Omatsu	T. Omatsu	T. Omatsu
PLD (Int. Conf. on Pacific-Rim Laser Damage)			T. Jitsuno	*(in China)*	T. Jitsuno, J. Shao, W. Rudolpf	*(in China)*	T. Jitsuno
LPCC (Laser Proc. for CFRP & Compos. Mater.)	M. Kutsuna	H. Ogata					
SLPC (Smart Laser Process. Conf.)			Y. Okamoto		Y. Okamoto, R. Poprawe		M. Tsukamoto R. Poprawe
XOPT (Int. Conf. X-ray Opt., Det., Sourc. & Appl.)					T. Ishikawa, K. Yamauchi	T. Ishikawa, K. Yamauchi	T. Ishikawa, K. Yamauchi

3. OPIC2018 Plenary and Reception

OPIC 2018 Plenary Session was held in the morning of April 25. Welcome Address were given by Sadao Nakai and Ruxin Li, Congress Co-Chairs. The plenary speakers were introduced by Congress Co-Chair, Reinhard Poprawe, and Co-Chair of Organizing

Committee, Yoshiaki Kato.

Four plenary talks were presented on optics and photonics covering broad fields: applications of VCSEL, NV centers in diamond for quantum sensors, photoacoustic tomography, and laser prasma accelerators. (Fig. 3).

Joseph Pankert, general manager of Philips Photonics, gave the first plenary talk entitled "VCSELs in every car, every home and every mobile device". After mentioning the history of VCSEL, he pointed out the several advantages of VCSEL, such as, fast switchable, circular optical profile, LED-like production flow, wafer-scale technology, and integration with lens and photodiode. Then, he introduced current application of VCSEL: optical interconnects with distance range of a few 100m and optical depth sensors for mobile-phone based on the time-of-flight principle. Finally, he mentioned future applications to automotive such as over-ground speed sensors and LIDARs. and to digital thermal processing with a 10kW class high power VCSEL arrays.

The second speaker was Matsuko Hatano, professor of Tokyo Institute of Technology. Title of her talk was "Diamond electronics and photonics: Application to quantum sensors". Her research is concentrated on nitrogen-vacancy (NV) centers in diamond which is the most promising candidate of the quantum sensors. Spin state of the electron localized at NV centers can be initialized and detected optically. Then the NV centers act as quantum sensor of magnetic field. The advantages of the NV centers are high sensitivity, high density alignment in large area, and the operation at room temperature. Then she talked about the applications of the NV centers to non-invasive sensors, nanoscale NMR imaging and in-cell sensing.

Lihong V. Wang, Bren Professor of Medical Engineering and Electrical Engineering at California Institute of Technology, talked about "Photoacoustic tomography: Omniscale imaging from organelles to patients by ultrasonically beating optical density". Principle of the photoacoustic imaging is to illuminate the objects (biomedical samples) by the laser light (IR or visible) which is absorbed by the absorber (e.g. blood vessel). Then heated absorber radiates the ultrasonic wave, which is detected by a microphone. Photoacoustic tomography enables us to image inside biomedical samples much deeper than the optical coherent tomography. He showed us many beautiful images, which proves that the photoacoustic tomography is the excellent tool for imaging inside the biomedical samples. He also mentioned about the super resolution of photoacoustic tomography.

The final plenary speaker was Wim Leemans, Director of the Acceleratoe Technology and Applied Physics Division and Director of BELLA (Berkeley Lab Laser Accelerator), Lawrence Berkeley National Laboratory. Title of his talk was "Experiments on laser plasma accelerators with the BELLA laser and exploring the path towards future applications". He talked about the particle accelerator based on the excitation of plasma

waves with intense laser beams especially in his lab. Several recent results were presented.

Fig. 3 Plenary speakers of OPIC2018:
Joseph Pankert, Mutsuko Hatano, Lihong V. Wang, Wim Leemans (from left to right)

The OPIC Reception was started by Kazuo Kuroda, Co-Chair of Organizing Committee of OPIC 2018, followed by Kagami-biraki, opening of a sake barrel (Fig. 4), and then Japanese Taiko (drum) show. With attendance of most of the OPIC participants, the Reception became a very good place for refreshing and starting the friendships among various communities.

Fig. 4 OPIC2018 Reception.
Kagami-Biraki by W. Leemans, N. Kondo, S. Nakai, J. Pankert and P. Hallett (from left to right).

4. Acknowledgement

We are indebted to Dr. Christopher P. J. Barty, Prof. Reinhart Poprawe, Prof. Sadao Nakai, and Prof. Ruxin Li as Congress Co-Chairs, members of the International Advisory Board, members of the Organizing Committee and the Steering Committee, and Chairs of the Specialized International Conferences, for organizing OPIC2018. We would like to thank MEXT, METI, MAFF, MHLW, MLIT and KEIDANREN for supporting OPIC2018.

We would like to thank the financial supports from the following organizations: Nippon Sheet Glass Foundation for Materials Science and Engineering, The AMADA Foundation, Tsurugi-Photonics Foundation, Research Foundation for the Electrotechnology of Chubu, Support Center for Advanced Telecommunications Technology Research, Foundation, The Foundation for Technology Promotion of Electronic Circuit Board, Konica Minolta Science and Technology Foundation, Yokohama Convention & Visiting Bureau, and Matsuo Foundation.

Furthermore, we would like to thank the corporate sponsors for their generous supports: OPTO SCIENCE, INC., OSA, SPIE, HAMAMATSU, Inc., Japan Laser Corporation, Laser World of Photonics China, KATAOKA Corp., KIMMON KOHA, MKS Ophir, OKAMOTO OPTICS WORKS, Inc., OPTO-LINE Inc., and THORLABS Japan. Partnerships with SPIE as the International Partner, and PHOTONICS MEDIA, OPTORNICS, and Physics World as the Media Partners are also greatly appreciated.