

# Curriculum Vitae

**Name:** Koji Yamada  
**Affiliation:** National Institute of Advanced Industrial Science and Technology  
**Position:** Principal Research Manager, Platform Photonics Research Center  
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**Date of Birth:** 19, June 1963                      **Nationality:** Japanese

## EDUCATION

**March 1986** Bachelor of Engineering, Nuclear engineering, Kyushu University, Fukuoka, Japan  
**March 1988** Master of Engineering, Nuclear engineering, Kyushu University, Fukuoka, Japan  
**February 2003** Ph. D., Applied quantum physics and nuclear engineering, Kyushu University, Fukuoka, Japan

## WORK EXPERIENCE

**April 1988-March 2015:** NTT Laboratories, Atsugi, Japan

- 1988~1998: Theoretical and experimental researches on beam dynamics in electron synchrotrons. Development of superconducting electron synchrotron.
- 1996~1999: Theoretical and experimental researches on electromagnetic interaction between relativistic electrons and dielectric nano-structures.
- 1999~2015: Theoretical and experimental researches on silicon-based nanophotonic structures and silicon-based photonic platform. Development of silicon-based photonic devices for telecommunications.

**April 2015-Present:** National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan.

- 2015~: Research and development of large-scale silicon-based photonic integration platform.

### Other work experience

- 2006~2008: Part-time lecturer, University of Tokyo, Tokyo, Japan
- 2006~2009: Development of micro-photonics devices for optical interconnects in MIRAI Project, Japan
- 2010~2015: Development of silicon photonics devices for optical interconnects in Photonics Electronics Technology Research Association(PETRA), Japan.

## **Professional Service**

Program committee chair: IEEE International Conference on Group IV Photonics (GFP) 2007

Program subcommittee chair: IEEE GFP 2013/2015/2016/2017/2019  
Opto-electronics and Communications Conference (OECC) 2019  
CLEO Pacific-Rim 2013

Workshop Organizer Asia Communications and Photonics Conference (ACP) 2019

Advisory committee: IEEE GFP 2008

Program committee: IEEE GFP 2009/2010/2011/2012/2014  
CLEO 2012/2013/2014  
Integrated Photonics Research (IPR) 2011/2012/2013  
ACP 2013/2015  
SPIE Photonics Europe 2012/2014/2016/2018/2019/2020  
SPIE Photonics Aisa 2018/2019  
OECC 2010/2015/2016  
CLEO Pacific-Rim 2011

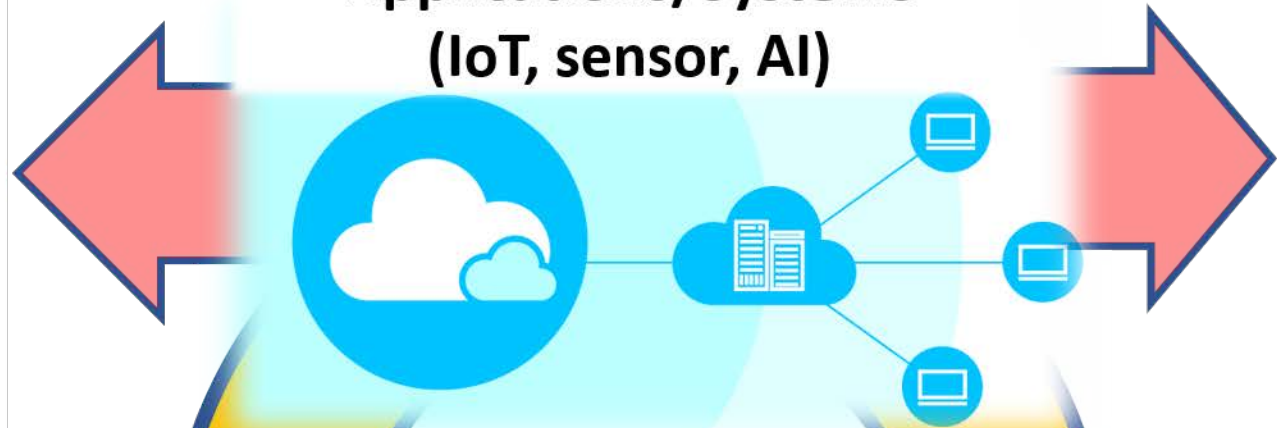
Associate editor: OSA Photonics Research 2014-2020  
IEEE Journal Quantum Electronics 2010-2012  
Frontiers in Materials: Optics and Photonics (from 2014)

Lead guest editor: OSA Photonics Research 2013/2014



**Society 5.0**

**Applications/Systems  
(IoT, sensor, AI)**



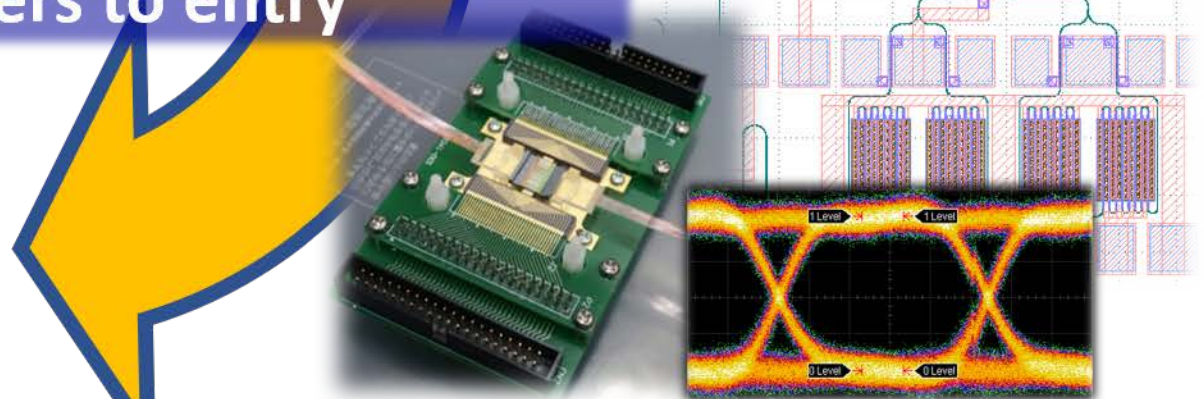
**INDUSTRIAL  
INTERNET  
OF THINGS**



**Sustainable R&D Eco System**  
Construction of supply chain  
Lower barriers to entry



**Silicon photonics foundry  
(Device chip provider)**



**Peripheral technology  
(Design, assembly, evaluation)**

**Low loss waveguides**

III-V device

Si photonic platform

c)

SiN

Si

800 nm

**Photonic switch**

**Light source integration**

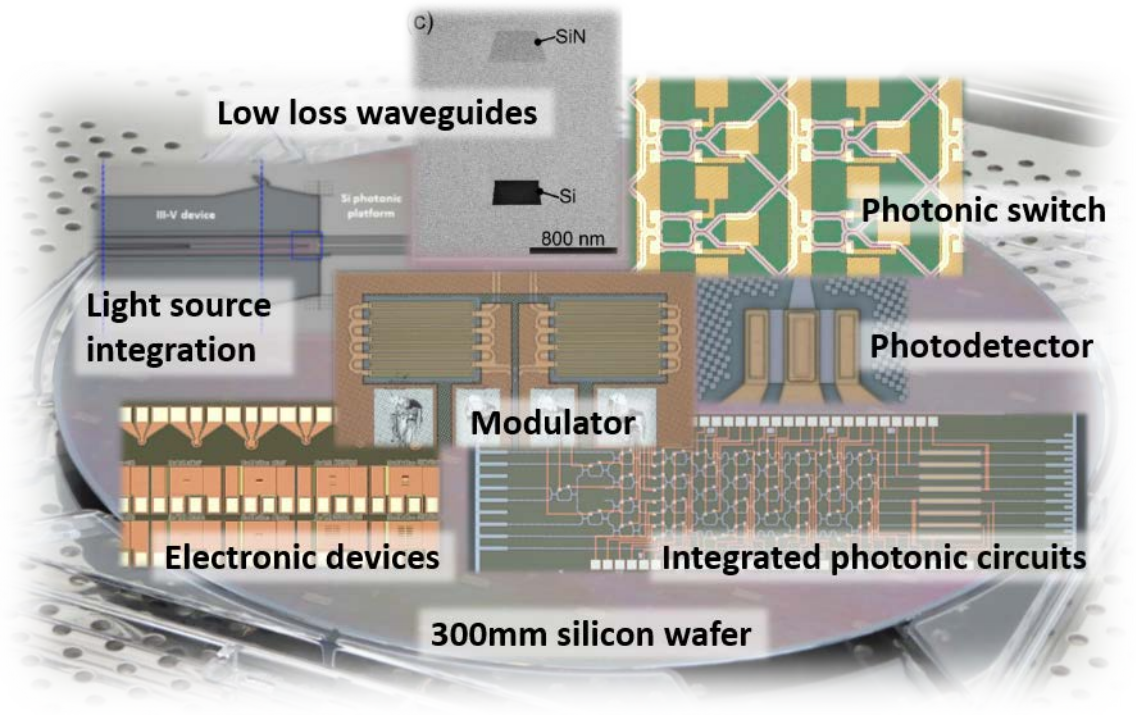
**Modulator**

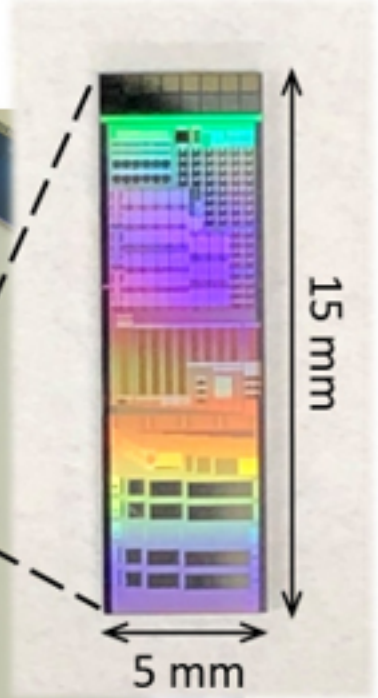
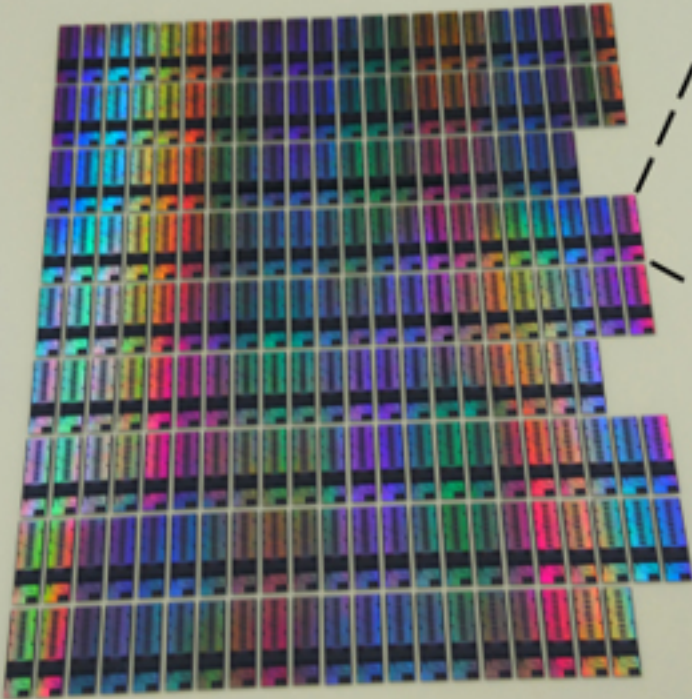
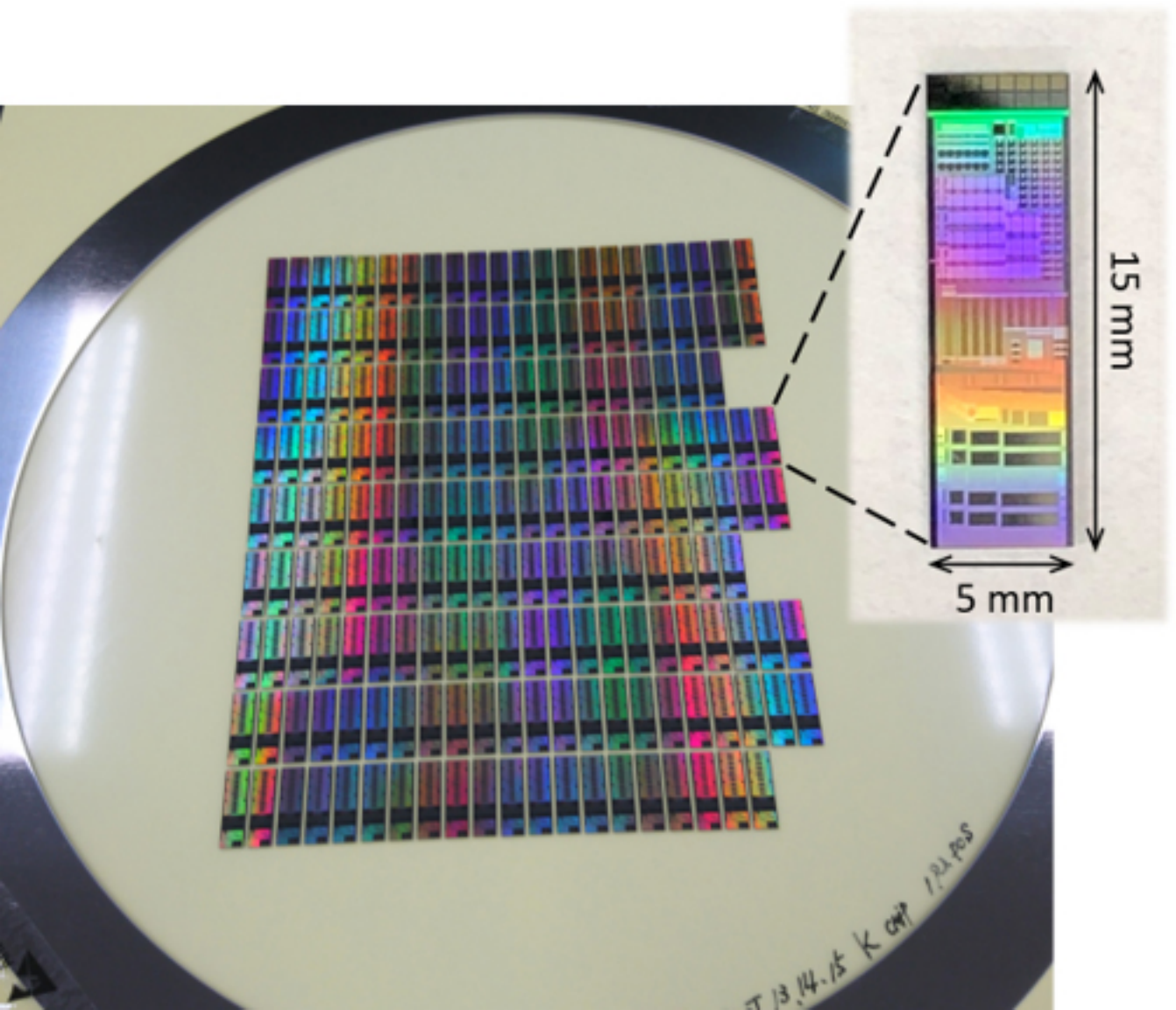
**Photodetector**

**Electronic devices**

**Integrated photonic circuits**

**300mm silicon wafer**





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## Publications

### Journal Publications

#### *Full-papers*

- [1] R. Kou, T. Hiratani, H. Yagi, H. Kuwatsuka, T-H. Yen, M. Okano, M. Ohno, H. Kawashima, K. Suzuki, N. Fujiwara, H. Shoji and K. Yamada, “Inter-layer transition in hybrid III-V/Si waveguides integrated by m-transfer printing,” *Optics Express* 28, pp.19772-19778, 2020.6..
- [2] S. Suzuki, S. Namiki, H. Kawashima, K. Ikeda, R. Konoike, N. Yokoyama, M. Sekim M. Ohtsuka, S. Saitoh, S. Suda, H. Matsuura and K. Yamada, “Nonduplicate Polarization-Diversity 32 x 32 Silicon Photonics Switch Based on a SiN/Si Double-Layer Platform,” *Journal of Lightwave Technology* 38, pp.226-232, 2020.
- [3] R. Kou, N. Yamamoto, G. Fujii, T. Aihara, T. Tsuchizawa, A. Ishizawa, K. Hitachi, H. Gotoh, M. Ukibe and K. Yamada, “Spectrometric analysis of silicon nitride films deposited by low-temperature liquid-source CVD,” *Journal of Applied Physics* 126, p.133101, 2019.10.
- [4] R. Kou, Y. Kobayashi, S. Inoue, T. Tsuchizawa, Y. Ueno, S. Suzuki, H. Hibino, T. Yamamoto, H. Nakajima and K. Yamada, “Dopamine detection on activated reaction field consisting of graphene-integrated silicon photonic cavity,” *Optics Express* 27, pp. 32058-32068, 2019.
- [5] Y. Yonezu, R. Kou, H. Nishi, T. Tsuchizawa, K. Yamada, T. Aoki, A. Ishizawa and N. Matsuda, “Evaluation of graphene optical nonlinearity with photon-pair generation in graphene-on-silicon waveguides,” *Optics Express* 27, pp.30262-30271,2019.
- [6] G. Cong, N. Yamamoto, T. Inoue, M. Okano, Y. Maegami, M. Ohno and K. Yamada, “Arbitrary reconfiguration of universal silicon photonic circuits by bacteria foraging algorithm to achieve reconfigurable photonic digital-to-analog conversion,” *Optics Express* 27, pp. 24914-24922, 2019.
- [7] Hiroyuki Shibata, Taturou Hiraki, Tai Tsuchizawa, Koji Yamada, Yasuhiro Tokura and Sinji Matsuo, “Waveguide-integrated SNSPD with spot-size converter on Si photonics platform”, *Superconducting Science and Technology* 32, p.034001, 2019.1
- [8] Kohei Ashida, Makoto Okano, Takamasa Yasuda, Minoru Ohtsuka, Miyoshi Seki, Nobuyuki Yokoyama, Keiji Koshino, Koji Yamada, Yasushi Takahashi, “Photonic Crystal Nanocavities with an Average Q factor of 1.9 Million Fabricated on a 300-mm-wide SOI wafer using a CMOS-Compatible Process”, *IEEE Journal of Lightwave Technology* 36 (29), pp.4774-4782, 2018.8
- [9] Guangwei Cong, Makoto Okano, Yuriko Maegami, Morifumi Ohno and Koji Yamada, “Interferometric autocorrelation of ultrafast optical pulses in silicon sub-micrometer p-i-n waveguides, *Optics Express* 26(12), pp.15090-15100, 2018.6
- [10] Guangwei Cong, Morifumi Ohno, Yuriko Maegami, Makoto Okano, Koji Yamada, “Silicon traveling-wave Mach-Zehnder modulator under distributed-bias driving,” *Optics Letters* 43, p.403-406, 2018.2
- [11] Ziyi Zhang, Motoki Yako, Kan Ju, Naoyuki Kawai, Papichaya Chaisakul, Tai Tsuchizawa, Makoto Hikita, Koji Yamada, Yasuhiko Ishikawa, Kazumi Wada, “A new material platform of Si photonics for implementing architecture of dense wavelength division multiplexing on Si bulk wafers,” *Science and Technology of advanced Materials* 18, pp.283-293, 2017.12
- [12] Yuriko Maegami, Guangwei Cong, Morifumi Ohno, Makoto Okano, Kazuto Itoh, Nobuhiko Nishiyama, Shigehisa Arai, Koji Yamada, “High-efficiency strip-loaded waveguide based silicon Mach-Zehnder modulator with vertical pn junction phase shifter,” *Optics Express* 25, pp.31407-31416, 2017.12.
- [13] Nobuyuki Matsuda, Hidetaka Nishi, Peter Karkus, Tai Tsuchizawa, Koji Yamada, William John Munro, Kaoru Shimizu, Hiroki Takesue, “Generation of entangled photons using an arrayed waveguide grating,” *Journal of*

- [14] A. Noriki, T. Amano, D. Shimura, Y. Onawa<sup>1</sup>, H. Sasaki, H. Yaegashi, K. Yamada, H. Nishi, T. Tsuchizawa, M. Mori, and Yoichi Sakakibara, "Mirror-based polarization-insensitive broadband vertical optical coupling for Si waveguide," *Japanese Journal of Applied Physics* 56, 090302, 2017.8.
- [15] A. Ishizawa, T. Goto, R. Kou, T. Tsuchizawa, N. Matsuda, K. Hitachi, T. Nishikawa, K. Yamada, T. Sogawa, and H. Gotoh, "Octave-spanning supercontinuum generation at telecommunications wavelengths in a precisely dispersion- and length-controlled silicon-wire waveguide with a double taper structure," *Applied Physics Letters* 111, 021105, 2017.7.
- [16] A. Ishizawa, R. Kou, T. Goto, T. Tsuchizawa, N. Matsuda, K. Hitachi, T. Nishikawa, K. Yamada, T. Sogawa, and H. Gotoh, "Optical nonlinearity enhancement with graphene-decorated silicon waveguides," *Scientific Reports* 7, 45520, 2017.4.
- [17] R. Kou, Y. Hori, T. Tsuchizawa, K. Warabi, Y. Kobayashi, Y. Harada, H. Hibino, T. Yamamoto, H. Nakajima, K. Yamada, "Ultra-fine metal gate operated graphene optical intensity modulator," *Applied Physics Letters* 109, p.251101, 2016.12.
- [18] Cong Guangwei, M. Ohno, Y. Maegami, M. Okano, K. Yamada, "Optical autocorrelation performance of silicon wire p-i-n waveguides utilizing the enhanced two-photon absorption," *Optics Express* 24-26, pp.29452-29458, 2016.12
- [19] Y. Maegami, Cong Guangwei, M. Ohno, M. Okano, K. Yamada, "Strip-loaded waveguide-based optical phase shifter for high-efficiency silicon optical modulators," *Photonics Research* 4-6, pp.222-226, 2016.12
- [20] Y. Maegami, R. Takei, Cong Guangwei, M. Ohno, M. Okano, T. Horikawa, K. Yamada, T. Kamei, "Hydrogenated amorphous silicon waveguide with vertical pin structure for infrared detection," *Electronics Letters* 52-20, pp.1705-1707, 2016.09
- [21] Y. Maegami, M. Okano, Cong Guangwei, M. Ohno, K. Yamada, "Completely CMOS compatible SiN-waveguide-based fiber coupling structure for Si wire waveguides," *Optics Express* 24-25, pp.16856-16865, 2016.07
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- [36] T. Hiraki, H. Nishi, T. Tsuchizawa, R. Kou, H. Fukuda, K. Takeda, Y. Ishikawa, K. Wada and K. Yamada, "Si-Ge-Silica Monolithic Integration Platform and Its Application to a 22-Gb/s x 16-ch WDM Receiver," *IEEE Photonics Journal* 5 (4), 4500407, 2013.
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- [46] T. Tsuchizawa, K. Yamada, T. Watanabe, S. Park, H. Nishi, R. Kou, H. Shinjima, S. Itabashi, "Monolithic Integration of Silicon-, Germanium-and Silica-Based Optical Devices for Telecommunications Applications", IEEE Journal of Selected Topics in Quantum Electronics 17, pp.516-525, 2011.
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waveguide and their application to thermo-optic switches,” Japanese Journal of Applied Physics 45, No.8B, pp.6658-6662, 2006.

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### **International conferences (listed 1<sup>st</sup> author only)**

#### *Tutorial, plenary, workshop*

- [1] K. Yamada, "Tutorial: Advanced Silicon Photonics for Post-Moore Era," 42<sup>nd</sup> European Conference on Optical Communication (ECOC 2016), SC4, Dusseldorf, 18-22 September, 2016
- [2] K. Yamada, "Plenary: Back-end Si Photonics for high-performance photonic systems," 4<sup>th</sup> Advanced Electromagnetics Symposium (AES 2016), Malaga, 26-28 July, 2016.
- [3] K. Yamada, H. Fukuda, T. Watanabe, T. Tsuchizawa, T. Shoji, S. Itabashi, "Microphotonics devices based on silicon wire waveguides," SOI Photonics workshop, 2005 Optical Fiber Communication Conference (OFC 2005), OSuB, Anaheim, March, 2005.

#### *Invited Papers*

- [1] K. Yamada, "How to fully make use of silicon photonics," International Symposium on Ultrafast Photonic Technologies & Special Symposium on Silicon Photonics of the Future (ISUPT/SSPhF 2019), Napa, 17-19 June, 2019.
- [2] K. Yamada, "Silicon Photonics as a Post Moore Technology," 2019 International Symposium on VLSI Technology, Systems and Applications (2019 VLSI-TSA), T9-4, Hsingchu, 22-25 April, 2019.
- [3] K. Yamada, G. Cong, M. Okano, Y. Maegami, M. Ohno, K. Suzuki, S. Suda, R. Konoike, K. Ikeda, H. Kawashima, T. Horikawa, S. Namiki, M. Mori, S. Ikta, K. Nozaki, A. Shinya, and M. Notomi, "A 300-mm-wafer silicon photonics technology for advanced information systems," 2<sup>nd</sup> International Symposium on Devices, Circuits and Systems (ISDCS 2019), Higashi-Hiroshima, 6-8 March, 2019.

- [4] K. Yamada, T. Horikawa, M. Okano, G. Cong, Y. Maegami, M. Ohno, N. Yamamoto, K. Suzuki, S. Suda, R. Konoike, H. Matsuura, K. Ikeda, H. Kawashima, S. Namiki and M. Mori, "A 300-mm-wafer silicon photonics technology for energy-efficient and advanced information systems," Asia Communications and Photonics Conference 2018 (ACP2018), S4F, Hangzhou, 26-29 October, 2018
- [5] K. Yamada, T. Horikawa, M. Okano, G. Cong, Y. Maegami, M. Ohno, N. Yamamoto, K. Suzuki, K. Tanizawa, S. Suda, H. Matsuura, K. Koshino, N. Yokoyama, M. Ohtsuka, M. Seki, K. Matsumaro, T. Narushima, K. Ikeda, H. Kawashima, S. Namiki and M. Mori, "A 300-mm-wafer silicon photonics technology for ultra-low-energy optical network systems," Asia Communications and Photonics Conference 2017 (ACP2017), S4H, Guangzhou, 10-13 November, 2017
- [6] K. Yamada, "Silicon Photonics as a Post-Moore Photonic Circuit Technology," Asia Communications and Photonics Conference 2016 (ACP2016), Ath2G.3, Wuhan, 2-5 November, 2016
- [7] K. Yamada, "Back-end Photonics for Silicon-based Integrated Photonic Platform," Asia Communications and Photonics Conference 2015 (ACP2015), A.Su3A.4, Hong Kong, 19-23 November, 2015
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- [9] K. Yamada, T. Tsuchizawa, H. Nishi, R. Kou, H. Fukuda, T. Hiraki, K. Takeda, H. Fukuda, K. Okazaki, Y. Ishikawa, K. Wada and K. Yamamoto, "Silicon-Germanium-Silica Monolithic Photonic Integration Platform for High-Performance Optical Data Communication Systems", The 226<sup>th</sup> Electrochemical Society Meeting (ECS 226), Cancun, 5-10 October, 2014
- [10] K. Yamada, T. Tsuchizawa, H. Nishi, R. Kou, H. Shinjima, H. Fukuda, T. Hiraki, Y. Ishikawa, K. Wada, "High-performance Photonic Integrated Circuits Based on Si-Ge-silica Monolithic Photonic Platform", The 18th OptoElectronics and Communications Conference (OECC 2013), TuN2-2, Kyoto, 30 June-4 July 2013.
- [11] K. Yamada, "Silicon photonics for optical interconnects and telecom applications", Vail Computer Elements Workshop, Vail, 24-26 June 2013.
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- [31] K. Yamada, "Compact and tunable X-ray source using electron LINAC and multilayer target with submicrometer period" The 6th International Conference on the Physics of X-Ray Multilayer Structures (PXRMS'02), Chamonix, 3-7 March, 2002.

### *Contribution papers*

- [1] K. Yamada, T. Tsuchizawa, T. Watanabe, R. Kou, H. Nishi, H. Shinojima, Y. Ishikawa, K. Wada, S. Itabashi, "Avalanche-mode operation of a simple vertical p-i-n germanium photodiode coupled with silicon waveguide," The 8th International Conference on Group IV Photonics Conference (GFP 2011), FA5, London, 14-16 September 2011.

- [2] K. Yamada, T. Tsuchizawa, T. Watanabe, H. Shinjima, H. Nishi, R. Kou, S. Park, Y. Ishikawa, K. Wada, S. Itabashi, "Optical Power Stabilization using a Germanium Photodiode and a Variable Optical Attenuator Integrated on a Silicon Wire Waveguide Platform," The 7th International Conference on Group IV Photonics (GFP 2010), FC3, Beijing, 1-3 September, 2010.
- [3] K. Yamada, T. Tsuchizawa, T. Watanabe, H. Fukuda, H. Shinjima, S. Itabashi, "Application of Low-loss Silicon Photonic Wire Waveguides with Carrier Injection Structure," The 4th Conference on Group IV Photonics (GFP 2007), WP23, Tokyo, 19-21 September, 2007.
- [4] K. Yamada, H. Fukuda, T. Watanabe, T. Tsuchizawa, H. Shinjima, T. Tanabe, M. Takahashi, S. Itabashi, "All-Optical wavelength Conversion using silicon photonic wire waveguide," The 3rd International Conference on Group IV Photonics (GFP2006), FB5, Ottawa, 13-15 September, 2006.
- [5] K. Yamada, H. Fukuda, T. Watanabe, T. Tsuchizawa, S. Uchiyama, H. Shinjima, T. Shoji and S. Itabashi, "Wavelength Conversion of 10-Gbps Signals using Four-Wave Mixing in ultra-small silicon waveguide," CLEO Pacific Rim 2005, CWE1-2, Tokyo, 30 July-2 August, 2005.
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- [9] K. Yamada, H. Hosokawa, "Present Status of Super-ALIS Electron Storage Ring," International Workshop on X-ray and EUV Lithography 1998 (XEL'98), Yokohama, 1998
- [10] K. Yamada and T. Hosokawa, "Suppressing the x-y coupling effect in compact electron storage rings," The 6th International Conference on Synchrotron Radiation Instrumentation (SRI'97), Himeji, 4-8 August, 1997.
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- [13] K. Yamada, M. Nakajima and T. Hosokawa, "Reduction of the Dynamic Field Deviation in Series-connected Superconducting Magnets for Compact Storage Ring," The 2nd European Particle Accelerator Conference (EPAC 90), Nice, 12-16, June, 1990.

## Books

- [1] K. Yamada, "Waveguide Design, Fabrication, and Active Device Integration," Section 7, *Photonics and Electronics with Germanium*, Wiley-VCH, June 2015.
- [2] K. Yamada, "Silicon Photonic Wire Waveguides," Section 2.2, *Handbook on Silicon Photonics*, Taylor & Francis/CRC Press, April 2013
- [3] K. Yamada, "Silicon Photonics Wire Waveguides: Fundamentals and Applications," Koji Yamada, Section 1, *Silicon Photonics II*, Springer Verlag, 2011

### Performance (short version)

In 1999, Dr. Yamada began research on silicon photonics at NTT laboratories. He has developed low-loss silicon photonic wire waveguides, low-loss waveguide-fiber connection structures, and various elemental photonic devices, such as wavelength filters, Si optical modulators, and Ge photodetectors on a Si photonic platform. Moreover, he has integrated these passive and active photonic devices monolithically on a silicon photonic platform. Furthermore, he was the first in the world to demonstrate the feasibility of silicon waveguides as efficient and compact media for optical nonlinearity. Recently in AIST, he has established a silicon photonics foundry service that features an ultrafine CMOS fabrication technology, and has contributed much to the development of silicon photonics technology for industry. More recently, he began research and development of reconfigurable photonic circuits for intelligent applications such as neuromorphic computing.

His work has immediately received worldwide attentions, and he has given many invited talks tutorials at major international conferences, such as OFC, ECOC, CLEO, IEEE LEOS/PHO/GFP, and so on. His work can also be seen in more than 100 papers published in major scientific journals. In this way, for these 20 years and more, he has been one of the leaders in the research and development of silicon-based integrated photonics.

In addition to his R&D activities, he has engaged many support activities in academic societies, such as serving as the committee chair or a member of the committee of international conferences (IEEE GFP, CLEO, SPIE...) and as an associate editor of international journals (IEEE JQE, OSA Photonics Research).