External Awards

Eco-ICT Award 2017
Winner: Hideki Maeda, Daisaku Shimazaki, Masaaki Inami, Takeshi Seki, Takafumi Fukatani, Masatoshi Namiki, and Yuji Minato, NTT Network Service Systems Laboratories
Date: February 21, 2018
Organization: Telecommunications Carriers Association

For the development of optical packet multifunctional system "100G-PTS."

Excellent Technology Award
Winner: Motohiro Makiguchi and Hideaki Takada, NTT Service Evolution Laboratories; Tohru Kawakami and Mutsumi Sasai, Tohoku University
Date: June 22, 2018
Organization: The Institute of Image Electronics Engineers of Japan (IIEEJ)

For the development of "glassless motion parallax 3D screen system using visual perception."

1906 Award
Winner: Yohei Sakamaki, NTT Device Technology Laboratories
Date: July 31, 2018
Organization: The International Electrotechnical Commission (IEC)

For his achievement and contribution as a key project leader in IEC Subcommittee 86C/Working Group 5, with very good results in developing IEC 62343-3-4, a performance specification template for the multi-cast optical switch—an important component in reconfigurable optical add-drop multiplexer (ROADM) systems.

Communications Society: Distinguished Contributions Award
Winner: Hideki Maeda, NTT Network Service Systems Laboratories
Date: September 12, 2018
Organization: The Institute of Electronics, Information and Communication Engineers (IEICE)

For his contributions as secretary of the Technical Committee on Network Systems.

Young Scientist Presentation Award
Winner: Motoki Asano, NTT Basic Research Laboratories
Date: September 18, 2018
Organization: The Japan Society of Applied Physics (JSAP)

For "Evanescent Coupling between an Optical Microbottle and an Electromechanical Resonator."
Published as: M. Asano, R. Ohta, T. Yamamoto, H. Okamoto, and H. Yamaguchi, "Evanescent Coupling between an Optical Microbottle and an Electromechanical Resonator," Proc. of the 65th JSAP Spring Meeting, 18p-C301-5, Tokyo, Japan, Mar. 2018.

Young Scientist Presentation Award
Winner: Masaaki Ono, NTT Basic Research Laboratories
Date: September 18, 2018
Organization: JSAP

For "Enhancement of Graphene Absorption in Plasmonic Waveguides with 30 x 20 nm^2 Core."
Published as: M. Ono, M. Hata, K. Nozaki, H. Sumikura, and M. Notomi, "Enhancement of Graphene Absorption in Plasmonic Waveguides with 30 x 20 nm^2 Core," Proc. of the 65th JSAP Spring Meeting, 20p-C301-13, Tokyo, Japan, Mar. 2018.

JSAP Poster Award
Winner: Makoto Takamura, Norio Kumada, Shengnan Wang, Kazuhide Kumakura, and Yoshitaka Taniyasu, NTT Basic Research Laboratories
Date: September 18, 2018
Organization: JSAP

For "Tuning of Plasmonic Reflection in Graphene by Carrier Density Modulation."
Published as: M. Takamura, N. Kumada, S. Wang, K. Kumakura, and Y. Taniyasu, "Tuning of Plasmonic Reflection in Graphene by Carrier Density Modulation," Proc. of the 79th JSAP Autumn Meeting, 18p-PB3-58, Nagoya, Aichi, Japan, Sept. 2018.

Best Paper Award
Winner: Hiroshi Ishikawa, Salah Ibrahim, Tatsushi Nakahara, Hiroki Sugiyama, and Toshikazu Hashimoto, NTT Device Technology Laboratories
Date: September 20, 2018
Organization: International Conference on Photonics in Switching and Computing 2018 (PSC 2018)

For "A Novel Optoelectronic Parallel-to-Serial Converter for 100-Gbps Optical Packets."
Published as: H. Ishikawa, S. Ibrahim, T. Nakahara, H. Sugiyama, and T. Hashimoto, "A Novel Optoelectronic Parallel-to-Serial Converter for 100-Gbps Optical Packets," PSC 2018, Th3B.3, Limassol, Cyprus, Sept. 2018.

Papers Published in Technical Journals and Conference Proceedings

Wideband Slow Short-pulse Propagation in One-thousand Slantingly Coupled L3 Photonic Crystal Nanocavities

E. Kuramochi, N. Matsuda, K. Nozaki, A. H. K. Park, H. Takesue, and M. Notomi

Optics Express, Vol. 26, No. 8, pp. 9552–9564, April 2018.

Coupled cavities have been used previously to realize on-chip low-dispersion slow-light waveguides, but the bandwidth was usually narrower than 10 nm and the total length was much shorter than 1 mm. Here we report long (0.05–2.5 mm) slow-light coupled cavity waveguides formed by using 50, 200, and 1000 L3 photonic crystal nanocavities with an optical volume smaller than $(\lambda/n)^3$, slanted from Γ-K orientation. We demonstrate experimentally the formation of a single-mode wideband coupled cavity mode with a bandwidth of up to 32 nm (4 THz) in telecom C-band, generated from the ultra-narrow-band (~300 MHz) fundamental mode of each L3 nanocavity, by controlling the cavity array orientation. Thanks to the ultrahigh-Q nanocavity design, coupled cavity waveguides longer than 1 mm exhibited low loss and allowed time-of-flight dispersion measurement over a bandwidth up to 22 nm by propagating a short pulse over 1000 coupled L3 nanocavities. The highly dense slanted array of L3 nanocavity demonstrated unprecedentedly high cavity coupling among the nanocavities. The scheme we describe provides controllable planar dispersion-managed waveguides as an alternative to W1-based waveguides on a photonic crystal chip.

Experimental Investigation of Laser Linewidth Tolerance of 32-GBaud DP-256QAM Optical Coherent System

T. Sasai, F. Hamaoka, A. Matsushita, M. Nakamura, H. Kawakami, and Y. Kisaka

Proc. of the 23rd OptoElectronics and Communications Conference (OECC 2018), 6D2-1, Jeju, Korea, July 2018.

We experimentally investigate the laser linewidth tolerance of 32-GBaud DP-256QAM system for back-to-back and 50-km transmission. Results show that laser linewidth (0.1–550 kHz) has only a slight effect on the signal quality even for higher-order QAM.

Room Temperature Continuous-wave Nanolaser Diode Utilized by Ultrahigh-Q Few-cell Photonic Crystal Nanocavities

E. Kuramochi, H. Duprez, J. Kim, M. Takiguchi, K. Takeda, T. Fujii, K. Nozaki, A. Shinya, H. Sumikura, H. Taniyama, S. Matsuo, and M. Notomi

Optics Express, Vol. 26, No. 20, pp. 26598–26617, September 2018.

Few-cell point-defect photonic crystal (PhC) nanocavities (such as L_X and H1 type cavities), have several unique characteristics including an ultrasmall mode volume (V_m), a small device footprint advantageous for dense integration, and a large mode spacing advantageous for high spontaneous-emission coupling coefficient (β), which are promising for energy-efficient densely integratable on-chip laser light sources enhanced by the cavity quantum electrodynamics (QED) effect. To achieve this goal, a high quality factor (Q) is essential, but conventional few-cell point-defect cavities do not have a sufficiently high Q. Here we adopt a series of modified designs of L_X cavities with a buried heterostructure (BH) multi-quantum-well (MQW) active region that can achieve a high Q while maintaining their original advantages and fabricate current-injection laser devices. We have successfully observed continuous-wave (CW) lasing in InP-based L1, L2, L3 and L5 PhC nanocavities at 23°C with a DC current injection lower than 10 μA and a bias voltage lower than 0.9 V. The active volume is ultrasmall while maintaining a sufficiently high confinement factor, which is as low as ~10^{-15} cm^3 for a single-cell (L1) nanocavity. This is the first room-temperature current-injection CW lasing from any type of few-cell point-defect PhC nanocavities (L_X or H1 types). Our report marks an important step towards realizing a nanolaser diode with a high cavity-QED effect, which is promising for use with on-chip densely integrated laser sources in photonic networks-on-chip combined with CMOS (complementary metal-oxide semiconductor) processors.

Adaptive Compensation for SOA-induced Nonlinear Distortion with Training-based Estimation of SOA Device Parameters

F. Hamaoka, S. Okamoto, M. Nakamura, A. Matsushita, and Y. Kisaka

Proc. of the 44th European Conference on Optical Communication (ECOC 2018), We2.31, Rome, Italy, September 2018.

The semiconductor optical amplifier (SOA)-induced nonlinear distortion is compensated solving a time-evolving equation for the gain exponent using SOA device parameters estimated by our proposed training-based technique. In experiments for 32-GBaud PDM-16QAM (polarization division multiplexed 16 quadrature amplitude modulation), a maximum 2.52-dB Q-factor improvement was obtained by adaptive nonlinear compensation.

150.3-Tb/s Ultra-wideband (S, C, and L bands) Single-mode Fibre Transmission over 40-km Using >519Gb/s/λ PDM-128QAM Signals

F. Hamaoka, K. Minoguchi, T. Sasai, A. Matsushita, M. Nakamura, S. Okamoto, E. Yamazaki, and Y. Kisaka

Proc. of ECOC 2018, Mo4G. 1, Rome, Italy, September 2018.

A record capacity of 150.3-Tb/s SMF (single-mode fibre) transmission over 40 km is achieved with 13.6-THz ultra-wideband WDM (wavelength division multiplexed) 45-GBaud PDM-128QAM signals with 11.05-b/s/Hz spectral efficiency by using our proposed optimization scheme of fibre input powers considering the nonlinear interaction by stimulated Raman scattering.

Novel ODU4 Path Protection without Bit Disruption for Low Latency and Resilient Core/Metro Network

K. Kitamura, F. Inuzuka, T. Tanaka, and A. Hirano

Proc. of ECOC 2018, Mo4D. 4, Rome, Italy, September 2018.

We demonstrate novel 100Gbit/s ODU4 path switching without bit disruption at a relative delay difference up to 400 km experimentally. We confirmed ITU-T (International Telecommunication Union - Telecommunication Standardization Sector) standard-compliant

jitter characteristics and applicability for core and metro networks by evaluating the accommodation rate in a European network.

Underground Infrastructure Management System Using Internet of Things Wireless Transmission Technology

Y. Yamaguchi, Y. Fujino, H. Katsuda, M. Nakano, H. Fukumoto, S. Teruhi, K. Akabane, and S. Yoshino

IEICE Transactions on Electronics, Vol. E101-C, No. 10, pp. 727–733, October 2018.

This paper presents a water leakage monitoring system that gathers acoustic data of water pipes using wireless communication technology and identifies the sound of water leakage using machine leaning technology. To collect acoustic data effectively, this system combines three types of data-collection methods: drive-by, walk-by, and static. To design this system, it is important to ascertain the wireless communication distance that can be achieved with sensors installed in a basement. This paper also reports on radio propagation from underground manholes made from reinforced concrete and resin concrete in residential and commercial areas using the 920 MHz band. We reveal that it is possible to design a practical system that uses radio communication from underground sensors.

Incremental Environmental Monitoring for Revealing the Ecology of Endangered Fish

Y. Shirai, Y. Kishino, S. Mizutani, Y. Yanagisawa, T. Suyama, T. Otsuka, T. Kitagawa, and F. Naya

IEICE Transactions on Communications, Vol. E101-B, No. 10, pp. 2070–2082, October 2018.

This paper proposes a novel environmental monitoring strategy, incremental environmental monitoring, that enables scientists to reveal the ecology of wild animals in the field. We applied this strategy to the habitat of endangered freshwater fish. Specifically, we designed and implemented a network-based system using distributed sensors to continuously monitor and record the habitat of endangered fish. Moreover, we developed a set of analytical tools to exploit a variety of sensor data, including environmental time-series data such as the amount of dissolved oxygen, as well as underwater video capturing the interaction of fish and their environment. We also describe the current state of monitoring the behavior and habitat of endangered fish and discuss solutions for making such environmental monitoring more efficient in the field.