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In recent years, research of microwave photonics (MWP) has progressed at an unprecedented pace, concentrating on deep interactions between microwaves and lightwaves for the generation, distribution, processing, control, and sensing of microwave, millimeter-wave, and terahertz signals. In addition to the growing interest from academic research and laboratory trials, MWP has increasingly evolved as an enabling technology for diverse fields and engineering applications, such as large-capacity wireless-fiber communications, remote radio-frequency sensing, low-noise signal sources, and military systems. Therefore, along with the celebration of the International Year of Light 2015, we are pleased to launch such a special section focusing on deep interactions between microwaves and lightwaves in *Optical Engineering* (the flagship journal of SPIE and a journal mostly technique and engineering oriented), to highlight the latest advances in the field of MWP, ranging from concepts, theories, and approaches, to devices, systems, applications, and engineering implementations.

In this MWP special section, 19 papers (including 2 invited papers) contributed by authors from Asia-Pacific, Europe, and America have been accepted for publication after rigorous and anonymous peer review. As an overall review of these papers, related topics include wireless-fiber communications and links (6 papers), microwave signal processing (7), microwave signal generation (3), and sensing and detection (3). The distributions of topics really reflect the technology readiness level of current MWP.

For more details, we start with introducing the two invited papers. In "Review of physical layer networking for optical-wireless integration," C. Lim, K. Lee, and A. Nirmalathas from University of Melbourne present the latest advances on physical networking options and enabling system technologies for optical and wireless access backhaul infrastructure. The other is entitled "Stimulated Brillouin scattering gain bandwidth reduction and applications in microwave photonics and optical signal processing," by S. Preussler and T. Schneider from Technische Universität Braunschweig. This paper describes ultranarrow stimulated Brillouin scattering (SBS) gain bandwidth and its applications in high-resolution microwave and optical signal processing.

Regarding the topic of wireless-fiber communications and links, the papers study digital linearization (by J. Ning et al.), elimination of cross-modulation distortions (by X. Liang, et al.), dispersion compensation (by T. Pu et al.), multifunction-stabilized photonic link (by A. Zhang, et al.), and uplink connection for radio-over fiber systems (by C. Zhang, et al.).

Within the topic of microwave signal processing, we have significant contributions on a tunable fractional-order photonic differentiator (by S. Sun et al.), optical single-sideband modulation (by S. Song), photonic digital-to-analog conversion (by F. Zhang et al.), a broadband radiofrequency converter (by R. M. Borges et al.), an all-optical correlator (by J. Sun et al.), and a microwave photonic filter (by E. Xu et al.).

Meanwhile, photonic microwave signal generation based on several techniques, including frequency quadrupling (by M. Zhu et al.), a tunable optoelectronic oscillator with fine step (by Y. Teng et al.), and a flat optical frequency comb (D. Chen et al.), is demonstrated.

Also, several papers address MWP applications in sensing and detection, such as a fiber-wireless sensor system (by J. Wang et al.), an optoelectronic oscillator–based sensor interrogation (by H. Chen et al.), and microwave characterization of Mach-Zehnder modulators (by H. Wang et al.).

To sum up, we would like to thank all authors for their contributions and all reviewers for their valuable comments and suggestions. We also appreciate the support and

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Xihua Zou is a full professor at the Southwest Jiaotong University, China, and a Humboldt Research Fellow at the University of Duisburg-Essen, Germany. He has authored over 80 papers in high-impact, peer-reviewed journals in the field of microwave photonics. He was the recipient of National Outstanding Expert in Sci&Tech of China (2014), nomination for the Award for Excellent Doctoral Dissertation of China (2011), Award for Young Scientist of Sichuan-Province, China (2013), and Outstanding Reviewer of Optics Communications (2015).

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