

# Introduction to the Issue on Optical Interconnects for Data Centers

WE are pleased to introduce the IEEE JOURNAL OF SELECTED TOPICS IN QUANTUM ELECTRONICS (JSTQE) Issue on “Optical Interconnects for Data Centers.” This issue signifies the first JSTQE issue dedicated to the emerging important roles photonics are playing in data centers. The issue showcases the significant research progress being made toward integrating optical interconnect technology (monolithically or multichip module) with CMOS computing logic to meet the challenges in achieving the high performance and energy efficiency needed for both high-performance computing and data centers.

This issue contains 20 papers, including seven invited and 13 contributed papers, authored by some of the leading photonics research groups in the world. The papers in this issue cover the broad scope of research representative of this growing field.

- 1) *Integrated Optical Networks and Switches*. Novel switches and integration techniques are applied to create dense wavelength division multiplexing (WDM) filters, routers, and parallel waveguides enabling the high-bandwidth and low-latency optical networks demonstrated in these papers.
- 2) *Optical Networking Architecture*. These papers demonstrate networking architectures that use the latency, power, and bandwidth benefits of optical technology to achieve more energy efficient and higher performance computing systems and data centers.
- 3) *Energy-Efficient Integrated Optical Receiver Technology*. Critical receiver technologies are covered including a paper on the experimental demonstration of 40-channel dense WDM signal DEMUXing and detection of optical signals at data rates up to 25 Gb/s and a paper addressing the fundamental energy efficiency limits of plasmonic photodetectors for data communication.
- 4) *High Data Rate Energy Efficient Optical Sources*. Some of the key source technologies including integrated silicon modulators and discrete vertical-cavity surface-emitting laser that can be electrically modulated up to 40 Gb/s are demonstrated in these papers.
- 5) *CMOS Integrated Optical Interconnects*. Technologies for CMOS logic compatible integration of all the elements for optical data communication are described in these papers contributing toward realizing fully integrated computing with optical network fabrics.

We hope you will find that this JSTQE Issue on Optical Interconnect for Data Centers has captured the exciting and valuable contributions from the scientists and engineers around the world, pioneering research in optical interconnects for high-performance computing. Furthermore, we hope that this issue serves as a milestone for stimulating the further advances in this field.

## ACKNOWLEDGMENT

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