

# Advancements in optical communication and networks

## 1 | INTRODUCTION

I joined Microwave and Optical Technology Letters (MOTL) in May 2021 as an Associate Editor, and I am witnessing the continuous progress of MOTL. In MOTL, we are receiving papers from various research domains related to microwave, optical sensors, optical communications, and so forth. I am thankful to the Editor in Chief Prof. Wenquan Che, who encouraged and suggested me to propose a special issue (SI) related to optical communication, which will further promote and attract researchers toward MOTL because this is a core journal related to the optical communications and networks. However, there is room to enhance MOTL visibility among the optical communications research community. I am thankful to all the editorial staff of MOTL who made it possible to offer and complete a successful SI. Most importantly, this task was not possible without the continuous help of Dr. Muhammad Imran and Dr. Gul Zameen Khan who contributed equally in handling this SI from the initial proposal to this concluding report as guest editors. I appreciate them for the volunteer service which they offered to MOTL.

## 2 | IMPORTANCE OF THIS SI

The communications industry heavily relies on optical communication systems to meet its capacity and reach requirements. Resultantly, this area remained a research hotspot and has made tremendous progress, especially for more than three decades. Revolutionary innovative optical/photonic technologies and techniques have been introduced one after another to cope with the new challenges in all research and network domains such as advanced high-speed modulation techniques, advanced and cost-effective optical access networks, coherent and multilevel noncoherent detection techniques, wavelength-division multiplexing (WDM), techniques managing and exploiting the nonlinearities in optical communication, and space-division multiplexing (SDM), to name a few.

Recently, the emergence of 5G has brought a new set of challenges by the introduction of disparate vertical services in addition to conventional challenges of capacity, reach, and flexibility. To cope with these new

diverse requirements, the research community is exploring various new and advanced techniques that would introduce advanced communication networks, optical components, and devices, long reach with the help of advanced modulation techniques, network security, and so forth. Similarly, optical wireless communication is very important for broadband communication, which is chosen as a backhaul approach for next-generation 5G services.

This SI aimed to gather the recent advancements and innovative applications of optical communication systems in all-optical network domains. The major research topics of interest for this SI are coherent optical communication employing advanced modulation formats; direct detection based long-reach and short-reach optical communication systems; optical multicarrier generation techniques and its applications; open optical networks; multiband (C + L) Optical Networks; free-space optical communication; network security and quality of services for optical communication; designing optical/photonic components; high throughput coding for optical communication; new modulation and coding schemes; multimode/few-mode fiber communication and/or equalization techniques; optical metro/access networks; blockchain-based secure optical communication.

## 3 | IMPACT OF THE SI ON THE RESEARCH COMMUNITY

We expect that this SI will play an important role in promoting MOTL in the following years. The incoming flow of research papers in MOTL pertaining to optical communications and networks has increased as compared to the previous years.

We received a large number of articles on the aforementioned topics from various locations, universities, and research institutes, but only 30%–35% of them were accepted. The selection criteria were simple: only submissions explicitly relevant to the provided subjects were encouraged for consideration, which is why several were rejected during the initial screening. Reviewers were invited to review the papers after the initial evaluation by the guest editors. The issue contains 11 research articles and one review

article. Four articles present excellent works on constellation shaping including both probabilistic and geometric shaping and fast-tracking of polarization impairments. There are two articles related to design and use of optical frequency combs (OFCs) in optical communications including an invited article on integrated gain-switched lasers for OFC generation. Three articles focus on network layer performance and reconfigurability. Remaining three articles cover free-space optical communication performance and system design issues. We are very thankful for the volunteer work of the international reviewers who indirectly participated with us in this SI. This was a challenging task and was not possible without the anonymous reviewers from different corners of the world. Finally, we are thankful to all the editorial team for working with us in a closed loop, the devoted efforts of all the team are appreciable.

Rahat Ullah<sup>1</sup>  
Muhammad Imran<sup>2</sup>  
Gul Z. Khan<sup>3</sup>

<sup>1</sup>*Institute of Optoelectronics,  
Nanjing University of Information Science and  
Technology, Nanjing, China*

<sup>2</sup>*High Capacity and Secure Optical Communication  
Group, TeCIP Institute, Scuola Superiore Sant'Anna,  
Pisa, Italy*

<sup>3</sup>*Senior Network Architect R&D (Fiber Optics), NLT Digital  
Solutions Australia Pty Ltd., Caboolture, Australia*

### Correspondence

Rahat Ullah, Institute of Optoelectronics, Nanjing  
University of Information Science and Technology,  
Nanjing, China.

Email: [rahat@nuist.edu.cn](mailto:rahat@nuist.edu.cn)