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Optical communications in free-space and fiber using orbital angular momentum modes

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Nowadays, optical communications supports a variety of information transmission infrastructures through global networks. Emerging applications place huge demands on the data capacity of communication systems. This talk presents high-speed fiber/free-space optical communications and networking using orbital angular momentum (OAM) multiplexing.

First, OAM basics and its traditional applications will be introduced. Spatial division multiplexing (SDM) utilizes multiple spatially orthogonal channels to transmit signals simultaneously, dramatically increasing data capacity. OAM states can be used as an extra dimension, creating an additional set of data carriers in the SDM system. First, we will list several typical scenarios for free-space optical OAM communications. Next, we will discuss the potential and applications of using OAM modes for spatial multiplexing in a ring fiber. Several types of ring-core fibers carrying different functions for OAM modes will be presented, including multi-core ring fiber supporting thousands of OAM modes, coupled ring-core fiber with large negative dispersion, non-zero dispersion-shifted ring fiber to balance the chromatic dispersion and nonlinearity, and fiber-based OAM amplifier. Finally, we will review several reconfigurable networking functions on multiplexed OAM beams with wavefront-phase-tailoring methods. Specifically, add/drop multiplexing, selective switching and multicasting for OAM channels will be discussed. Moreover, we will show selective data switching among three 100 Gb/s quadrature phase-shift keying OAM channels. The scheme of selective OAM-beam manipulation can be potentially cascaded to realize an arbitrary n × n switching function.

Biography

Yang Yue received the B.S. and M.S. degrees in electrical engineering and optics from Nankai University, China, in 2004 and 2007, respectively. He received the Ph.D. degree in electrical engineering from the University of Southern California, USA, in 2012. He is a Professor with the School of Information and Communications Engineering, Xi'an Jiaotong University, China. Dr. Yue's current research interests include intelligent photonics, optical communications and networking, optical interconnect, detection, imaging and display technology, integrated photonics, free-space and fiber optics. He has published over 200 peer-reviewed journal papers (including Science) and conference proceedings with >9,000 citations, four edited books, >50 issued or pending patents, >100 invited presentations (including 1 tutorial, >10 plenary and >30 keynote talks). Dr. Yue is a Senior Member of the Institute of Electronic and Electrical Engineers (IEEE). He is an Associate Editor for IEEE Access, and an Editor Board Member for three other scientific journals. He also served as Guest Editor for eight journal special issues, Chair or Committee Member for >60 international conferences, Reviewer for >60 prestigious journals.

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