

8<sup>th</sup> International Conference and Exhibition on

# LASERS, OPTICS & PHOTONICS

November 15-17, 2017 | Las Vegas, USA

## Improvement of optical transmission capacity by data compression and amplitude/phase/frequency 3-dimensional modulation

**Dongsun Seo**

Myongji University, Korea

In this talk, we discuss novel schemes that improve significantly the spectral efficiency (i.e., channel capacity) of an optical access link. Firstly, an optical orthogonal frequency division multiplexing (OFDM) signal, which is encoded by multilevel quadrature amplitude modulation (QAM), is compressed using the proposed sampling scheme sampled at a lower than conventional Nyquist rate. At the receiver, the OFDM signal is recovered by a Bayesian compressive sensing (CS) technique. We show experimentally the spectral efficiency improvement (i.e., data compression) up to <40% and <20% for 4-QAM and 16-QAM encoded OFDM waveforms, respectively. Secondly, we discuss channel capacity improvement by simultaneous modulation of amplitude, phase and frequency i.e., by combining frequency shift keying (FSK) and QAM. This 3-dimensional modulation so called NOFQAM, increases the modulation order dramatically by multiplying both the FSK and QAM orders. Unlike a conventional orthogonal FSK modulation, the FSK channels are overlapped in our non-orthogonal (NO) FSK modulation. Therefore, the NO-FSK modulation increases the channel capacity at a fixed channel bandwidth. For experimental verification, we implement a 20-km optical access link, which transmits a 64-NOFQAM signal formed by combining both 4-FSK and 16-QAM. The symbol rate and FSK channel spacing are 200 M-symbol/s and 45 MHz, respectively. Comparing to a 200 M-symbol/s 16-QAM transmission, the suggested 64-NOFQAM transmission shows negligible increase in the occupied channel bandwidth and very small power penalty less than 0.5 dB. Finally, we apply the CS based data compression technique to the 64-NOFQAM signal and show greater than 50% of data compression.

### Biography

Dongsun Seo has received his PhD degree in Electrical Engineering (Optoelectronics) from the University of New Mexico in 1989. In 1990, he has joined the Faculty of Myongji University, Korea, where he is currently a Professor in the Department of Electronics. From 2002 to 2004, he was with Purdue University, as a Visiting Research Professor in the School of Electrical and Computer Engineering. He has published over 70 journal articles and over 100 conference papers. His current research interests are in the areas of optical pulse sources, ultrafast optics, high-capacity optical communications, optical processing and photonics.

sdsphoto@mju.ac.kr

### Notes: