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WDM bidirectional optical wireless communications

In this talk, high-speed free space optics communication (FSO) technologies will be reviewed and introduced. Then we will design and demonstrate two proposed FSO schemes. The first scheme is bi-directional short-range free-space optical (FSO) communication with 2x4x10 Gb/s capacity in wavelength division multiplexing (WDM) channels short transmission distance. The single-mode-fiber components are used in the optical terminals for both optical transmitting and receiving functions. The measured power penalties for bi-directional, four-channel WDM FSO communication are less than 0.8 dB and 0.2 dB, compared with the back-to-back link and uni-directional transmission system, respectively. The second scheme is hybrid optical fiber and FSO link in outdoor environments such as cross bridge or inter-building system. A sensor head is used for monitoring the condition of bridge, and in the case of the bridge being damaged the transmission path could be changed from fiber link to FSO link to ensure data link connectivity. In both cases, the single-mode-fiber (SMF) components are used in the optical terminals for both optical transmitting and receiving functions. The influences of environmental factor including window glasses, air turbulence and rainfall will also be addressed. The colorless and colored window glasses introduce losses under various incident angles, but did not induce substantial power penalties. The air turbulence induces extra transmission loss and instability in the received power. Raindrops are the most influential environmental factor. The bit error rate (BER) test shows that raindrops result in a seriously impaired BER to interrupt the transmission instantaneously. After appropriate performance improvement, these proposed transmission structures show potential applications for outdoor transmission under various natural weather conditions.

Biography

Shien-Kuei Liaw received Double Doctorate from National Chiao-Tung University in Photonics Engineering and from National Taiwan University in Mechanical Engineering, respectively. He joined the Chunghua Telecommunication, Taiwan, in 1993. Since then, he has been working on Optical Communication and Fiber Based Technologies. He joined the Department of Electronic Engineering, National Taiwan University of Science and Technology (NTUST) in 2000. He has ever been Director of the Optoelectronics Research Center and the Technology Transfer Center, NTUST. He was a Visiting Researcher at Bellcore (now Telcordia), USA for six months in 1996 and a visiting Professor at University of Oxford, UK for three months in 2011. He owned six US patents, and authored or coauthored for 250 journal articles and international conference presentations. He earned many domestic honors and international honors. He has been actively contributing for numerous conferences as a conference chair, technical program chair, organizing committee chair, steering committee and/or keynote speaker. He serves as an Associate Editor for Fiber and Integrated Optics. Currently, he is a Distinguished Professor of National Taiwan University of Science and Technology (NTUST), Vice President of the Optical Society (OSA) Taiwan Chapter and Secretary-General of Taiwan Photonic Society. His research interests are in Optical Sensing, Optical Communication and Reliability Testing.

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