



Free-space optic WDM bidirectional transmission: Design and Evaluation

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Abstract:

In this talk, high-speed free space optics communication (FSO) technologies will be reviewed and introduced. We design and demonstrate two proposed FSO schemes. The first scheme is a bi-directional, short-range and free-space optical (FSO) communication with 2x4x10 Gb/s capacity in wavelength division multiplexing (WDM) channels for short-distance transmission. Compared to the back-to-back link and uni-directional transmission system, the measured power penalties for bi-directional, four-channel WDM FSO communication are less than 0.8 dB and 0.2 dB, respectively. The second scheme is the hybrid optical fiber and FSO link for outdoor environment, such as cross bridge or inter-building system. In case that the bridge breaks, the transmission path can be switched from fiber link to FSO link to ensure the connectivity of data link. In both cases, the single-mode-fiber (SMF) components are used in the optical terminals for both optical transmission and receiving functions. The environmental and infrastructure factors including window glasses, air turbulence and rainfall that influence the case will also be addressed. The air turbulence induces extra transmission loss and instability in the received power. We found that raindrops are the most influential environmental factor. The bit error rate (BER) test shows that raindrops seriously increase the BER that may interrupt the transmission instantaneously. After appropriate performance improvement, the proposed transmission structures show potential applications for outdoor transmission under various natural weather conditions.

Biography:

Shien-Kuei (Peter) Liaw received double PhD degrees 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. Prof. Liaw 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.

Publication of speakers:

1. Zhang, Li-Qiang & Tian, Zhen & Chen, N.K. & Grattan, Kenneth & Yao, Yicun & Rahman, B. & Li, Xiaohui & Yao, Cheng-Kai & Han, Haili & Chui, Hsiang-Chen & Liaw, S.K.. (2020). Pulse dynamics of an all-normal-dispersion ring fiber laser under four different pulse regimes. IEEE Access. PP. 1-1. 10.1109/ACCESS.2020.3004384.
2. Yu, Yi-Lin & Kishikawa, Hiroki & Goto, Nobuo & Liaw, S.K.. (2020). D-Shaped Silicon Core Fiber based Surface-Plasmon-Resonance Refractive Index Sensor in 2-μm. Applied Optics. 59. 10.1364/AO.387832.
3. Kishikawa, Hiroki & Kishimoto, Haruya & Sakashita, Noriyuki & Goto, Nobuo & Liaw, S.K.. (2020). Pilot beam-assisted adaptive compensation for atmospheric turbulence in free-space optical transmission of beams carrying orbital angular momentum. Japanese Journal of Applied Physics. 59. 10.35848/1347-4065/ab9351.
4. Sung, Jiun-Yu & chen, jin & Liaw, S.K. & Kishikawa, Hiroki & Goto, Nobuo. (2020). A fiber Bragg grating sensing system with wavelength-swept-laser distribution and self-synchronization. Optics Letters. 10.1364/OL.403671

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