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Improvement In Bit-Rate Of Indoor Wireless Optical Communication System

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ABSTRACT—*A high-speed optical wireless communication system for indoor networking applications is studied. A proof-of-concept at 12.5-Gb/s wireless transmission has been successfully demonstrated with limited mobility. When integrated with a WiFi-based localization system, high-speed optical wireless communication with a mobility feature can be achieved over the entire room. The relation between maximum beam footprint and overall bit rate have also been studied and find the results show that error-free BER reception can always be achieved for a wide range of bit rates from 10 to 12.5 Gb/s.*

I. INTRODUCTION

However, an angle-diversity receiver was used and three transmitters and receivers were needed for each user. In this letter, we further improve our system to 12.5 Gb/s communication. We also keep the error-free BER and quantify the trade-off between the maximum beam footprint and achievable bit rate of our proposed OW system.

BLOCK DIAGRAM OF SYSTEM AS CENTRAL OFFICE (CO)

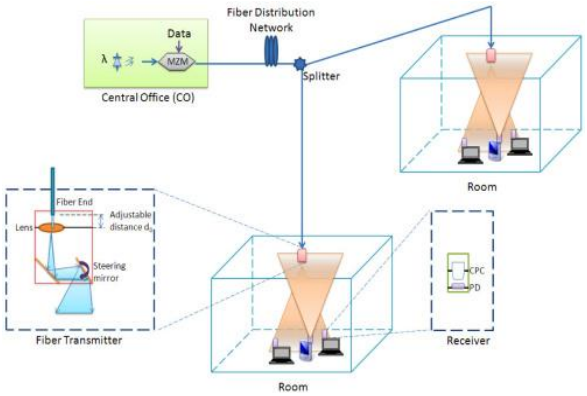

Figure-1 system set-up

ceiling mounted fiber transmitter which provide the optical signal entire the room This fiber transmitter consists of a fiber end, a lens and a steering mirror. The lens is used to spread the signal beam to cover a certain area and the steering mirror is used to change its direction of propogation according to the localization receiver. At the receiver end, a compound parabolic concentrator (CPC) pointed straight up is employed to compress the signal before detection with a photodiode (PD) directly. The localization function can be realized through a number of different methods, such as WiFi-based, Zigbee-based system and infrared-sensor-based. We have chosen the WiFi-based localization scheme in our system for its low-cost and easily available nature. Furthermore our system does not require precise location which is also more suited to the WiFi- based localization system. In the Wi-Fi localization scheme the mobility feature also achieved because in this scheme no need of line-of-sight. The system can be performed as diffused system.

Wireless optical communication systems are demanding because of its capability to provide mobility to end users. Compared with the traditional radio frequency (RF) technology, optical wireless (OW) tech-nology has multiple advantages, such as the unregulated large bandwidth available, remove to electromagnetic interference, and the possibility of frequency reuse and high security at physical layer where optical beam does not penetrate walls or opaque objects. Therefore, for over one decade OW communication for indoor applications has attracted considerable attention. Optical wireless (OW) communications can be devided into two groups: the diffused system and the line-of-sight (LOS) system . The former utilizes totally diffused beam that covers the entire service area and provides mobility functionality to subscribers. However, the diffused system suffers from several multipath dispersion which limits the transmission bit

rate and also it is not energy efficient. And the direct LOS system employs a narrow laser beam to establish a point-to-point transmission link between the transmitter and receiver; thereby the transmitter and receiver must be fixed to satisfy the strict alignment requirement. Therefore no mobility can be provided in this scheme but providing extreme high transmission bit rate. To take advantage of both kinds of OW systems, we have recently proposed a OW system for indoor area networking applications and have demonstrated error-free BER transmission of up to 10 Gb/s. The method used by us is similar to the hotspot. however instead of using a separate light source in each "hotspot", we proposed the ceiling mounted fiber transmitter which is simply composed by a fiber end and have a lens and a steering mirror. All these fiber transmitters are connected to a central office (CO) by a fiber distribution network and multiple rooms can be served by a single CO. All the complex functions and expensive devices are located in the CO to reduce the cost. We also proposed to incorporate WiFi-based localization function with the OW system and it enables dynamic change of the beam position to provide whole coverage of the entire room. It should also be noted that recently a remarkable 10.5 Gb/s indoor cellular OW communication has been demonstrated.
Now it was necessary the comparison between two different bit-rate to find out how the bit- rate increases with keeping error-free BER or cotrolable BER .At the different bit-rate studied about how to change in-

1- distance from beam center and BER
2- beam footprint and BER

and at different BER studied about change in-

1-bit-rate and footprint

The result are shon in below figure-

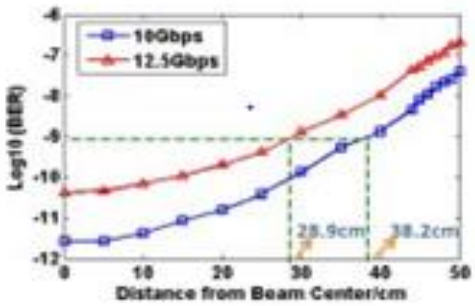

Figure-2 (a) BER with respect distance from beam center

By this comparison it was fount out –the BER is less for less bit-rate at same distance from beam center if keep other thing constant.

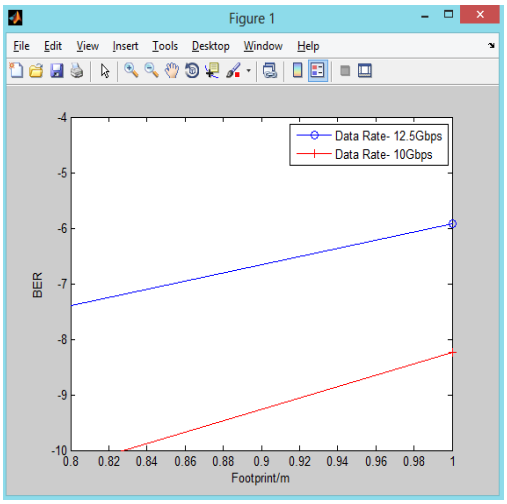

Figure2(b) BER and footprint

This result show that the BER is less for less bit-rate at same beam footprint if other things are contant.

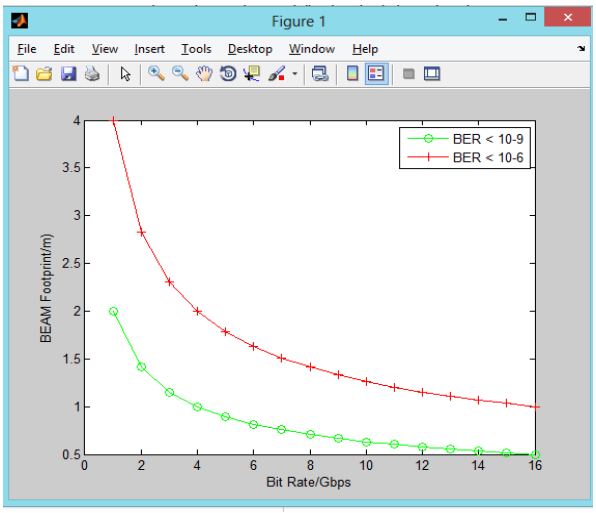

Figure-2(c)bit-rate and beam footprint

The graph show that for less BER need a less beam footprint for same bit-rate.

II. -CONCLUSION-

We proposed a comparison between 10 and 12.5 Gb/s bit-rate for achieve a higher bit -rate with keeping error-free or less BER by the reducing the footprint .when footprint is reduce the we can achieve higher bit-rate and with reduce the BER also.when this system is using in Wi-Fi based scheme ,high speed error-free wireless optical communication with mobility feature can be provide over the entire room.

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