Experiment - 8: Design an FSO Communication System

Date: -

1. **Aim:** Design an FSO Communication System and Analyze the BER by varying the optical parameters using Optisystem 22

2. **Requirements:** Optisystem 22

3. **Pre Experiment Exercise:**
   Brief Theory

FSO is a line-of-sight technology that uses lasers to provide optical bandwidth connections or FSO is an optical communication technique that propagate the light in free space means air, outer space, vacuum, or something similar to wirelessly transmit data for telecommunication and computer networking. Currently, FSO is capable several Gbps of data, voice and video communications through the air, allowing optical connectivity without requiring fiber-optic cable or securing spectrum licenses.

Links typically operate between the 780 – 1600 nm wavelengths bands and use O/E and E/O converters. FSO requires light, which can be focused by using either light emitting diodes (LEDs) or lasers (light amplification by stimulated emission of radiation). The use of lasers is a simple concept similar to optical transmissions using fiber-optic cables; the only difference is the transmission media. Light travels through air faster than it does through glass, so it is fair to classify FSO as optical communications at the speed of the light. FSO communication is considered as an alternative to radio relay link line-of sight (LOS) communication systems. FSO communications can provide high data rates in Gbits/s ranges through the atmosphere for ranges from a few hundreds of meters to a few kilometers.

FSO components are contain three stages: transmitter to send of optical radiation through the atmosphere obeys the Beer-Lamberts`s law, free space transmission channel where exist the turbulent eddies (cloud, rain, smoke, gases, temperature variations, fog and aerosol) and receiver to process the received signal. Typical links are between 300 m and 5 km, although longer distances can be deployed such as 8–11 km are possible depending on the speed and required availability.

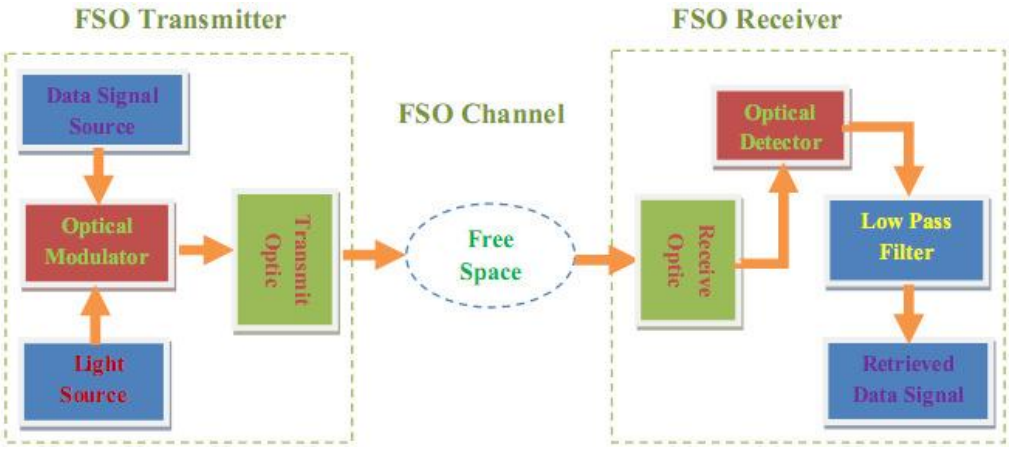

Fig. 1: A typical FSO system

4. Procedure

Simulate an FSO System:

a. Connect the optical components as represented in the block diagram Fig. 2.
b. Vary the FSO range and observe the BER.
c. Vary the source wavelength and analyze the effect on BER by observing the eye diagram.

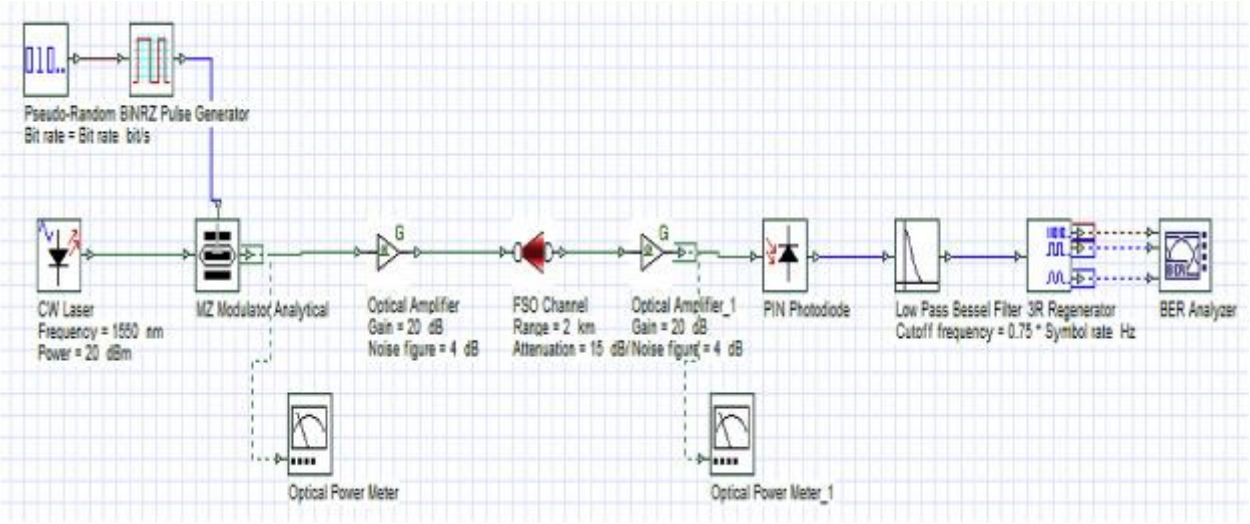

Fig. 2: Layout to demonstrate FSO System

5. Observations:

Attach the simulated block diagram and graphical observations

6. Conclusion/Comments:

Comment on your observations on the basis of following points:

a. Effect of varying FSO range on BER
b. Effect of source wavelength on eye diagram:

7. Questions

Write a Report containing the following points

a. An FSO system block diagram
b. Compare FSO with optical fiber communication
c. Advantages of FSO
d. Applications of FSO

Attach and understand a Research paper on FSO