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ISSN : 2454 – 308X | Volume : 04 , Issue : 01 | January – March 2017

Study of various parameters of MZM and OPM modulators by observing optical spectrum BER and Eye diagram

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Introduction : ROF technology has emerged as a cost effective approach in which the central site and multiple number of remote sites are connected by using optical fiber. It is a technology by which microwave signals are distributed by means of optical components and techniques
Radio-over-Fiber technology uses optical fiber links to distribute modulated RF signals from BS to Remote Antenna Unit (RAU). In narrowband communication systems, RF signal processing functions such as frequency up-conversion, carrier modulation, and multiplexing are performed at the BS and then fed into the antenna

Key words: RoFSO, EAM, MZM, BER.

MZM : A Mach-Zehnder modulator is used for controlling the amplitude of an optical wave. The input waveguide is split up into two waveguide interferometer arms. If a voltage is applied across one of the arms, a phase shift is induced for the wave passing through that arm. When the two arms are recombined, the phase difference between the two waves is converted to an amplitude modulation.
This is a multiphysics model, showing how to combine the Electromagnetic Waves, Beam Envelopes interface with the Electrostatics interface to describe a realistic waveguide device.

OPM : Optical phase modulator (OPM) is an optical device in which a signal-controlled element 8exhibiting the electro-optic effect is used to modulate a beam of light. The modulation may be imposed on the phase, frequency, amplitude, or polarization of the beam. Modulation bandwidths extending into the gigahertz range are possible with the use of laser-controlled modulators.

The electro-optic effect is the change in the refractive index of a material resulting from the application of a DC or low-frequency electric field. This is caused by forces that distort the position, orientation, or shape of the molecules constituting the material. Generally, a nonlinear optical material (organic polymers have the fastest response rates, and thus are best for this application) with an incident static or low frequency optical field will see a modulation of its refractive index.

The simplest kind of EOM consists of a crystal, such as lithium niobate, whose refractive index is a function of the strength of the local electric field. That means that if lithium niobate is exposed to an electric field, light will travel more slowly through it. But the phase of the light leaving the crystal is directly proportional to the length of time it takes that light to pass through it. Therefore, the phase of the laser light exiting an EOM can be controlled by changing the electric field in the crystal.

The voltage required for inducing a phase change of is called the half-wave voltage (. For a Pockels cell, it is usually hundreds or even thousands of volts, so that a high-voltage amplifier is required. Suitable