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Bidirectional ROF Links with Dynamic Capacity Allocation

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ABSTRACT : Radio over fiber (ROF) technology is an integration of wireless and fiber optic network. It plays vital role for broad band wireless communication. The well known advantages of optical as a transmission medium such as low loss, light weight, large bandwidth characteristics, small size and low cable cost make it the ideal and most flexible solution for efficiently transporting radio signals to remotely located antenna site in a wireless network. The joint venture of radio signal and optical fiber technology provides dynamic capacity allocation in radio over fiber links.

KEYWORDS

WDMPON,OLT (optical link terminal), (ONU optical network unit), EDFA (erbium doped fiber amplifier), BER(bit error rate), OSNR (optical signal to noise ratio)
SCM (sub carrier multiplexing)

INTRODUCTION

Radio-over-fiber is modern technique that can be achieved using radio frequency (RF) and optical wireless approaches at the physical level[2].RF spectrum is very congested so the provision of broadband services in new band is increasingly more difficult[3]. optical wireless networking provides a vast unregulated bandwidth that can be exploited by mobile terminals within an indoor environment to set up high speed multimedia services[3]. Fiber optic LANs will be carrying traffic at data rates of tens of gigabits per second in the near future, where data rates of tens of megabits per second are difficult to provide to mobile users[4]. In this regime optical channels, offering terahertz of bandwidth, have many advantages. The RF signal may be baseband data, modulated IF or the actual modulated RF signal to be distributed. The RF signal is used to modulate the optical source in transmitter. The resulting optical signal is launched into an optical fiber[2][3]. At the other end of the fiber, we need an optical receiver that converts the optical signal to RF again[5][6].Recent progress in wavelength division multiplexing make it possible to use the same fiber for duplex communication using different wavelengths.WDM can combine several wavelengths together to send them through a fiber domain, which is then directed to an antenna for wireless coverage.

METHODOLOGY:

SETUP MODEL: The setup model of the work is demonstrated below (fig no 1). The complete set up model consists of four distinct circulator two for downstream and another two for up-stream.The model is designed for the both of the up- and-down stream transmission consisting of the two set in the OLT and ONU side respectively. The combination of electrical and optical signal is allowed to pass through the mach-zehnder modulator from both OLT.WDM mux(2×1) combined the signals of OLTs.after that combined signal is allowed to pass through EDFA and after that circulator.further signal is allowed to pass through bidirectional optical fiber.

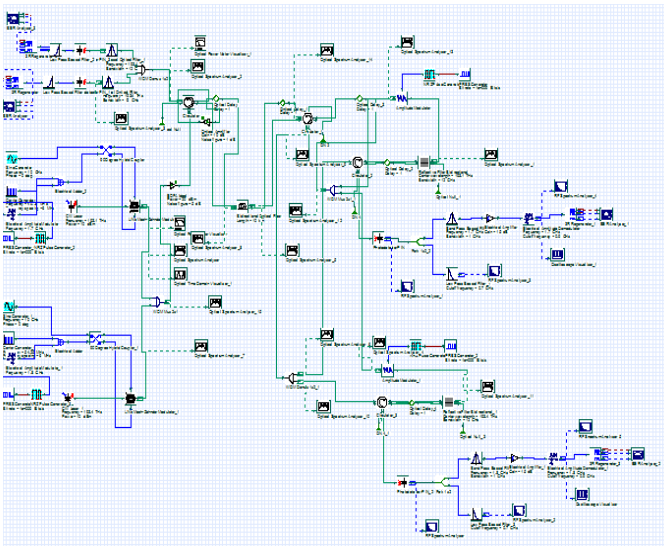

Fig. No. 1 set up model.

RESULT & DISSCUSSION

The eye diagram of the model is shown below. The continuous wave laser have the specific power of 10dbm and the frequency is of 193.4 Thz .The line width used in the model is of 10MHz. The mac-zehnder modulator have the extinction ratio of 30 db at the normal mode . bidirectional optical fiber having the reference wavelength of 1550 nm of the normal mode is used. The length of the optical fiber is assigned to be equal to 10 km. The eye diagram of all four ONU is shown in the figure no. 2. The maximum Q point of the system is also mentioned in every graph of the BER Analyser.

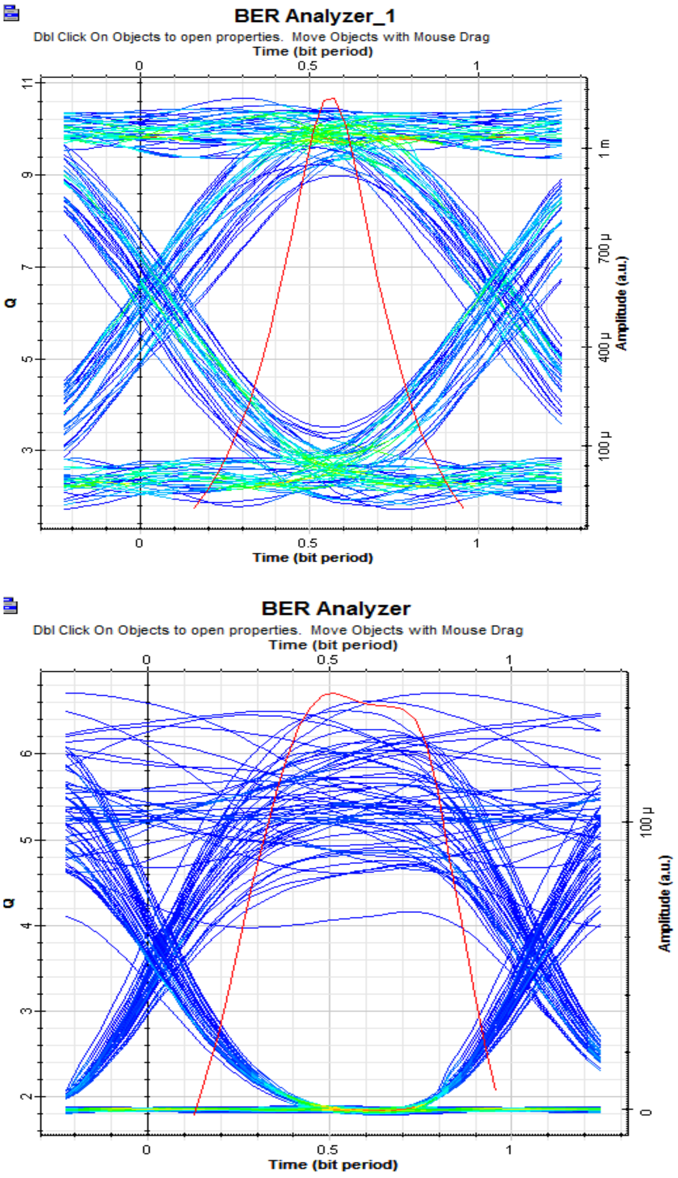

Fig.no.2 Eye diagram of the OLT and ONU.

The different plotting of the parameters has been demonstrated below , the very first plotting is between the power and the Q factor. The power and the Q-factor are directly propotional to each other as clear from the diagram that the when the power is increasing the Q factor is also increasing. The valve of Q factor is almost equal to 12.24 when the power is equal to the 20 dB. The complete plot is shown in fig. No.3

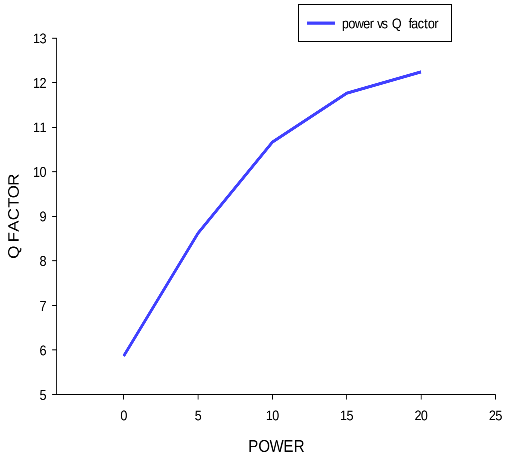

Fig.no.3 power v/s Q factor

The Graph between power and BER is given below.In this graph we observe that as power increases the BER gradually increases and incline towards Y axis of the graph.The value of BER is almost equal to 2.3 $*10^{-9}$ when power is equal to 21 db.the complete graph is shown in fig.no.4

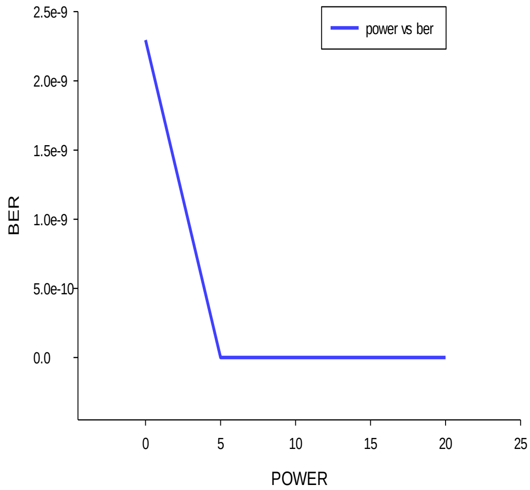

fig.no.4

Power v/s BER

The graph between power and OSNR is given below.In this graph we observe that power and OSNR is directly proportional to each other.AS power approaches to 20 db the OSNR reach at -44.the complete graph is shown in fig.no.5

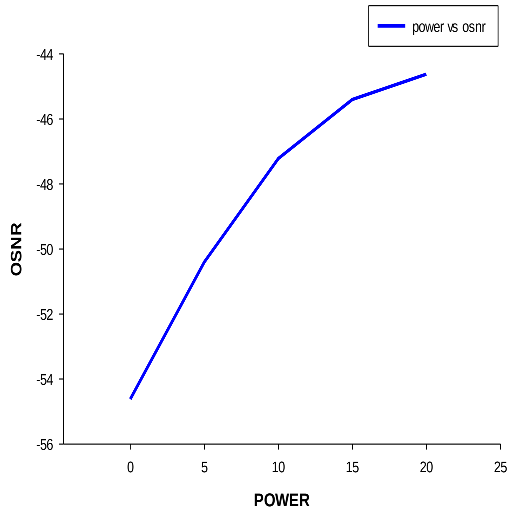

Fig.no.5 power v/s OSNR

The graph between OSNR and received power is demonstrated below.As received power increases the OSNR also increases.the complete graph is shown in fig.no.6

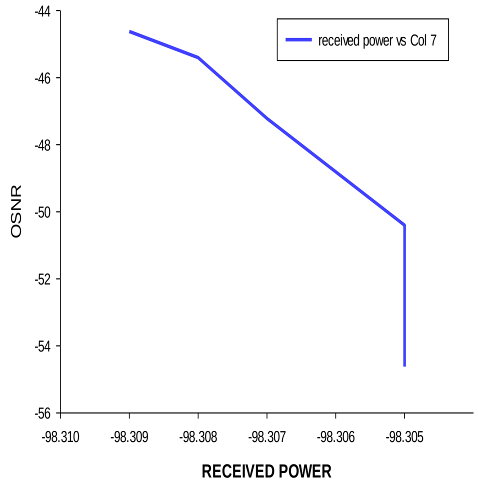

Fig.no.6 Received power v/s OSNR

Conclusion

By combining the optical routing function together with electrical SCM, a novel architecture with improved flexibility for dynamic capacity allocation in the RoF links has also been experimentally demonstrated.We believe this work presents a robust integrated (electrical and optical) dynamic capacity allocation approach for broadband in-building networks, enabling more flexible and efficient network management.

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