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Multihop Amplified Relaying Optical Network to Improve Transmission Signal Quality

I. Dhurgabai
A P Department of Electronics and Communication,
Theni Kammavar Sangam College of Technology,
Theni.

K. Sindhuja
A P, Department of Electronics and Communication,
Theni Kammavar Sangam College of Technology,
Theni.

***Abstract*:- Optical amplify-and-forward (OAF) relaying technique can amplify and filter the attenuated optical signal in optical domain, and thus is regarded as a simple way to extend the transmission distance of free-space optical (FSO) communication systems. The data transmitted over the optical wireless communication channel may fade due to turbulence effect, scintillation effects etc., In long distance communication, the transmitted data is affected by inter symbol interference. The ISI is removed by introducing the relaying network with duo binary scheme. The relay network with proposed hybrid amplifier and duobinary signaling scheme reduces Bit Error Rate and improves Quality factor .**

Keywords:-Gain flatness, multipump, hybdid structure, high gain ,low noise figure. duo binary signaling, relay, multihop

1.INTRODUCTION

To lengthen the transmission distance of free space optical communication and also to resolve the optical signal impairments mutihop relay network with duo binary correlative signaling is adopted.The relay network performs amplify and forward and the amplification when performed in better way reliability is ensured and to increase the transmission capacity of network duo binary signaling scheme is done and this additionally provide ISI reduction as ISI is intentionally added at the transmitter side.The relay node is optical amplifier and when it is necessary to flatten the gain of the amplifier used and so hybrid amplifier in cascade structure is adopted.

2.MULTIHOP RELAYED OPTICAL NETWORK

In optical communication network to improve the transmission distance over wider distance multihop relayed network is used and also when we go for freespace communication the environment is more pollutant and so signal contamination is higher due to environmental factors and so over information carry the signal has to be amplified and forwarded and for amplification a better relay element has to be used and the relay is also an important element to be designed efficiently and so a cascaded hybrid amplifier structure is used to clean up the contaminated signal in digital communication over fiber.

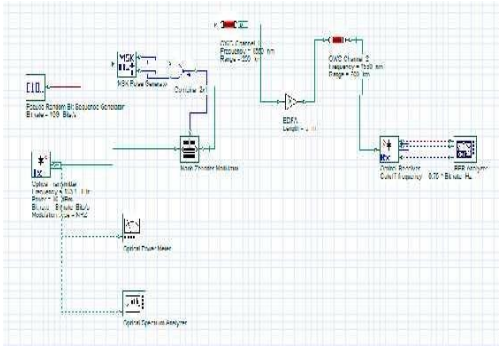

Fig 1.Multihop relayed network

3.DUOBINARY SIGNALING

Intentionally adding ISI at transmitter side to double the transmission capacity and this also mitigates the effects of ISI.The ISI is added in controlled amount by increasing the correlation between the adjacent data and so this signaling is said to be correlative coding.As transmission channel is dispersive in nature cause severe ISI and this is resolved out as already the ISI is introduced.

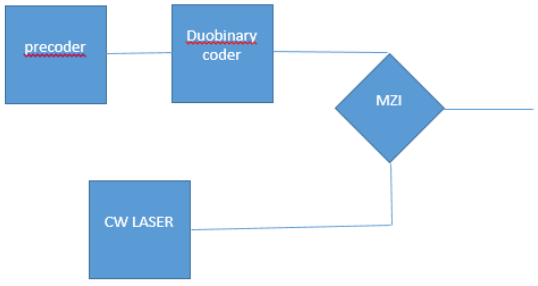

Fig 2:Duobinary signaling at transmitter side

The precoder preceeding the duo binary coder avoid error propagation and buffer requirement.

4.DUOBINARY SIGNALLING IN MULTIHOP RELAYED OPTICAL NETWORK

The digital data is first waveform encoded with duo binary correlative coding to increase transmission capacity and to improve reliability.The waveform encoded baseband transmission is converted into passband data by MSK modulation technique and sent through the free space channel .The multihop relayed network ensures reliability as it cleans up the repaired signal by amplify and forward technique.This multiple advantageous technique make the network yield low bit error rate and high Q factor.Q factor

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measures the quality of the signal and which is the main figure of merit for analysis the network performance.

5.SIMULATION RESULTS

The single hop network with optical free space communication is simulated initially with PSK and MSK modulation technique and performance parameters are analysed .Results shows MSK modulation technique performs better and so multihop optical relayed network and multihop optical relayed network with duo binary signalling with MSK modulation is simulated and performance parameters are analysed and compared.

Table 1.Comparision Table

MODULATION TECHNIQUES	BITERRORRATE (BER)	Q-FACTOR
PSK	0.0208391	2.03629
MSK	0.001396	3.60105
MSK DUAL HOP RELAY	1.36014e^-055	15.6625
MSK DUAL HOP RELAY WITH DUO BINARY SIGNALLING	1.04139e^-210	30.9561

The relay used is amplifier element and so it is necessary to meet the demand by proper designing of relay element.The relay elemrent should be with high gain and low noise.The relay element proposed for this multihop relayed optical netrwork is the hybrid amplifier cascaded structure.

6.OPTICAL AMPLIFICATION

Optical amplification increses gain and also increses the range of operating frequency.different types of optical amplification is available using different techniques.optical pumping introduces amplification.fiber amplifiers are available which makes implementation easy with much efficiency.To have high flattened gain diversified techniques are available.The conventional available raman and EDFA amplifiers offers amplification gain to an accountable extent.When these conventional amplifiers when come in cascade offers high flattened gain.

8.HYBRID AMPLIFIER

Hybrid amplification is the best method to increase gain and to achieve low noise figure. In WDM network covering long distance undergoes various attenuation andso signal becomes weak. To boost the information signal EDFA Amplifier is used. The pump given to EDFA transfers energy to information signal and dies. To flatten the gain of EDFA amplifier Raman amplifier is cascaded.EDFA –Raman configuration performs well than Raman-EDFA configuration. Raman with multipump performs well than Raman with single pump.EDFA amplifier is fed with forward pumping and Raman is fed with backward pumping.The virtual implementation is made in optisystem.7 and the schematic is shown below.

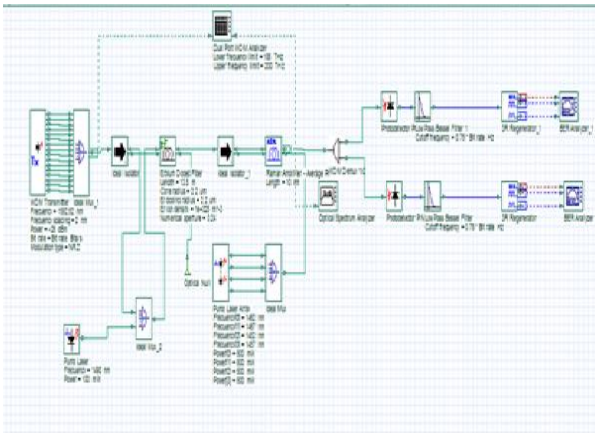

Fig.5Schematic diagram of diversified amplifier

Table 2.Simulation Parameters

WDM Transmitter	EDFA Amplifier	RAMAN Amplifier
Frequency=1552.52nm Frequency spacing=2nm Power=-26dBm Modulation type=NRZ	Length=13.5m Core radius=2.2um Er doping radius=2.2um Er ion density=1e=025m^-3 Numerical aperture=0.24 Single pump: Frequency=1490 Power=100mW	Length=10km Multi pump: Frequency=1462nm Frequency=1467nm Frequency=1452nm Frequency=1457nm Power=500 Power=500 Power=500 Power=500

9.SIMULATION RESULTS

The comparision were made for many configurations of hybrid configuration and the configuration of EDFA-Raman performs well with gain around 52 dB increased gain flateness and noise figure of about 4 dB.This shows the optical signal has to be EDFA amplified first and then it has to be raman amplified

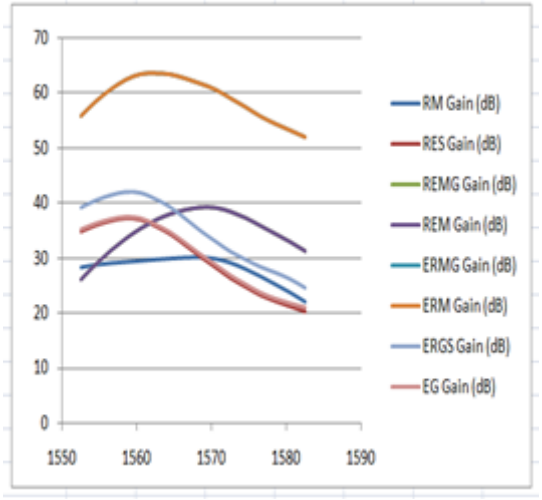

Fig.6 Wavelength andGaincomparision chart

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The figure above represents the comparision values of various amplification configuration and the results shows the EDFA-raman hybrid amplification gives optimum gain flateness and increased gain of about 52 dB.

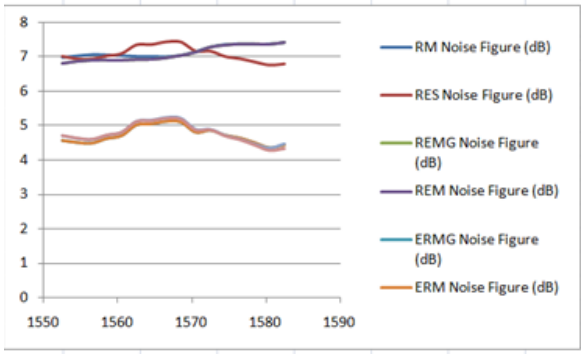

Fig.7 Wavelength and Noise comparision chart

The figure above represents the comparision values of various amplification configuration and the results shows the EDFA-Raman hybrid amplification gives reduced noise figure of 4 dB. EDFA –Raman with multipump outperforms well with gain around 50-60 dB and noise figure around 4 db.Hybrid amplification with better amplifier arrangements improves WDM network performance.This cascaded amplifier structure works best as relay element in multihop optical relayed network.

10.CONCLUSION

The data transmitted over the optical wireless communication channel may fade due to turbulence effect, scintillation effects etc.To repair the contaminated signal over this noisy environment and to transmit over longer distance multihop relayed network architecture is used and this provides better performance criteria.In long distance communication, the transmitted data is affected by inter symbol interference due to the dispersive nature of the transmission channel. The ISI is removed byduo binary scheme.This relayed multihop networkincorporated with duo binary signaling scheme further improves the performance.The relay element in network when replaced with this hybrid cascaded amplifier structure the results are more pronounced by achieving the desired performance criterias.

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