OCDMA System Performance review- A Review Paper

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Abstract

this paper present analysis of various methods for Optical code division multiple access code technique. Codes are designed based on the cross correlation property .The cross correlation may be unit or zero. The MDW, MS and FCC codes, follows the unit cross correlation and MD,MZCC code follows the zero cross correlation. The code also categorized based on unipolar and bipolar code. The analysis is performed for variation in number of users, received power, data bit rate and their effect on bit error rate (BER). The various detection techniques such as subtraction, AND detection and NAND direct detection method are also used for code detection so analysis of given methods are also analysed.

Introduction –

In optical networks, the Optical code division multiple access (OCDMA) is getting more and more attraction as multiple user shares the communication network asynchronously and synchronously with high security level [1-2].In optical code division multiple access system, user information is transmitted by assigning the code address on OOK (on off keying) based pattern to '1' information bit. Information about a user is extracted at the receiver end by correlating the assign code between the users [3-4].but in case of bipolar method one code is assigned to the on position and another code is allotted to the another off position [5]. This bipolar coding method supports the system with high security against the unwanted users. Multiple Access interface (MAI) exists in the network due to in phase cross correlation property that degraded the system performance. MAI is reduced by reducing the in phase cross correlation property and detection technique [6]. Zero in phase cross correlation in code of different users, eliminates the effect of the MAI. Security of the network against the eavesdropper is another issue that can be enhanced in OCDMA by increasing the length of code such as Modified Frequency Hopping code, Optical Orthogonal Codes, Modified Double Weight code (MDW) and MQC [7-8]. These codes suffer too long length of code situation and large weight problem. This requires the broadband source and narrow band filters. The m-sequence code support the bipolar method for code generation

Table.1 Various Detection Methods

	Complementary Detection				AND Detection				NAND Detection			
X	1	1	0	0	1	1	0	0	1	1	0	0
Y	1	0	1	0	1	0	0	0	1	0	1	0
	θ_{XY}				$\theta_{XY} = 1$				θ_{XY}			
	$\theta_{\overline{XY}}$				$X \& Y = 1000$				$\theta_{\overline{XY}}$			
	$\theta_{\overline{XY}} = 1$				$\theta_{X \& Y} = 1$				$\theta_{(\overline{XY})Y} = 1$			
Z	$Z_{com} = \theta_{XY} - \theta_{XY}$				$Z_{NAND} = \theta_{XY} - \theta_{(X \& Y)Y} = 0$				$Z_{NAND} = \theta_{XY} - \theta_{(\overline{XY})Y}$			

The performance of system depends on the code construction as well as detection method at the receiver end for correlating the correct code. The detection methods available are the AND subtraction, NAND subtraction and direct detection methods.Table.1 shows the detection method. As compare to the cost AND and NAND subtraction method are very costlier than the Direct detection method [911]. Complementary NAND.

Table.2 Code comparison

CODES	NO. OF USER (K)	WEIGHT (W)	CODE LENGTH (N)	CROSS CORRELATION λ_{max}
MFH	30	7	42	1
MDW	30	4	90	1
FCC	30	2	31	$(\lambda_{max} \leq 1)$.

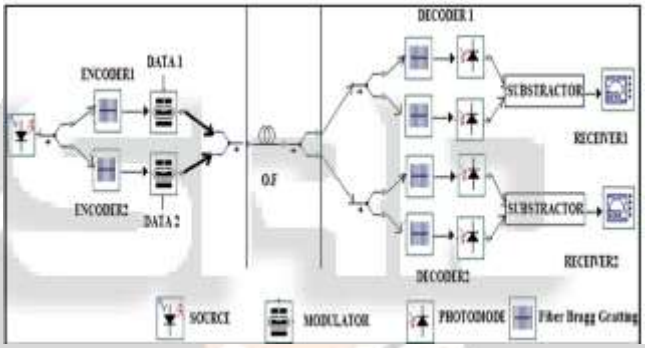

Fig.1 Complementary Detection

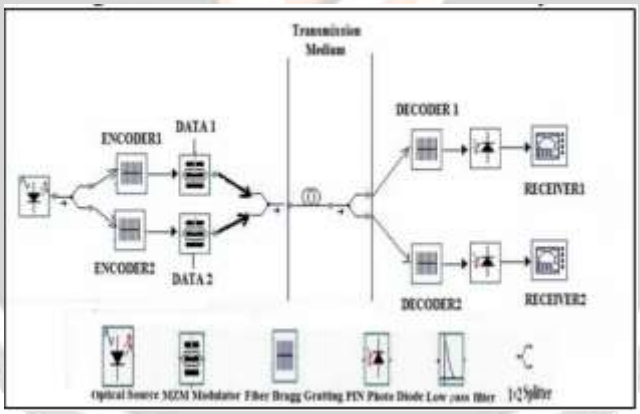

Fig.2 Direct Detection

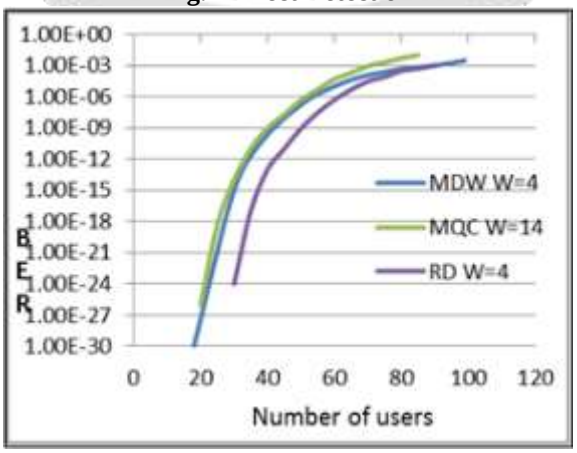

Fig.3 BER Vs Number user for unipolar code

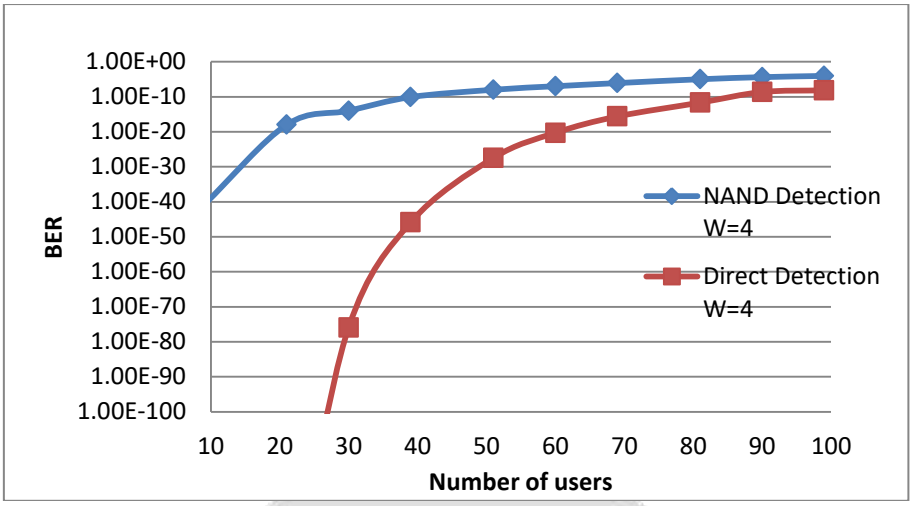

Fig.4 BER Vs Number user detection methods

The figure.3 shows the comparative analysis at -10dBm power for unipolar code where MDW stands in better position and fig.4 analysed the comparison of two detection method where direct detection shows the better performance.

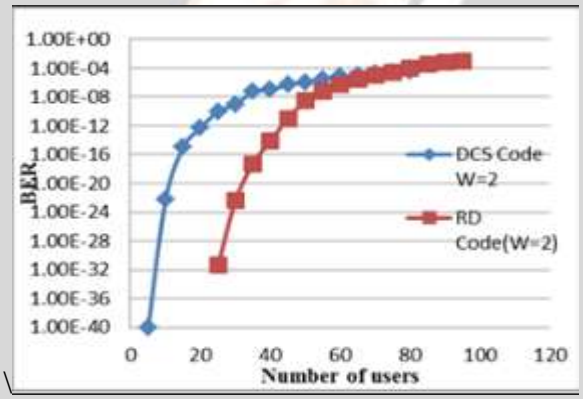

Fig.5 BER Vs Number user for variable cross correlation code.

The figure .5 shows the performance of variable cross correlation based code where DCS code having the better output in form of BER versus number of users.
Figure .6 gives the analysis of detection technique in form of BER versus received power. Where -15 dBm nana

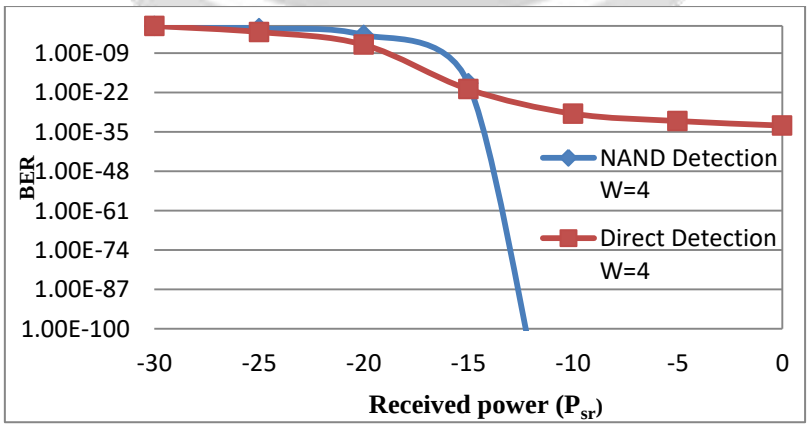

Fig.6 BER Vs received power user for unipolar code

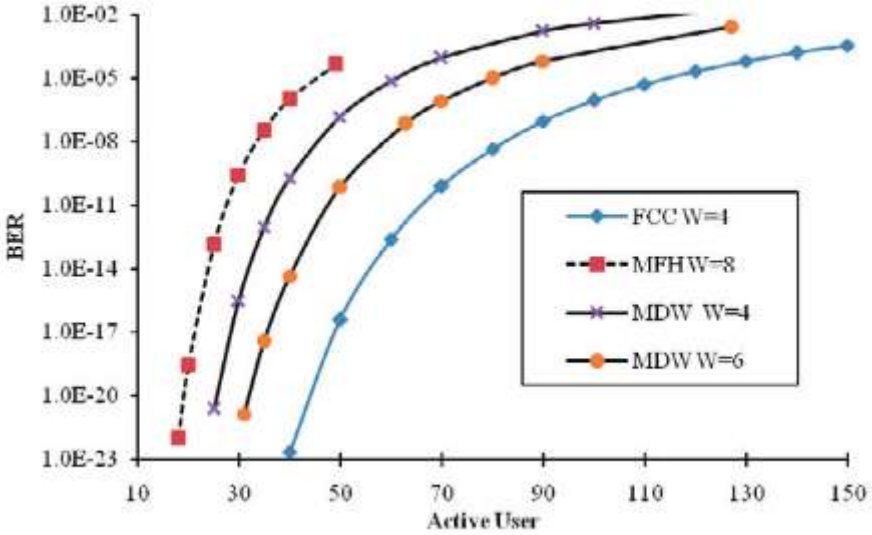

Fig.7 BER Vs Number user unipolar uniform cross correlation

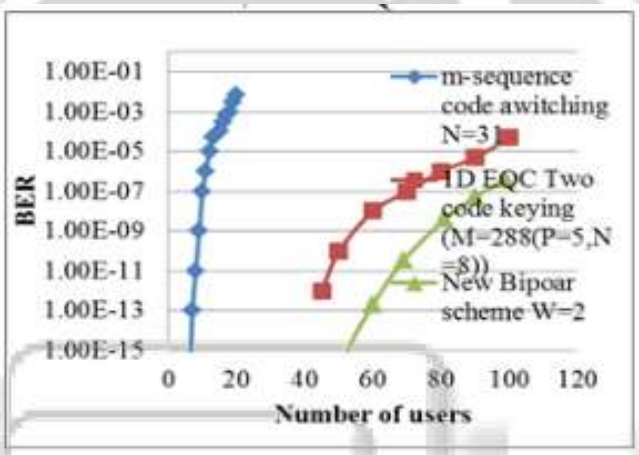

Fig.8 BER Vs Number user for bipolar code

Conclusion:

This paper analysis the various existing method and provide the comparative study of various detection methods. The analysis shows that AND subtraction method shows the lower than performance the NAND detection method but the direct detection method is much better than the in existing methods. The paper also compared the method based on the length of code and flexibility of choosing the weight in code. It is found that, in MDW, DW code the choice of weight depends on the numbers of users but in Multi service and RD code the weight does not depends upon the numbers of users. This paper also analysis the unipolar, bipolar and various cross correlation based methods

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