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Multiuser Interface Optical Code Division Multiple Access System

Shweta Patel, Mukesh Tiwari, Jaikaran Singh

Abstract*— CDMA and FIBER OPTICS individually are the best technologies in their respective zones. We all know that CDMA (multiple access technology) is the best as compared to TDMA & FDMA & similar is the case with FIBER OPTICS also. Fiber optic technology is best compare to all other communication technologies. In this Paper, the comparative analysis of a fibre optics CDMA system using Matlab simulation. By varying numerous parameters of the systems, we compare the systems in terms of BER. As the number of active users increases the BER increases.

Keywords— **CDMA, BER, FIBER OPTICS.**

I. INTRODUCTION

FO-CDMA or OCDMA systems are offer keys to multiple accesses in all optical communication networks. OCDMA systems make available for users with high security by coding the data before transmission and recover the data at the receiver using this coding. Initially, OCDMA systems coded the incoherent pulses in the time domain and recovered the data using taped delay lines. Then OCDMA system performance is reduced because of the correlation properties of the special univocal codes used. In these system use the optical summation that causes significant losses. **C**ONSTANTLY-INCREASING demand for higher data-rates and data security has moved great interest in optical code-division multiple access (OCDMA) technology. here we can try to focus on increased the BER(Bit Error Rate) and reduces the MUI(Multi-user Interference) and PIIN(Phase Induced Intensity Noise). The performance of OCDMA systems is mainly affected by interference from other simultaneous users called Multi-user Interference (MUI) or Multiple Access Interference (MAI). MUI can be negated by using code sequences with fixed in-phase cross correlation. Spectral Amplitude Coded-OCDMA (SAC-OCDMA) systems have presented extra attention because spectral coding can be completely eliminated the MUI. Another way to reduce the MUI, used Code sequences with fixed in phase cross correlation such as Hadamard Codes. Then the rate of the in phase cross correlation between code sequences is large, the phase induced intensity noise (PIIN) caused by non-Coherent broadband light sources of the SAC-OCDMA systems, which is decreases the system performance.

II. SYSTEM DESCRIPTION

The broadband signal from the light source is ON-OFF keying (OOK) modulated through the binary data. The transmitter sends a pulse through spectral distribution changing with time if the data bit rate is “1”; otherwise no power is transmitted. The encoder is a fast TOF controlled with an electrical signal that signifies the Functional code. Signals transmitted from all synchronized users will be mixed up in the network before received by all users. At the receiver, the composite signal is decoded by a matched TOF. Then, the signal go through a photo detector, an integrator and a threshold decision to recuperate the data transmitted.

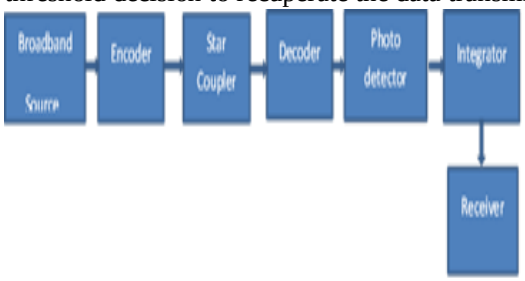

Fig 1: Block Diagram of Optical CDMA system

The Signal to Noise ratio is:-

$$SNR(K) = \frac{I^2}{(k-1)\delta^2_{DAI} + \delta^2_{PIIN} + \frac{4K_b T_n B}{R_t}}$$

The Probability of Error is thus

$$BER(K) = \frac{1}{2}\,\mathrm{erfc}\left(\frac{\sqrt{SNR(K)}}{2}\right)$$

III. PROPOSED SYSTEM

The broad band signal from the light source is ON-OFF keying (OOK) controlled through the binary data. The transmitter delivered a pulse with spectral distribution varying with time if the data bit value is “1”; otherwise, no power is transmitted. So the electronic data are changed to broadband optical pulses. Then, these optical pulses are sends to the two sets of FBGs and the splitter used for encoding. The spectral coding and the spatial encoding are done by using the two sets of FBGs and splitters, respectively. When the optical pulse is entered into FBG1, the spectral components matched to “1s” of the spectral code sequence are returned back and the remaining are filtered out. However, the matched spectral components are returned by different gratings. Once spectral encoding done, then the optical pulses are delivered to the splitter for spatial encoding. The splitter similarly splits each optical pulse and passed these split portions to the star couplers according to the spatial code sequence. The encoder is a fast TOF modulated with an electrical signal that signifies the functional code. The spectral and spatial codes are modulated

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through the Functional codes by Optical Multiplier. Signals transmitted from every synchronized users will be mixed up in the network before received through all users. The composite signal is decrypted through a matched TOF at the receiver. In each balanced detector have two groups of FBGs and two p-i-n photodiodes.

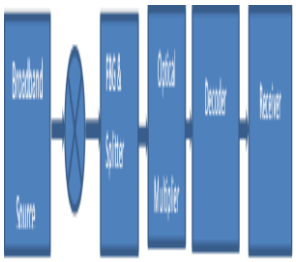

Fig 2: Block Diagram of Proposed Optical CDMA System

The BER of the proposed system can well be approximated as BER= (0.5 erfc (iSNR(k)/2)).(0.5 erfc(iSNR/8))

IV. SIMULATION TOOLS

MATLAB is used as a simulation tools.

V. SIMULATION RESULTS

Parameters Used For Calculation PD quantum efficiency =0.6, Spectral width of broadband light source= Δλ=30nm, Electrical Bandwidth=320 MHz, Receiver load resistor= RL=1030 Ω,k1= 5,k2=.6,number of active users=1000.

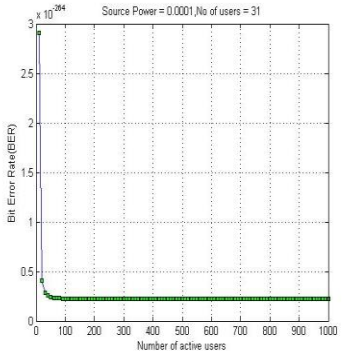

Fig 3: Normalized System

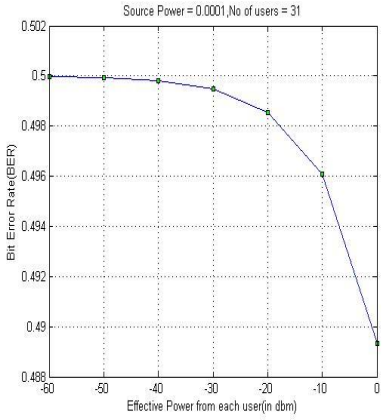

Fig 4: Normalised System

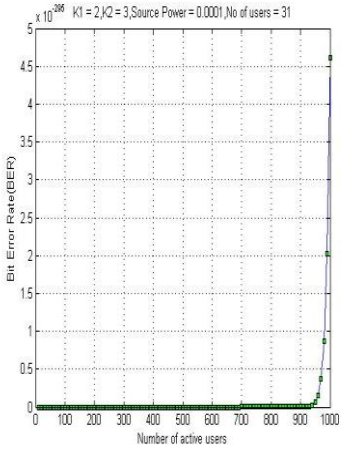

Fig 5: Proposed System

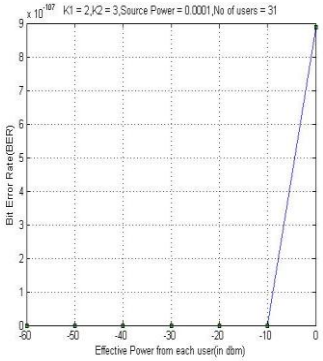

Fig 6. Result Graph

VI. CONCLUSION

In this paper, we can conclude from the simulation results that in the first system transmission the bit error rate first decreases and then it remains constant for further users .And for the proposed system the bit error rate is almost zero for the First 900 users than it starts increasing. In addition, DOCDMA and Proposed optical CDMA systems are tested under different effective power from each user, and it is shown that the system with proposed scheme still has a much better performance than the first one scheme.

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Author's Profile

Shweta Patel has M. Tech Student in RGPV, Bhopal, M.P., India, B.E. in Electronics and Communication Engineering.

Prof. Mukesh Tiwari has Master in Electronics Engineering. Dean in Digital communication department at SSSIST, Sehore College, M.P India.

Prof. Jaikaran Singh has Master in Electronics Engineering. Head of the Department in Digital communication department at SSSIST, Sehore College, M.P India.