Efficient Pilot Assisted Channel Estimation Scheme with 32-PSK Modulation and Different Diversity

Kamlesh Vishwakarma[1], Prof. Omesh Singh Hada[2]

[1]M Tech Research Scholar, [2]Research Guide, Deptt. Electronics & Communication

NRI Institute of Research & Technology, Bhopal

Abstract* - Modern wireless communication system is getting better for the new generation of data communication technology, because it have to facilitates the user to communicate and share information through various wirelessly connected devices in moving. The research works are delicately exploring new dimensions of the technology and fixing the bugs day by day. The every researchers aim to explore new techniques and analyze the existing technologies to make technology easier for the subscribers having several features. In the same context this work also analyzing for estimation of channel with utilizing pilot assisted scheme and spatial diversity using different number of antennas at the transmitter and receiver side to make system more efficient for random channel behavior. The methodology of this work having better error probability than the existing work done on the same context. The proposed system utilizes multi antenna diversity for 4xM and 2xM,configurationswhere M is number of receiver antennas and modulation scheme is 32-PSK.

***Keywords* - Pilot Assisted, Spatial Diversity,32-PSK, MIMO.**

I. INTRODUCTION

During the last decade, the demand for capacity in wireless local area networks and cellular mobile systems has grown in a literally explosive manner. In particular, compared to the data rates made available by today's technology, the need for wireless Internet access and multimedia applications require an increase in information throughput with order of magnitude. One major technological breakthrough that will make this increase in data rate possible is the use of multiple antennas at the transmitters and receivers in the system.

In recent years, researchers have realized that many benefits as well as a substantial amount of performance gain of receive diversity can be reproduced by using multiple antennas at Introduction 2 transmitter to achieve transmit diversity. In the early 1990's, development of transmit diversity techniques has started. Since then the interest in the topic has grown in a rapid fashion. In fact, we can expect multiple-input multiple-output (MIMO) technology to be a cornerstone of many wireless communication systems due to the potential increase in data rate and performance of wireless links offered by transmit diversity and MIMO technology.

MIMO is the current theme for the international wireless research [7] [8]. The feasibility of implementing MIMO system and the associated signal processing algorithms is enabled by the corresponding increase of the computational power of integrated circuits, which is generally believed to grow with time in an exponential fashion. Figure 1.1 shows a MIMO wireless communication system which contains multiple antennas at both the transmitter and receiver.

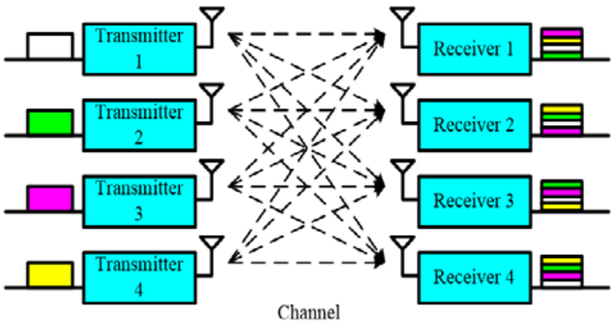

Fig 1: MIMO Channel

The predominant cellular network implementation is to have a single antenna on the mobile device and multiple antennas at the base station. This minimizes the cost of the mobile radio. A second antenna in mobile device may become more common when the costs for radio frequency components in mobile devices go down. Today, cellular phones, laptops and other communication devices have two or more antennas. The use of multiple antennas will become even more popular in the future.

II. PILOT-ASSISTED

Pilot-assisted methods use a subset of the available sub carriers to transmit training sequences known to the receiver. The desired frequency domain channel transfer function is directly estimated over the pilots and an interpolation method is then used to obtain the remaining values. The most important issues are the optimum choice of training sequences, their placement, their dimension and the used interpolation method.

The importance of the pilot pattern choice has been evidenced, by comparing in terms of BER several positioning of the pilot symbols, both in time and frequency. The number and placement of pilots in the time-frequency grid has been extensively studied, and their references. It represents an important topic, affecting not only the quality of CIR evaluation but the transmission rate as well.

III. PROPOSED METHODOLOGY

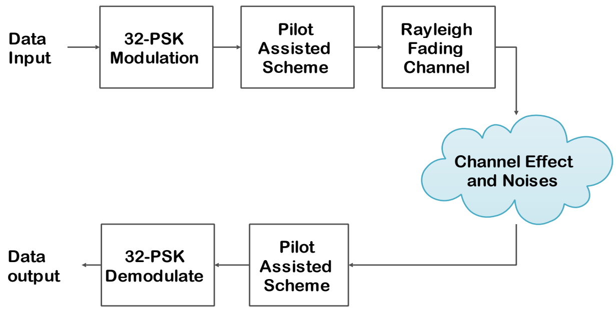

Fig. 3.1 Block Diagram

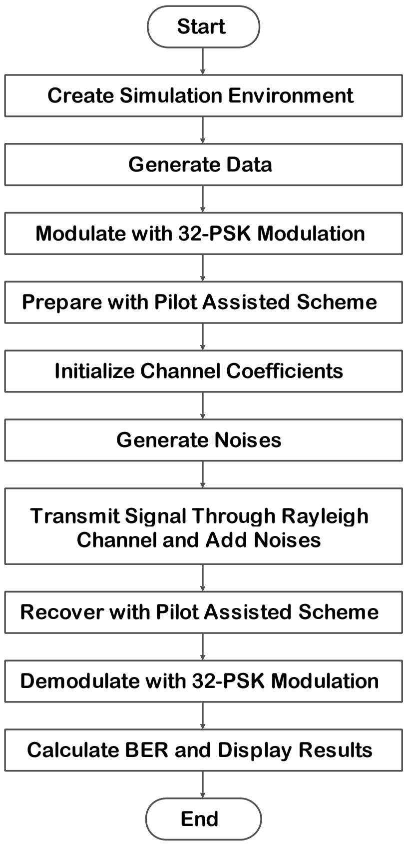

Fig. 3.2 Flow Chart

IV. SIMULATION OUTCOMES

The simulation of proposed model is done and the simulation outcomes shown in this section. From the results it can be analyzed that the proposed system with different spatial diversity i.e. multiple input multiple output (MIMO) enhances the performance of system and reduces error rate.

In Fig. 3.1 the proposed system with 10000 pilots and 32-psk modulation and two transmitter antennas and two receiver antenna is implemented and the lowest BER achieved is 2.5×10^{-4}. The proposed technique also compared with the previous method using 2 transmitter antennas and 1 receiver antenna using STBC which is having higher error rate than the proposed results.

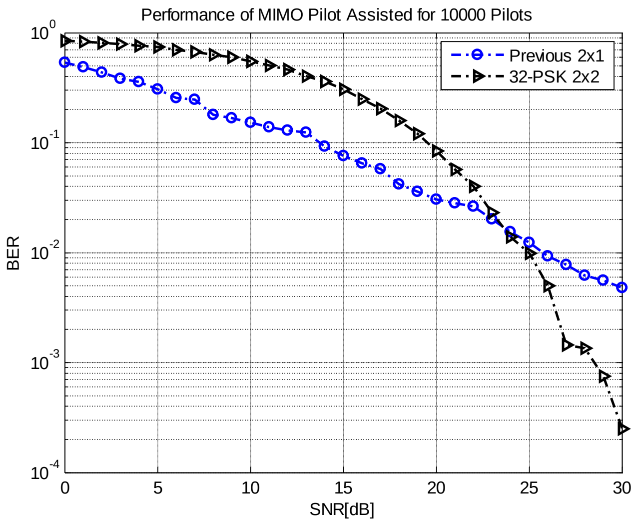

Fig. 3.1 Performance Graph for 2x2 MIMO with 32-PSK and Pilot Assisted Scheme

In Fig. 3.2 the proposed system with 10000 pilots and 32-psk modulation and 2 transmitter antennas and 4 receiver antenna is implemented and the lowest BER achieved is 1.5×10^{-4}. The proposed technique also compared with the previous method using 2 transmitter antennas and 1 receiver antenna using STBC which is having higher error rate than the proposed results.

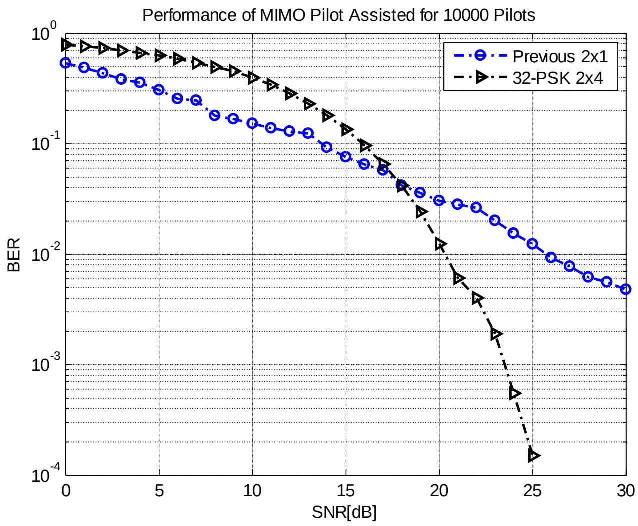

Fig. 3.2 Performance Graph for 2x4 MIMO with 32-PSK and Pilot Assisted Scheme

In Fig. 3.3 the proposed system with 10000 pilots and 32-psk modulation and 2 transmitter antennas and 6 receiver antenna is implemented and the lowest BER achieved is $1x10^{-4}$. The proposed technique also compared with the previous method using 2 transmitter antennas and 1 receiver antenna using STBC which is having higher error rate than the proposed results.

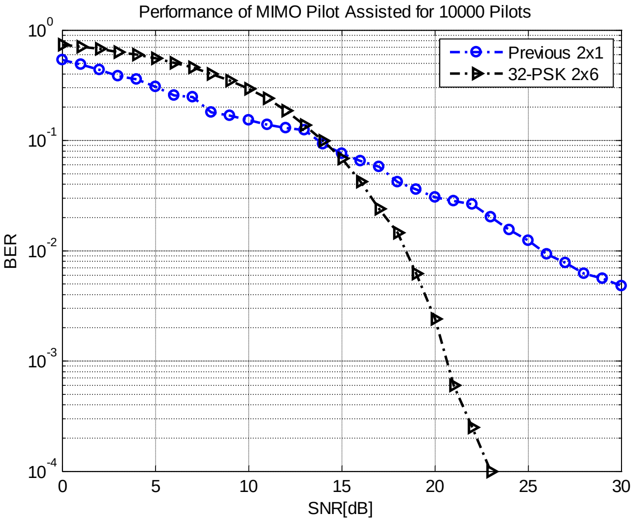

Fig. 3.3 Performance Graph for 2x6 MIMO with 32-PSK and Pilot Assisted Scheme

In Fig. 3.4 the proposed system with 10000 pilots and 32-psk modulation and 2 transmitter antennas and 8 receiver antenna is implemented and the lowest BER achieved is $1.5x10^{-4}$. The proposed technique also compared with the previous method using 2 transmitter antennas and 1 receiver antenna using STBC which is having higher error rate than the proposed results.

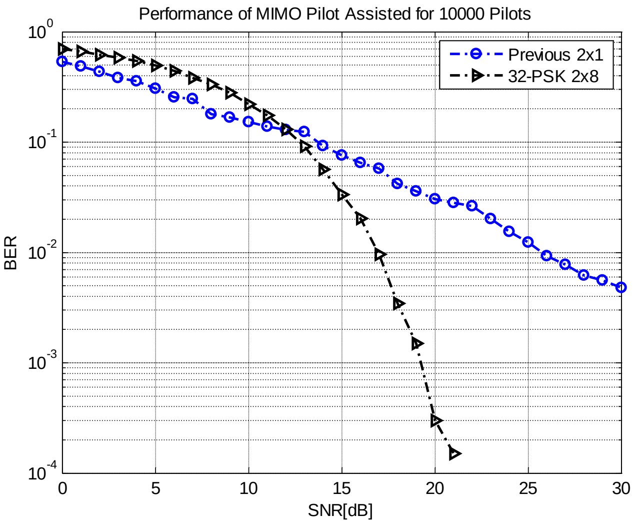

Fig. 3.4 Performance Graph for 2x8 MIMO with 32-PSK and Pilot Assisted Scheme

In Fig. 3.5 the proposed system with 10000 pilots and 32-psk modulation and 4 transmitter antennas and 2 receiver antenna is implemented and the lowest BER achieved is $2x10^{-4}$. The proposed technique also compared with the previous method using 4 transmitter antennas and 1 receiver antenna using STBC which is having higher error rate than the proposed results.

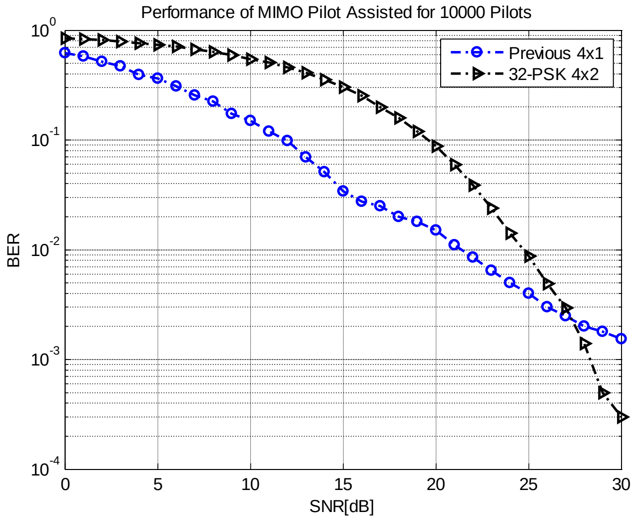

Fig. 3.5 Performance Graph for 4x2 MIMO with 32-PSK and Pilot Assisted Scheme

In Fig. 3.6 the proposed system with 10000 pilots and 32-psk modulation and 4 transmitter antennas and 4 receiver antenna is implemented and the lowest BER achieved is $1.5x10^{-4}$. The proposed technique also compared with the previous method using 4 transmitter antennas and 1 receiver antenna using STBC which is having higher error rate than the proposed results.

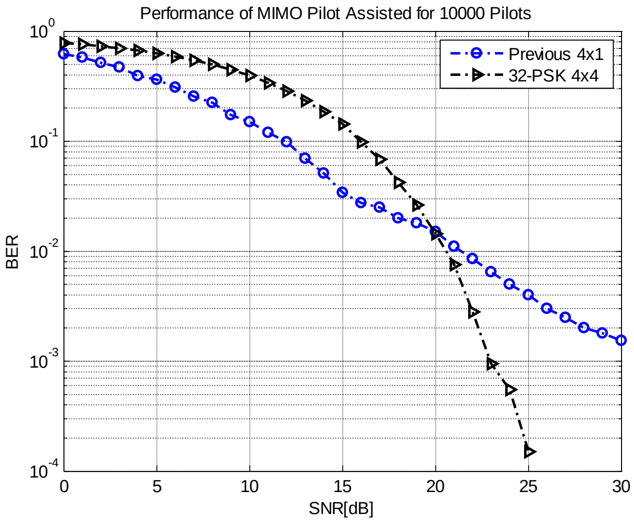

Fig. 3.6 Performance Graph for 4x4 MIMO with 32-PSK and Pilot Assisted Scheme

Table 1 - Comparison of BER

SNR	Existing 2x1 Configuration	Proposed Scheme 2x8
0	0.5365	0.6922

1	0.4855	0.6630
2	0.4350	0.6192
3	0.3845	0.5876
4	0.3580	0.5422
5	0.3050	0.4918
6	0.2565	0.4367
7	0.2470	0.3881
8	0.1790	0.3305
9	0.1669	0.2727
10	0.1521	0.2230
11	0.1390	0.1706
12	0.1298	0.1291
13	0.1245	0.0930
14	0.0927	0.0587
15	0.0761	0.0357
16	0.0653	0.0195
17	0.0575	0.0094
18	0.0420	0.0040
19	0.0358	0.0013
20	0.0305	0.0005
21	0.0281	0.0001
22	0.0263	0
23	0.0202	0
24	0.0155	0
25	0.0124	0
26	0.0093	0
27	0.0077	0
28	0.0062	0
29	0.0056	0
30	0.0048	0

V. CONCLUSION AND FUTURE SCOPE

The results of the proposed model after simulation is displayed in the previous section and the analysis of the system with BER and spatial diversity architecture used conclude that the proposed approach is better with the reduced error probability in the system. The 2xM and 4xM configuration giving better BER for higher signal power range keeping number of receivers (M) lower or equal to number of transmitters. But when number of receivers are increased than the transmitters BER for all the signal powers perform better than the existing work which was pilot assisted STBC MISO system.

The MIMO architecture shown that the performance can be better than MISO used with 32-PSK modulation, and it can be more better with efficient modulation technique like QAM instead of PSK, and the digital filtering or detections techniques will make proposed system better.

REFERENCES

[1] E. Ben Slimane, S. Jarboui, Z. Ben Mabrouk and A. Bouallègue, "Pilot assisted channel estimation in MIMO-STBC systems over time-varying fading channels," Modeling and Optimization in Mobile, Ad Hoc, and Wireless Networks (WiOpt), 2014 12th International Symposium on, Hammamet, 2014, pp. 119-124.

[2] S. M. Alamouti, "A simple transmit diversity technique for wireless communications," in IEEE Journal on Selected Areas in Communications, vol. 16, no. 8, pp. 1451-1458, Oct 1998.

[3] V. Tarokh, H. Jafarkhani,and A. R. Calderbank, "Space-time block codes from orthogonal designs," IEEE Trans. InfTheory,vol. 45,no.5,pp. 1456-1467,Jul. 1999.

[4] M. Biguesh and A. B. Gershman, "Training-based MIMO channel estimation: a study of estimator tradeoffs and optimal training signals," in IEEE Transactions on Signal Processing, vol. 54, no. 3, pp. 884-893, March 2006

[5] J. K. Cavers, "An analysis of pilot symbol assisted modulation for Rayleigh fading channels [mobile radio]," in IEEE Transactions on Vehicular Technology, vol. 40, no. 4, pp. 686-693, Nov 1991.

[6] S. Ohno an G. B. Gianakis, "Average-rate optimal PSAM transmissions over time-selective fading channels," IEEE Trans. Wireless Commun.,vol. I,no. 4,pp. 712-720,Oct. 2002.

[7] K. Yu, 1. Evans, and 1. Collings, "Performance analysis of pilot symbol aided QAM for Rayleigh fading channels," in Proc. IEEE ICC,NewYork,NY,pp. 1731-1735,May 2002.

[8] S.S. Ikki, S. AI-Dharrab and M. Uysal, "Error Probability of OFRelaying with Pilot-Assisted Channel Estimation over Time-Varying Fading Channels," IEEE Transactions on Vehicular Technology,vol. 61,no. I,393 - 397,2012.

[9] Wenyu Li, Yunfei Chen and Norman C. Beaulieu,"BEROptimization of Pilot Symbol Assisted MRC PSI for Slow Fading Channels " IEEE Communications Letters,vol. 13,no. 12,December 2009.

[10] EijiOkamoto,Huan-BangLi,andTetsushiIkegami,"A Pilot Symbol Assisted Compensation Scheme of Fading an Frequency Offset for 16QAM," IEEE International Conference on Universal Personal Communications (ICUPC),vol. 2,pp. 921 - 924,1998.

[11] XiaodongCai an Georgios B. Giannaks, "Adaptive PSAM Accounting for Channel Estimation and Prediction Errors," IEEE Transactions on Wireless Communications, vol. 4, no. 1, Janary2005.

[12] Amine Maaref an Sonia Alssa,"Optimized Rate-Adaptive PSAM for MIMO MRC Systems with Transmit and Receive CSI Imperfections," IEEE Transactions on Communications,vol. 57,no. 3,March 2009.

[13] Wenyu Li and Norman C. Beaulieu, "Effects of Channel-Estimation Errors on Receiver Selection-Combining Schemes for Alamouti MIMO Systems With BPSI (" IEEE Transactions on Communications,vol. 54,no. I,January 2006.

[14] Jie Wu and Gary J. Saulnier, "Orthogonal Space-Time Block Code Over Time-Varying Flat-Fading Channels: Chanel Estimation, Detection, and Performance Analysis," IEEE Transactions on Communications,vol. 55,no. 5,May 2007.

[15] Duo Zhang,GuoWei,Jinkang Zhu an ZhiTian,"On the Bounds of Feedback Rates for Pilot-Assisted MIMO Systems," IEEE Transactions on Vehicular Technology,vol. 56,vo. 4,July 2007.

[16] H. Meyr,M. Moenec1aey,and S. A. Fechte1. "Digital Communication Receivers," New York: Wiley, 1997.