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Simulation of Noise Removal for Cell Phone Network Extender (NE)

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Abstract- In this paper we consider the weak signal leading to barely audible conversations and continuously dropped calls and loss of data connection in cell phones. This paper introduces a novel product called Cell phone network extender which conquers this wireless dead zone. It strengthens weak cellular signals to deliver high quality signals for voice, data and video reception on cell phones. Here we are introducing adaptive noise cancelling using LMS algorithm which helps Performance of the Network extender. All idea is about bringing the base station nearer to Cell phone.

***Keywords*— CellPhone Network extender, EVM, BER, LMS.**

I. INTRODUCTION

This product is an intelligent integrated cell phone signal repeater box, alternately referred as Mobile Network Extender. It is a carrier agnostic broadband repeater with channelized performance. Physically it is a small solution to improved cell phone performance in the automobile (to be adapted to a home use product later).The performance of the Network Extender will be affected by the noise signal.

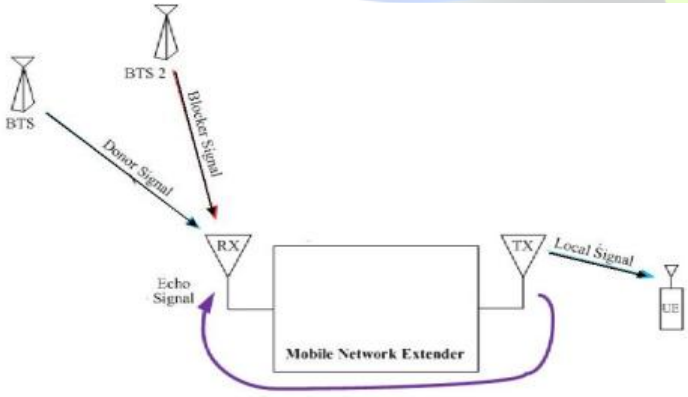

Fig.1: Noise in downlink

The received signal at the local receiver antenna will have actual signal to be received from the donor side and the part of the signal from local transmit antenna of the RF repeater (Which is also called as the Noise Signal). To handle this undesirable scenario LMS algorithm will estimate channel variations in the Echo path and subtract from the received signal.

II. LITERATURE REVIEW

One current class of products in the market designed to improve poor cell reception involves what are called repeaters, also called cell phone boosters, which depend on at least a weak cell tower signal to amplify and rebroadcast. Many repeaters have multiple parts, starting with an antenna that you place as close as possible to the strongest cell tower signal, which is typically found near a window or even outdoors or on the roof. The antenna transmits signals over a cable connected to an amplifier, which boosts the signal and retransmits in indoors. However, this lacks portability as one has to deal with an external antenna and an extension of coaxial cable. Network Extender is the size of a paper book, doesn't have the messy cable and antenna of repeaters, doesn't require handoff to the Internet and is fully portable. The product has a compact, fully integrated antenna which is used for both outgoing and incoming signals. The Network Extender operates for all radio frequencies and spectrums as shown in Table.1.

Table.1: Network Extender operates for all radio frequencies and spectrums

BAND	Uplink (UL) Band FUL_low – FUL_high	Downlink (DL) Band FDL_low – FDL_high
12	698 MHz – 716 MHz	728 MHz – 746 MHz
13	777 MHz – 787 MHz	746 MHz – 756 MHz
5	824 MHz – 849 MHz	869 MHz – 894MHz
4	1710 MHz – 1755 MHz	2110 MHz – 2155 MHz
2	1850 MHz – 1910 MHz	1930 MHz – 1990 MHz

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A. Features of NE

Main feature of the NE is to boost the signals from 1 bar signal strength to 5 bars signal strength. Network extender is an easy plug and play installation. For users it is exciting feature. Device covers 4000 square feet of space spherically in both home and office and has got adaptive adjustments of RF links. Calibration of the NE will be done by self once it is powered up. To maintain good performance it will adapt automatically to changes in environment. Oscillations of the signals are not found because it detects oscillations early and suppress it. It has got auto intelligent system to shut down at the high RSSI power levels and high temperature range. This product has got the intelligent power management, regulates the how much power is needed to operate based on signal strength. Due to good network availability user will experience the good download and upload speeds and also sound and voice quality will also be increased. Device is a low cost for consumer. This network extender helps to extend user battery life 80% more and 10x data throughput. Christo Ananth et al. [3] discussed about E-plane and H-plane patterns which forms the basis of microwave engineering for signals.

B. Problem Definition

Main problem in the cell phone communication is the user experience the last mile connectivity problem. Lot of research is going on improving the cell phone modification, internal software modification but no one is bothered about the last mile connectivity. While in moving scenarios users also experience the frequent call drops. Due to this call drops user experience the bad communication experience as a result of interrupted conversation.

When signal power is low cell phone signals uses the lot of power to boost the signals. Hence due to high power operation cell phone battery life will be reduced .High power radiation coming out of the cell phones will cause health hazards to the human being. Now a days in congested areas network operators are deploying the lot of base stations. Due to these increased base stations causes the health hazards to people residing nearby base station.

Existing cell phone network extender are single band supported, they only support for single band operation. All NE found in current market has got lot physical overheads that is They have got external antenna's that has to place near window or top of the house and cables has to drawn from the connected to it. Due to lot of physical overheads NE available in market has got portable issues.

III. LMS ALGORITHM

- The least mean squares (LMS) algorithms adjust the filter coefficients to minimize the cost function (Deviation in measurements).
- The standard LMS algorithm performs the following operations to update the coefficients of an adaptive filter
- Calculates the output signal y(n) from the adaptive filter.
- Calculates the error signal e(n) by using the following equation:
  e(n) = d(n)–y(n).
- Updates the filter coefficients by using the following equation:

$$w(n+1) = w(n) + \mu . e(n) . x(n)$$

Where $x(n) = input\ signal$
$w(n) = Filter\ Coefficient$
e(n) = Error signal
μ = Step size (Convergence factor)[0<μ<1]

- For Normalised LMS algorithm

$$\mu(n) = \frac{\mu}{x(n)^2}$$

IV . PERFORMANCE PARAMETERS

A. Bit Error Rate (BER)

The bit error ratio is the number of bit errors divided by the total number of transferred bits during a studied time interval.BER is a unit less performance measure, often expressed as a percentage.

B. Error Vector Magnitude (EVM)

Sometimes also called (**receive constellation error** or **RCE**) is a measure used to quantify the performance of a digital radio transmitter or receiver.

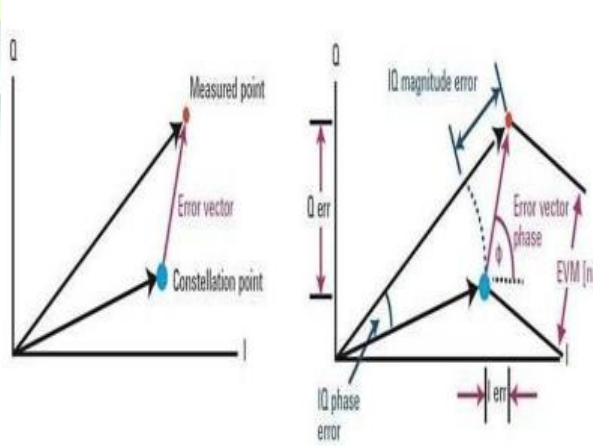

Fig.2: Constellation diagram

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A signal sent by an ideal transmitter or received by a receiver would have all constellation points precisely at the ideal locations; however various imperfections in the implementation cause the actual constellation points to deviate from the ideal locations. Informally, EVM is a measure of how far the points are from the ideal locations in Constellation diagram as shown in Fig.2.

IV. ANALYSIS OF SIMULATIONS AND RESULTS

The simulation is done using Simulink.

- EVM we are getting as 9.54 %(<12,5% is allowed as for 3GPP documentation), So that we can recover the signal at receiver with less error.
- BER is found zero, ie The data trasmited is received properly.

V. CONCLUSION

In this paper, we are simulated the Adaptive noise canceller for the Network extender. Since user experience the low signals and frequent call drops in both home and moving scenarios. So Network Extender gives Better solutions for above problems and helps to conquer dead zones.

A. Future Work

Design and simulation of Noise Canceller for network extender has been done for 4-QAM.The proposed method can also be extended to 16-QAM,64-QAM,256-QAM.The above proposed method can also be implemented using RLS algorithm.

VI. REFERENCES

[1] John G. Proakis, "Digital Communication", McGraw Hill, 4th edition, 2001.

[2] Bernard Sklar, "Digital Communication - Fundamental and applications", Pearson education (Asia), Pvt. Ltd., 2nd edition, 2001.

[3] Christo Ananth, S.Esakki Rajavel, S.Allwin Devaraj, M.Suresh Chinnathampy. "RF and Microwave Engineering (Microwave Engineering)." (2014): 300.

[4] John G. Proakis, "Digital signal processing principles, algorithms, and Application".