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Performance Evolution of 5g VOLTE Network with Space Time Coding

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***Abstract*--The advancement within the modern verbal exchange generation makes it incumbent to research the traditional functions of reflect array antenna for destiny adaptability. This paper very well critiques the design and experimental functions of reflect array antenna for its bandwidth improvement in microwave and millimeter wave frequency degrees. The paper surveys the essential and advanced topologies of reflect array design implementations, which might be wanted mainly for its broadband features. The attention of its layout methods has been studied at unit cellular and full reflect array stages for its bandwidth enhancement. Various layout configurations have also been severely analyzed for the compatibility with the high-frequency 5G structures.**

Keyword: Reflect Arrays, Bandwidth, Unit Cell, Multi-resonance, Millimeter Wave, 5G VOLTE.

1. Introduction:

The remote broadband association is much less demanding to send, have long scope of scope, less demanding to get to and more adaptable. They depend on IEEE 802.16 principles that take care of the network issues identified with BWA. These measures can work in both Line-Of-Sight (LOS) and Non-Line-Of-Sight (NLOS) situations. In NLOS, the PHY detail is reached out to 211 GHz recurrence band to minimize impact blurring and multipath proliferation. The OFDM physical layer based IEEE 802.16 standard is practically indistinguishable to European Telecommunications Standard Institute's (ETSI) High execution Metropolitan Area Network (HiperMAN) as they participate with one another [1]. This proposal is about 5G VOLTE OFDM PHY layer execution where we dissected the outcomes utilizing MATLAB test system with various balance strategies. A few decades prior, both the sources and transmission framework were on simple organization yet the progression of innovation made it conceivable to transmit information in advanced structure. The information payload limit and transmission rate expanded from kilobit to gigabit because of expansion in pace of PCs [3]. From wire to remote idea developed and scientists motivate accomplishment to concoct remote transmitter to transmit information. Applications like voice, web access, texting, SMS, paging, document exchanging, video conferencing, gaming and excitement and so on turned into a piece of life. Remote innovation gave higher throughput, gigantic versatility, longer range, vigorous spine to thereat. The vision extended more to give smooth transmission of sight and sound anyplace with assortment requiring little to no effort and adaptability even in odd environment. Wireless Broadband Access (WBA) by means of DSL, T1-line or link foundation is not accessible in country zones. The DSL can conceals just to close around 18,000 feet (3 miles), that is the reason numerous urban, rural, and country ranges can't be served by WBA. The Wi-Fi standard broadband association might take care of this issue a bit however it has scope restrictions. In any case, the Metropolitan-Area Wireless standard which is called 5G VOLTE can settle these constraints [4].

The goal of this thesis is to implement and OFDM Physical layer specification by following IEEE 802.16e-2005[1] Using Adaptive decision control techniques we analyze the performance of OFDM physical layer in mobile 5G VOLTE based on the simulation results of Bit-Error-Rate (BER), Signal to Noise Ratio (SNR) and Probability of Error (Pe). The performance analysis of OFDMA- is done in MATLAB 7.4 under reference channel model with channel equalizer.

2. Related Work:

T. S. Rappaport, 2017 [1] compared two popular channel models for 5G wireless communications, the 3GPP TR 38.900 Release 14 and the NYUSIM channel models. Simulation results indicate that the 3GPP channel model yields unrealistic eigenvalues and higher spectral efficiency than NYUSIM, revealing the problematic choice of some channel parameters in the 3GPP model for frequencies above 6 GHz. The above work shows that the 3GPP channel model is optimistic when predicting diversity and the achievable SE at mm Wave frequencies, and will yield unrealistic eigen value distributions for mm Wave channels.

According to **[2] Shunqing Zhang, (2016)** with years of remarkable traffic and power consumption growth, green radio has been valued now not most effective for theoretical research pastimes however additionally for the operational expenditure discount and the sustainable development of wi-fi communications. Fundamental green tradeoffs, served as an essential framework for evaluation, include 4 simple relationships: spectrum efficiency (SE) versus energy performance (EE), deployment efficiency (DE) as opposed to energy performance (EE), postpone (DL) versus strength (PW), and bandwidth (BW) versus electricity (PW). In this work, we first offer a comprehensive evaluate at the great on-

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going studies efforts and categorize them primarily based on the fundamental green tradeoffs.

Non-orthogonal multiple get admission to (NOMA) is one of the promising radio get entry to techniques for overall performance enhancement in next-technology cell communications. Compared to orthogonal frequency department multiple get admission to (OFDMA), that's a well-known high-capacity orthogonal more than one access (OMA) technique, NOMA offers a hard and fast of acceptable advantages, which includes extra spectrum efficiency. There are exceptional styles of NOMA strategies, including energy-domain and code-domain. **[3] J. Xiao,2006** worked in general make a speciality of energy-domain NOMA that utilizes superposition coding (SC) at the transmitter and successive interference cancellation (SIC) on the receiver. Various researchers have tested that NOMA can be used efficaciously to meet both network-level and consumer-skilled facts rate necessities of 5th-generation (5G) technologies

The stringent requirements of a 1,000 times increase in facts site visitors and one millisecond round experience latency have made proscribing the potentially first rate ensuing energy intake one of the most difficult issues for the design of the imminent fifth-era (5G) networks. To permit sustainable 5G networks, new technologies had been proposed to enhance the machine energy performance and opportunity strength assets are brought to reduce our dependence on traditional fossil fuels. In specific, various 5G techniques target the reduction of the power consumption without sacrificing the fine-of-provider. Meanwhile, strength harvesting technologies, which permit communique transceivers to reap energy from numerous renewable resources and ambient radio frequency indicators for verbal exchange, have drawn full-size interest from both academia and industry. In this article, we offer an assessment of the cutting-edge studies on both green 5G strategies and power harvesting for communiqué. In addition, some technical demanding situations and potential studies subjects for realizing sustainable green 5G networks are also identified. In this article, **[4] Qingqing Wu, 2016** have surveyed the advanced technology that are anticipated to allow sustainable green 5G networks.

The performances of the 5th era (5G) wireless communication systems are drastically laid low with facet cache and shipping community. These emerging additives convey great expenses of the position and utilization, and the evaluation of the cost impact is past the capability of conventional performance metrics, such as spectral performance (SE) and power performance (EE). In this newsletter, economical strength efficiency (E3) is proposed, whose core concept is to take SE/EE and fee into consideration to evaluate complete profits when different types of superior technologies are utilized in 5G systems. The E3 effects are shown while the shipping network and edge cache are one by one or collectively used. Open troubles in phrases of modeling the cost, E3 optimization primarily based radio useful resource allocation, and E3 optimization for internet of things, are recognized as well. To symbolize the scalability, flexibility, and interoperability, a complicated E3 metric is proposed in this newsletter to assess the influences of X-Haul and edge cache within the F-RAN based 5G structures. With the conventional EE and the cost taken into account, the proposed E3 metric affords a viable manner to expose complete profits whilst specific kinds of superior technologies are used. Based at the numerical consequences, approaches to optimize E3 overall performance of 5G systems are included in this newsletter. **[5] M. Peng,2016** concluded that E3 metric serves as a proper choice when the impacts on throughput, greenness, and affordability all require consideration. However, being a brand new proposed performance metric, there are still some of issues urgent to be solved in the future, and special attention is required by using the key problems which includes the model of price, E3 optimization based totally radio resource allocation, and E3 optimization for IoTs

3. Physical layer model with fading:

After justifying the 5G VOLTE model performance in AWGN noise we have tested our model in the presence of fading channel along with AWGN noise. The model is shown in figure 1.

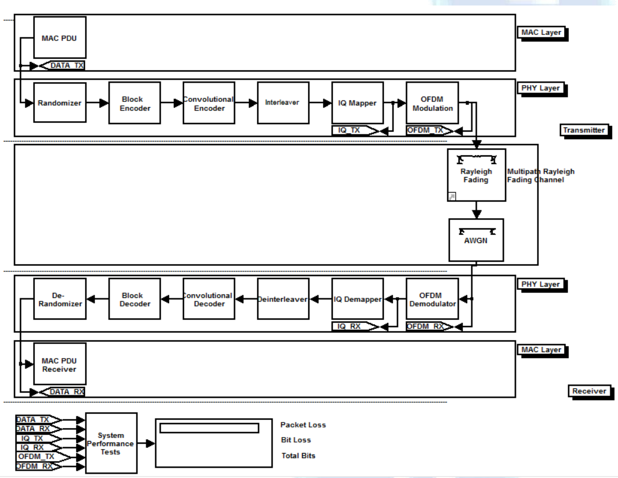

Fig. 1.Model for 5G VOLTE Physical layer in presence of Rayleigh flat fading

3.1. Multipath Rayleigh Fading Channel:

The Multipath Rayleigh Fading Channel block implements a baseband simulation of a multipath Rayleigh fading propagation channel. You can use this block to model mobile wireless communication systems. This block accepts a scalar value or column vector input signal. The block inherits sample time from the input signal. The input signal must have a discrete sample time greater than 0.

Parameters:
Maximum Doppler shift (Hz): 40
Doppler spectrum type: Jakes
Discrete path delay vector (s): [0 2e-6]

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Average path gain vector (dB): [0 -3]
Initial seed: 73

4. Channel Estimation:

For eliminating the effect of channel fading we apply channel estimation on 7 different modulation schemes and it is found that the estimated gain and phase delay when adjusted with the received data we get a lower value of BER.
To minimize the multipath fading effect we have designed 5G VOLTE models with different IQ mapping schemes. The preferred IQ mapping schemes are BPSK1/2, QPSK1/2, QPSK3/4 and QAM 16.For each IQ mapping simulink models are designed along with channel estimation subsystem.
The channel estimation subsystem extracts the pilot data inserted before transmission and compare with original pilot data. In course of comparison the estimator calculates the change in gain and phase.

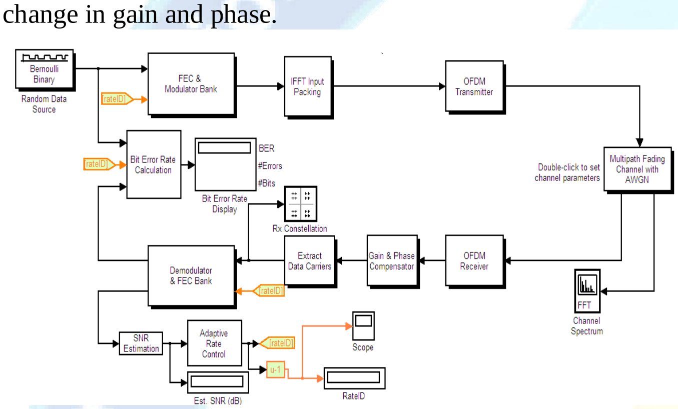

Fig. 2. 5G VOLTE Model Adaptive rate control in Flat fading channel

5. Transmit Diversity vs. Receive Diversity-

Using diversity reception is a well-known technique to mitigate the effects of fading over a communications link. However, it has mostly been related to the receiver end. In [1], Alamouti proposes a transmit diversity scheme that offers similar diversity gains, using multiple antennas at the transmitter. This was conceived to be more practical as, for example, it would only require multiple antennas at the base station in comparison to multiple antennas for every mobile in a cellular communications system.
This section highlights this comparison of transmit vs. receive diversity by simulating coherent binary phase-shift keying (BPSK) modulation over flat-fading Rayleigh channels. For transmit diversity, we use two transmit antennas and one receive antenna (2x1 notationally), while for receive diversity we employ one transmit antenna and two receive antennas (1x2 notationally).
The transmit diversity system has a computation complexity very similar to that of the receive diversity system.The resulting simulation results show that using two transmit antennas and one receive antenna provides the same diversity order as the maximal-ratio combined (MRC) system of one transmit antenna and two receive antennas.
Also observe that transmit diversity has a 3 dB disadvantage when compared to MRC receive diversity. This is because we modelled the total transmitted power to be the same in both cases. If we calibrate the transmitted power such that the received power for these two cases is the same, then the performance would be identical. The theoretical performance of second-order diversity link matches the transmit diversity system as it normalizes the total power across all the diversity branches.

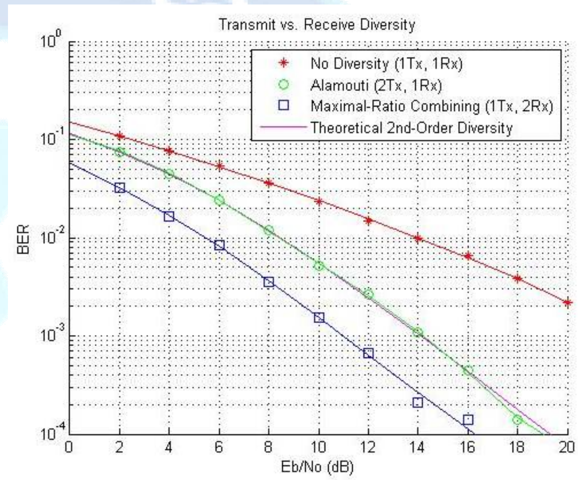

Fig. 3. BER performance at different MIMO coding schemes for 1x2 or 2x1 sytems.

After discussion and analysis of MIMO systems of data coding and transmission and OFDM performance at different modulation scheme we are going to describe the results that are obtained for MIMO OFDM system by using the adaptive modulation strategy that estimates the channel SNR from the pilot symbols and cyclic prefix values and then from the estimated SBR the algorithm decides the modulation scheme that can be most suitable for minimum BER values. The MIMO OFDM configuration that has been used is:
Choice for modulation scheme is from 1 to 5 each choice represents:
1:Adaptive Modulation
2:BPSK
3:QPSK
4:16QAM
5:64QAM

Random binary data is generated for Mt transmitters and pilot data is inserted thereafter the cyclix prefix is added.Initially a random data stream is generated having size of Nsym*Nfft= 6144 samples with 6 (Nsym) OFDM blocks with 1024(Nfft) size of each block. The transmitted signal is has length extra then the generated block due to addition of cyclic prefix block. Since CP length is 128 thus the transmitted signal block will have length as Nfft+CP. Thus a Tx array is initialized to store transmitted data with size Nsym*(Nfft+CP)= 6912.

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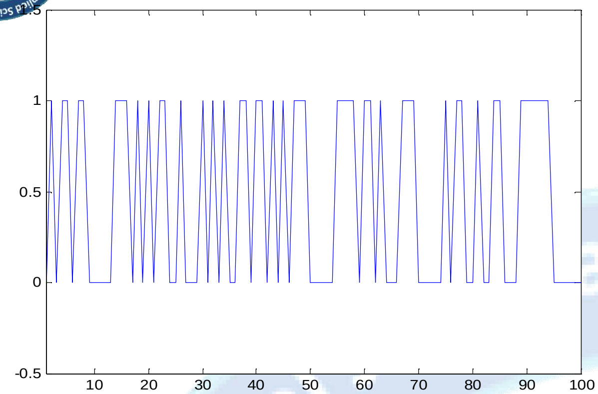

Fig 4. Initial 100 samples of generated binary data.

After generating the binary data modulation is applied on the data for example if we apply BPSK then we will get two values of same magnitude but opposite phases as shown in figure2.

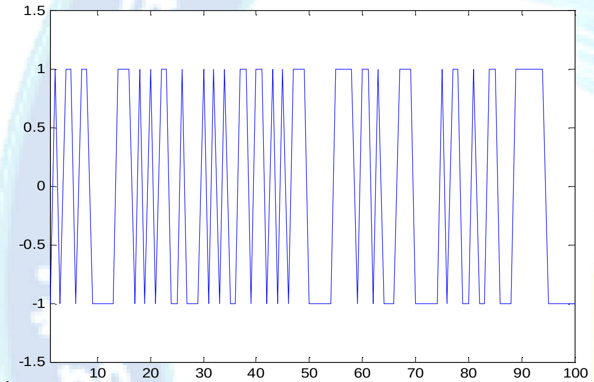

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Fig. 5. Initial 100 samples of BPSK modulated binary data.

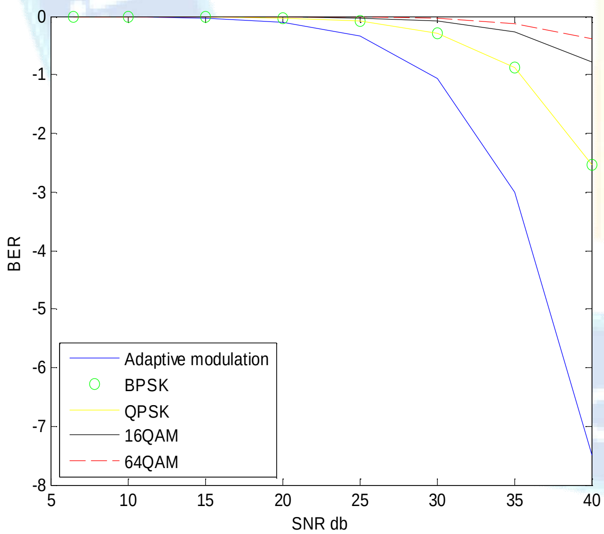

Fig. 6. Performance evaluation of CP based channel estimation and correction in terms of BER at different modulation for MIMO OFDM systems.

6.Conclusion:

This work discuss and implements the issue that has helped to improve the channel distortion estimation accuracy due to the channel effect for enhancing the standard a reliable transmission for different modulation technique including adaptive channel modulation in presence of channel fading, noise and distortions. To this end in the thesis work we have develop an highly accurate and simple algorithm which can jointly estimate channel state prior to data decoding for a wireless communication system. In the future numerous algorithms can be applied to deal channel estimation for MIMO-OFDM systems. The results are generated at different modulation schemes at different SNR values and then we have tabulated the estimated carrier frequency offset values to observe the average estimated offset frequency and its error to the ideal offset value as defined in the algorithm. The average error is found to be very small.

References:

[1] T. S. Rappaport et al., “A single-hop F2 propagation model for frequencies above 30 MHz and path distances greater than 4000 km,” IEEE Transactions on Antennas and Propagation, vol. 38, no. 12, pp. 1967–1968, Dec 1990.

[2] Shunqing Zhang,’ yIntel Labs, Beijing, 100080, China zGeorgia Institute of Technology, Atlanta, GA, 30332, USA Emails: fshunqing.zhang, shugong.xug@intel.com, fqingqing.wu, liyeg@ece.gatech.edu.

[3] P. Wang, J. Xiao, and L. P “Comparison of orthogonal and non-orthogonal approaches to future wireless cellular systems,” IEEE Veh. Technol. Mag., vol. 1, no. 3, pp. 4-11, Sep. 2006

[4] Qingqing Wu J. G. Andrews, S. Buzzi, W. Choi, S. V. Hanly, A. Lozano, A. C. Soong, and J. C. Zhang, “What will 5G be?” IEEE J. Sel. Areas Commun., vol. 32, no. 6, pp. 1065–1082, Jun. 2014

[5] M. Peng, C. Wang, J. Li, H. Xiang, and V. Lau, “Recent advances in underlay heterogeneous networks: Interferencecontrol, resource allocation, and self-organization”, IEEE Communications Survey & Tutorial, vol. 17, no. 2, pp. 700–729,second quarter, 2015.

[6] William Stallings,“Wireless Communications and Networking”, ISBN 81-7808-560-7, 7th Edition, 2005.

[7]NasifEkiz, Tara Salih, SibelKucukoner and Kemal Fidanboylu, “An Overview of Handoff Technique in Cellular Networks”, Volume 2 Number 2.

[8]VinitGrewal and Ajay K. Sharma, “Performance Evaluation of Wi-Max Network with AMC and MCCDMA for Mobile Environments”Vol. 7, No. 4, October, 2012.

[9]LoutfiNuaymi, “Wi-Max Technology for Broadband Wireless Access, Chapter 3.4: Security Sublayer”6th Edition,2010.

[10] Jeffrey G. Andrew,ArunabhaGhosh, RiasMuhamed: “Fundamentals of Wi-Max: Understanding Broadband Wireless Networking'“Chapter 2, Table 2.3 OFDM Parameters used in Wi-Max.

[11]NasifEkiz, Tara Salih, SibelKucukoner and Kemal Fidanboylu, “An Overview of Handoff Technique in Cellular Networks”, Volume 2 Number 2 June 2012
[12]Jeffrey G. Andrew, ArunabhaGhosh, RiasMuhamed :“Fundamentals of Wi-Max: Understanding Broadband Wireless Networking” Chapter 2, 5th Edition 2010.