IMPLEMENTATION OF LTE ADVANCED USING DIFFERENT RELAY ENVIRONMENT IN OFDMA SYSTEM WITH SER PERFORMANCE

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Abstract: *The challenging task in a wireless communication system is to design an efficient communication system because of many factors, which affects the performance. In recent years due to rapid development in wireless communication, huge demands for broadband mobile wireless communications and the emergence of new wireless multimedia applications have constituted the motivation to the development of broadband wireless access technologies. The Long Term Evolution (LTE) system has been specified by the Third Generation Partnership Project (3GPP) on the way towards Fourth-Generation (4G) mobile to ensure 3GPP keeping the dominance of the cellular communication technologies. LTE-A will meet or exceed the requirements of the International Telecommunication Union (ITU) for the 4G radio communication standard. LTE-A is being specified initially as part of the 3GPP specifications. Where the current generation of mobile telecommunication networks are collectively known as 3G (for "third generation"), LTE is marketed as 4G. In this paper, LTE-A WINNER MIMO uses Orthogonal Frequency Division Multiplexing (OFDM) for the downlink is proposed. OFDMA meets the LTE requirement for spectrum flexibility and enables cost-efficient solutions for very wide carriers with high peak rates. The multiple access schemes in LTE downlink uses Orthogonal Frequency Division Multiple Access (OFDMA). Power saving in transmission is an extensive issue for the multiple access techniques used in LTE, therefore in this paper, an important transmission factor SER for OFDMA system, is considered. It is proved that the proposed model with the existing model by the comparison of SER performance versus SNR, CCDF of PTS-PAR reduction with different fading models (Rayleigh, Rician and Standard) and CDF plot for capacity of power with various cases (Random, Water Filling / Pouring and Equal) in both channel and link of OFDMA system for different relay environments in WINNER MIMO LTE-A has better performance in all aspects.*

Key words: *LTE, LTE-A, WINNER, MIMO, OFDM, SER.*

1. Introduction

Continuous growth of the wireless communication industry has led to the advent of different wireless standards. The requirement for high data rate in wireless communication makes these systems complex. Increasing design complexity [1-3] and tremendous time-to-market pressure make verification a complex and time-consuming process, which also requires enormous resources. To meet all these challenges, a fully automated and generic verification tool is required that can generate corner test cases according to the design requirements and execute these test cases in regression mode. It should also be easily customizable for any scenario to minimize deployment effort. Wireless communication systems started off as single-user analog voice transmission as in a Frequency Modulation (FM) radio transmitter. It required only a modulator and a transmitter. The wireless technology [4-6] has evolved and wireless users demand for data rates in Mbps and beyond to support all real-time services. However, the spectrum available is too little to share among millions of subscribers. Hence, a sophisticated processing chain in the transmitters/receivers with modules like encoder/decoder, modulator/demodulator, scheduler, radio resource managers, and so on is required. The evolution of the wireless technology from 2G communication to 4G communication is being represented in this Fig. 1.

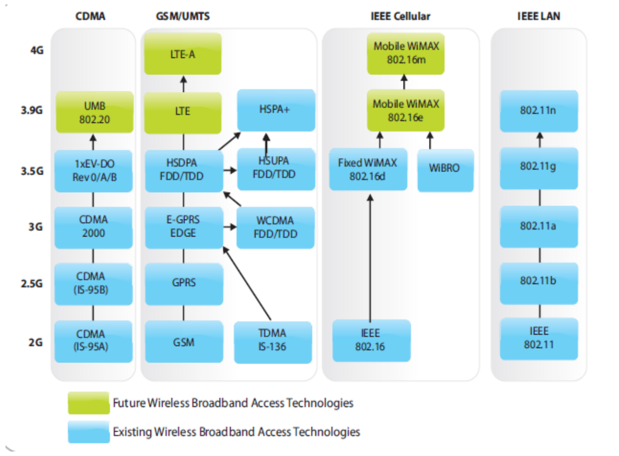

Figure 1. Communication System and Technology Growth

From 2G communication system to the modern era Long Term Evolution (LTE) system, the exponential increase in data rates can be inferred from Table 1. LTE provides an uplink speed of up to 75 Mbps and a downlink speed up to 150 Mbps in a 2x2 MIMO configuration. 3GPP LTE provides numerous technical benefits to service providers and to the users at the cost of complex design implementations, such as Multiple Input Multiple Output (MIMO), Orthogonal Frequency Division Multiple Access (OFDMA) and Single Carrier Frequency Division Multiple Access (SC-FDMA) the key elements to achieve higher data rate.

2. METHODOLOGY

The method proposed here divides the initially 3D antenna array model creation, extract the scenario and link level with Base Station (BS) and Mobile Station (MS), generation for LTE-A WINNER MIMO model, path powers of OFDMA with different relay environments like without relay environment, non-cooperative relay environment, cooperative with one relay environment and cooperative with two relay environment. Finally, it calculates the SER performance. The schematic workflow of the proposed method is shown in the Fig. 2.

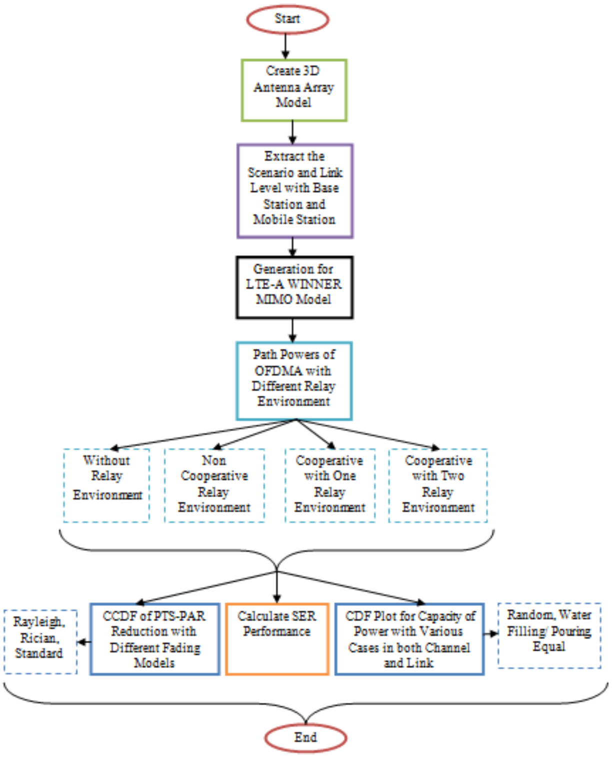

Fig. 2. Work flow of the proposed method

3. LTE-A WINNER GENERATION

The goal of WINNER (Wireless World Initiative New Radio) is to develop a single ubiquitous radio access system adaptable to a comprehensive range of mobile communication scenarios from short range to wide area. This will be based on a single radio access technology with enhanced capabilities compared to existing systems or their evolutions. WINNER II is a continuation of the WINNER I project, which developed the overall system concept. WINNER II will develop and optimise this concept towards a detailed system definition. All investigations will take place within the context of a system view to enable a focused development of a system rather than individual components. In addition, limited trials will be performed in order to assess some key elements of the WINNER II system. The radio interface will support the challenging requirements [7-9] of systems beyond 3G. It will be scalable in terms of carrier bandwidth and carrier frequency range and it will allow deployment in newly identified and “re-farmed” frequency bands. The system will support a wide range of usage and radio environments providing a significant improvement in performance and Quality of Service. The resulting system specification [10-13] will meet future market demands and will provide optimum user experience. The radio interface will optimise the use of spectral resources, e.g. through the exploitation of actual channel conditions and multiple antenna technology. The Fig. 3 shows that the technical approach of WINNER. New networking topologies (e.g. relaying) will support cost effective deployments. Support of advanced resource management and handover will ease the deployment of the WINNER system enabling seamless service provision and global roaming. The project will also contribute to the global research, regulatory and standardisation activities. The WINNER approach targets a globally harmonised system. The project objectives are shared by a strong consortium [14-17] of major players in the mobile and wireless communication industry including manufacturers, network operators, R&D centres and the academic domain.

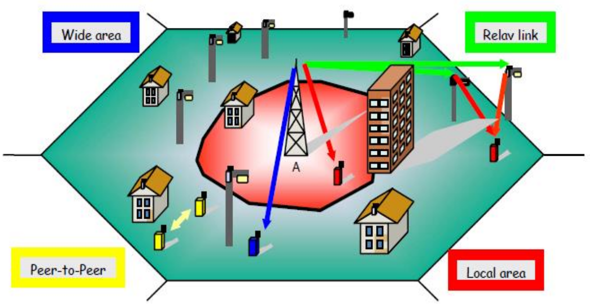

Figure 3. WINNER Model

4. PERFORMANCE MEASURES

The Performance Measures are SER, CCDF of PTS-PAR reduction with different fading models (Rayleigh, Rician and Standard) and CDF plot for capacity of power with various cases (Random, Water Filling / Pouring and Equal) in both channel and link.

A. Symbol Error Rate

The SER (Symbol Error Rate) function [18-20] compares binary representations of elements in x with those in y. For example the sample schematics illustrate how the shapes of x and y determine which elements SER compares as shown in the Fig. 24. The output number is a scalar or vector that indicates the number of elements that differ. The size of number is determined by the optional [21] input and by the dimensions of x and y. The output ratio equals number divided by the total number of elements [22] in the smaller input.

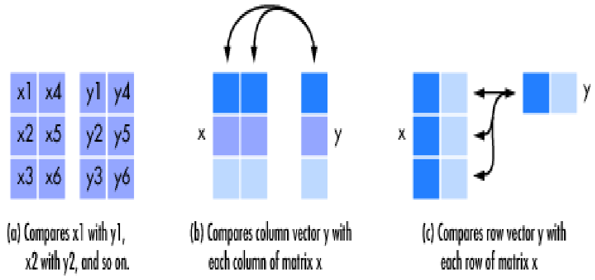

Fig. 24. Sample schematics SER

5. RESULTS AND DISCUSSION

All processing blocks were implemented in MATLAB code, in version R2014. This paper has analyzed the performance of LTE-A WINNER. The analysis for this model has focused on the main feature involved in the downlink, like the OFDMA through MIMO channel. The present results in this paper show that, SER performance versus SNR (Signal to Noise Ratio), CCDF of PTS-PAR reduction with different fading models (Rayleigh, Rician and Standard) and CDF plot for capacity of power with various cases (Random, Water Filling / Pouring and Equal) in both channel and link compared with different relay environments. The Fig. 4 shows that the SER vs SNR for without relay environment.

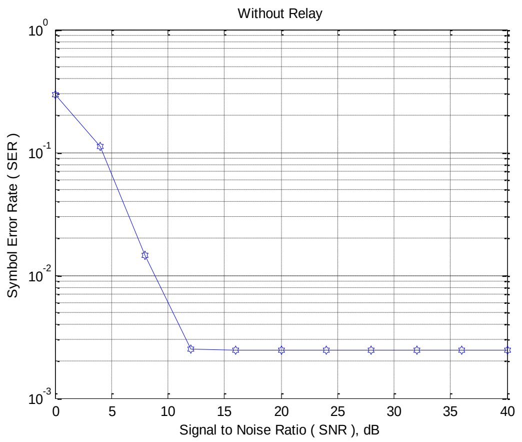

Fig. 4. SER vs SNR for without relay environment

The Fig. 5 shows that the SER vs SNR for non cooperative relay environment.

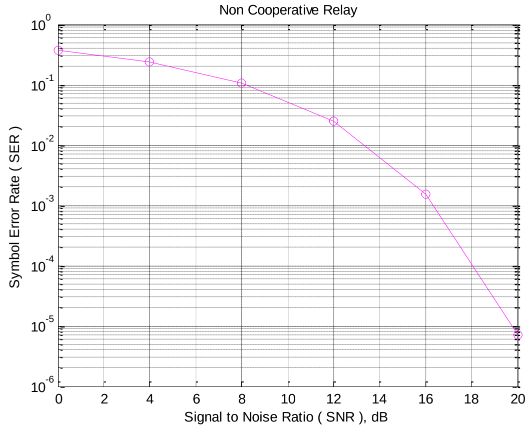

Figure 5. SER vs SNR for non cooperative relay environment.

The Fig. 6 shows that the SER vs SNR for cooperative with one relay environment.

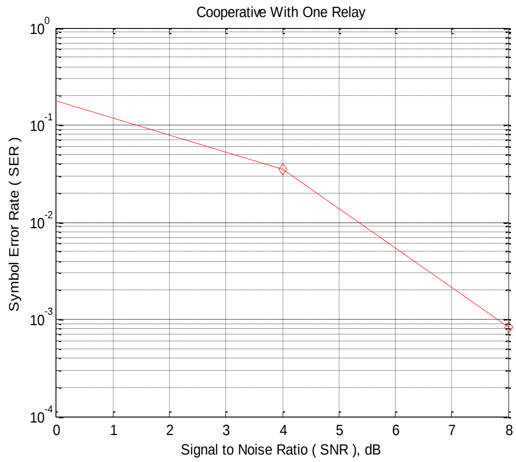

Figure 6. SER vs SNR for cooperative with one relay environment

The Fig. 7 shows that the SER vs SNR for cooperative with two relay environments.

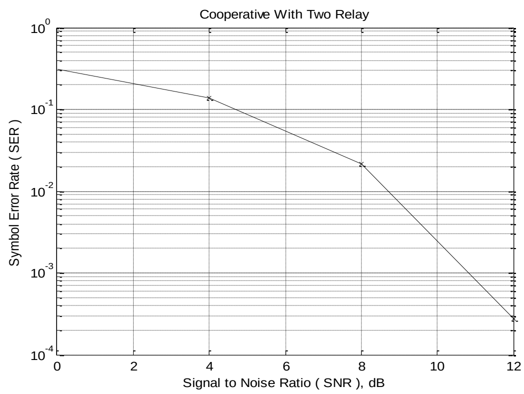

Figure 7. SER vs SNR for cooperative with two relay environment

The Fig. 8 shows that the CDF plot (Ergodic Capacity vs SNR) for different relay environments in channel.

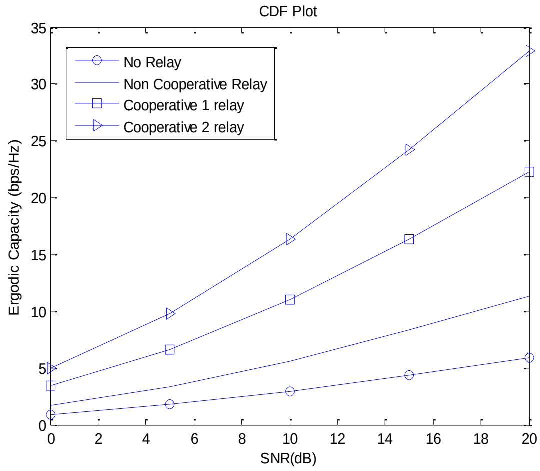

Figure 8. CDF plot (Ergodic Capacity vs SNR) for different relay environments in channel.

6. Conclusion

In this paper, provides the 3D AA creation, link and scenarios extraction between BS and MS, then using WINNER model with MIMO channel for OFDMA downlink access technique process can be done. The proposed process modelling has work out in different relay environments like without relay, non-cooperative relay, cooperative with one relay and cooperative with two relays. Finally calculate the SER performance and compared with SER versus SNR. Then calculate and plotting the CCDF of PTS-PAR reduction with different fading models (Rayleigh, Rician and Standard) and CDF plot for capacity of power with various cases (Random, Water Filling / Pouring and Equal) in both channel and link compared with different relay environments. The main idea of this proposed system is to compare the advantages of LTE-A WINNER model with the other existing models into a current model to show which one is better for improved and better performance and to extend system support in the near future. SER is a key parameter for indicating the system performance of any data link. From that results have showed that, it has performed better than the because of its low SER and high response for high SNR. In next, PTS method can be used to reduce the PAR using different fading models

(Rayleigh, Rician and Standard) has implemented. In this method is at the cost of less in data rate, transmit signal power increase, SER performance degradation, computational complexity increase, and so on. It has better performance in all fading models because it has low PAR and compared with CCDF versus PAR. Finally, we evaluate the capacity of power allocation for various cases (Random, Water Filling / Pouring and Equal) and the data rate is adapted to achieve instantaneous capacity. These cases have a better effect on the performance of MIMO OFDMA system by allocating optimum power to the sub-channels adaptively. In random case is observed that the probability of achieving the ergodic capacity increases with an increase in SNR values in random case of CDF plot. Then other two cases have SNR value increases, the ergodic and outage capacity decreases.

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