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NOMA in 5G Sysems by using Mimo Technique

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Abstract:-- **Non orthogonal multiple access (NOMA) is one of the radio access technique for performance enhancement in the next generation in the cellular communication. The orthogonal multiple access technique is well known technique for providing high capacity. NOMA offers a desirable benefits, including greater spectrum efficiency. There are different types of NOMA techniques like power domain and code domain .This work mainly focuses on the power domain NOMA which utilizes superposition coding at transmitter and successive interference cancellation at the receiver. Unconventional researchers have taken demonstration that NOMA can be used effectively on both network level and user experienced data rate requirements for 5G technology. From simulation results it is observed that BER is high for Max Doppler shift of 300Hz and BER is least for Doppler shift of 5Hz .**

Index Terms **— BER, Doppler effect, NOMA, Power domain**

I. INTRODUCTION

Non orthogonal multiple access(NOMA) is one of the radio access technique for the upcoming 5G networks. A cellular network implement Orthogonal Multiple Access(OMA) techniques such as Time Division Multiple Access (TDMA),Frequency Division Multiple Access(FDMA) or Code Division Multiple Access(CDMA). However, none of these techniques can meet the high demands of future radio access systems. NOMA was proposed as the radio access technology for 5G cellular systems. Practical implementation of NOMA in cellular networks require high computation power to implement real-time power allocation and successive interference cancellation algorithms. By 2020, 5G network are targeted to be deployed to high enough to run the NOMA algorithms. It achieves superior spectral efficiencies by Superposition Code (SC)at the transmitter with SIC at the receiver.

NOMA (Non Orthogonal Multiple Access)

Non orthogonal multiple access (NOMA) is an upcoming technology for the 5G networks to meet the content demand on low latency , high reliability , massive connectivity and high throughput. In the NOMA we have two major approaches like power domain and code domain. Unlike power domain NOMA which attains multiplexing in power domain, code domain NOMA achieves multiplexing in code domain. In CDMA systems, code domain NOMA shares the entire available resources in time and frequency. The code domain NOMA utilizes the user specific spreading sequences that are either non orthogonal cross correlation sequences for low correlation coefficient. These can be classified into different classes like Low Density Spreading CDMA (LDS-CDMA), Low Density Spreading-based OFDM (LDS-OFDM) and Sparse Code Multiple Access(SCMA). The LDS- CDMA is used to decrease the impact of interference on each chip of basic CDMA system. There are some other multiple access technique which are also closely related to NOMA, including pattern division multiple access and Spatial Division Multiple Access (SDMA).The working principle of SDMA is basic CDMA systems. Instead using user-specific channel impulse responses (CIRS).The CIR estimation becomes challenging for a large no of users. The (SDR-MA) allows various forms of NOMA schemes to coexist. This technique provides a flexible configuration of participating multiple access schemes to support various services and applications in 5G.It isn't exhaustive and therefore it primary focus on this power domain NOMA .The key feature of NOMA is to realize a balanced tradeoff between system throughput and fairness .NOMA can serve users with different channel conditions in a timely manner, which provides the possibility to meet the demanding 5G requirements of ultra-low latency and ultra-high connectivity. Various MIMO-NOMA designs will be introduced to achieve different tradeoff between reception reliability and data rates.

II. CLASSIFICATION OF NOMA

In the NOMA technology we have mainly classified into two types power domain and code domain. Power domain is further classified into SIC Receiver, Massive MIMO Systems and Network MIMO. MIMO is an antenna technology for wireless communication in which multiple antennas are used at both source and destination.

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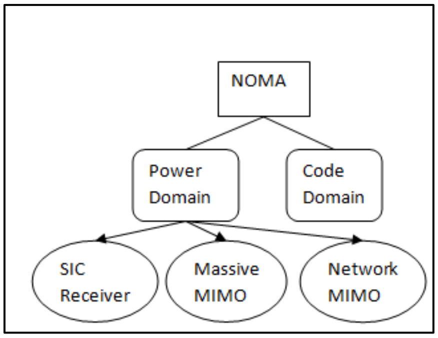

Fig (1)
Classification Of NOMA

POWER DOMAIN

Power domain multiplexing means that different users are allocated different power levels according to their channel conditions to obtain the maximum gain in the system performance. Such power allocations is also beneficial to separate different users, where successive interference cancellation(SIC) is often used to cancel multiuser interference .Code domain multiplexing is similar to CDMA or multi carrier CDMA(MCCDM) that is, different users are assigned different codes, and are then multiplexed over the same time frequency resources. The difference between power domain multiplexing and code domain multiplexing is that it can achieve certain spreading gain and shaping gain at the cost of increased signal bandwidth.

In the power domain multiplexing we have 3 types:

a) Basic NOMA with a SIC receiver.
b) NOMA in MIMO systems.
c) Network NOMA.

A. BASIC NOMA WITH A SIC RECEIVER

The basic NOMA scheme via power domain multiplexing with a SIC receiver in the downlink. Note that this NOMA scheme can also be applied in the uplink. At the BS transmitter, signals for different users are linearly added up under certain power partitions to balance the sum rate of all multiplexed users and the throughput fairness among individual users .At the receiver SIC is commonly used to realize Multi User Detection (MUD).SIC is performed at users with relatively high Signal-to-Interface-Plus-Noise Ratio(SINR) and should be carried out in descending order of SINR. The basic form of NOMA with SIC exploits SINR difference among user, either due to the natural near far effect (or) by non-uniform power allocation at the transmitter. A similar scheme can be used for uplink to increase the uplink system capacity.

B. NOMA IN MASSIVE MIMO SYSTEMS

NOMA can be used in conjunction with Multi User Multiple-Input Multiple Output (MU-MIMO) to improve the system spectral efficiency. Multiple transmit antennas at a BS are used to form different beams in the spatial domain adopts the basic NOMA. At the receiver, the inter-beam interference can be suppressed by spatial filtering, and then inter-beam SIC can be used to remove the inter-user interference. The extension of NOMA in massive MIMO systems can further improve spectral efficiency.

C. NETWORK NOMA

When transmit power allocation is biased towards faraway users in downlink NOMA, cell edge users experience increased interference from neighboring cells, where a two user NOMA scheme is assumed.user1 and user2 are served by BS1,while user 3 and user 4 are served by BS2.Strong interference is expected between user 1 and 3,which may degrade the performance of network. NOMA, this is a multicell NOMA. To mitigate the intercell interference, joint precoding of NOMA users signals across neighboring cells can be considered. Moreover, the multi-user precoding used for single-cell NOMA may not be feasible for the network NOMA scenario. The precoder for geographically separate BS antenna does not actually from the physical beam can be used for intrabeam NOMA. Based on the fact that large-scale fading would be quite different between the links to different cells, where the multi-cell joint precoder is applied only to cell edge users.

III. SIMULATION RESULTS

The simulation results have been carried out for two users for different Doppler Shift. The BER is high for Max Doppler shift of 300HZ and least for Doppler Shift of 5HZ as shown in fig.2.

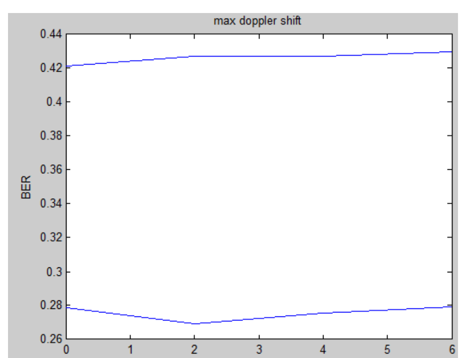

Fig.2.BER for user1 and user2

IV. CONCLUSIONS

This paper provides a comprehensive overview of the present and emerging power domain NOMA. It is clear that NOMA is a candidate multiple access technology for next generation radio access. The diversity gain originates from the power domain of the signals to be transmitted in a superposed fashion. From simulation results it is observed that BER is high for Max Doppler shift of 300Hz and BER is least for Doppler shift of 5Hz .

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