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USED SUCCESSIVE INTERFERENCE CANCELLATION (SIC) AT USERS CLUSTERING FOR NON-ORTHOGONAL MULTIPLE ACCESS (NOMA) WITH BEAMSPACE MIMO-NOMA

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ABSTRACT

Non-orthogonal multiple access (NOMA) using transfer energy difference and successive interference cancellation (SIC) at the receiver's side and it has been perceived as a competitor wireless communication technology system in the future dues to its significance of high data rate. In this paper, we proposed a novel mmWave communication method that combines the concept of non-orthogonal multiple accesses (NOMA) with beamspace MIMO along with efficient user clustering approach which is called beamspace MIMO-Clustering_NOMA, i.e. MIMO-CNOMA. The proposed beamspace MIMO-CNOMA combines the advantages of NOMA and beamspace MIMO at the first place, and then combine the lightweight user clustering technique by using a k-Mean algorithm to enhance the throughput of beamspace (BS)-MIMO-NOMA scheme by using SIC technique. The efficient clustering of users will help to improve power efficiency as well as compared existing solutions. Additionally, using CNOMA in beamspace MIMO systems, the number of supported users can be larger than the number of RF chains at the same time-frequency resources. The simulation results confirm the effectiveness of the advanced system in terms of energy efficiency measures connected to underlying methods.

Keywords: SIC, K-Mean clustering, energy efficiency, beamspace MIMO, NOMA.

1. INTRODUCTION

There are many studies to increase the innovative backhaul and fronthaul explications to High-density heterogeneous networks to development of the current backhaul and fronthaul technologies. The 5G network is mostly expected to increase the speed of mobile data to transfer and receive not for the voice applications in mobile [1]. The problem is that currently used operators are used to migrating both of current backhaul, and fronthaul which support the internet protocol (IP) depends on the backhaul and fronthaul resolutions as the development of the hyperdense small cells. In the 5G network system, the data rates imply that the backhaul and fronthaul as a fibre optic. The fibre is cost-effective to all other installation sites, and it uses the face deployment restrictions for the lay fibre building in multiple areas [2]. The millimetre indicates backhaul and fronthaul is an option, but some problems are remaining too addressed like regulatory and technological. Some other emergent solutions are used to the interworking or build design for the open accesses in backhaul and fronthaul system network architecture in hyperdense small cells depend on cloud networks [3]. It is required the smart backhauling and front hauling solutions that are optimized operations combine using the open-access network optimizations. The cost-effective, convergence and availability of smart backhauling and front hauling network systems. It is important in picking suitable backhaul and fronthaul techniques on heterogeneous kinds of redundant transfer and multiple radio access techniques in future mobile cellular and data networks. That is mandatory to verify that various end backhauls solutions for 5G network systems [4]. The Different standard or bodies were the same as the Generation Mobile Networks, Broadband Forum and Metro Ethernet Forum. The LTE-Advanced systems are researched in system-level simulations. The Simulation results are used in the handover optimization techniques is effectively decreasing the handover failure rate [5].

1.1 Millimetre-Wave (mm-Wave)

In addition to enhancement of larger bandwidths, the smaller wavelengths provide more antennas in the same environmental area, which allows to multiple-input multiple-output to give more extra multiplexing profit and beamforming profit [6] [7].

It has been described that mmWave massive MIMO canister produces order-of-magnitude improvement incapability of the system [8]. However, the challenging for achieving mmWave massive MIMO in application Leads to more energy consumption and large transceiver complexity [9] [10]. Principally, any antenna in MIMO schemes normally needs one consecrate of radio frequency (RF) [11]. Hence, the application of a very high number from antennas into mmWave massive MIMO systems commands to a fairly high number from RF chains. Furthermore, it is determined that RF elements may use up to 70% of the complete consumption of energy [12] [13]. A consequence, the energy consumption and hardware cost produced with a high number of RF become unaffordable in practice in mmWave massive MIMO systems. In the research work, we attempt to present the novel technique for Massive MIMO systems with the goal of PAPR reduction, energy efficiency and spectral efficiency using the mm-Wave communications with BS MIMO-NOMA such as 5G networks.

1.2 Non-Orthogonal Multiple Access (NOMA)

NOMA there is much study in this field, we present some of it: [14]. Explored the NOMA with mmWave connectors which it called immWave -NOMA, lead to getting an increase in the data rate for a support multi-user by using mmWave-NOMA System. Can use mmWave-NOMA, to connect the element in the downlink case, after power allocation. There for limitation of this research Assumes maximize the sum rate of a 2-user mmWave-NOMA system another study. Addition line of sight (LOS) the element represented Rayleigh fading, but the achievement by a LOS channel preference related to the non-line of sight (NLOS) channel. In [15] reported that by making use of the infrastructure that has been widely deployed the LTE network has a promising to support the internet of things (IoT) services. In [16] investigated the purpose of cellular systems which it used NOMA with SIC in downlink multiuser MIMO. In this case, at the base station (BS), the number of the antenna is more than the number of antennas at the user's equipment. Therefore, accept 5G cellular can be considered, NOMA, MIMO, linearly beamspace, effective user clustering, and effective power allocation. The single beamforming Vector has been concluded and when shared with every one of the users in a cluster.

1.3 Successive Interference Cancellation (SIC)

[17] Studied primarily focuses on power-domain NOMA that utilizes superposition coding (SC) at the transmitter and successive interference cancellation (SIC) at the receiver. The author also focuses on Performance enhancement in next-generation cellular communications, the need to meet the requirements of the new generation of mobile technology. Buy used NOMA, OMA, 5G, NOMA Solutions, NOMA Review, the challenges, and application Editions. Therefore, the 5G has interesting to research and performance of SC-based NOMA and also in the domain of power with numerical results. NOMA a candidate for multiple access technologies for next-generation radio access [18]. To get a better mathematically result in the power problem in NOMA schemes and proved the NP-hardness. To beginning solve this problem, in this research the author first to know a convex predicament on relaxation. Then recommend an effective "relax-then-adjust" algorithm including giving results regarding review evaluation. This work to include NOMA in programming at the time dimension by a mix from service classes to further explicitly discuss different metrics, such as that overall delay. The limits of this research with the performance evaluation to minimization power for NOMA.

1.4 Energy for Beamforming

[19] has view the novel communication scheme in this study that combines beamforming, energy harvesting, and cooperative non-orthogonal multiple access (NOMA) system is introduced, by using NOMA, self-interference, beamspace energy collection, power allocation, full-duplex, synchronous Wireless information and cooperative NOMA. The design system can achieve a bigger sum-rate compete to the standard of non-mutual NOMA including OMA-BF ways. SI following of FD transmitting method is collected to give more energy to power this relay node and decreasing that SI adversarial result in obtaining the FD concept greatest work.

1.5 Hybrid Beamforming Massive MIMO Systems

[20] reported that the channel reciprocity calibration in TDD hybrid Beamforming massive MIMO systems. The idea was taken by the author how to build low cost massive multiple-input Multiple-output (MIMO) systems. The author has been summarized his work of channel reciprocity calibration, channel state information at the transmitter (CSIT), hybrid analogue-digital beamforming, Massive MIMO, time division duplex (TDD). However, the research has a limitation in the term of the CSIT acquisition method based on reciprocity calibration in a TDD hybrid beamforming massive MIMO system.

1.6 Power Allocation (PA)

According to [21] Improvident PA is studied for a MIMO-NOMA system. The author des cases to use the system depending on the NOMA, MIMO, EE, PA, QoS and User access. The researcher should be considered the EE problem as a multi-cluster which include the more users MIMO-NOMA. However, the considered energy efficiency (EE) maximization problem is feasible. In [22] introduces new, stable, and broadband skin-equivalent semisolid phantoms for mimicking interactions of millimetre waves. Therefore, in 5G-Multi-Tiere Networks, every generation of the cellular technology marks a technological evolution ranging from digital voice calls instead of analogue, the introduction of packet-switched data with always-on connection, and ultimately voice and data over All-IP network. The fifth-generation (5G) is expected to bring in reduced latency, increased throughput, support for a higher number of connected devices and Device-to-Device communication. These enhancements would extend the wireless connectivity to a wide range of devices/application and satisfy the emerging communication requirements of both consumer and the industry by 2020 [23]. To look at NOMA multiple access technologies it is staying recognised tile now as promising in fifth-generation 5 G. To representation, the basic idea of NOMA is to serve more item e.g., packets of data rate to give a set of the number of users which are similar through the frequency resources time resources [24]. Therefore, inter-intra-cluster interference, the NOMA can superposition set of users which represent the cluster with they have similarity in the required power domain where it exploiting the corresponding of channel gain diversity. We plan to use user clustering with both methods, first with the successive interference cancellation (SIC) in the received side to remove the interference in each cluster and superposition code in the transmitter side [24]. The optimized resource allocation algorithm for multi-user network MIMO system was proposed by [26]. Their result showed that the proposed resource allocation algorithm was achieved a substantial network throughput gain while ensuring fairness. The joint approach of MIMO user selection strategy and optimal water-filling (WF) power allocation in CoMP (JP) transmission was proposed by [27].

1.7 Clustering

Clustering can be considered the most important unsupervised learning problem so as every other problem of this kind; it deals with finding a structure in a collection of unlabelled data. A loose definition of clustering could be the process of organizing objects into groups whose members are similar in some way.About recursively uses the highest density appropriate to make clusters by resource block (RB). Specific the clusters, RB distribution is optimal. The result for this Proposed is the algorithm which gives great achievements both in the total network latency and total data rates [28]. The authors recommend mmWave MIMO-NOMA system with short feedback, his applied in Downlink by using mmWave with MIMO NOMA schemes. The Proposed design performs a more reliable sum-rate achievement than traditional MIMO-OMA, which including the internal intra-cluster interferences. The better result when decreased the interferences by using the advanced clustering, beamforming and efficient energy allocation algorithms [29]. Another study to solve the minimize optimization problem by MU clustering with MIMO transmission method. The complete energy using for the BS which it proposes a cluster beamforming approach to measure the beamforming vector in The NOMA uplink. This proposed method can avoid the match result at MUs are grouped in various clusters [30-31].

2. SYSTEM MODEL

In this section, we describe to used K-mean clustering at first then we palely to used SIC process method in beamspace MIMO NOMA downlink system which it used multi-cluster in one beamspace in the same time and same frequency rescuers without any loss in the performers to enhance the energy efficiency of the system. Also, to express an optimization dilemma for satisfying quality of serves (QoS) in the system.

2.1 Use the K-Means Algorithm to Clustering the Users

To start the k-mean user clustering we should understand in Figure-1 the flow chart of this algorithm. Then we use to input the different number of users which with different distance to the BS we need to cluster. Then we assume any random user as the center or more than one center that depending on the number of the cluster which we need. Then we calculate the distance between the users and the centers, in our case we used three clusters that why we used thee random center. Then we used the iteration to find the Minimum distance on the group of users. In our case, we used eight to clustering to three clusters and send each cluster by using SIC and superposition code.

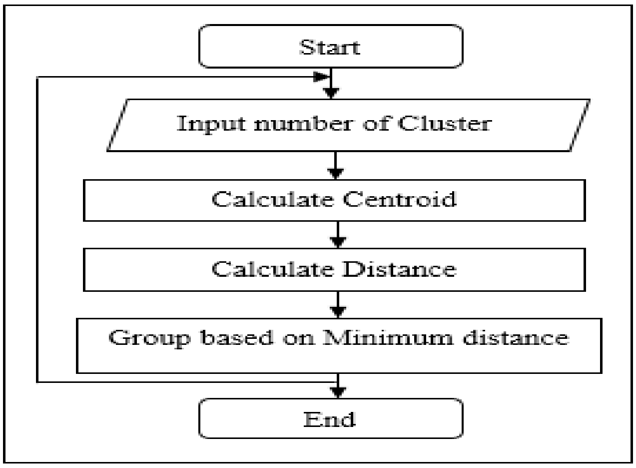

Figure-1. Flow chart K-Mean users clustering.

2.2 K-Mean Clustering

K-Mean clustering is a method or algorithm to cluster based on their features or attributes into K cluster or partitions where the number of clusters is less than the number of users. K-Mean clustering is a method for unsupervised learning. Also, it is the way that we calculate the distance between all users to Form many clusters and served it with low energy. There are two methods that we can calculate the distance between the two user's points. Suppose that the two user's points are represented as U and V we show them as a vector U and vector V. There're for if we want to measure the length between these two vectors one easy way is the Euclidean distance which uses the summation of the squared of the intervals between each pair of the parts of the two vectors as shown following.

$$\mathrm{d_{u,v}} = \sqrt{(\mathrm{u_1} - \mathrm{v_1})^2 + (\mathrm{u_2} - \mathrm{v_2})^2 + \cdots + \left(\mathrm{u_q} - \mathrm{v_q}\right)^2} \quad (1)$$

Another measure of the distance between the two vectors could be looking at directly a rectilinear distance between the two users which is this time instead of the sum of the squared differences. We used simply two some of the absolute differences between the users in each of these vectors so this equation is presented as:

$$d_{u,v} = |u_1 - v_1| + |u_2 - v_2| + \cdots + |u_q - v_q| \quad (2)$$

Therefore, we explain K-Mean clustering with an example so that it's easier and more intuitive for understanding. Suppose we have a two-dimensional set of points users so you have eight points users and all of them are two-dimensional it means that it's in an XY axis so you have all this information, and you would like to cluster them in three groups. So, one of the criteria or one of the parameters of K-Mean clustering is number K. K is referring to the number of clusters despite the hierarchical clustering. In K-Mean clustering we have to know what K or the number of clusters, in this case, the number of the cluster are three or if we want to cluster the user's data points in three distinct groups. To start the K-Mean

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clustering we assume a centre for each of these clusters, it means that since K is equal to three. We have to identify the centre by three random users' points for these clusters. The question is how we define those users points centre. Sometimes we can pick three users points randomly from the set of the user's points that we have available as the initial centres. In Table-1 can show the case of choosing three users points from the data set randomly, as the Center for each cluster. The Center for a cluster could be a random number that is generated in X Y. however in this example suppose that we have user point 1 (2, 10), user point 4(5, 8), and user point 7(1, 2) as our initial starting point. Now I have to calculate the distance of each of these users' points from these centres and fill out this matrix.

In this case, we need to use only three Iteration (0,1, and 2) then the result is returned, that means the result of iteration 3 is the same result for iteration 2, for this reason, we must stop and keep this result which it includes three clusters for eight users.

Table-1. Iteration 0.

		User1(2,10)	**User 4(5,8)**	**User 7(1,2)**	
	Distance point	**Random Centre cluster 1**	**Random Centre cluster 2**	**Random Centre cluster 3**	**Cluster Name**
User 1	(2,10)	0	5	9	1
User 2	(2,5)	5	6	4	3
User 3	(8,4)	12	7	9	2
User 4	(5,8)	5	0	10	2
User 5	(7,5)	10	5	9	2
User 6	(6,4)	10	5	7	2
User 7	(1,2)	9	10	0	3
User 8	(4,9)	3	2	10	2

In Table-2 we can new random cluster centre for the three clusters such as (2, 10), (6, 6) and (1.5, 3.5).

Table-2. To find a new cluster centre.

Point Centre cluster 1	**Point Centre cluster 2**	**Point Centre cluster 3**
(2,10)	(8,4)	(2,5)
	(5,8)	(1,2)
	(7,5)	
	(6,4)	
	(4,9)	
<u>New Centre</u> (2,10)	<u>New Centre</u> 8+5+7+6+4/5=6 4+8+5+4+9/5=6 (6,6)	<u>New Centre</u> 2+1/2= 1.5 5+2/2= 3.5 (1.5, 3.5)

The distance function between two users
$a = (x_1, y_1)$ and $b = (x_2, y_2)$ Is defined as:
$p(a, b) = |x_2 - x_1| + |y_2 - y_1|$

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Table-3. Iteration 1.

	Distance point	New Centre cluster1 (2.10)	New Centre cluster 2 (6.6)	New Centre cluster 3 (1.5, 3.5)	Cluster Name
User 1	(2,10)	0	8	7	1
User 2	(2,5)	5	5	2	3
User 3	(8,4)	12	4	7	2
User 4	(5,8)	5	3	8	2
User 5	(7,5)	10	2	7	2
User 6	(6,4)	10	2	5	2
User 7	(1,2)	9	9	2	3
User 8	(4,9)	3	5	8	1

Table-4. To find a new cluster centre.

Point Centre cluster 1	Point Centre cluster 2	Point Centre cluster 3
(2,10) (4,9)	(8,4)	(2,5)
	(5,8)	(1,2)
	(7,5)	
	(6,4)	
New Centre 2+4/2= 3 10+9/2=9.5 (3, 9.5)	New Centre 8+5+7+6/4= 6.5 4+8+5+4/4=5.25 (6.5, 5.25)	New Centre 2+1/2= 1.5 5+2/2= 3.5 (1.5, 3.5)

Table-5. Iteration 2.

	Distance point	New Centre cluster1 (3,9.5)	New Centre cluster 2 (6.5,5.25)	New Centre cluster 3 (1.5,3.5)	Cluster Name
User 1	(2,10)	1.5	9.25	7	1
User 2	(2,5)	5.5	4.75	2	3
User 3	(8,4)	10.5	2.75	7	2
User 4	(5,8)	3.5	4.25	8	1
User 5	(7,5)	8.5	0.75	7	2
User 6	(6,4)	8.5	1.75	5	2
User 7	(1,2)	9.5	8.75	2	3
User8	(4,9)	1.5	6.25	8	1

Table-6. New point centre clusters.

Point Centre cluster 1	Point Centre cluster 2	Point Centre cluster 3
(2,10) (5,8) (4,9)	(8,4)	(2,5)
	(7,5)	(1,2)
	(6,4)	
New Centre 2+5+4/3= 3.67 10+8+9/3=9 (3.67,9)	New Centre 8+7+6/3= 7 4+5+4/3=4.3 (7,4.3)	New Centre 2+1/2= 1.5 5+2/2= 3.5 (1.5,3.5)

Table-7. Iteration 3.

	Distance point	New Centre cluster 1 (3,67.9)	New Centre cluster 2 (7,4.3)	New Centre cluster 3 (1.5,3.5)	Cluster Name
User 1	(2,10)	2.67	10.7	7	1
User 2	(2,5)	5.67	5.7	2	3
User 3	(8,4)	9.33	1.3	7	2
User 4	(5,8)	2.33	5.7	8	1
User 5	(7,5)	7.33	0.7	7	2
User 6	(6,4)	7.33	1.3	5	2
User 7	(1,2)	9.67	8.3	2	3
User 8	(4,9)	0.33	7.7	8	1

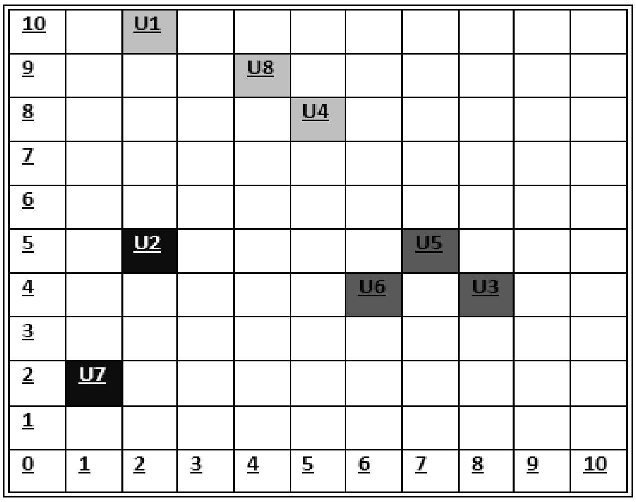

Figure-2. Eight users with different distance to BS.

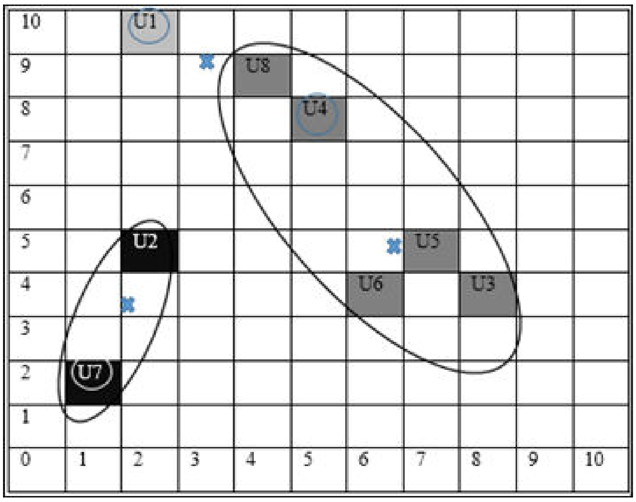

Figure-3. New point centre clusters iteration 0.

In Figure-2 we can see eight users with different location of the X, Y dimension. Therefore, we used the k-mean algorithm to cluster all users into three groups that department of the result of iteration which ends when getting to optimize design cluster between all the users.

In Figure-3 we can show all the users can formal only two clusters in the first iteration which it's called 0 iterations after we find the random centre.

In Figure-4 we can show all the users can formal the three clusters but are not optimize that we notice it in cluster Iteration number 1. Therefore, we can show a different number of users with different designs clusters. Then we search about of new point centre to all cluster. In Figure-5 we can show the new cluster design with an almost homogeneous number of user 3-3-2, which represents the best clusters number of users. After the next iteration, we can stop the system because it returns the same Iteration result and this is the optimal cluster.

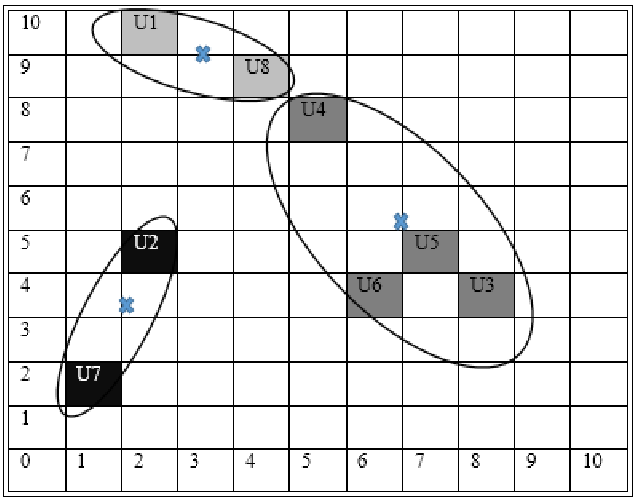

Figure-4. New clusters iteration1.

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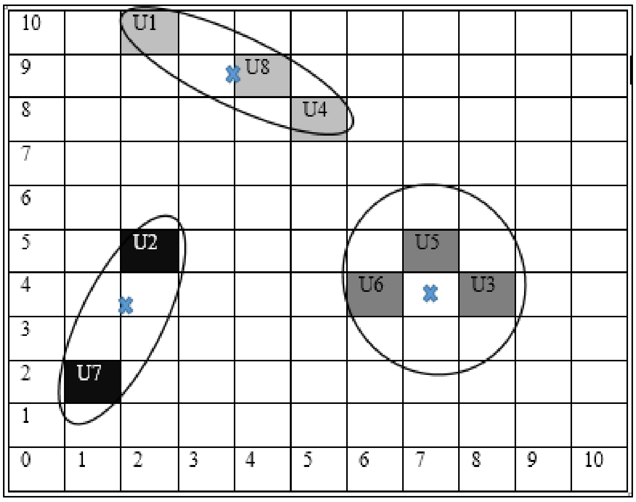

Figure-5. New Point Centre clusters Iteration 2.

2.3 The Cluster Used NOMA SIC Downlink Transmission in BS

To transmission the cluster by used NOMA SIC. The BS superimposes the data waveforms for any clusters by used the beamspace. Each cluster utilizes SIC to discover the own type signs. There for in Figure-6 illustrates a BS including a number cluster which they include many users which is dependent on the parameter in the algorithm of SIC. However, the system Can be accepted the cluster1 which it the nearest to BS and cluster 2 which is furthest to BS. The analysis of BS is to choose how to distribute the energy among the original data waveforms, which is essential for SIC. The high power in NOMA downlink, are allotted to cluster farthest to BS and low power to the cluster which is related to the nearest distance to the BS. In this method, each group can have the same signal that includes information for all users. Each group takes the highest downlink signals and then begins to subtract the encoded signal from the hyphen sign. The SIC receiver returns the reduction until the time it finds its own signal. The mass near the BS station can reduce the signal of the outermost block. The far signal in most from this signal received, it will decode its signal first.

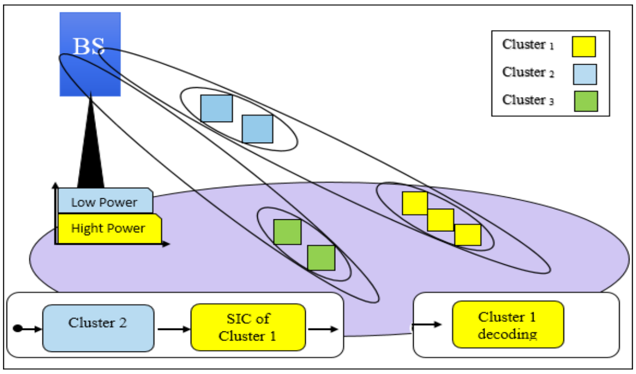

Figure-6. Three cluster in the downlink NOMA.

The transmitted signal can be written in BS as:

$$X(S) = \sum_{c1=1}^{c1} \sqrt{\alpha_{c1} p_T x_{c1}(S)} \tag{3}$$

(S) = special data transfer OFDM waveform.
αk = the power diffusion coefficient to cluster1
PT = collect available energy at the BS = available total energy near the BS.

The energy attached on any cluster to this case leads to becoming PT = αc1 PS.

To each cluster the power apportioned is PT = αc1 PS.

3. RESULT

The power is allotted by the separation of the cluster to BS. The energy among any cluster to the BS is allotted by the separation. Cluster 1 is the nearest to the BS, the selected of the least energy, though cluster 1 is the furthest one, finally, it has several high powers. Least energy in the state is cluster 2 because of the nearest BS while the highest energy is cluster 1 in light of the evidence that common reserved one to BS. The captured movement at the cluster 1 is at that limit the signal received at each cluster 1 as.

$$y_{c1}(S) = x(S) g_{c1} + w_{c1}(S) \tag{4}$$

We can use the equation, g_{c1} which is the weak channel component among the BS and the cluster 1, and (nc1) is the additive white Gaussian Noise (AWGN) on the cluster1 with zero N0 (W/Hz). Interprets first, the most distant cluster the particular signal will be it is own and high energy signal because it is chosen high energy as others. Therefore, the signals for various clusters will be observed as interference. Forward the signal to transfer dimension SNR for cluster1 can be formed as:

$$SNR_{c1} = \frac{P_{c1} g_{c1}^2}{N_0 W + \sum_{i=1}^{c1-1} P_i g_{c1}^2} \tag{5}$$

The frequency of bandwidth to cluster 2 it is (W) which represents the near BS which it will be decoded. Therefore the (W) is represented to the near the BS and will be decoded. The transmission bandwidth for cluster 2 is W which it near the BS and last signal will be decoded. We assuming perfect case can be written in the SNR at cluster 1 as:

$$SNR_{c1} = \frac{P_{c1} g_{c1}^2}{N_0 W} \tag{6}$$

In overall, the SNR can be written for cluster 1 as:

$$SNR_{c1} = \frac{P_{c1} g_{c1}^2}{N_0 w + \sum_{i=1}^{c1-1} P_i g_{c1}^2} \tag{7}$$

Can be written a throughput (bps) for the cluster as:

$$R_{c1} = W \log 2 \left(1 + \frac{P_{c1} g_{c1}^2}{N + \sum_{i=1}^{c1-1} P_i g_{c1}^2}\right) \tag{8}$$

In this case, the cluster can be transferred to a group of subcarriers to receive the data. We can use both energy and the data transfer function is divided in similarly among all clusters. Then the throughput OFDAM for the cluster1 can be written as:

$$R_{c1} = W_{c1} \log 2(1 + \frac{P_{c1} g_{c1}^{2}}{N_{c1}}) \quad (9)$$

That means the $W_{c1} = \frac{w}{c1}$ $and\ N_{c1} = N_0 W_{c1}$

There for can be formed the total limit which including values to both OFDMA and NOMA as:

$$R_{Total} = \sum_{c1=1}^{c1} R_{c1} \quad (10)$$

This equation can be an adjustment the framework limit which is distributed among all the clusters if the F is near to cluster1. The framework limit can be collected for each cluster design near to each. We can establish the purpose of the energy allocation as maximizing the capability RT with the integrity force as NOMA systems. We can be streamlining result is then described as.

Maximize w $\log_2 \left(1 + \frac{p_{c1} g_{c1}^{2}}{N + \sum_{i=1}^{c1-1} p_i g_{c1}^{2}}\right)$ that is subject to

$$\sum_{i-1}^{c1} p_j \leq p_S \quad (12)$$

$$\mathrm{P}_{c1} \geq 0, \forall \mathrm{c1}, \mathrm{F} = \mathrm{P}$$

Therefore, the aware beam selection can be proposed to choose the more reliable beam scheme to performance. The important purpose is to clustering all the users into three clusters according to as possible interference. The small interference users can immediately select to the beams which have huge energy, while we can use the incremental algorithm for users who have high interference, to scrutinize the optimal beams.

3.1 Distribution of Energy to Cover the Number of Clusters

We describe in this section different level of energy in the wireless communication network. By using multiple clusters in one beam can increase the energy-efficient in the cell. our proposal considers using SIC to send the data for the far cluster with high power and nearest cluster with low power, and in the same way which is using SIC for one user but here we using clusters which they more than one users in any cluster. The result considers that BS-CNOMA-SIC can more energy Provide in the cell.

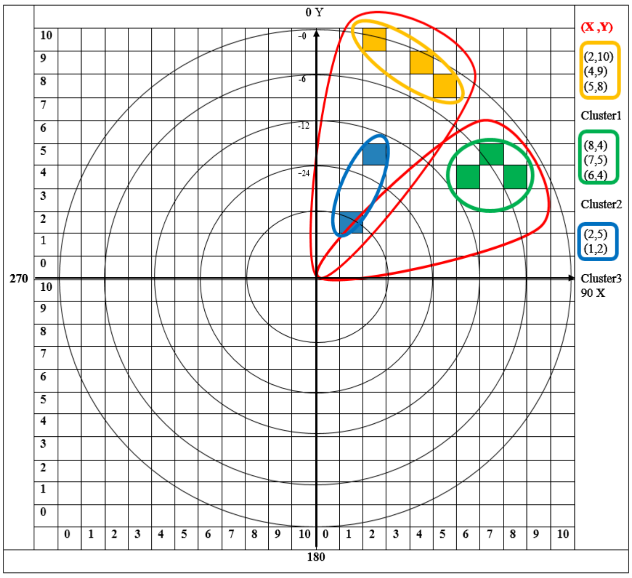

Figure-7. Distribution of energy to cover the number of clusters.

In Figure-7 we can show three clusters, which they include a varying number of users which is dependent on the k-Mean algorithm to clustering al the user in the cell. Then they first advantage from the result we can serve multi-users in one beamspace and the second we can using SIC to an arrived the cluster which has low power.

3.2 Effect of Number in Beamspace VS the Energy Efficient

In Figure-8 we show the number of beams affects energy consumption. When increasing the number of beams that mean increased the number of antennae and that lead to high energy consumption. Therefore we proposal one beam to serving not only two users same the traditional method but to serving two or more cluster, which includes more number of users. This proposal can be to enhance energy efficiency. In this case, we have proven that by using the different number of user with a different number of beams. We can see in table 8. So in the first step, we use 16 users with a varying number of beams (1, 2, 4, 8 and 16). The result when use one beam with a different number of users is better than the result when using more than beams of the item EE. therefore we can exploit the area of beamspase to coverage more than one cluster, the improvement of the system can be across to optimize, and the capacity is increased because the number of users is an increase by using our propose.

Figure-8 can be shown the effect of using the SIC process with varying number of users. The energy by used BS-CNOMA SIC process is better than the energy when user BS-CNOMA without SIC.

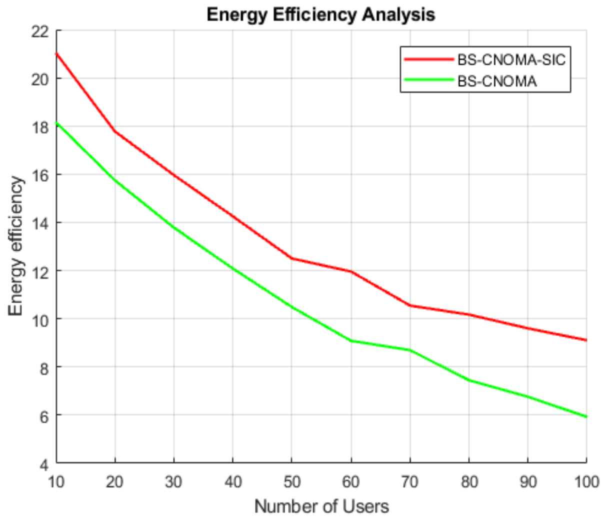

Figure-8. Effect of using SIC process with varying number of users to EE.

4. CONCLUSIONS

In this paper, the mm Wave communication method and non-orthogonal multiple accesses (NOMA) have been jointly considered with beamspace MIMO along, with efficient user clustering approach which is called beamspace MIMO-Clustering NOMA, i.e. MIMO-CNOMA. The proposed beamspace MIMO-CNOMA has been designed in two stages first to user clustering by using K-mean cluster algorithm while the second stage employed the SIC to decoded two clusters in one beam. The enhanced performance of the proposed method. The efficient clustering of users will help to improve power efficiency. Additionally, using CNOMA in beamspace MIMO systems, the number of supported users can be larger than the number of RF chains at the same time-frequency resources. The simulation results confirm the effectiveness of the advanced system in terms of energy efficiency measures connected to the underlying method

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