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Optimization of Spectral Efficiency of Long Term Evolution Systems

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Abstract:

Long Term Evolution (LTE) is viewed as the invention of the mobile telecomm network. Recent technologies like multiple input multiple output (MIMO), Orthogonal Frequency Division Multiplexing (OFDM) have been utilized in LTE. In this paper, a thorough analysis of LTE systems is presented. LTE is evaluated as a network system and a femtocell network. Simulation results are provided for the analysis.

1. INTRODUCTION

LTE alludes to another higher-performance air interface in the 3GPP. LTE is an absolutely PSR "packet-switched radio" access media transmission technology, giving exceptional provision for 4th Generation technology at low latency and higher data rate. The purpose of 3rd Generation Partnership Project is to address the issues on faster data transmission media in addition to higher capacity in terms of voice and data. The prerequisites of the subsequent generation systems focused by long-term evolution are crest throughput of fifty Mbps for uplink and one hundred Mbps or additional for downlink. Also low latency and higher bit rate, power saving of UE (user equipment) is additional significant problem with LTE. The long-term evolution physical layer utilizes innovative technologies comprising OFDMA and MIMO[1-5]

LTE is a progressive technology which incorporates few novel unexpected features that were not ever before utilized in mobile and wireless communications and which provide long-term evolution an benefit contrasted to different innovations. Aside from that, certain properties that were incorporated in previous releases of the present standard of mobile telephony, known as UMTS (Universal Mobile Telecommunications System), were upgraded so as to give long-term evolution with the ability to perform superior to some other telecommunications standard and with the goal for it to cover the necessities of an incredible assortment of apps. Few of the characteristics are perfect for use on account of ITS (Intelligent Transportation System) applications, where the quickly varying condition and the extremely stringent defer necessities; represent few hard performance needs on the communications system. With the utilization of few of these properties the delays are reduced and the execution of long-term evolution can be enhanced so as to oblige the exceptional

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requirements of the vehicular setting for instance, broadcasting minor periodic packets, lower latency, and reception of a broadcast by many receivers and so on.[6-8] In this phase, the capabilities, functionality and characteristics of long-term evolution will be exhibited with the goal that its role in a future Intelligent Transportation System network must be estimated.

LTE, an abbreviation for Long-Term Evolution, it is viewed as the standard innovation of the mobile telecomm network which is advancement of 3G/2G. In view of it implemented evolving technology for instance, OFDM, MIMO to be utilized as fundamental innovation, it is advanced changed associating 3G (3rd Generation) innovation, irrespective of the network architecture and wireless access innovation. Consequently it is termed ”LTE”, likewise known as 3.9G.

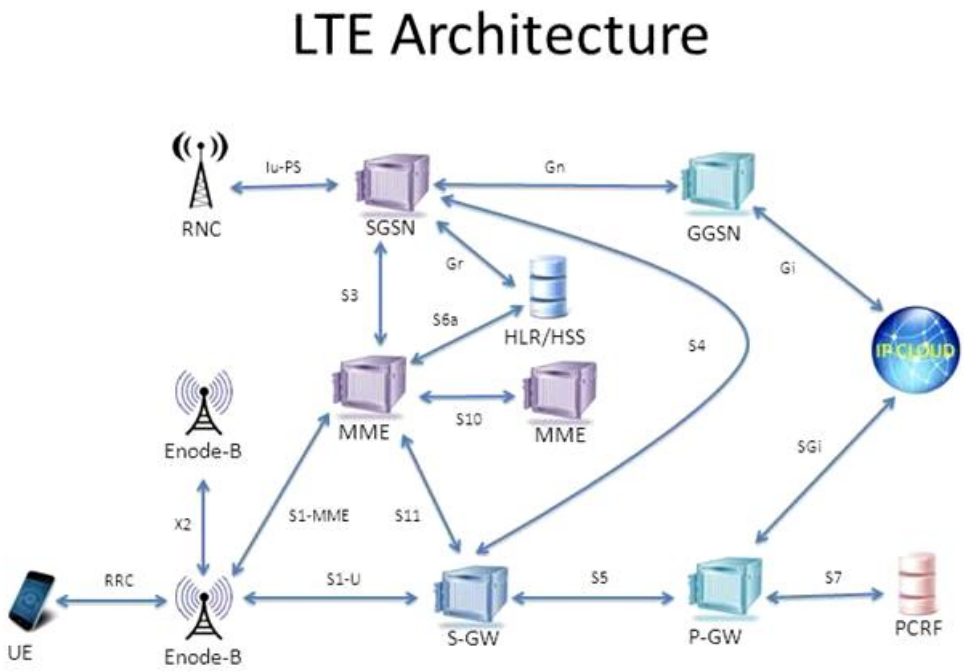

Fig. 1 LTE Architecture

Meanwhile 3GPP (3rd Generation Partnership Project) suggested the idea of LTE (Long-term evolution) at Toronto gathering in 2004, the long-term evolution standard has been explored over two stage which is Work Item and Study item. In 8th Release LTE document was indicated in Dec 2009, In 10th release defined LTE (Long-term evolution) –Advanced 1st standard. Presently, the LTE (Long-term evolution) Advanced standard properly fulfills the

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ITU-R (ITU Radio Communication Sector) needs to be assumed IMT Advanced and ITU-R characterized it as " genuine 4G" network.

The LTE network comprises of 2 fundamental parts: EPC (Evolved Packet Core) and E-UTRAN (evolved UMTS terrestrial radio access network). The MME is an important control plane constituent which forms the motioning among the core network and UE (User Equipment), as well as authorization, authentication, roaming, bearer establishment, P-GW/ S-GW (serving gateway) selection and location registration management[9-11]. The conventions running in the MME (mobility management entity) are called NAS rules. The serving gateway accomplishes forwarding of data and routing among Enode- B and UE (User Equipment), which attends as a native mobility anchor for the information bearers when the UE (User Equipment) moves among Enode-B.

1.1 Features of LTE

- Peak uploading rates upto 75.4 Mbit/s and downloading rates upto 299.6 Mbit/s relying upon the UE classification.
- Lower latency for handover
- Upgraded mobility upto 500 km/h .
- Single-carrier FDMA / OFDMA for the uplink/ downlink respectively.
- Support all communication networks in addition to half-duplex Frequency Division Duplexing with the similar radio access innovation.
- Support for each frequency bands presently utilized by IMT networks by ITU Radiocommunication .
- Improved spectrum adaptability: 3-20 MHz (for example, 2G CDMA and GSM One).
- Provision for cell sizes from 10's of meters radius upto one hundred
- Provision for co-existence and inter-operation with bequest principles. Clients can begin a data transfer territory utilizing a LTE (Long-term evolution) standard and, must inclusion be inaccessible, proceed task with no activity on their part utilizing GPRS/GSM or W-CDMA.

Higher level architecture of LTE is consist of subsequent 3 main parts:

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1. The evolved packet core (EPC).
2. UE (User Equipment).
3. The advanced UMTS E-UTRAN.

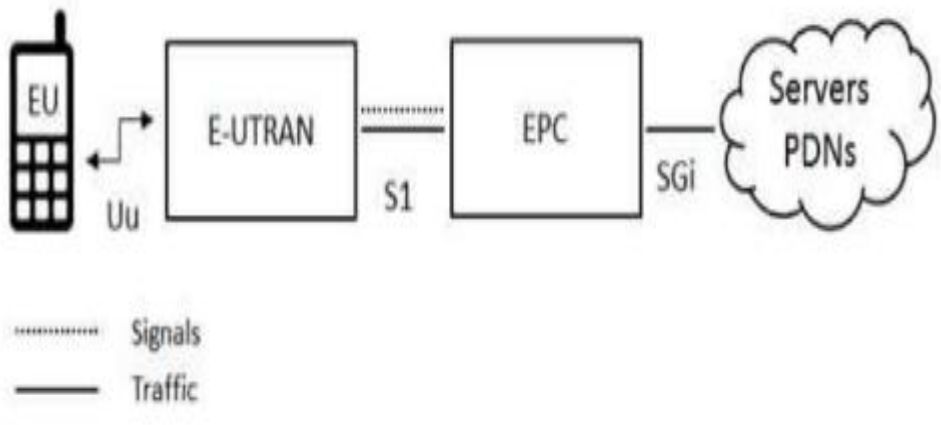

Fig. 2 Component of LTE network

EPC incorporates packet data network gateway, mobility management entity and S-GW (serving gateway). The main elements of E-UTRAN is ENode-B, which achieves radio interface associated tasks for example, packet scheduling.

2. Literature Survey:

MIMO antenna for 5th generation basestations is manufactured making use of three dimensional printing technological know-how. An excessive- resolve printer headquartered on three dimensional audio litho-graphy is prompted to make sure printing accurateness. Process of printing of suggested antenna. The published pattern is created of a sort of photo-sensitive mastic, thus, majority of its exteriors are metallized as conductive antenna exteriors utilizing a metallic plating process. The traits of 3-Dimersional printed antena are examined. Antenna's bandwidth is estimated to be 3.5 - 5.1 GHz. It consists of 2 symmetrical polarized dipoles. In bandwidth, both VSWRs of 2 dipoles are beneath 1.5, and confinement among 2 dipoles is superior to 18 dB. Long way subject radiation paterns of the antenas in each vertical and horizontal plane are estimated in an echoic space. Every feature of suggested antenna are additionally replicated making use of a HFSS [1].

In [2], a design of 28 GHz phased array antenna for forthcoming 5th generation cellular-telephone purposes has been introduced in this study. Suggested antenna may also be

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employed utilizing low rate FR-four substrates, though keeping excellent efficiency in phrases of achieve and effectively. This is carried out through engaging a novel air filled slotloop constitution because radiator. A model exhibit inclusive of 10 radiator components has been intended for idea authentication. Both overall efficacies and radiation of antenas array are better than -0.5 dB (90%) for scanning range among 0^{o} to 50^{o}, at same time good points are better than thirteen dB. Furthermore, simulated and measured outcome exhibit that antenna has S11 response not up to -10 dB within the frequency variety of 27 GHz to 29 GHz.

In [3], a supply summary on enormous multiple-input and multiple-output framework and its sign processing functions in forthcoming trends revealing points 5G of cell communication. Important thing innovations incorporates multiple-input and multiple-output combination to developing innovations such gadget to gadget support, base central construction for mm wave range for setting up forthcoming new release 5generation usual for wireless cell. Design of system modeling is likewise demonstrated in that way delivering a direction for assembly excessive information and bandwidth wishes in future by using large multiple-input and multiple-output cell networks with present wireless applied sciences had been recognized.

Authors in [4] describes 3-aspect single-band printed inverted Fantenna (PIFA) process running in 28 GHz band for upcoming mmWave (millimeter-wave) 5^{th} generation wireless comm. is offered. MIMO antenna framework of 3 single-band planar inverted-F antenna factors. Dimensions of a only planar inverted-F antenna component is 0.85 x 0.85 at 28 GHz. Antena array indicates great confinement features among carefully spaced antena factors. A minimal segregation of 13 dB is located among its antena components. Output exhibit that suggested antenna has a band-width of 807 MHz. Different principal variables in any wireless comm. method akin to ME (multiplexing efficiency), ECC (envelop correlation coefficient), MEG (mean effective gain), and DG (diversity gain) were computed and talked about. Outcome exhibit that suggested antenna array is an effective contender for long run 5G MIMO conversation apps.

In [5], a conventional Reuse-1 scheme has been proposed. The simulation outcomes display critical enhancements as far as normal and pinnacle execution, while accomplishing a cell-edge act practically identical to a traditional Reuse-3 conspire in comparison with existing approaches [5].

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In [6] proposed the exceedingly interference-sensitive cell-edge zones, interference is lessened by power drop or sub-band segregation, while for the other cell-edge zones extra bandwidth is distributed if this prompts to improved execution [6].

In [7] proposed an improved frequency reuse system, the EFFR (Electrically-Evoked Frequency-Following Response) system, for InterCell Interference extenuation in orthogonal frequency division multiplexing access networks is established and analyzed and obtained outcome demonstrate that noteworthy cell capacity advances and increments at cell edge can be accomplished with the organization of the suggested electrically-evoked frequency-following response system.

Authors in [7] proposed the FFR provide better probability of coverage and probability of acceptance rate than Traditional frequency reuse 1 and reuse. The result demonstrated that proposed approach performs better as associated to additional the traditional plans.

Authors in [8] proposed the ML-SFR method can accomplish improved interference pattern over SFR-2, additionally refining the general data rate and cell edge. It might be utilized in the present LTE framework and must be a competitor key innovation for forthcoming 5^{th} generation frameworks [8].

In this study [9], a new frequency reusage structure has been presented for multicell OFDMA framework for co-channel interference decrease. Simulation outcomes demonstrate that this system can bring low CCI and high framework throughput, and it additionally can enhance the data rate at the cell-edge [9].

In [10] investigates the execution of diverse configurations of power mask contrary to the ideal case, in which a chief entity ideal allocates resource blocks and power between the clients of the system [10].

Authors in [11] show a dynamic resource allocation algo, named DMA (Dynamic Major group Allocation), relied upon SFR which is an proficient strategy to alleviate ICI in OFDMA frameworks. Simulation outcomes demonstrate that the suggested DMA algo carries better throughput execution of CEU over the customary TLA scheme which simply combines SFR with PF.

In [12] proposed ML-SFR plan and a resource allocation approach for wireless communication frameworks. The suggested plan is used in current 4 generation systems. In

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order to attaining good interference pattern for suggested ML-SFR plan, there will be 2 N PD levels. In this paper, proposed scheme shows improved overall data rate and cell edge as compared with 2- level SFR scheme. Additionally, 8 levels SFR scheme has also been designed in this paper. The result indicates that efficiency of celledge spectrum is expanded to multiple times of that of reuse1 & efficiency of general spectrum is upgraded by 31 percent.

In [13] proposed ICI organization by using ASFR in 4G system. Basically, frequency reuse schemes in LTE network are only utilize to progress the capacity of system. The proposed scheme is used to develop the capacity of SFR scheme by combining the power allocation and optimizing subcarrier in multi-cell LTE network. Result indicates that the suggested scheme works better as compared to present SFR scheme and FFR schemes.

Authors in [14] suggested a new adaptive SFR scheme in the dense Femto cell networks. in the paper many dense femto cells are categorized in to different gatherings as per the prevailing impedance solidarity to other people. FemtoCell have appeared as a chief innovation in hotspot, , office building or residential deployments which may considerably accomplish higher information requests so as to offload interior traffic from outside macrocells. Simulation results demonstrates that the suggested system provide incredible execution advances as far as the SE in respect to the legacy SFR and UFR.

3. LTE Advanced (Long-term evolution - A) Network System

LTE-A network is development release of LTE (Long-term evolution), pointing to meet remote network marketing more interesting, additionally to encounter or surpass the need from IMT-Advanced in not so distant forthcoming. In the meantime, LTE Advanced stays the backward similarity for LTE (Long-term evolution). The novel wireless innovation for example Coordinated Multi-point Rx & Tx, improved DL/UL MIMO, Carrier Aggregation, Relay and Improved Inter-cell Interfernce Cordination for Heterogeneous Network etc are received in LTE-A (Long-term evolution Advanced) network system. It significantly raises system ability of average spectral efficiency, peak transmitting information rate, avg. spectral of edge user and cell efficiency, in addition to boosts the proficiency of networking, accordingly LTE- A (Long-term evolution Advanced) will turn into the most possible communication innovation.

Given points defines new highlights are presented in LTE-A Long-term evolution Advanced) contrasting LTE:

1. Flexible Spectrum Use: Higher frequency band upgraded framework is utilized in situation of little inclusion of hotspot, indoor situation and Home NodeB (HeNB).

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Lower frequency band reimburse the inclusion of higher frequency band framework lost, likewise serving the higher-speed (User Equipment).

2. CA (Carrier Aggregation): Utilizing LTE-A (Long-term evolution Advanced) CA, it is likely to use more than one transporter and along these lines increment the complete transmission bandwidth.
3. RNBS (Relay Node Base Station): This innovation means to improve the established signal to ICI (InterCell Interference) plus NPR (Noise Power Ratio) and improve throughput. As follows, radio waves might be proliferated all the more proficiently, inclusion broadened and throughput improved at cell edge.
4. CoMP (Coordinative Multiple Point): CoMP empower the active management of reception and broadcasting over a variation of diverse base stations. It is intending to progress general quality for the individual in addition to improve the usage of the system.
5. Interference suppression and management? Utilizes several receiving antennas on the versatile terminal to sup-press interfering incoming from neighboring cells. The objective is to improve throughput execution, chiefly nearby cell boundaries.
6. HeNB (Home NodeB): The objective is to increase cell coverage, upgrading framework limit and supporting the overabundance of evolving enterprise/home apps.

4. LTE femtocell network

Presently, we live in the commercial eon of 4G (4^{th} Generation) utilizing LTE (Long-term evolution), in any case, there still exists a test for frequency resource compelled. This problem prompts to high frequency is worked in the novel communication network framework, regularly they works in the frequency upper than 2GHz. Because of lessening of electromagnetic wave proliferation, the wave quality endured in different level of weakening in many condition for example, broadcasting over window, wall etc. Especially high than the 2GHz frequency, when wave proliferated through building wall, the weakening is increasingly genuine. Thus, this problem makes worry for indoor system proficiency of inclusion utilization.

So as to comprehend this problem, FemtoCell network has been suggested in LTE and grewup in LTE- A. It isn't just intending to understand that the system for indoor, edge inclusion poor utilizing issue, yet additionally to proficiently evade the problems of the impedance among cells and improve handover excellence. Intially, the femtocell network organize extremely intense. The big companies MOTOROLA and NOKIA has created Picocell and Nanocell innovation in 1990's of last century, and push these novel innovation to the marketplace. Sadly, right then and there they are not broadly acknowledged by customer. In 1999, Bell labs and Alcatel has suggested definition of the "Home Base Station", then later this definition was generally acknowledged by individuals. In 2006, individuals termed this sort of innovation "femtocell". In 2008, HeNB of W-CDMA and HeNB of LTE has been incorporated investigation plan to focus standardizing Femtocell system. Associating picocell, femtocell is increasingly fruitful in the market, and established

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very quickly, because it was struggling market. Since Picocell has clearly wastefulness, conversely there is many impediment for femtocell relating Picocell.

Parameter and Arbitrary	*Picocell*	*Femtocell*
Coverage radius	< 100	< 50
Number of user	10∼100	4∼64
Connection with core network	Coaxial-cable, Fiber	Coaxial-cable,Fiber,ADSL
Installation	Installed by operator	Installed by user
Installation complexity and flexibility	Easy	Easy and Flexible
Transmitting power	High	Low
Volume	Big	Small

Fig 3. Comparison with Picocell and Femtocell

Consequently, the femtocell appeared due to request of proficient indoor inclusion, its capacity consistently improved, Because of uncertainties plug & play highlight, femtocell isn't just utilized in indoor settings, then likewise it execute exceptionally great in the event of edge inclusion of system. For example, macrocell is conveyed concurring the populace force, the low power of populace territory regularly situated at edge of cell networks,in this case this region can utilize femtocell. Since utilizing femtocell isn't important to expand communicating power from macrocell, in this manner to accomplish the point of sparing very number of asset.

4.1 Up to now, we can summarize some highlights about femtocell as given below:

1. FemtoCell give better QoS (Quality of Service), it links to central system through IP networking, along with giving better quality of Voice over IP (VoIP) and information administration.

2. People in FemtoCell has association with user in MacroCell, put differently; the user device standard for macrocell is identical to FemtoCell.

3. Effectively install, FemtoCell is capable of play & play, when it was enacted by administrator.

4. Lessen the traffic heap of macrocell or additional FemtoCell, increment network limits.

5. Lower OPEX and CAPEX, FemtoCell doesn’t need to change the network system.

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6. Lower expenses.

5. PROBLEM FORMULATION

By reutilizing the frequency bands repeatedly over a provider of a mobile network can help a vast no. of clients concurrently, thus improving the system capacity. Frequency reuse can considerably increase the spectrum efficiency of the cellular system, but appropriate planing is needed to evade the interfering instigated by the common usage of the similar frequency bands. Because of the closeness of frequency bands, interferences such as adjacent channel interference and co-channel interference can severely degrade the quality of service provided to a mobile user. Effectual frequency allocation methods have been established over the years to minimize these interferences and maximize the benefits of frequency reuse. In spite of that, the path model used for the purpose here is based on the generalized path modeling whereas the application area may differ. Hence, we can look for a different and accurate path model so as to advance the capacity of the channel.

6. Optimization of Spectral efficiency

6.1 Design of Multi-Level Soft Frequency Reuse

An interference example of SFR-2 scheme can be considered. Two UEs are available in cell edge area of the Cell 1 which is represented as T11 & T12 to communicate with basestation while utilizing the frequency *f1* & *f2* in the main band, either in the uplink or downlink. Two UEs are available in cell centre area of the Cell 2 which is represented as T21 & T22 to communicate with basestation on frequency *f1* & *f2*. As stated by SFR description, *f1* and *f2* can be in subordinate band of the Cell 2. Consequently, interference patern is, T11 make the interference with T12 and T21 make interference with T22.

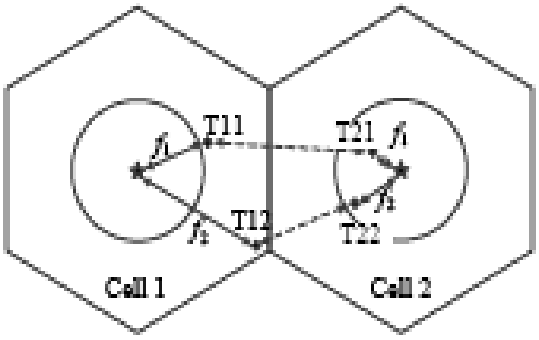

Fig. 4 An interference pattern of SFR-2 scheme

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In this figure, T22 and T12 are much a long way from the base-station of T21 and T11, individually, so require higher transmitting power. In this situation, switch0 to the communicating resources for the T22 and T21 make a good pattern for interference. Therefore, T12 is susceptible as compare to T11 which is a suitable to pair this with T21 that contain small intrusive power as compare to T22. With this pattern, user equipment is most celledge that can accomplish larger data rate at price of the low data-rate of user equipment at maximum cell Centre. It is necessary for the operatives; therefore client grumbles may successfully decreased by prolongs the data rate of most powerless user equipments.

Therefore, SFR-2 will not give the restraints to understand improved pattern of interference. In the 2-cell situation improve pattern may accomplished with fifty percent chance through arbitrary resource distribution. In the 7-cell situation, a essential cell plus 6 neighboring to the cells, situation of the dynamic distribution to understand ideal pattern. To improve interference pattern, the multilevel of soft frequency reusage has been displayed.

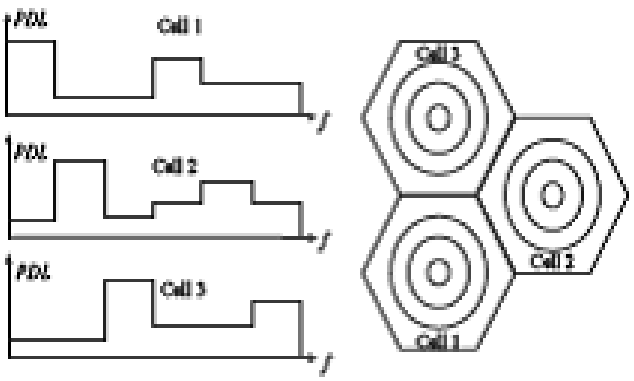

Fig. 5 Power density and the coverage of SFR-4 method

In ML-SFR method, the entire frequency band has been split into *N* parts on of every different SFR-2 method is worked. In i^{th} Cell i, the secondary and main bands are represented as $h_n^{(i)}$ and $l_n^{(i)}$ correspondingly,

$$l_1^{(i)} \leq l_2^{(i)} \leq \ldots\ldots \leq l_N^{(i)} \leq h_N^{(i)} \leq \cdots\cdots \leq h_2^{(i)} \leq h_1^{(i)} \qquad (1)$$

A SFR-4 method has been displayed. It has been noticed the particular PDL setting in the largest PDL pairs with lowest, in this second largest pairs with second lowest, and so on. In the SFR-2 method, the entire cell has been quantized into two areas, cell edge and cell centre. It is relative coarse framework for the resource allocation. In the ML-SFR method, there are 2N PDL levels divide the entire cell into the 2N areas and creating a refined framework.

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A user equipment is situated in Cell '0' and their place is inadequate among base station and point A, connection of Cell is 0,1, & 6. Thus, represent distance among base station and user equipment as

$$r_0 = \beta_0 r , \qquad (2)$$

Then β_0 is coefficient in (0,1)

Reflect the downlink and assume p_n is the transmitting power density of base station of the Cell n, which is stated by

$$p_n = k_n N_0, \qquad n= 0,1,\ldots\ldots\ldots,12, \qquad (3)$$

There, N_0 can be the PD of the white noise in user equipment receiver. Assume B is bandwidth and power of noise in user equipment receiver is

$$\sigma^2_z = N_0 B \qquad (4)$$

Consider the distance among basestation of the Cell n and UE (User Equipment) as d_n and L(d) the path loss model, then established power of User Equipment from serving cell is

$$\sigma_s^2 = \frac{p_0 B}{L(d_0)} = \frac{k_0}{L(d_0)}\sigma_z^2, \qquad (5)$$

Interference power from the additional cells is

$$\sigma_I^2 = \sum_{n=1}^{12} \frac{p_n B}{L(d_n)} = \sum_{n=1}^{12} \frac{k_n}{L(d_n)}\sigma_z^2. \qquad (6)$$

where

$$k_n = \gamma k_0 , \qquad n = 1,2,\ldots..6,$$

$$k_n = k_0 , \qquad n = 7,8,\ldots..12,$$

It means transmitting power of every main bands is $_{p0}$B, and every subordinate bands is $_{\gamma p0}$B, then

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$$\sigma_I^2 = \left[\gamma \sum_{n=1}^{6} \frac{k_0}{L(d_n)} + \sum_{n=7}^{12} \frac{k_0}{L(d_n)}\right] \sigma_z^2. \quad (7)$$

Accepting the ICI which is efficiently eradicated in OFDM framework, l that must be stated as

$$\eta(\gamma, \beta_0) = \log_2\left(1 + \frac{\sigma_s^2}{\sigma_I^2 + \sigma_z^2}\right) \quad (8)$$

This is a function of γ and β_0

6.2 Particle Swarm Optimization (PSO)

PSO is a populace based stochastic optimization method created by Dr. Kennedy and Dr. Eberhart in year 1995 [10], stimulated by social conduct of fish schooling. Particle swarm optimization shares several likenesses with evolutional calculation methods like GA. The system is introduced with a public of random resolutions and examines for optimal by stimulating ages. Nevertheless, in contrast to genetic algos, Particle swarm optimization has no progression operatives like mutation and crossover.

PSO replicate elegant movement of swarms of birds as piece of a socio intellectual work examined view of "collective intelligence". In PSO "best" value is the greatest value, got until now by every particle in the particle neighbors. This position is known as *lbest*. At the point when a molecule accepts all the populace as its topographical neighbors, the finest value is a global best i.e. *gbest*. The concept PSO comprises of, at every time step, altering the velocity of every particle on the way to its *lbest* and p*best* locations.

In recent years, PSO has been effectively functional in several application and research field. It is shown that PSO improves results in a quicker, less expensive Every insect must be defined by 2 parameters- position (x_i) and velocity (v_i), which is simplified by the subsequent rule as in equation below:

$$v_i(t + dt) = w * v_i(t) + c_1 * r_1 * \big(pbest_i(t) - x_i(t)\big) + c_2 * r_2\big(gbest(t) - x_i(t)\big) \quad (9)$$

$$x_i(t + dt) = x_i(t) + v_i(t)dt \quad (10)$$

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Here, $pbest_i$ is the finest position acquired by *ith* particle and *gbest* is the finest position acquired by every particle till existing iteration. c_1, c_2 are known as acceleration vectors whereas r_1, r_2 are two arbitrary vectors consistently circulated among '0' and '1' and *w* indicates inertial weight.

Research amongst PSO & GA most of formative procedures has given below procedure:

1. Subjective creation of primary masses.
2. Computation of wellness function. It will direct depend upon separation to perfect.
3. Reproduction of masses rely on fitness characteristics.
4. If requirements are met, then stop. Generally backtrack to two.

5.2.1 Algorithm

Steps :

1) maximum iteration *(T*max*)* = 40 where *t* =1, 2, . . . , *T*max;
2) swarm size *(N)* = 50 where *i* = 1, 2, 3, . . . , *N*;
3) initial velocity *vi,d(0)* = 0;
4) initial position *xi,d(0)* = *Pf* ~ 2+*U*[0, 1];
5) inertial weightw= 0.01;
6) initial personal best position *p*Best*i,d*= *xi,d*;
7) acceleration constant c1=c2=0.7

For each iteration, the following parameters are evaluated:

$$v_i(t+dt) = w * v_i(t) + c_1 * r_1 * \left(pbest_i(t) - x_i(t)\right) + c_2 * r_2\left(gbest(t) - x_i(t)\right) \quad (15)$$

$$x_i(t+dt) = x_i(t) + v_i(t+dt) \quad (16)$$

7. RESULTS

The results for the experiment are as shown further. The graphs show the channel capacity with respect to the distance parameter and gain.

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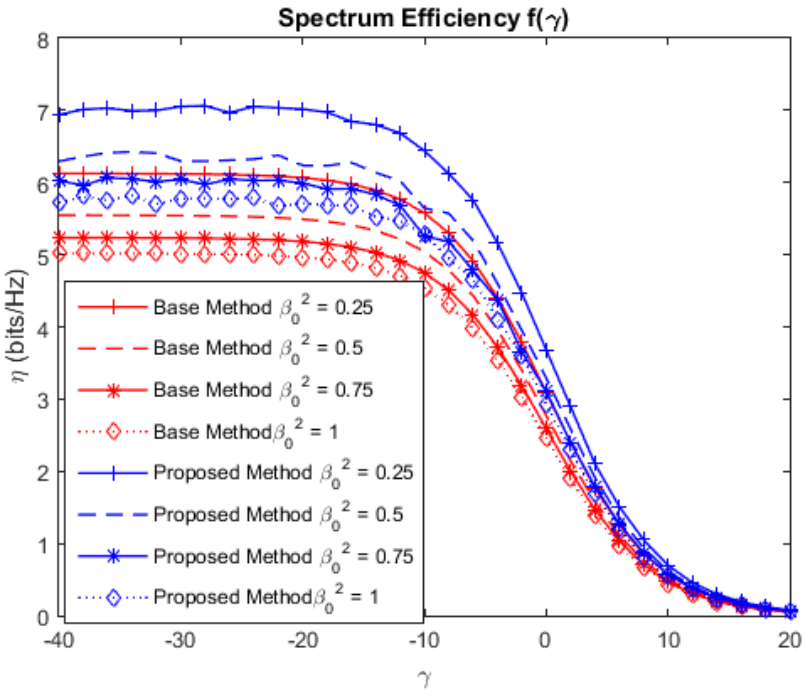

Fig5 Spectrum efficiency vs gamma (γ)

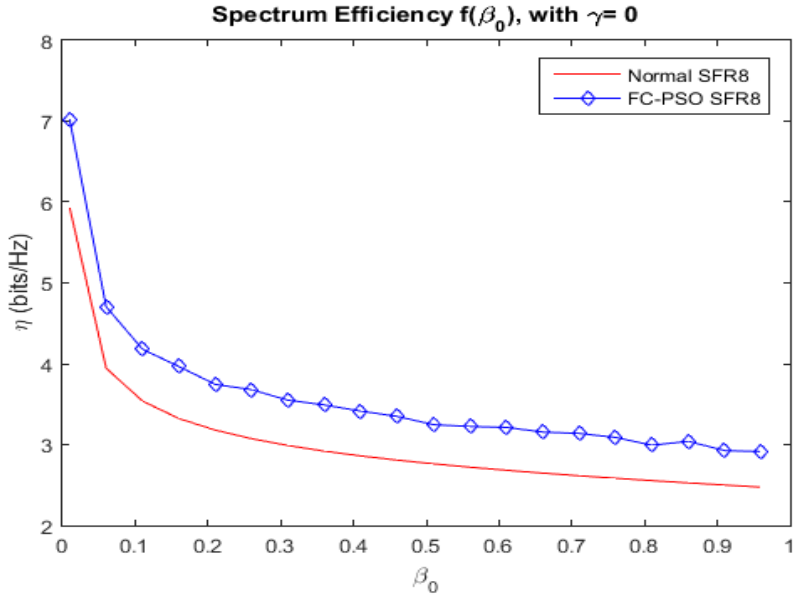

Fig.6Spectrum efficiency as a function of Beta with γ=0

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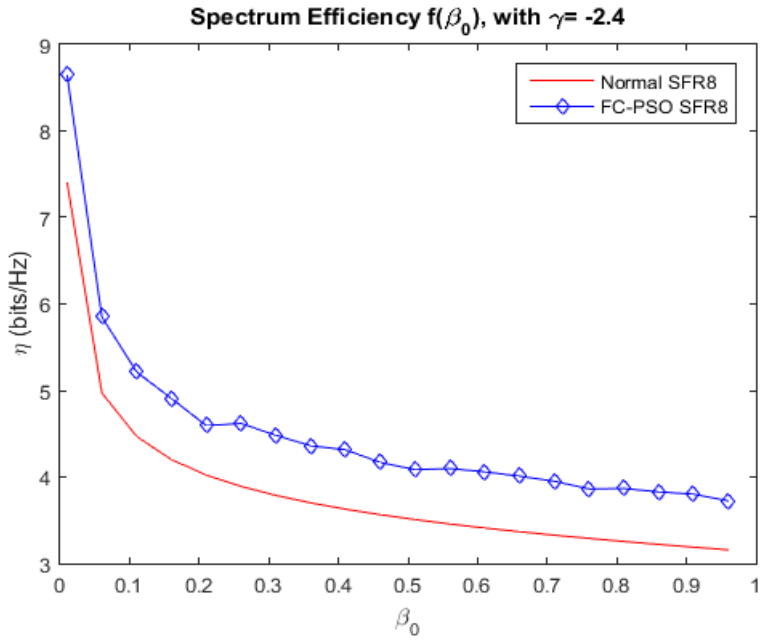

Fig7 Spectrum efficiency as a function of Beta with γ = -2.4

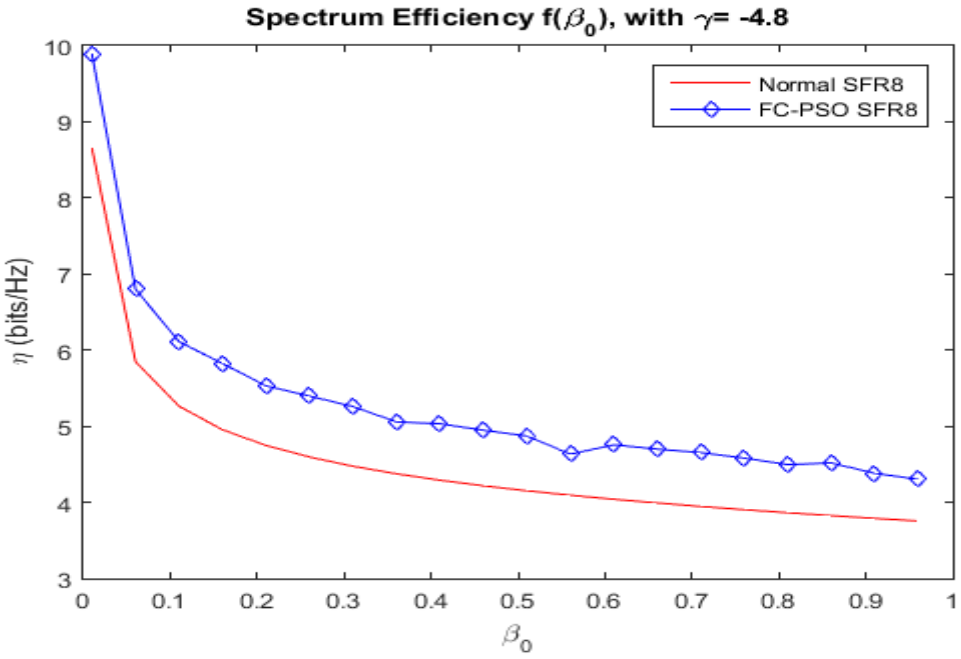

Fig8 Spectrum efficiency vs Beta with γ = -4.8

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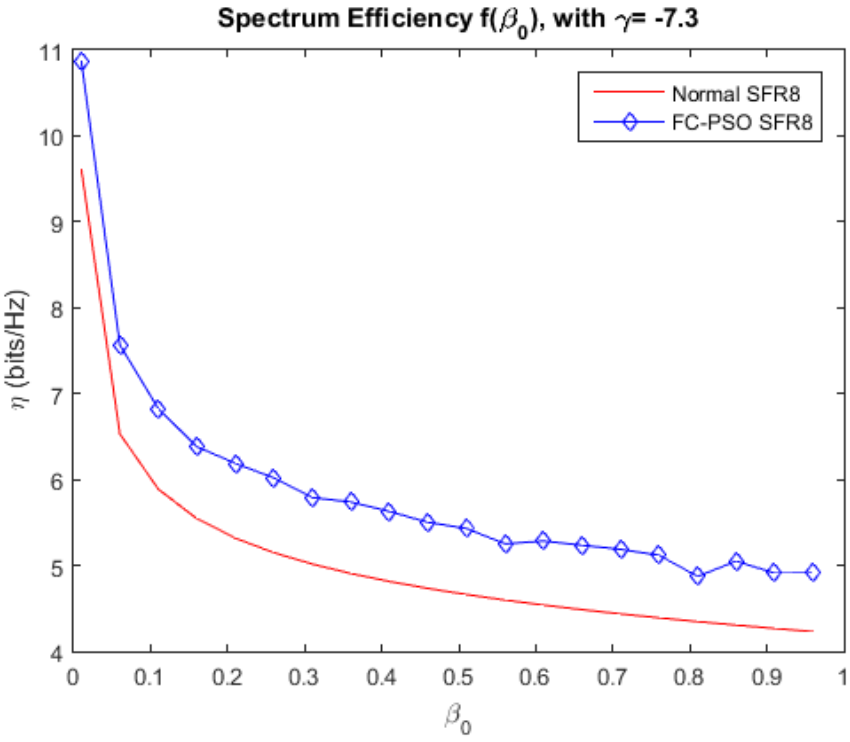

Fig.9 Spectrum efficiency as a function of Beta with γ = -7.3

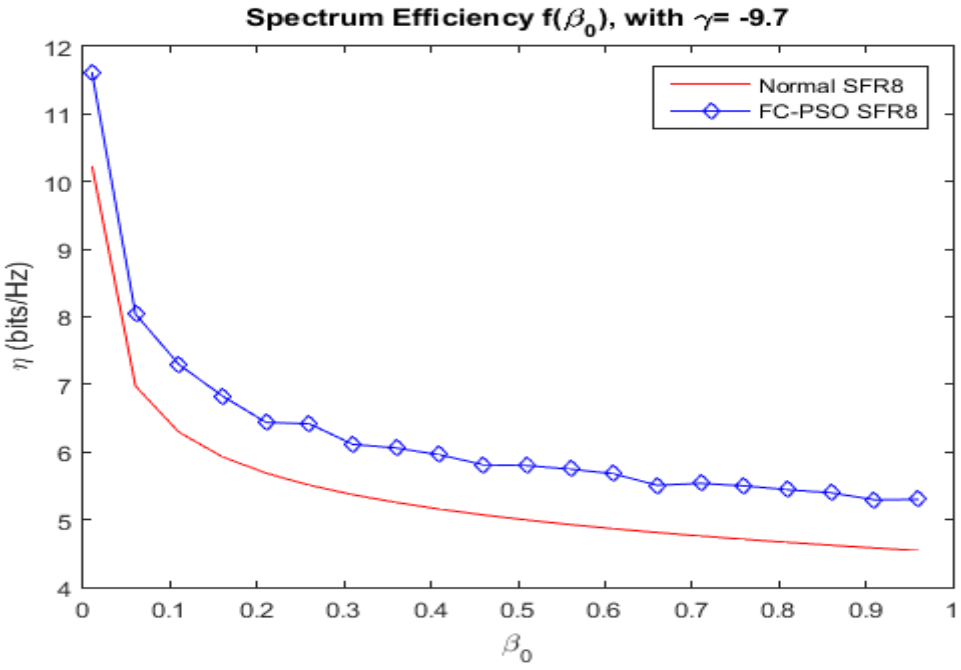

Fig.10 Spectrum efficiency vs Beta with γ = -9.7

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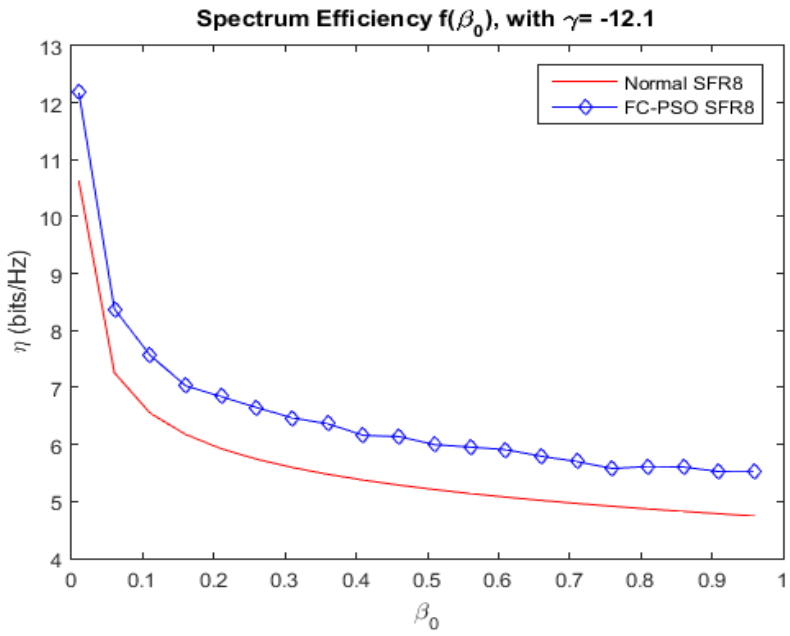

Fig.11 Spectrum efficiency vs Beta with γ = -12.1

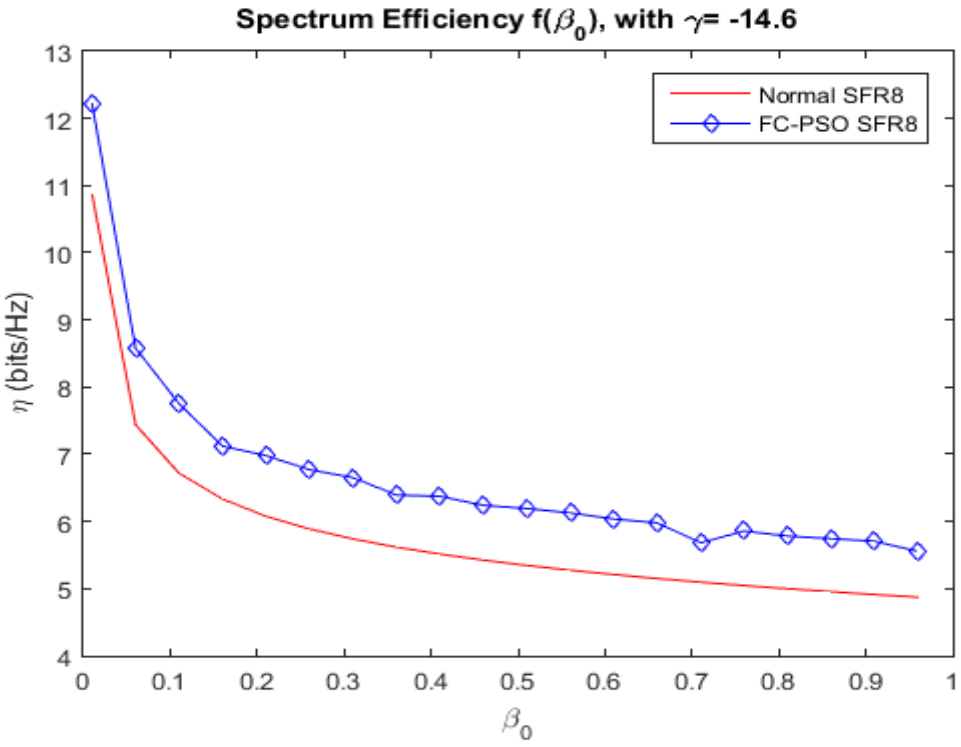

Fig.12 Spectrum efficiency vs Beta with γ = -14.6

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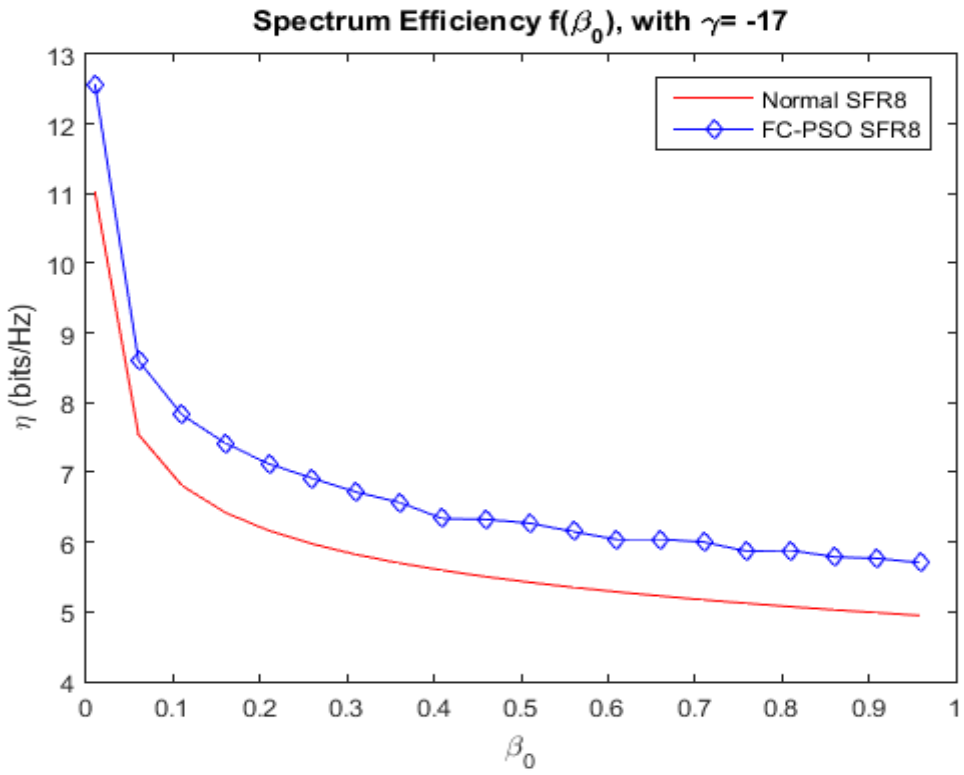

Fig.13 Spectrum efficiency vs Beta with γ = -17

The cell edge spectral efficiency as in the SFR-8 base method is found to be 2.475 dBm/Hz and for that of the proposed method, it is 2.975 which is a 20% improvement from the base method.

7 CONCLUSION

In this study, a new method for optimizing the ICI to enhance the channel capacity of the system or the throughput has been proposed. The proposed algorithm has higher channel capacity than the previous method without optimized inter Cell interference. This is due to the suggested algo takes optimizes the loads keeping in mind when distributing resources to diverse cells and exploits system throughput by reducing the effective interference. However, in SFR, the power and subcarrier distribution in every cell is pre- decided earlier and not adjusted to the variations in networking traffic. This is due to the suggested algo efficiently decreases Inter Cell Interference by progressively changing the minor and key sub cariers' transmitting power in every cell while in SFR-8 both outer cell and inner cell client involvement the maximum interfering from neighboring cells. In second figure the cell-edge user execution of the two systems.

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The suggested algo ensures cell-edge client data rate need when allotting resources. It changes the no. of main sub-carriers and transmits power as stated by cell-edge data rate necessities. Though in additional scheme, the resource assigned to every cell locale is already defined. At the point the cell-edge traffic load is higher the accomplished framework throughput in every reiteration of the suggested algo for each cell region might not be sufficient to attend every clients which will prompt the blackout of cell edge clients.. Therefore, the proposed can be a better option in order to reduce the ICI.

8 FUTURE WORK

The future work may involve the reduction in the complexity of the system. This is because the current system based on PSO may be a bit complex in terms of implementation because of the algorithm's iterative structure. Hence, a further research can be to reduce the complexity and improve the timing performance of the algorithm.

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