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A Review on Mitigating Interference Between Macrocells and Femtocells In Use of Wireless Services

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Abstract: ***Cellular networks are comprised of a few number of radio cells. Base station (BS) encourages each station to offer radio inclusion over some restricted districts. Radio cell are also classified as Femtocells and Macro cell. Femtocells are low power access points, high reliability, better coverage and capacity, reduced subscriber turnover, low cost, improved quality of service (QoS), which is deployed by end customers. Within femtocells which are organized based on co-channel can be subjected to two types of interference such as among nearby femtocells and among macrocell and femtocell. The process of mitigation need to be carried out in two interference types due to enhance the use of entire existing spectrum. Macrocell offers coverage larger than the microcell. Macrocells along with femtocells is mostly used for creating LTE (Long Term Evolution) network. In these paper analysis the characteristics and advantages of Femtocell and Macrocell. Provisioning of nature of administration denoted the chief dedicated test for femtocell/macrocell incorporated systems, while the fundamental regulatory test is the decision of the correct transformative way from the current microcellular systems towards the coordinated system. The analysis the techniques for Mitigation interference between Macrocell and Femtocell in use of wireless networks.***

Keyword: Optimization, Cellular Resources, Evading, Intra, Inter Tier, Interference, Femtocells, Macro cell Networks

I. INTRODUCTION

Recently, the development of internet services through mobile network is increasing tremendously. At the same the utilization of existing spectrum and macrocell by the users were limited. Additionally in order to make enhancement in cell capacity, the technique called cell splitting can be used. This technique cannot be used in every traffic, because only certain position of cell is responsible for creating traffic. For solving this issue the less powered nodes must be developed and used in high traffic places. The classification of less powered nodes is as follows, relay, femto and Pico nodes. **Picocells**- when compared to macro BS these picocells has less power transmission. For this reason picocells are developed by operators. The transmission of power in picocells differs from 2W to 250mW. For obtaining inter-cell interfering organization these picocells will exhibit connection towards the BS of macrocells. This connection is done using X2-based interface. These picocells can be used as an alternative to macrocells. In certain areas the signal produced by macrocells cannot be reached as well as in certain areas like stadiums or

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railway stations heavy traffic will be found. In these areas instant of macrocells picocells can be used. Femtocell- femtocell refers to low powered and small base station. This can used in application such as office or home. These femtocells are organized through customers. Through IP backhaul which looks like Cable modem or via DSL (digital subscriber line) the connection of femtocells can be made along with the core network. Within shorter range using this femtocells huge rate of data transfer can be achieved. At the same time enhanced coverage can be attained. The coverage area of femtocells is found to be 10-50 meters and the power of transmission is found to be 100mW or even lesser. The femtocells can be classified according to mode of operation as hybrid mode, open access mode and closed access mode. The user those are subscribed from the macro user can only use the service offered by femtocell in closed access mode. Bit in open access mode all macro user can use the service offered by femtocell. The femtocells BS which are used in closed access mode is named as closed femtos. In case of hybrid mode the non- subscribed user can also use the femtocell service but merely restricted amount can be used. The order of priority will be given less for the unsubscribed user when compared to the subscribed user. Relay Node- relay node is also referred to as relay base station. This helps in increasing the coverage area of macrocell. These macrocells will remain connected to the network with the aid of wireless backhaul. In case if similar sort of frequency is utilized by relay node as like operator then it is termed as in-band relays. But, for performing operation in backhaul the extra spectrum is required by Out- of-band relays. Generally the traffic that is created through mobile is referred to as indoor traffic. For this indoor traffic the femtocells can be used. In certain networks called two-tier networks, both femtocells and macrocells were utilized. Similar two sort of spectrum can be utilized in in two-tier networks: mostly the partitioned spectrum is used in first system. The existing spectrum called licensed spectrum get spitted into two portions. The portion called dedicated spectrum will be used by both of the femtocell and macrocell. The main drawbacks in this system are that the overall obtained spectrum for both femtocells and macrocells get decreased. The equal amount of licensed spectrum is shared by both femtocell and macrocell in the second system. This equal sharing of spectrum is termed as shared spectrum usage or co-channel. In this situation, the existing spectrum entirely can be used by femtocell and macrocell. The main drawback in this system is that there is possibility of heavy cross-tier interference. Within co-channel spectrum development of femtocell dual kinds of interference can take place: among nearby femtocell (Intra-tier interference) or between femtocell and macrocell (Inter-tier interference). The possible interference should must be minimized in order to improve the use of available spectrum as a whole. The methods developed for decreasing the interference is classified into two [3]: Interference coordination: the orthogonality can be achieved among interfering transmitted signal under certain Time-frequency, Antenna spatiality domain or, Location/space. OFDMA system has been developed for attaining interfering signal in various sub channels present within time-frequency domain. The orthogonality in case of location/space domain was attained through monitoring the power of transmission in BS which depends on space of victim. To reduce interference in case of antenna spatiality, by means of unrelated spatial paths within MIMO (multiple-input multiple-output) the signal transmission is achieved. Interference cancellation: under this method the process of regeneration is made for interfering at the same the process of subtraction is done in the received signal. This process is performed in order to obtain the specified signal. Generally the technique called sphere decoding or dirty paper coding (DPC) is referred to as coding technique. These techniques were used to remove the interfering signal in the received signal by means of

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permitting a victim. The above mentioned techniques can be combined and used in the process. In the proposed system for minimising the intra-tire interference present within femtocells the technique named frequency domain was developed. For heterogeneous network the process of reducing the interference can done using Cognitive radio techniques. This technique can also be used for improving the spectrum utility. The two main features for CRN is Cognitive configurability and Cognitive capability [4]. The examination of spectrum is carried out by Cognitive module in order to find the existing spectrum. While through self-configuration module the adaptation to dynamic environment can be achieved. Two kinds of users are present in cognitive radio network, (CRN) one is primary user (PU) and another is secondary users (SU). The more preference is given for PU when compared to SU. The spectrums can be used only occasionally by SU. The macro users is referred to as PU and the femto users is referred to as SU within heterogeneous network. Mostly the CRN is related to femto users or femto BS.

II. LITURATURE SURVEY

Many researches are carried out by various authors for monitoring the power transmission in femtocell. In [20], the author developed distributed joint resource allocation algorithm for minimising the ICI present in two-tier femto-macro network. The parameter such as channel state information (CSI), transmission mode selection and spectrum sensing can be estimated through the developed algorithm. By means of cognitive femtocell the slots which are vacant were found and allocation of every slot by user is done. In [21] the author developed an algorithm for decreasing the interference in power transmission. It was found that the some edge of the macrocell is subjected to interference during power transmission. The process of this interference avoidance system can be performed on obtaining the data regarding MUE present within femtocell. Through this Interference avoidance system the organization of many femtocells within the indoor environment can be made by means of great capacity. In [22] the author developed an algorithm named Water Filling (CSWF) power allocation algorithm on the basis of cross-tier signal-to-leakage-plus-noise (SLNR) for mitigating the interference present in femtocell to macrocells. The developed algorithm mainly focuses on power transmission present in each Resource Block (RB) within femtocell. In [23] the author developed Cognitive power control technique for solving the problem of interference travelling from femtocells to macrocells. With the Assist of FBS the spectrum analysis is performed in order to gather information regarding the downlink radio assets present within macrocells. The modulation of power transmission is carried out effectively by FBS and further the process of improving the capacity of the system can be achieved through interference mitigation. Stochastic Approximation (SA) algorithm was developed to gather information for controlling the power obtained during the signaling of macrocell. Using this information the updating of power transmission is done. The prediction of Downlink (DL) power was made which depends upon Channel Quality Indicator (CQI) as well as on ACK/NAK signal. In [24] the author developed dynamic power tuning technique for solving downlink interference which is occurring between HeNB and MUE. With the aid of HeNB the tuning of power is carried out through the information gathered from MUE. Through this interference mitigation technique the throughput obtained based on MUE can be improved and power consumption will be scaled up. In the close vicinity of HeNB MUE will be present. Due to this close vicinity the inference will be sent back to HeNB. To solve this problem influence control scheme was developed by the author in [25]. This system can be used in network listening. In [26], the author developed completely unique scheme for reducing the

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mitigation of interference occurring in cognitive femtocell networks. This is also called as power assignment and joint channel allocation. Based on this scheme the mitigation of interference from femtocell onto MUEs is done. At the same time co-tier interference was reduced by presenting the channels and power resources among various femtocells. The reduction of interference mainly depends on Virtual Cluster (VC) and Physical Cluster (PC). Hungarian algorithm and power budget adjustment algorithm on the basics of VC was developed for assisting the power resources, reducing cross-tier and co-tier existing in femtocell. In [27], the author developed distributed coordination techniques existing among macrocells in order to monitor the ICI that is created within two-tier networks through femtocell. In this technique the reuse of Resources is not possible. The independent process is carried out by femtocell through self-organizing deployment in the developed system. In [28], the author presented downlink power control system for reducing the interference occurred to the users of neighboring cell through femtocell. The least power transmission can be satisfied for femtocell which is achieved through path-loss compensation. Through this interference caused to neighboring cells can be reduced. By means of this technique Quality-of-Service (QoS) and SINR level can be maintained. In [29], the author presented distributed Reinforcement Learning (RL) technique for reducing the interference made from femtocells to MUE. The developed technique is also called as Distributed Power Control using Q-learning (DPC-Q). Within cognitive femtocell networks the sub-optimal pattern for assigning the power is found in order to attain improved capacity. For performing the process of reinforce the method called Cooperative Learning (CL) and Independent Learning (IL) can be utilized.

III. PROPOSED SYSTEM

Femto-access points (FAPs) were small size, low power consumption; base station can be suited for home and help in achieving improved capacity. The enhanced capacity is achieved through Femto-access points (FAPs) when compared to cellular system. The place where the increased capacity is achieved is referred to as femtocells. Certain spectrum will be operated based on cellular service providers. The femtocells will be operated based upon this system. The main use of this femtocell technology is no new equipment (UE) is required for the users. In order to achieve processing among the licensed spectrum, the relationship must be existing among the macrocells and femtocells. The connection is extended between the mobile network and femtocells through the subsequent backhaul network technologies. The backhaul network technology may be WiMAX, Metro Ethernet, cable TV (CATV), residential xDSL etc.

The main purpose for developing this FAP is to achieve access to cellular network of one to six mobile users at a time residing in the indoor environments. It is assumed that approximately 90% of knowledge traffic and 60% of voice traffic will be created through indoor environments which include a faculty, an airport, an office, and home. The enhanced coverage is required in indoor environment through larger rate of data. For managing heavy traffic it is quite difficult to be made using macro cellular coverage. So decreased cellular capacity is needed. By means of Femtocells increased data transfer with high coverage area can be achieved.

Many techniques were present for improving the coverage of indoor environment with high data rate but the technique based on femtocell is found to be interesting. On contrast to Fixed Mobile Convergence (FMC) framework this femtocells can used in many indoor environment. In 3 G/Wi-Fi

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UMA (Unlicensed Mobile Access) technologies the dual-mode handset is required but this is not necessary for femtocell. The main issue in Wi-Fi is that unlicensed ISM band will be used greatly which leads to interference. At last the coverage of wireless can be improved by repeaters (or signal booster) rather the capacity cannot be enhanced. The newer backhaul connections are necessary for the Repeaters in order to overcome the issue of decreased coverage in rural areas. The low coverage is found in this area because the lower fixed broadband penetration is found. The technique related to femtocells on the basics of cellular was developed in order to achieve better performance when compared to other Wi-Fi solutions such as SIP and UMA in the year 2013.

A schematic representation of macrocell network combined together with femtocells is given in the figure 1. In case of macrocells the operation is carried out with the help of mobile wireless operators but in case of femtocells the operation is carried out secretly through connection with the broadband service provider. The broadband service provider may be online Service Provider (ISP). When the process is carried out through macrocell-related cellular network many number of femtocells will be present along with it.

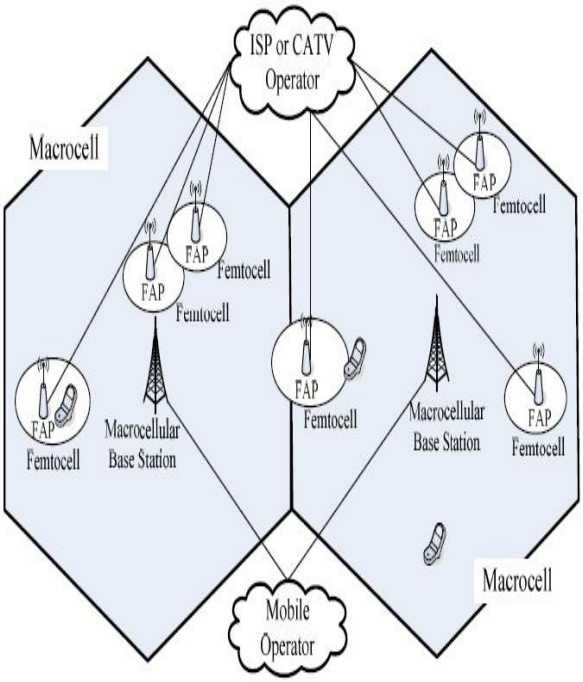

Figure 1: Integration of a macrocellular network with femtocells

There are many ways and means to examine the benefits of the developed femtocellular, for example, substance suppliers, the administration, the clients, the system administrators and the makers and the application designers. For instance, from the client's point of view, clients regularly expect high information rate remote indoor access requiring little to no effort and with great nature of administration (QoS). Apparently, the main advantage of using femtocells is that the double mode handset which is very expensive is not needed rather single- mode handset can be used for obtaining FAPs for organizing macrocellular network.

IV. CONCLUSION

The aim of this paper is to investigate and propose a mechanism for mitigating interference between Microcell and Femtocell use of wireless networks. This paper focuses on macrocell and femtocells for decreasing the interference prevailing among macro cells and femtocells. The proposed method focused

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on realistic scenario, path loss equation and wireless networks users. These mechanisms would be more effective in terms of fairness. The proposed system can be still developed with more number of variable in future to be used in various other network. Further, future research would focus on the optimization of femto and macro cells resources.

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