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Cell Zooming Techniques and Optimization Function in Cellular Based Networks with Energy Efficient and Consumption

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Abstract*: Today, the major mobile network utilizes energy in the range of giga watts per year. Nowadays, in European markets energy prices increased around 18% of mobile network operational cost. The design methodology is provisioned with tradeoff between maintenance cost, energy consumption, QOS assurance and deployment. In the existing work, an optimization function for the network design and management has been formulated and its validity has been verified using results of simulation The overall objective of this work is to evolve a strategy to operate a cellular network in an energy efficient manner, thereby reducing energy consumption and electromagnetic pollution. Range of each sector corresponding to a particular cell differs from each other. This allows the sectors to be treated as individual cells and hence, sector zooming can be done.

Keywords* : Cellular networks, Green communication, Cell zooming, Base station, Mobile stations.

I. INTRODUCTION

Green communication techniques intend to reduce the power consumption of cellular networks and the electromagnetic pollution due to them. Green communication naturally be considered to provide energy for all the level metrices in coverage and various components of cellular network to identify the properties in accordance with efficiency and significant network performance. Assessing Greenness of the network is plays vital role in Green communication solutions. The huge number of work has been carried out in computer applications into electrical and electronics engineering. [1-31] In, improved by the optimization framework proposed, selects base stations to be installed and their model has been shared jointly by considering this dynamic energy management.

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The goal of the optimization process help to determine the total input costs, sum of installation and operational expenditures. They are often determined with the resources in more cost for the assessment of cell zooming. This design deals with energy efficient power amplifiers even at low output power levels and implementation of dynamic voltage and frequency scaling in the electronic components [32-33].

1.2 LITERATUREN REVIEW

In [34], the green network solutions are classified into three levels - Component level, Link level and Network level. This paper suggests, the improvements in the performance of power amplifiers and incorporation of dynamic power and frequency scaling according to the load at component level. Link level solutions suggest, to consider factors like spectral efficiency and information overhead, discontinuous transmission by Base station. Network level solutions suggests packet lookup operation thereby maintaining network operation to push high level elements as a function of cell size and bear all operating costs, for given traffic distributions and charge of conflicting sustained level of operations from dense urban to rural areas. In [35], the author discussed about 'Greenness', depends on the usage to obtain energy savings in base stations providing significant cellular networks using energy efficient power amplifiers as well as distributed antenna. The heterogeneous network aggregate the highest amount of bits as the worst case used in cellular system based on micro, pico and femtocells. In [36] the idea is considered to reduce the information exchange and signaling overhead for better performance in Centralized cell zooming algorithm, they also propose a distributed cell zooming algorithm, negotiate to optimize access probability and each urban area does not change BS's by itself with low traffic loads and resource allocation of forecast channel conditions. In [37], optimal design of Small cell networks is discussed; using RMT theory and it has provided an efficient system dimensions in a large system regime of multiple access system. In [38], potentially covering the network problem and feasible to resort maximum covering problem in all the way of network. Heuristic algorithm POPSTAR is used to solve this problem. This also discuss the deployment of small cells only around periphery of existing macrocells collocated with a subset of existing fiber backhaul facilities using PON. Literature mentioned at, proposes architecture, to enhance the conventional femtocell performance using the multi-cell basebandprocessing for interference mitigation based on a distributed antennas system.

In, a scheme to design an energy efficient network is proposed. To optimize uniform over the space the distributed antennas has subsequently increased via the intended user's location and user's presence probability.

II. METHODOLOGY

In the considered real time scenario, each BS corresponds to a single cellular region with single configuration type and operating power level is same for all BS. Simulation of this propoed work is performed using MATLAB tool. Control and access of network variables in MATLAB is easier. The cellular network simulated is a 2G-GSM network and it involves definition of the scenario, call generation, mobility, path loss model, association of mobiles to the sectors. Base stations and Mobile stations are defined by parameters such as location, power, height, etc. Association between the Mobile station and Base station is provided in terms of structure referencing in MATLAB. Scenario is validated in terms of number of calls generated, their location, call duration, call blocking ratio, etc. Region in MATLAB is defined as a 2D-matrix . This matrix size depends on the region's span that has to be modeled. Each element in a matrix corresponds to a distance in meters that depend on the desired accuracy of the location modelled.. Mutipath components and shadowing is modeled as an instantaneous fading with a fading margin from 6 to 8 dB . Here fading margin of 6 is taken. Guassian Random Variable around 6 dB is used.

MS which are mobile may switch over between different sectors. So the handoffs between the mobile is also addressed in this model. MS association with BS and mobility of MS are defined. Due to mobility, MS's position and the sector that covers it changes. So every second the position and corresponding sector association have to be checked and changed if MS gets associated to new BS.

III. CHANNEL AND MOBILITY MANAGEMENT

Traffic channel (TCH) has to be assigned to each MS if it receives at least the power that equals the threshold power. At the same time the availability of the traffic channel must also be checked. MS is assigned to a TCH, if at all a single TCH is free. Traffic load in cellular networks use time series prediction to forecast fluctuations in space and time to deploy mobility and behavior. To adapt the necessary representation of the network it shows significant data collection. Many factors choose the data intended to serve roaming in partner networks to provide convex optimization. This scenario provides a comparison with lower bands by adding the small cells when combining in a good end service. It may be difficult to cover fixed channels from single resource utilization. The contents of this channel contribute the physical limitations to assess the rate of system level. More precisely, BSs are considered at different time slots mitigated by network or traffic situation. To evaluate the traffic load in the cell area propagation data transfer are highlighted with reduced energy consumption.

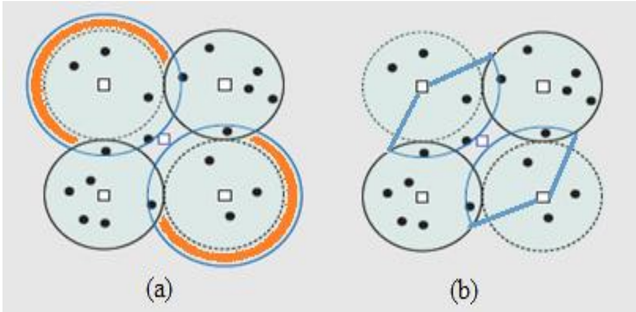


Figure 1.Cells with Load increases

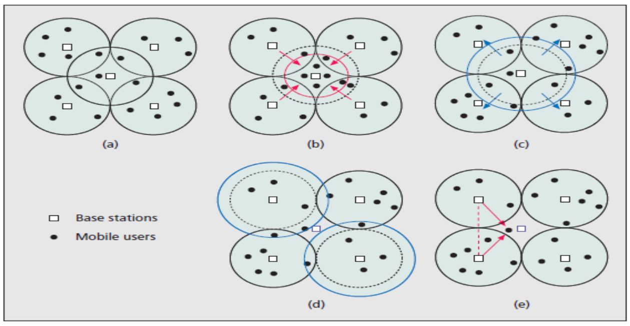
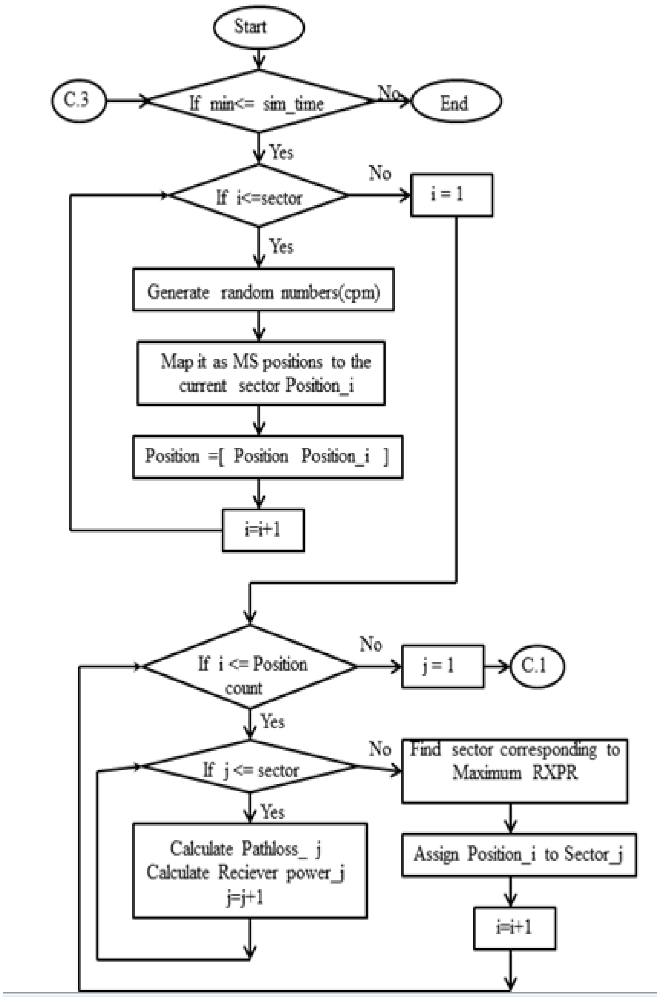


Figure 2.Cell zooming and Sector



. Figure 3.Main Flow Chart for the initial sector association and Position generation

Table- I: Random generation distributions of the traffic

	Type of Distribution	*Distribution*	*Mean /Boundary*
Call generation instant	*Uniform Distribution*	*Maximum value: 60*	*Call generation instant*
Number of calls / minute	*Poisson Distribution*	*Mean: Avg calls/minute of the sector*	*Number of calls / minute*
Call duration	*Exponential Distribution*	*Mean: Avg call duration of the sector*	*Call duration*
Mobile position (x ,y and height	*Uniform Distribution*	*Maximum value: Depends range of the sector*	*Mobile position (x ,y and height*

IV. RESULTS AND DISCUSSION

MATLAB has been used to write program in the prediction of Testbed. In each scenario value remains constant is the installation cost and the total power consumption for operating the Base stations are assumed to be constant.Main objective of this project is to reduce the power consumption and EPI of the GSM cellular networks. So initially a Testbed that replicates the real time scenario is created in MATLAB. Validation of Testbed is done by comparing the real time data and the same data from the Testbed such as total number of calls in each sector, traffic carried in each sector. After that optimization function values obtained in sector zooming with different power levels and different traffic values are compared with cell zooming scenario.

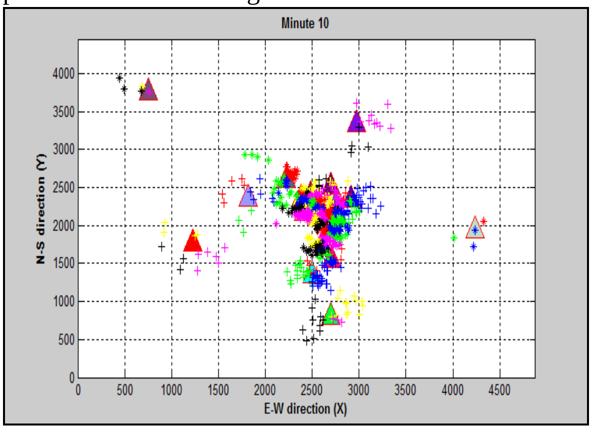


Figure 4.Simulated location with 20 Base station and their MS

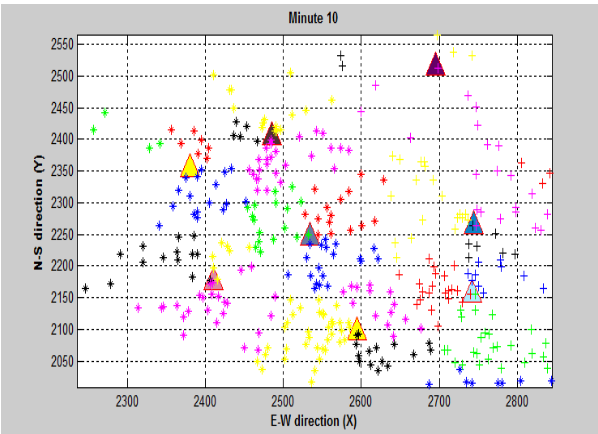


Figure 5.Simulation location of Mobile stations

Total number of calls established in each sector for 10 minutes is plotted along with total number of calls from simulation. The simulation to analyze the cell zooming and proposed sector zooming concepts have been performed for a duration of 10 minutes with 30 sectors, using the Testbed created. The optimization function values for different transmit power levels. The remaining two terms of the optimization function, namely the QOS assurance and EPI depend on the traffic associated with the sector and transmit power of the sectoral antenna. So these parameters differ on varying the transmit power and zooming handoffs of the sectors. A computer code, for the prediction of Testbed that replicates the real time scenario is created in MATLAB. Validation of Testbed is done by comparing the real time data and the same data from the Testbed such as total number of calls in each sector.From these results in computer programme it is clear that the Testbed closely approximates the real time scenario and hence this Testbed can be used to perform cell zooming and sector zooming.

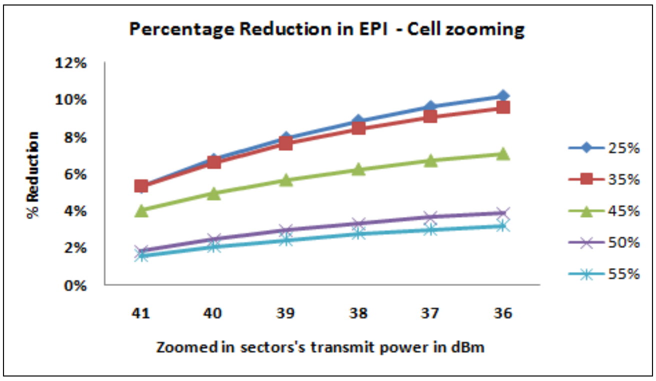


Figure.6.Percentage reduction in cell zooming

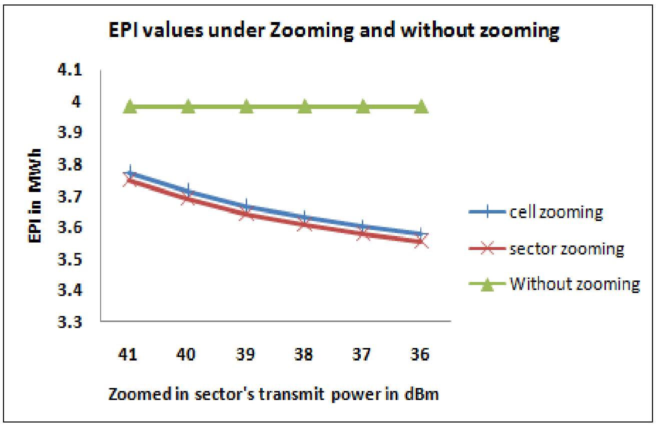


Figure 7.Values of EPI under Zooming and without zooming

Table- II: EPI in a Sector and its neighbour

Sectors	*18*	*19*	*1*	*2*
EPI (MWh) Without zooming	*1642*	*730*	*550*	*3512*
EPI (MWh) Sector zooming	*400*	*1741*	*550*	*3512*

V. CONCLUSION

EPI function for the sectorial antenna has been derived and the Optimization function values,with the modified EPI function. Typical values of EPI from the real time scenario put forth a platform to analyze the enormous electromagnetic radiation existing in the environment. Testbed created to simulate the cellular network closely approximates the real time cellular networks and supports wide variety of coverage angles and ranges of sector. Sector zooming concept proposed in this work, results in reduced EPI value than cell zooming till 39 % zooming handoffs. This reduction in EPI is analysed based on different parameters and results are shown. It possess energy saving schemes with standard industry business practices and bursty in nature for many data applications.The cell size in a cellular network can be degraded due to cell zooming and it may lead to increase their service area to absorb the traffic fluctuations in several networks.

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