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Simulation Result of Energy Efficient Resource Allocation in Uplink SC-FDMA Systems

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Abstract *– In this research work, investigate quality-of-service (QoS)-driven energy-efficient style for the uplink of long term evolution (LTE) networks in M2M/H2H co-existence situations. the precise constraints of single carrier frequency division multiple access (uplink air interface in LTE networks) bearing on power and resource block allocation not only complicate the resource allocation drawback, however additionally render the quality Lagrangian duality techniques unsuitable. There are several energy-efficient style is compared with the spectral efficient style alongside round robin (RR) and best channel quality indicator (BCQI) algorithms. In Previous work uplink resource allocation algorithmic rule for LTE systems, that focuses on QoS provision in time period applications and energy efficiency, however therein work answer of multicell situation shouldn't be taken part and therein interference thought rejection ought to be taken.*

Keywords*: Delay, energy efficiency, Long Term Evolution (LTE), Quality of Service (QoS), resource allocation, uplink.*

I. Introduction

The past many decades have witnessed monumental evolutions of communication systems, particularly wireless communications. Because of the rising technologies and up QoS demand, future-generation wireless communication systems are expected to satisfy even more difficult demands of high rate and reliable transmission communications. Thus, to develop a cheap network, using progressive technical advances provides a practical however efficient way to improve the network performance and QoS provisioning.

During this work focuses briefly on varied resource allocations algorithmic rules for LTE transmission system and describes the suboptimal transmission resource allocation rule [7] in part. Single carrier frequency division multiple access (SCFDMA) technique has been selected as transmission scheme in long run evolution (LTE) system. Not like orthogonal frequency division multiple access (OFDMA), it converts time domain transmit signal into frequency domain signal which may be wont to improve system outturn. Conjointly its low peak to average power ratio (PAPR) feature has the potential to learn the mobile terminals in terms of transmit power energy [2]. In [6] the authors had performed the resource allocation in time and frequency domains considering energy potency as a main issue. The authors in [7] projected an transmission resource allocation rule supported optimum cake cutting drawback for LTE system, that focuses on QoS provision in period of time applications at constant time enhancing energy efficiency issue. On the other hand, quality-of-service (QoS) provisioning for varied varieties of delay sensitive services could be an important issue that possesses to be thought of in most resource allocation problems. Normal resource allocation algorithms for H2H typically target outturn maximization that cannot hold for M2M situations as MTC largely consists of low rate applications. However, delay desires for MTC are crucial particularly for applications wherever real time deciding thinks about like smart grids. Therefore, simultaneous thought of delay and rate necessities fully characterizes the M2M/H2H being situation. During this work address the matter of energy-efficient resource allocation for the transmission of LTE networks (or SC-FDMA transmission systems) underneath applied math QoS guarantees. To the simplest of our data, this drawback has not been investigated before normally or in M2M/H2H co-existence situations.

II. Long Term Evolution

In this frame of skyrocketing demand for mobile information, LTE may be a radio access network technology standardized in 3GPP and evolving as an evolution of Universal Mobile Telecommunications

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System (UMTS). LTE may be a converged all-IP network, wherever providing QoS is important for allowing a variety of IP-based services and applications among the new generation networks. So an evolved 3GPP QoS thought has been developed. In wireless networks, QoS provides traffic prioritization and multiple bearers (a bearer is an end-to-end communication service between 2 network elements) with configuration and priorities to ensure satisfactory service quality for every service.

A network-initiated bearer creation and QoS class identifier (QCI) institution are among the key parts of the evolved QoS conception. The aim of each is guaranteeing consistent QoS between completely different User equipment (UE) vendors and standards likewise as in roaming situations.

LTE has been designed to produce spectrum flexibility, that is, to form attainable its preparation in many various spectrum allocations. Besides, support for broad transmission bandwidth of up to 20MHz is provided so as to attain high information rates. Simultaneously low transmission bandwidths, down to 1.4 MHz, are attainable. In addition, the main focus of LTE is on the development of packet primarily based services. The general goal is to develop an optimized packet primarily based access system with high rate and low latency.

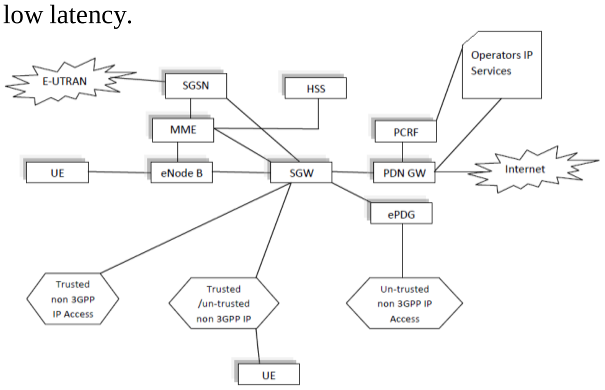

Fig.1 LTE System Architecture

III. Proposed Methodology

The methodology has been implemented in this research work is utilizing the basic concept of the CR using the OFDM. Orthogonal frequency-division multiplexing (OFDM), essentially identical to coded OFDM (COFDM) and discrete multi-tone modulation (DMT), is a frequency-division multiplexing (FDM) scheme utilized as a digital multi-carrier modulation method. A large number of closely-spaced orthogonal sub-carriers are used to carry data. The data is divided into several parallel data streams or channels, one for each sub-carrier. Each sub-carrier is modulated with a conventional modulation scheme (such as quadrature amplitude modulation or phase-shift keying) at a low symbol rate, maintaining total data rates similar to conventional single-carrier modulation schemes in the same bandwidth.

OFDM has developed into a popular scheme for wideband digital communication, whether wireless or over copper wires, used in applications such as digital television and audio broadcasting, wireless networking and broadband internet access.

The primary advantage of OFDM over single-carrier schemes is its ability to cope with severe channel conditions (for example, attenuation of high frequencies in a long copper wire, narrowband interference and frequency-selective fading due to multipath) without complex equalization filters. Channel equalization is simplified because OFDM may be viewed as using many slowly-modulated narrowband signals rather than one rapidly-modulated wideband signal. The low symbol rate makes the use of a guard interval between symbols affordable, making it possible to handle time-spreading and eliminate inter symbol interference (ISI). This mechanism also facilitates the design of single frequency networks (SFNs), where several adjacent transmitters send the same signal simultaneously at the same frequency, as the signals from multiple distant transmitters may be combined constructively, rather than interfering as would typically occur in a traditional single-carrier system.

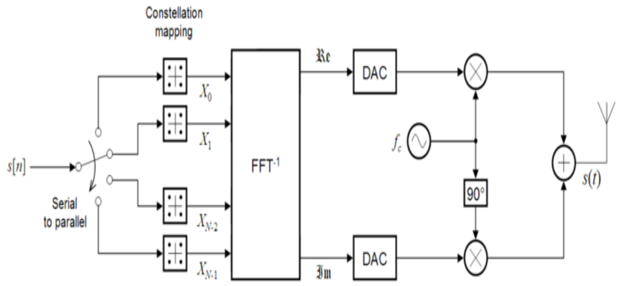

Fig.2 Transmitter

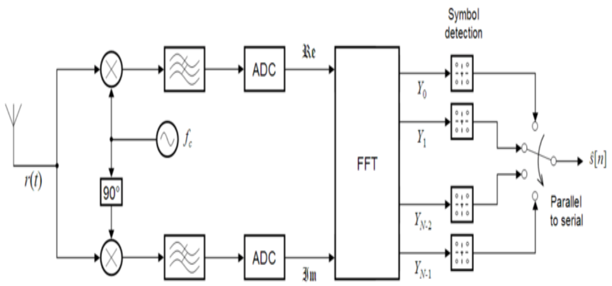

Fig.3 Receiver

IV. Result

The proposed work is efficient resource allocation in an OFDM-based CR network and simulation in MATLAB tool. There are many simulations results of research work show in below:

Fig.4 shows energy efficient of cognitive radio system as a function of the transmission power limit k=4, L=2. In this figure x level shows transmission power limit in W and y level shows the average EE of CR system in bits/symbol/joule.

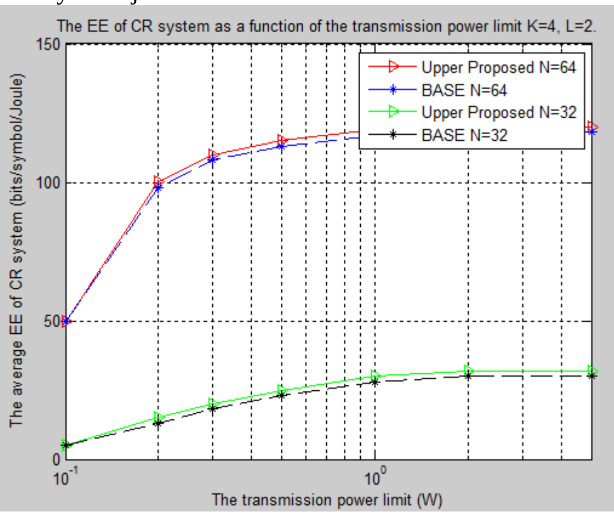

Fig.4 the EE of CR system as a function of the transmission power limit k=4, L=2

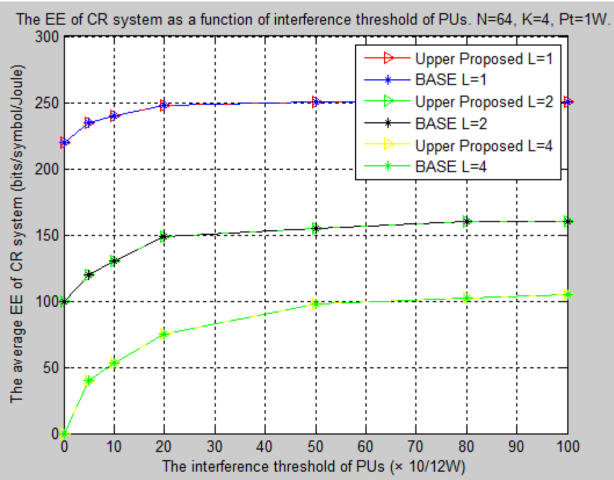

Fig.5 the EE of CR system as a function of interference threshold of Pus. N=64, k=4, Pt=1W

Fig.5 shows energy efficient of cognitive radio system as a function of interference threshold of Pus. N=64, k=4, Pt=1W. In this figure x level shows the interference threshold of PUs and y level shows the average EE of CR system in bits/symbol/joule.

Fig.6 shows energy efficient of cognitive radio system as a function of the minimal rate requirements of SUs N=64, L=2. In this figure x level shows the minimal rate requirement of each SU in bits/symbol and y level shows the average EE of CR system in bits/symbol/joule.

Fig.7 shows number of newton iterations required for convergence with 500 channel realizations. N=64, K=4, L. In this figure x level shows the random instance and y level shows number of newton iteration.

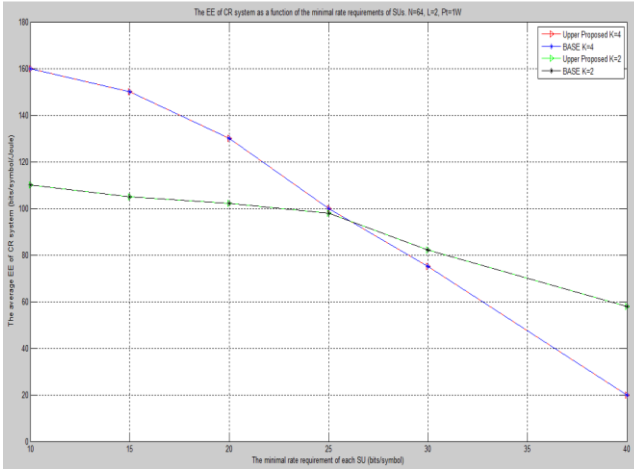

Fig.6 the EE of CR system as a function of the minimal rate requirements of SUs N=64, L=2, Pt=1V

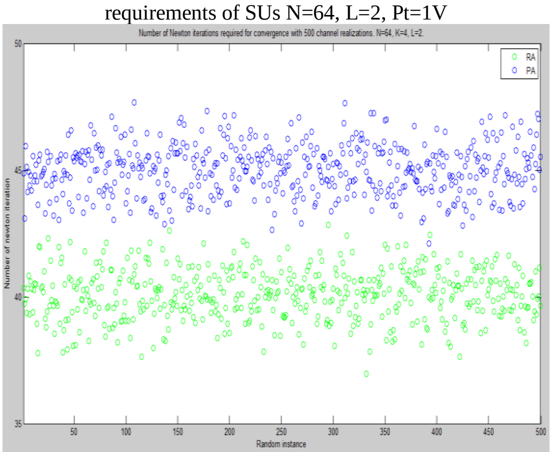

Fig.7 number of newton iterations required for convergence with 500 channel realizations. N=64, K=4, L

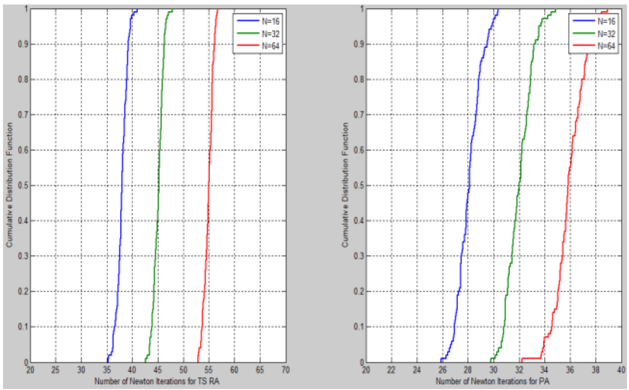

Fig.8 CDF of the number of Newton iterations required for convergence for 1000 channel realization K=4, L=2
(a) Fast barrier method for optimal RA based on time-sharing (b) fast barrier method for optimal power allocation

Fig.8 shows CDF of the number of Newton iterations required for convergence for 1000 channel realization K=4, L=2. In this figure x level shows the number of newton iterations for TS RA and PA and y level shows commulative distribution function.

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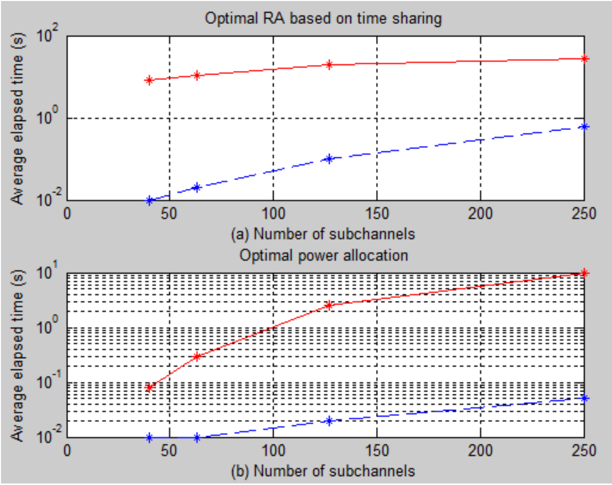

Fig.9 optimal RA based on time sharing and optimal power allocation

Fig.9 shows optimal RA based on time sharing and optimal power allocation. In this figure x level shows the number of subchannels and y level shows average elapsed time.

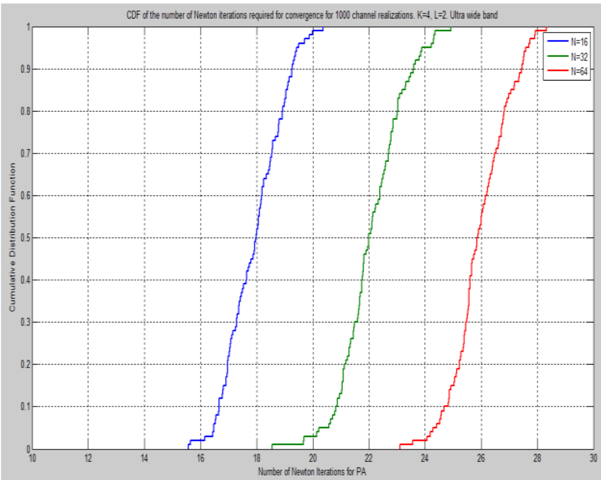

Fig.10 CDF of the number of newton iterations required for convergence for 1000 channel realization K=4, L=2 ultra wide band

Fig.10 shows CDF of the number of newton iterations required for convergence for 1000 channel realization K=4, L=2 ultra wide band. In this figure x level shows the number of newton iterations for PA and y level shows commulative distribution function.

Fig.11 shows Graph representation of optimal RA based on time sharing and optimal power allocation. In this figure x level shows the number of subchannels and y level shows average elapsed time.

Fig.12 shows Graph of Average packet timeout rate. In this figure x level shows Number of user and y level show packet rate.

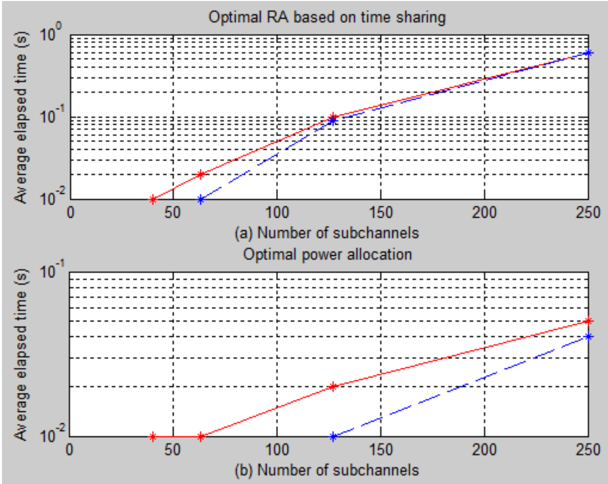

Fig.11 Graph representation of optimal RA based on time sharing and optimal power allocation

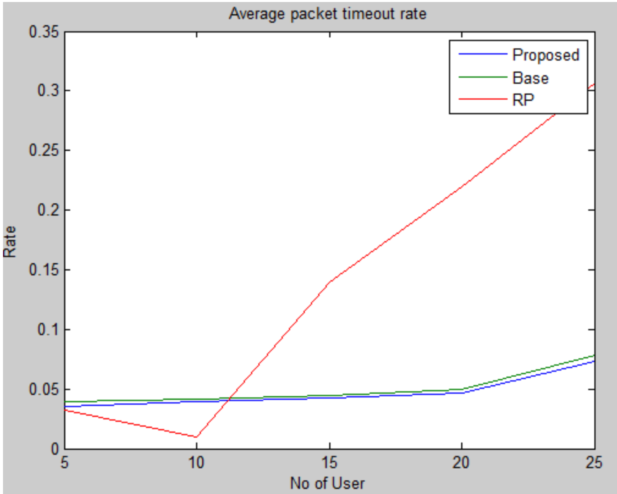

Fig.12 Graph of Average packet timeout rate

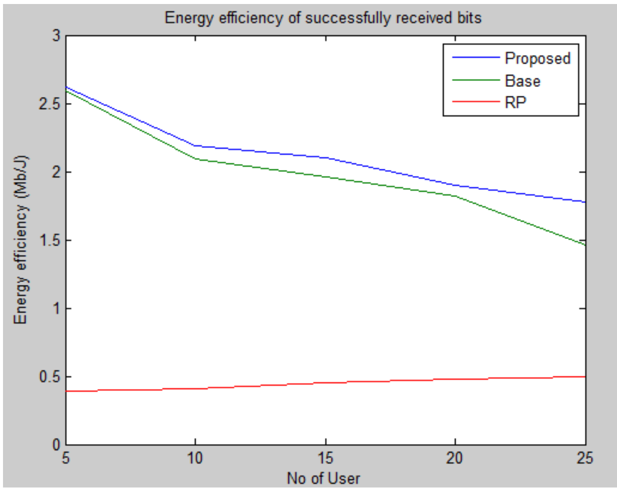

Fig.13 Energy efficiency of successfully received bits

Fig.6.13 shows Energy efficiency of successfully received bits. In this figure x level shows number of user and y level shows energy efficiency in Mb/j.

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V. Conclusion

We studied the energy-efficient resource allocation in an OFDM-based CR network, which is an urgent task for green communication design. Our model is general and covers many practical constraints, leading to an intractable mixed integer programming problem. We perform a series of equivalent transformations by analyzing the formulated problem intensively, converting it into a convex optimization problem which can be solved by standard optimization technique. Furthermore, we develop an efficient algorithm to work out the (near) optimal solution by exploiting its special structure to update Newton step in an ingenious way, reducing the computation complexity dramatically and making its applications possible. Numerical results show that our resource allocation proposal can achieve near optimal energy efficiency, while the algorithm developed in this research converges quickly and stably.

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