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Effective Resource Sharing With Universal Base-Band Processing Technology Supporting All Mobile Users

Kaustav das[1], Sangram Sahu[2]
1(Department of Electronics & Communication Engineering, Gandhi Engineering College, India)
2(Department of Electronics & Communication Engineering, Gandhi Institute For Technology, India)

Abstract: *In our paper, SRAN (single radio access network technology) supports multi-band and multi- mode communication for mobile users. In this, we address the signaling impact results of various mobile bands and its spectrum utilization, resource utilization for high speed and its reduced latency model. We deployed this architecture of network using reduced space capacity and increased network resource utilization. Achievements made by simplicity of baseband board technology. This introduces an optimization problem involving a trade-off between the number of additional bands that are required and the costs of moving through the mobile field for the purpose of spectrum usage. The Basic idea is to achieve 2G, 3G and LTE communication using a single multi-band rectangular antenna. The method proposed guarantee that no further delay or latency of the network can occur during the restoration. It considers about the energy consumption and the remaining energy of base station as well as quality of links to find energy-efficient and reliable routes that increase the operational lifetime of the network. Quality of Service of the communication network is also improved in rural or hilly regions. From this, we will analyze the multimode concurrency and conclude the performance of different bands. The performance can be shown in graphicalmodel.*
Key words: *2G, 3G, LTE communication, Effective Resource Sharing, SRAN, UBBPd6 technology*

I. Introduction

1. Communication Network Using SranTechnology

Figure 1 shows the base station functioning in an SRAN network. In this paper, users of different band technologies are considered and they are connected to RNC (Radio Network Controller) via UBBPd6 (Universal Base-Band Processing unit) card. SRAN is similar to Software Defined Radio (SDR), ie., controlling hardware using appropriate software. With SRAN, all relevant wireless technologies are supported by modular multi-standard architecture for wireless base stations (BTS). The functionality of BSC and RNC is made available on a common platform. And third, the standardization of the management solution for the network elements (NEM/ OMC) leads to economic operation and first opens the door to the use of cross-technology techniques for networkoptimization.

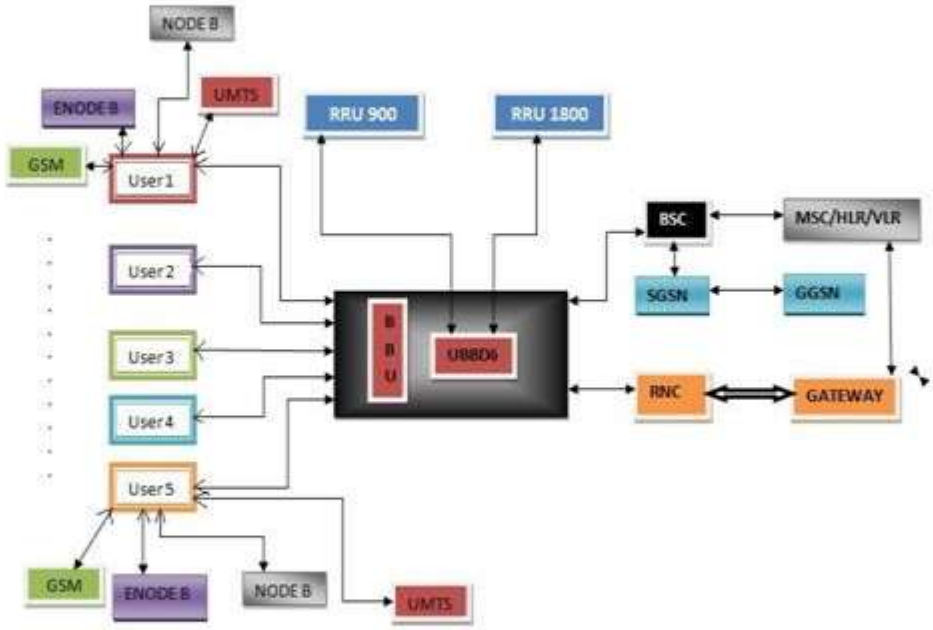

Figure 1 Proposed work –General block diagram using SRAN technology

2. Principle OfOperation

In real time, radio unit is connected to common rectangular antenna which is supporting GSM technology via diplexer. Then the radio unit is connected to base-band board through optical connection. The combination of different band function is done on a single board using SRAN solution via UBBPD6 card.

From base-band board it gets connected to SRAN. SRAN separates the different technologies according to band function and then it is connected to different gateway.

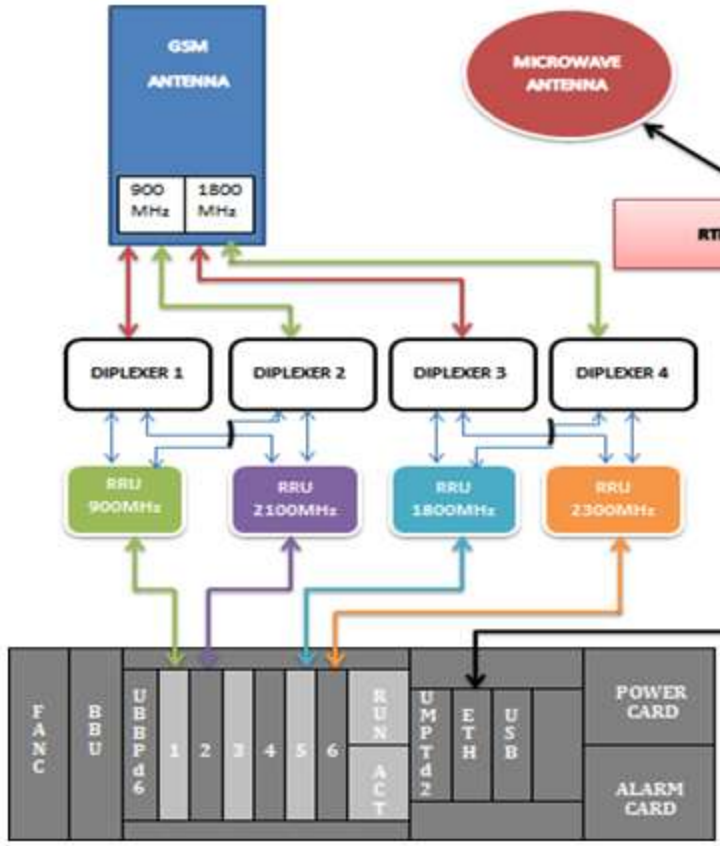

Figure 2 Block diagram of communication network using UBBPd6 card

In above block diagram, RRU 900MHz is connected to slot 1, RRU 2100MHz is connected to slot 2, RRU 1800MHz is connected to slot 5, RRU 2300MHz is connected to slot 6. Then it is processed and given to UMPTd2 card and then to receiver antenna via RTN (Radio Transmission Network) unit. The description of each unit is explained below.

The basic blocks involved are: Rectangular antenna, RRU, Diplexer, UBBPd6 card, Optical cables and connectors.

Rectangular Antenna

These antennas transmit signals from the base station to the mobile phone. They are directional and arranged in normal implementation. Every base station has three of these. Coverage area of each antenna will be within 120 degrees.

RRU (Remote RadioUnit)

One or more RRU constitute the radio frequency (RF) part of a distributed base station. RRU can be installed on a pole, wall, or stand. It can or close to antennas in order to shorten the feeder length, reduce feeder loss, and improve system coverage. RRU provide the functions such as modulate and demodulate baseband signals and RF signals, process data, amplify power and detect standing waves.

One RRU= 4Tx + 4Rx.

In 900MHz = 2G (2Tx , 2Rx)+ 3G (2Tx , 2Rx) In 1800MHz=2G (2Tx , 2Rx)+ 4G (2Tx , 2Rx)

The RRU performs the following functions:

- Receives downlink baseband data from the BBU and sends uplink baseband data for the communication between the BBU and theRRU.
- Receives RF signals from the antenna system, down-converts the received signals to IF signals, amplifies the IF signals, and performs analog-to-digital conversion. The transmitter channel filters downlink signals and performs digital-to-analog conversion, and up-converts RF signals to the TXband.
- Multiplexes RX and TX signals, which enables these signals to share the same antenna path. It also filters the RX and TXsignals.

Diplexer

It is a passive device that implements frequency-domain multiplexing. Two ports (e.g., L and H) are multiplexed onto a third port (e.g.,S). The signals on ports L and H have mismatched frequency bands. Typically, the signal on port L will occupy a single low frequency band and the signal on port H will occupy a higher frequency band. In that situation, the diplexer consists of a lowpass filter connecting ports L and S and high pass filter connecting ports H and S. Ideally, all the lowband signal power on port L is transferred to the S port and vice versa. All the highband signal power on port H is transferred to port S and vice versa. Ideally, the separation of the signals is complete. None of the low band signal is transferred from the L port to the H port. In the real time application, some power will be lost, and some signal power will leak to the wrong port. The diplexer is a different device than a passive combiner or splitter. The ports of a diplexer are frequencyselective.

UBBPD6 (Universal Base Band ProcessingUnit)

UBBP is a universal baseband processing unit and can be installed in a BBU3900 orBBU3910.It supports 8T8R per cell. It uses maximum UE per cell. It supports all technologies like GSM, LTE, UMTS etc…It has high speed and mobility. Using this card dynamic multiuser is enabled. Figure 3 shows the multiple functions of UBBPd6 card. It also converts inter frequency bands as single frequency. 7 RRU's are supported in a single UBBPD6 card. There are 6 cells and each cell bandwidth will be 1.4/3/5/10/15/20 MHz. Antenna configuration is as follows: 6x20 MHz 1T1R, 6x20 MHz 1T2R, 6x20 MHz 2T2R, 6x20 MHz 2T4R, 6x20 MHz 4T4R.A UBBP performs the following functions:

- Provides CPRI ports for communication with RFmodules.
- Processes uplink and downlink basebandsignals.
- Supports the multiplex of baseband resources among different modes, thereby implementing multimode concurrency.

The number of 2R and 4R carriers is 48 and 24. The number of uplink and downlink CEs are 1024 & 1024.

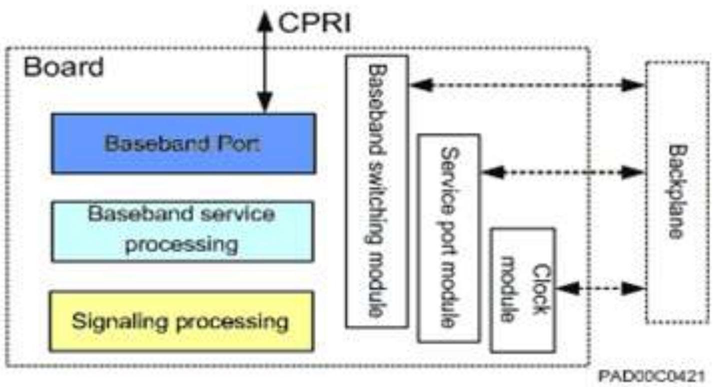

Figure 3 Principle of UBBPd6 card

In real time system, the GSM antenna has two positive and two negative terminals. Diplexer multiplexes the incoming frequencies without any interference between them. One positive terminal from 900MHz is connected to diplexer 1 and another positive terminal from 1800MHz is connected to diplexer

3. Similarly, One negative terminal from 900MHz is connected to diplexer 2 and another negative terminal from 1800MHz is connected to diplexer 4. Then RRU's are connected to BBU. In BBU, there are 6 slots in UBBPd6 card. These slots will convert the incoming bands of different frequencies into inter-mediate frequency.

4. Modules Of Our ProposedSystem

- Networkcreation
- Technologydifferentiation
- Networkoptimization
- SRAN
- Latencymodel
- SPECTRUM
- Base bandTechnology
- Multi-usermulti-band
- Energyconservation
- Life timeenhancement
- Latencyachievement

Network Creation

4 base stations are created. Each base station has the capacity to handle multiple technologies like 2G, 3G, 4G and LTE enhanced model. The base station will support for different operators as well as different user belongs to different technologies. Also we create user of different types of mobile users.

Technology Differentiation

We differentiate by showing how user connected through single base band for multiple technologies supporting user end Devices.

Network optimization

In this, we execute how the efficiency of the network planned and while on the same way explained about the network performance by adjusting network parameters.

SRAN

SRAN aims to simplify the radio access networks. Its modularity allows capacity to be scaled up. New and existing spectrum will be utilized more efficiently. Operational efficiency can be improved through network sharingand software can be used to define the functions of the hardware for ultimateflexibility.

Base bandtechnology

Multiple technologies can operate at single base-band board to utilize the spectrum effectively and to occupy less space less energy consumption reduced up to 70%.We make changes on user plane to control demand of traffic and its way to reduce latency and its energy efficiency.

With the help of above block diagram, multi-user and multi-band mobile communication is achieved by the reuse concept of frequency spectrum. Due to this, better energy conservation and reduced latency is achieved. We can address the signaling impact results of various mobile bands, spectrumutilization,resource utilization for high speed. But in our prototype model, we are considering if node is moving outside of AP or BS then fading will be more.

Advantages of proposedmethod

- High speed.
- Old and unused rectangular antennas (supporting GSM technology)can be reused in an efficientmanner.
- GSM bandwidth supports both UMTS and LTEtechnology.
- Lowcost.
- Increased network resourceutilization.
- Reducedspace.
- Reducedlatency.
- Better energy conservation.
- To support different technology functions on single spectrum to produce better network performance and cheaper.
- In future, this idea can be extended to support 5G as well as 5.5G. This may reduce the requirement of higher frequencyantennas.
- This idea can be used inTele-communicationindustry.
- Area such as terrains, mountains and hilly regions can use this technique to improve its communication

quality.

II. Simulation Results

Considering, Nodes 0,1,2,3 as base station(BS) & nodes 4,5,6,7,8,9 as users. Node 0 & 2 supports GSM technology. Node 1 supports UMTS/LTE technology. Node 3 supports GSM/UMTS/LTE technology. Nodes 7,8,9 requires 2G communication. Nodes 5,6 requires 3G/LTE communication. Node 4 requires 2G/3G/LTE communication.

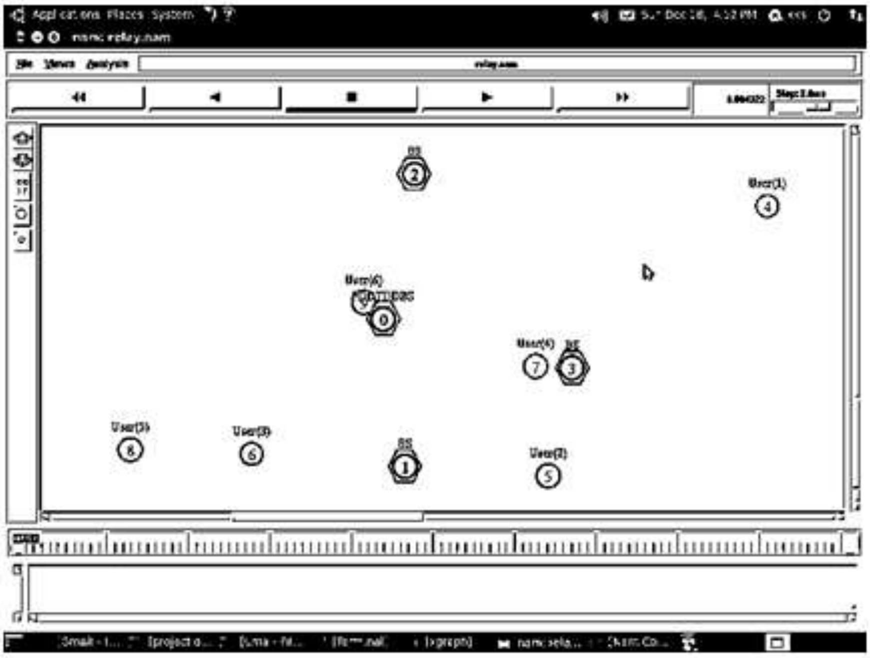

Figure 4 Creation of Users and Base Stations

In figure 5, Node 4 move towards the BS 3, node 5 move towards the BS 0 &node 6 move towards the BS 1.

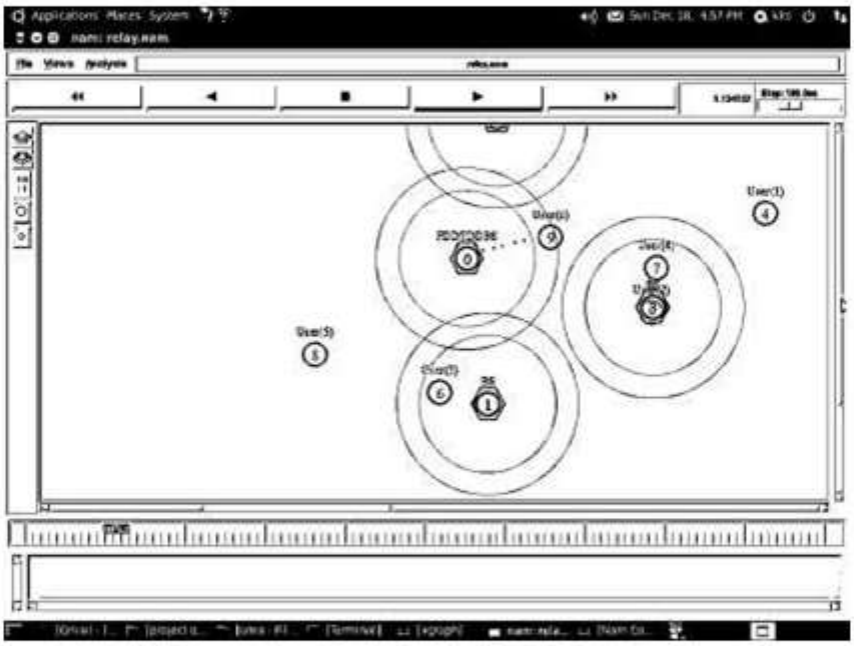

Figure 5 Parallel communication Node 0 (BS) & Node 9(user)

In figure 6, base station 3 supports GSM, UMTS, LTE technology. Users 5,6 ,7,8,9 moving towards BS 3 will be providedcommunication.

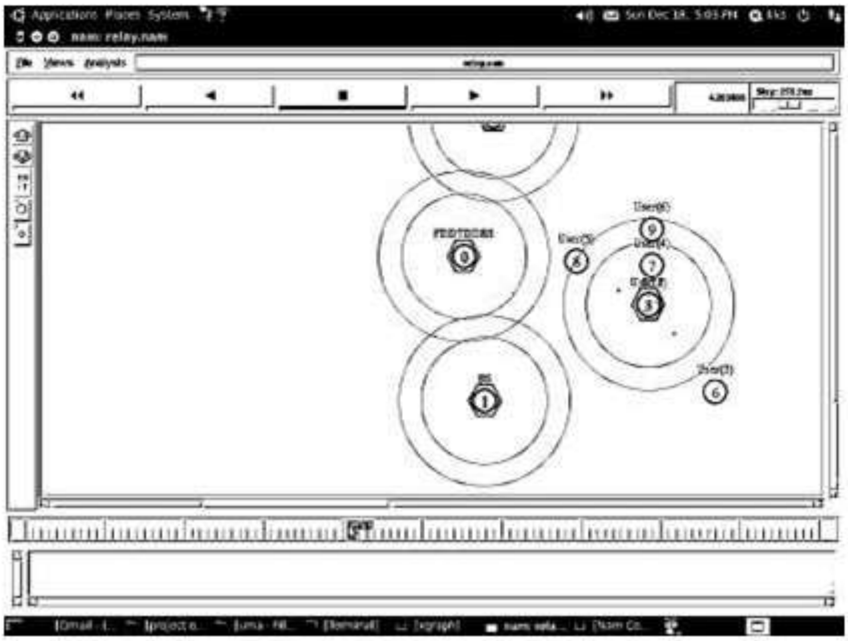

Figure 6 Parallel communication Node 3 (BS) & Nodes 5,6,7,8,9(users)

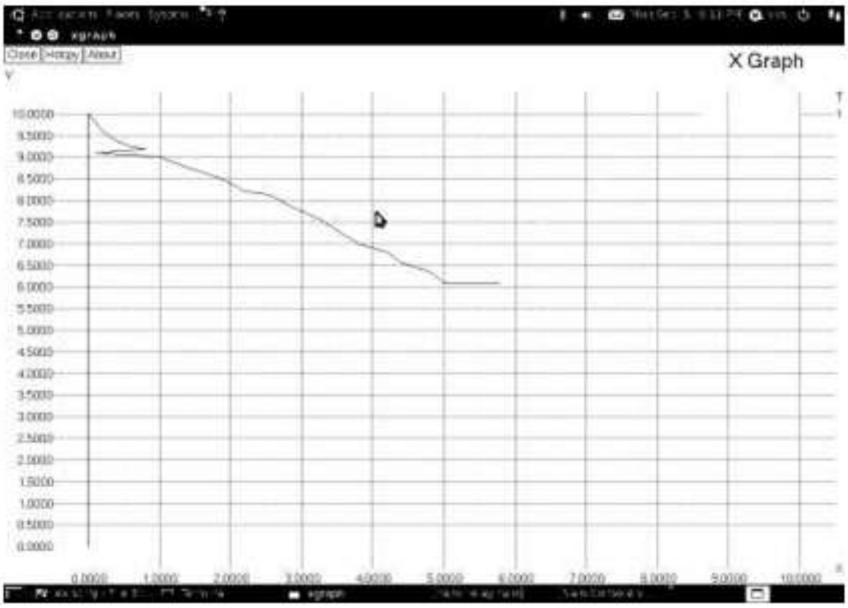

Figure 7 Network throughput with using SRAN technology and UBBPd6 card of Base station 3 which is equal to51.33 %

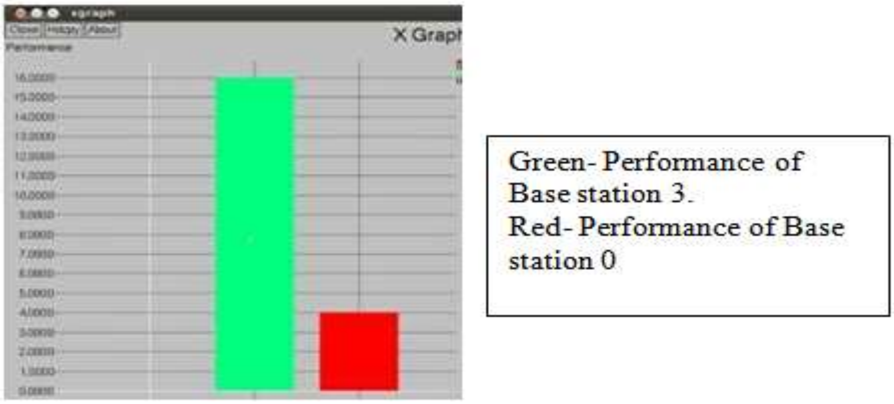

Figure 8 Performance analysis between base station 0 & 3

III. Conclusion And Future Work

Above simulation results shows the effective resource sharing (common rectangular antenna) of base-station 3 supporting different bands in same operator using universal base-band board technology. This base-band system support for multi-band concurrency. With this simulated experimental result, we conclude the performance based on user connectivity on different technologies like TDD, FDD, LTE, UMTS, GSM on individual base station that support only single technology for single mode user. In Figure 8, the performance of BS 3(supports all users with different technology) is more when compared with BS 0 (ie., supporting only 2 users). In future the network throughput should be increased by covering more area.

References

[1] Le Huy Trinh, Fabien Ferrero, Leonardo Lizzi, Robert Staraj, Jean-Marc Ribero“Reconfigurable Antenna for Future Spectrum Reallocations in 5G Communications”, IEEE antennas and wireless propagation letters, vol. 15,2016

[2] Huawei, “White paper on spectrum,” Feb. 2013 [Online]. Available: http://www.huawei.com/ilink/en/download/HW_204545

[3] Nokia white paper on “Single RAN Advanced Evolution: The future just got simpler”, June2014.

[4] S. Sesia, I. Toufik, and M. Baker, LTE—The UMTS Long Term Evolution: From Theory to Practice. Hoboken, NJ, USA: Wiley,2009.

[5] “Requirements of 4G-Based Mobile Broadband on Future Transport Networks”MatthiasFrickea, Andrea Heckwolfa, Ralf Herberb, Ralf Nitschc,SilviaSchwarzed, Stefan Voßd, and Stefan Weveringe, Journal of telecommunication and information technology,2012.

[6] “Multi-carrierspreadspectrumsystemsfromOFDMandMC-CDMAtoLTEandWiMax“,K.Fazel, S.Kaiser

[7] S. C. Del Barrio, M. Pelosi, and G. F. Pedersen, “On the efficiency of frequency reconfigurable high-Q antennas for 4G standards,” Electron.Lett., vol. 48, no. 16, pp. 982–983,2012.

[8] “Why SingleRAN is becoming ubiquitous”Huawei Publications, June2016.

[9] Radio Access Networks Design and Optimization Technology, UMEMOTO Kenichi, IMAMURA Tomoyasu ,TAKAHASHI Gen, NEC TECHNICAL JOURNAL Vol.1No.2/2006.

[10] “3G RADIO NETWORK PLANNING FOR A MOBILE NETWORK OPERATOR”, Miguel França Martins, António Rodrigues,ArturVargas.

[11] Ono et al., “RADIOSCAPE -A Radio Propagation Analyzing Service for Effective Coverage Area Design-,“ NEC Journal of Advanced Technology,Vol.1, No.4, pp.353-356, Fall2004.

[12] Mudassar Ali, AsimShehzad, Dr. M.AdeelAkram,“Radio Access Network Audit & Optimization in GSM (Radio Access Network Quality Improvement Techniques),International Journal of Engineering & Technology IJET-IJENS Vol:10No:01.

[13] Niwa, et al., "Deployment of Network Manged Services," NEC Technical Journal, Vol.1, No.2, pp.61- 64, May2006.

[14] PurnimaK.Sharma, R. K. Singh, “Cell Coverage Area and Link Budget Calculations in GSM System”,International Journal of Modern Engineering Research (IJMER),Vol.2, Issue.2, Mar-Apr 2012 pp-170-176.

[15] Amitavaghosh, Rapeepatratasuk, bishwarupmondal, nitinmangalvedhe, and timthomas, “LTE- ADVANCED: NEXT-GENERATION WIRELESS BROADBAND TECHNOLOGY”- Motorolainc.

[16] Er.Dinesh Kumar, 2Er. ManpreetKaushal,“Improve GSM Network Call Drop by RF Optimization “IOSR Journal of Electronics and Communication Engineering (IOSR-JECE) e-ISSN: 2278-2834,p- ISSN: 2278-8735.Volume 11, Issue 1, Ver. II (Jan. - Feb.2016)

[17] Richa Chitranshi, Jyoti Kushwaha, Prakash Pancholy, “Intelligent Optimization of GSM Network” International Journal of Engineering Science and Innovative Technology (IJESIT),Volume 1, Issue 2, November 2012.

[18] White paper LTE: The Future of Mobile BroadbandTechnology.

[19] Jahangir khan, “Handover management in GSM cellular system”, International Journal of Computer Applications (0975– 8887) Volume 8– No.12, October2010.

[20] AtomCell9.0 Lamp Site Solution White Paper- Huawei, Issue V1.0(2015-01-09).

[21] Ms. Deshmukh Sonali S. and Mr. Wahi Gurdeep Singh, 4G Communication Architecture, International Journal of Electronics and Communication Engineering & Technology (IJECET), 4 (3), 2013, pp. 56– 62.