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Analysis of Call Drop Problem in 3G Networks by Using KPI Report

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ABSTRTACT
This paper present, a basic Approach to radio network planning that provides effective solution in terms of coverage and quality. The objective of this study, which is coverage driven is to find the minimum number of sites required providing sufficient coverage. large no. of BTS present in the network which we check their individual & mutual performance on the basis of different parameters. In this 3G KPI parameter for GSM are used on the basis of telecom software .There are few example of parameters like total Attempted Calls, Total Dropped Calls, Total Blocked Calls etc.by improving these parameters, we improve the quality of network.

Keywords-GSM, KPI, Blocked calls, RF, Heavy Traffic

Software Used: TEM'S: Collection of log files, MAP INFO: Export of log file, PATHLOSS: proper linking purpose

1. INTRODUCTION
The Global System for Mobile communications (GSM) is a huge, rapidly expanding and successful technology. Less than five years ago, there were a few 10's of companies working on GSM. Each of these companies had a few GSM experts who brought knowledge back from the European Telecommunications Standards Institute (ETSI) committees designing the GSM specification. Now there are 100's of companies working on GSM and 1000's of GSM experts. GSM is no longer state-of-the-art. It is everyday-technology, as likely to be. Understood by the service technician as the ETSI committee member. GSM evolved as a mobile communications standard when there were too many standards floating around in Europe. Analog cellular was in use for several years in different parts of world. Even today there are few networks of Analog cellular. The experience of analog cellular helped in developing specifications for a Digital Cellular standard. The work on GSM specs took a complete decade before practical systems were implemented using these specs. GSM is quickly moving out of Europe and is becoming a world standard. In this presentation we will understand the basic GSM network elements and some of the important features. Since this is a very complex system, we have to develop the knowledge in a step by step approach.

2. GSM NETWORK COMPONENTS
A GSM network is made up of three subsystems:

1. The Mobile Station (MS)
2. The Base Station Sb-system (BSS) – comprising a BSC and several BTSs
3. The Network and Switching Sub-system (NSS) – comprising an MSC and associated registers Several interfaces are defined between different parts of the system:

ABBREVIATIONS
MSC – Mobile Switching Centre
BSS – Base Station Sub-system
BSC – Base Station Controller
HLR – Home Location Register
BTS – Base Transceiver Station
VLR – Visitor Location Register
TRX– Transceiver
AuC – Authentication Centre
MS – Mobile Station
EIR – Equipment Identity Register
OMC – Operations and Maintenance Centre
PSTN – Public Switched Telephone Network

3. PHYSICAL AND LOGICAL CHANNEL: ARFCN (200 KHz):

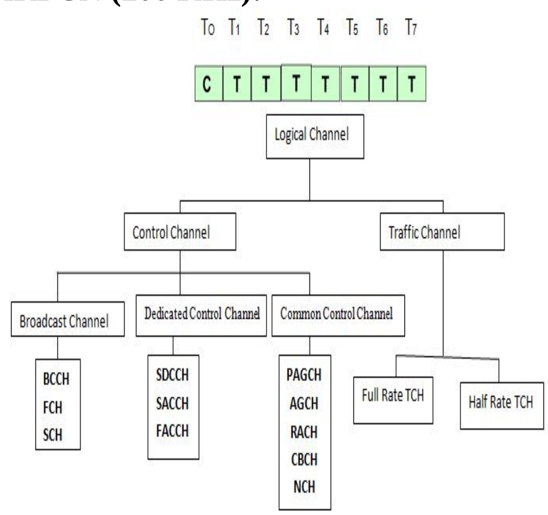

Fig. 1. Diagram Showing Logical Channels Classification

3.1 Logical Channels:

3.1.1. Traffic Channels

Traffic Channels carry either encoded speech or user data Two forms of Traffic Channels are defined :

Full rate Traffic Channel: Carries encoded information at gross rate of 22.8Kbps

Half rate Traffic Channel: Carries encoded information at gross rate of 11.4 Kbps

3.1.2. Speech Traffic Channels

Full rate Traffic Channel for speech: Speech out of encoded information is at 13 kbps

Half rate Traffic Channel for speech: Speech out of encoded information is at 6.5 kbps

3.1.3. Data Traffic Channels

Full rate Traffic Channel for 9.6 kbps user data, Full rate Traffic Channel for 4.8 kbps user data, Full rate Traffic Channel for ≤ 2.4 kbps user data

3.1.4. Traffic Channels Modes

Circuit Switching mode (transparent connection to a service like telephony), Packet Switching mode (as per recommendation X.25 or other standardized Protocols**.**

Frequency Correction Channels (FCCH): Carries Information for frequency correction of the mobile stations. (Downlink)

Synchronization Channels (SCH): Carries information for frame synchronization of the mobile stations and identification of BTS (Downlink). Contains two pieces of information: BSIC & Reduced Frame Number

Broadcast Control Channels (BCCH): Broadcasts various cell parameters and other information required by the mobile to access the network. (Downlink)

Dedicated Control Channels: Standalone dedicated control channel (SDCCH): Used for conveying signaling information (Downlink & Uplink).

Slow Associated Control Channel (SACCH): Used for conveying slow information associated with SDCCH and TCH (Downlink and Uplink).

Fast Associated Control Channel (FACCH): Associated with TCH for conveying fast signaling information (D & U).

Cell Broadcast Control Channel (CBCH): Subset of SDCCH used for broadcasting cell broadcast messages (Downlink).

RF Activities Application Segments:

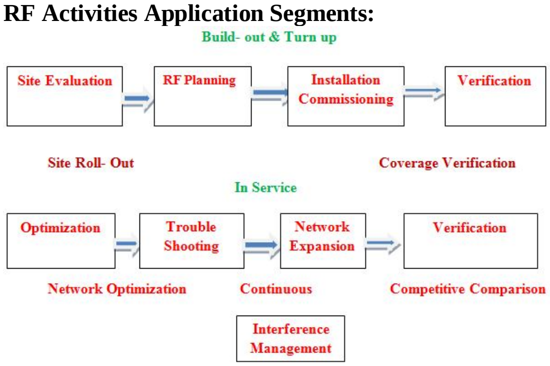

Fig.2 Block Diagram Showing RF Activities

4. SEARCH AREA SELECTION

- Study of Contour / City Map.
- Identifying potential search zones.
- Correlating with nearby existing sites.
- Drive/Walk through physical Land Survey.
- Identifying Potential Sites in Search zone.
- Physical verification of the infrastructure.
- Major obstacles around.
- Future potential of major obstacles.
- LOS to other sites.

4.1 RF Coverage Prediction

- Uses Prediction Software tool to estimate coverage
- Software has electrical map and the city contour information
- Parameters like frequency, power, antenna parameters, height, etc. are fed to the software
- Based on the city model and these parameters the tool estimates the coverage area.
- Data for all sites are fed to estimate the level of interference**.**

The data available after test transmission is analyzed by the measurement analysis system. This system consists of a work station and a plotter. The work station has software which contains the map of the geographical area to covered by the network. This map is accurate and is in terms of earth coordinates. The test transmission data is fed to this work station. The work station software then correlates this data with the map and plots out the coverage on the map. The coverage level could be preset in zones of various color like good, average, poor and no-coverage. With this map representation the sites capability is determined Prediction tool uses either area- to - area or point-to-point prediction models. Area-to-Area are based on prediction models like HATA, Walfish, etc. These prediction tools may give a standard deviation from later actual measured coverage in the range of 12 - 14 dB and above. Point-to-Point model based prediction tool are specific for a particular terrain and hence are more accurate and will have a standard deviation of 7-8 dBs and is generally accepted. Prediction tool which deviates from actual measured coverage by 2-3 db over 90% predicted area is considered to be excellent. This level of accuracy can only be maintained by consistently modeling the planning tool.

4.2 Test Transmission

- Measure test transmitter signal strength as a function of location.
- Generate Coverage Map
- Evaluate foliage and shadowing effects.
- Help set modeling parameters in RF planning software.
- Calibrate planning software tool.

The typical configuration for a pre-installation RF coverage measurement system has two major components a transportable signal source and a drive system. The signal source is placed at the location of the prospective cell site. The transmitter is elevated to the proposed antenna height of the cell site, often using a scissor lift or a crane. It may be desirable to execute the drive test with various antenna heights. Initial measurements are made with a continuous wave (CW) signal. Typically CW testing provides adequate data for pre-installation coverage assessment. In some cases a modulated signal source may be used. A decision must be made to trade off time to turn-up for a more complete coverage data set. A modulated signal source also requires a more sophisticated measurement at the receiver to capitalize on the modulation. The drive system contains a receiver to measure signal strength and a mechanism for determining location (typically GPS vehicular navigation, or both). Test Transmitter can be Single Channel CW Source; or a GSM BCH Transmitter For CW source, Receiver should be preferred in Drive Test System. Receiver can do CW measurements accurately, because Mobile does Channel Power measurement. For a GSM BCH transmitter, use a different network code, or preferably activate cell barring, to avoid traffic discrepancies.

4.3 Frequency Planning:

Frequency Re-use: GSM uses concept of cells One cell covers small part of network but Network has many cells. Frequency used in one cell can be used in another cell. This is known as Frequency Re-use.

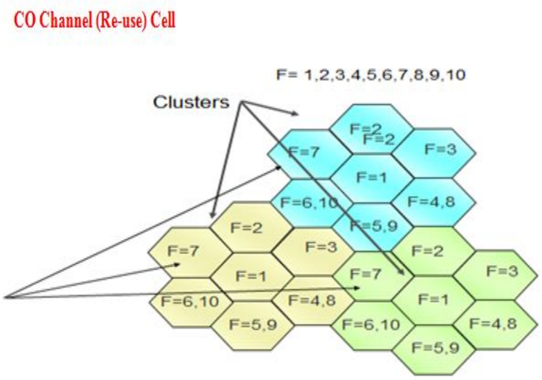

Fig.3. Diagram Showing Frequency Re-use Pattern

4.3.1 Objective:

- Optimum uses of Resources
- Reduce Interference
- Co - Channel Re-use factor

Frequency reuse implies that in a given coverage area there is several cells that use the same set of frequencies. These cells are called co-channel cells and the interference between signals from these cells is called co-channel interference. An increase in transmit power and decrease in cell size leads to this problem. Considering each cell size to be same co-channel interference becomes the function of the radius of the cell (R), and the distance to the center of the nearest co-channel cell (D). This ratio of D/R is termed as co - channel reuse ratio (Q). By increasing Q the spatial separation between two co-channels is increased thereby reducing interference. A small value of Q provides larger capacity by more re- use; where as a large value of Q provides improved transmission quality, due to a smaller level of co-channel interference.

4.3.2 Adjacent-Channel Re-use Criteria: Adjacent ARFCN's should not be used in the same cell It will have no problems in Downlink, but will have high risk of uplink interference (due to mandatory uplink power control). Adjacent ARFCN's can be used in adjacent cells, but as far as possible should be avoided. As such separation of 200 KHz is sufficient, but taking into consideration the propagation effects, as factor of protection 600 Khz should be used. In the worst, Adjacent ARFCN's can also be used in adjacent cells by setting appropriate handover parameters.

4.3.3 Re-use Patterns

Re-use Patterns ensures the optimum separation between Co-Channels. Re-use pattern is a formation of a cluster with a pattern of frequency distribution in each cell of the cluster. Same cluster pattern is then re-used. Preferred Re-use Patterns
Omni - Cells : 3 cell, 7 cell, 12 cell, 14 cell, 19 cells etc
Sector - Cells : 3/9 , 4/12

4.3.4 3/9 Re-use Pattern:

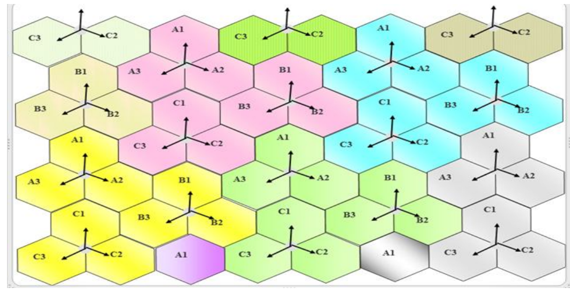

Fig.4. Diagram Showing 3/9 Frequency Re-use Pattern

4/12 Reuse Patterns:

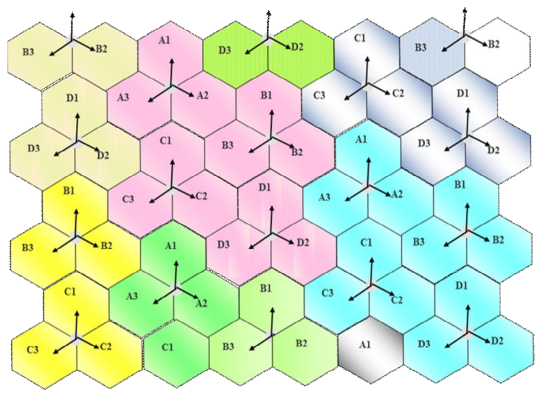

Fig.5. Diagram Showing 4/12 Reuse Patterns

4.3.5 Reuse Patterns Conclusion

- Larger reuse patterns give reduction in interference
- Re-use patterns become more effective with sectorial cell configurations.
- To implement large patterns (like 4/12, 7/21), more channels are required.

So with less resource, the best way to plan is:
1. Use optimum no of channels per cell.
2. Thus, increase the pattern size

5. CO-CHANNEL INTERFERENCE

Co-Channel Interference can be Downlink as well as Uplink Interference. Downlink Interference: If caused by. BCH carrier will be present always. Non_BCH carrier interference will be traffic dependent During peak traffic hours, the interference will be high
Uplink Interference: Uplink Co-Channel Interference will never be continues for a long period, since Mobiles always have busted transmission. So interference will be high during peak traffic hours

5.1 Causes

- Distant Cells due to tight frequency re-use patterns.

- Distant Cells due to errors in frequency planning.
- Multipath from Distant cells(strong reflector, Water).
- C/I will degrade the Ec/No, so if Noise floor itself is high, then even a high value of C/Ic can deteriorate quality.

6. Adjacent Channel Interference

Interference resulting from signals which are adjacent in frequency to the desired signal is called adjacent channel interference. Adjacent channel interference results from imperfect receiver filters which allow nearby frequencies to leak into the pass-band. The problem can be particularly serious if an adjacent channel user is transmitting in very close range to a subscribers receiver, while the receiver attempts to receive a base station on the desired channel. Adjacent channel interference can be minimized through careful filtering and channel assignments. By keeping the frequency separation between each channel in a given cell as large as possible, the adjacent channel interference may be reduced considerably. Thus instead of assigning channels which form a continuous band of frequencies within a particular cell, channels are allocated such that the frequency separation between channels in a given cell is maximized.

6.1 Causes

- Adjacent ARFCN's in same cells
- Adjacent ARFCN's in adjacent cells
- Distant Cells due to tight frequency re-use patterns.
- Distant Cells due to errors in frequency planning.

6.2 Sources

- Malfunctioning or Maladjusted Transmitters
- Base station malfunction, rogue Mobile
- Paging, broadcast, etc.
- Intermodulation Products
- Strong signals in adjacent channels
- Harmonics from Other Bands
- Radar- Big problem near harbors

6.3 Coverage Planning

Coverage in GSM network stands for the geographical area covered by the network from which mobile is accessible to the network. In GSM Coverage area is planned in division of cells. Each cell covers a particular geographical area, the size of which depends on the terrain and other system configurations. Generally the more the number of cells, the better the coverage, but by just creating cells may not give good quality of coverage.

Mobile Communications Propagation: Mobile Communications propagation is impacted by

- Path Loss
- Reflection
- Diffraction

Path Loss: The basic path loss is the transmission loss in free space

Lfsl = 32.4 + 20 log d(in Kms)+ 20logf(in MHz)

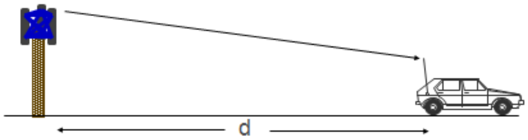

Fig. 6. Diagram Showing Path loss

At 900 MHz, at a distance of 1km, Loss = 91.5 db. Actual prediction of loss cannot be done on this, since in a mobile environment the mobile will receive signals from several reflections. The above formula is only valid under direct LOS and no reflection conditions.

Reflection:

- Reflection occurs when a propagating electromagnetic wave impinges upon a surface which has very large dimensions as compared to the wavelength of the propagating wave.
- Reflections occur from surface of earth, buildings, walls and water.
- The wave is partially absorbed and partially reflected.
- Amount of absorption will depend on the reflection coefficient of the reflecting surface.
- Reflection coefficient is function of the material properties and depends on wave polarization , angle of incidence and the frequency.

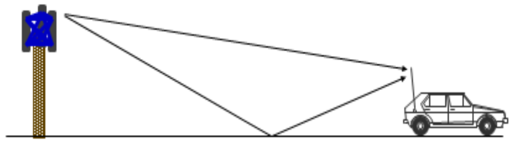

Fig. 7. Diagram Showing Reflection

Path loss for 2 -ray Model (over flat conductive surface):

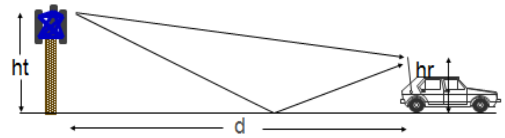

Fig.8. Diagram Showing Ray Model

L2ray = 40 log d -(20 log ht+ 20 log hr).

Analytical formula, only valid for larger distances (> 10 Km) Loss increases at larger distance at a rate of 40db /dec. At 900 MHz, 10,000m distance, ht = 100m, hr = 1.5m, Lfs = 111.5 dB, L2ray = 116.5 db. This indicates that in 2 ray path, additional loss of 5 db

Diffraction: Diffraction allows radio signals to propagate around the curved surface of earth and behind obstruction.

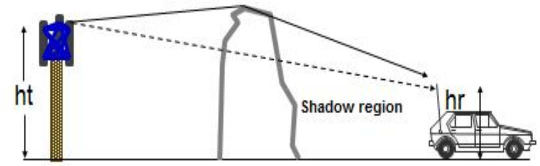

Fig. 9. Diagram Showing Diffraction

7. HUYGEN'S PRINCIPLE ON PHENOMENON OF DIFFRACTION

All points on a wave-front can be considered as point sources for the production of secondary wavelets, and that these wavelets combine to produce a new wave-front in the direction of propagation Diffraction is caused by the propagation of secondary wavelets into the shadowed region**.** Diffraction is of two types in general

7.1 Smooth Sphere Diffraction

Diffraction takes place through almost a flat surface.

7.2 Knife Edge Diffraction

- Hills, Mountains, Buildings will cause knife edge diffraction
- In a Mobile environment most of the diffraction is knife edge**.**

8. CALCULATION OF DIFFRACTION LOSS

Fresnel zone geometry

Area around the LOS within which diffraction can result into anti phase (180 deg) condition is the first Fresnel zone.

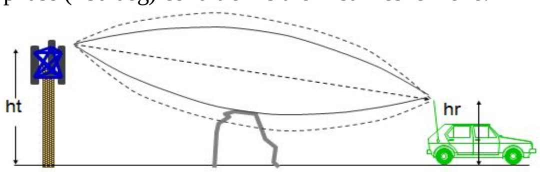

Fig.10. Diagram Showing Fresnel Zone Diffraction

If an object is within the Fresnel zone or completely blocks the zone, then also energy will arrive at the receiver but will diffraction loss. In Mobile environment, we are not worried about clearance, but only with the loss.

8.1 Calculation of Diffraction Loss: Fresnel diffraction parameter (v):

Indicates the position of the object with reference to the Fresnel zones (0 means, object tip on LOS, 1 means tip on 1st Fresnel zone on upper side).

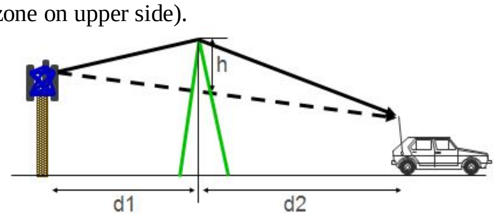

Fig.11.Diagram Showing Calculation of Diffraction Loss

$$V = \sqrt[h]{2(d1 + d2/\lambda d1d2}$$

From "V" , we can compute the diffraction loss

8.2 Calculation of Diffraction Loss: Relation of "v" with diffraction loss:

Loss(dB)=0 $v \leq -1$
Loss (dB) = 20 log (0.5 - 0.62v) $-1 \leq v \leq 0$
Loss (dB) = 20 log (0.5 exp (-0.95v $0 \leq v \leq 1$
Loss(dB)=20log(0.4-0.1184-(0.38-0.1v) $1 \leq v \leq 2.4$
Loss (dB) = 20 log (0.225) $v > 2.4$ **6**

8.3 Path Loss Predictions for GSM

Selection of models for predicting path loss for GSM will depend on the cell ranges. GSM has 3 cell ranges and different prediction model for each

8.3.1 Large Cells: Antenna is installed above the maximum height of the surrounding roof tops. Propagation is mainly by diffraction and scattering at roof tops in the vicinity of the mobile i.e. the main rays propagate above the roof tops. Cell radius is mainly 1 km and normally exceeds 3 km. Hata's model and the COST 231-Hata model can be used to calculate path loss in such cells.

8.3.2 Small Cells

Antenna is sited above the median but below the maximum height of the surrounding roof tops. Propagation mechanism is same as large cell**,** Maximum range is typically less than 1 - 3 kms. Hata model cannot be used since it is applicable above 1 km. COST 231-Walfish-Ikegami model is used for radius less than 5kms in urban environment.

Microcells: Cell in which the base station antenna is mounted generally below roof top level. Propagation is determined by diffraction and scattering around buildings ie. the main rays propagate in street canyons. Microcells have a radius in the region of 200 - 300m. Microcells can be supported by smaller and cheaper BTS's.

9. MICROCELLS MODEL

With a free LOS between bs and ms (Street Canyon)
Path Loss (GSM 900) = 101.7 + 20 log (d) for d > = 0.020 km
Path Loss (DCS 1800) = 107.7+ 20 log (d) for d > = 0.020 km
Propagation loss in microcells increases sharply as the receiver moves out of LOS, (ex: around a street corner). 20db of loss could be added per street corner, up to two or three corners. Beyond, the COST231 - Walfish Ikegami model should be used.

9.1 Critical Network Implementation Features:

- Dynamic Power Control
- Discontinuous Transmission
- Frequency Hopping
- Intra-cell Handover

9.2 Dynamic Mobile Power Control:

- Mobile is commanded to change its Transmit Power
- Change in Power is proportionate to the Path Loss
- Change is Power is done in steps of 2 dbs

10. Frequency Hopping

Multipath Fading results in variations in signal strength which is known as Rayleigh Fading. Rayleigh Fading phenomenon is dependent on path difference and hence frequency of reception. A fast moving mobile may not experience severe effect of this fading since the path difference is continuously changing. A slow moving mobile (or a halted mobile) may experience severe deterioration in quality. But, if the frequency of reception is changed when this problem occurs, could solve it. The fading phenomenon is fast and almost continuous, this means the frequency change should also be continuous. This process of continuously changing frequency is known as Frequency Hopping. Frequency Hopping is done in both Uplink and Downlink .Frequency is changed in every TDMA Frame Mobile can Hop on maximum 64 frequencies. The sequence of Hopping can be Cyclic or Non-Cyclic, There are 63 Non-Cyclic Hopping sequences possible Different Hopping sequence can be used in the same cell. BCH Timeslot can never HOP, but the remaining Timeslots can very well hop.

10.1 Troubleshooting & Optimizing GSM Networks: Troubleshooting:

- Blocked Calls
- Poor Quality and Drop calls

- Abnormal Handovers
- Interference
- Termination Failures

10.2 Blocked Call Troubleshooting

Blocked Calls can occur due to

- Access Failures
- SDCCH Congestion
- SDCCH Drop
- TCH Congestion

10.3 Blocked Call - Cause troubleshooting

- CCCH Overload at the Base Station
- Uplink Interference at the Base Station
- Low Rxlev at the Base Station
- Base Station TRX decoder malfunctioning
- Downlink Low Rxlev (Coverage Hole)
- Downlink Interference
- Excess Cell Range

10.4 Access Failure - Uplink Problem: Causes

- AGCH Overload at Base Station
- RACH Collisions
- MS out of Range
- Poor Uplink quality
- BTS Receiver Problem

10.5 RACH Non-Detection:

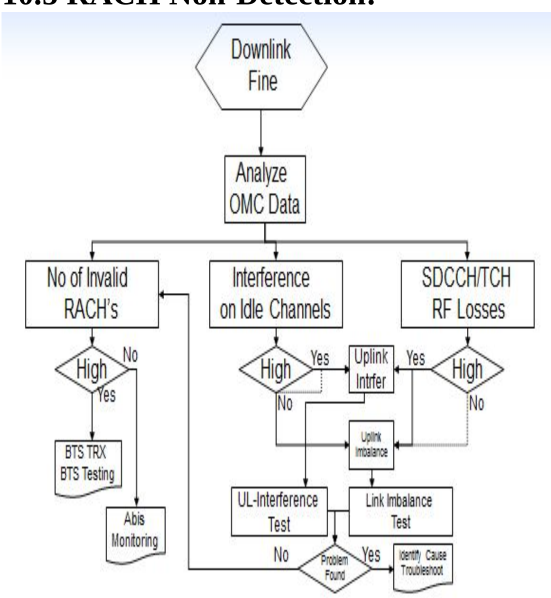

Fig.12.Block Diagram Showing RACH Non Detection

Now let us go a step further in understanding the most probable causes behind call block problems.

10.5.1 Access Failures

It could simply be caused by coverage holes . Interference could however play an important role. Uplink interference on a serving cell can result in RACH rejections and hence no AGCH assignments. Improper channel distribution between AGCH and PCH (paging channel) can result in RACH/AGCH overloading. Paging Failures can be impacted by BCH pollution (co-channel and adjacent channel interference).

10.5.2 SDCCH Blocked

Heavy Traffic and excessive Location Updates can result in congestion of SDCCH resources. Interference can block the channels, so though resources are available they may not be able to be used.

10.5.3 TCH Blocked: Heavy Traffic is the main cause of TCH congestion. The TCH can also be blocked due to continuous interference in the uplink. Solutions to access failures would be to ensure continuous coverage and optimization of CCCH configuration parameters. For TCH and SDCCH congestion, the hot spots need to be identified and load sharing techniques implemented. Some techniques that have been used successfully involve adjusting cell powers to vary the coverage and therefore the location where mobiles will hand over from one cell to the next. Interference management is essential for optimum network performance. Location updates can be optimized by independent drive tests on the ALL BCH carriers. The delta is measured of each BCH with the current serving BCH and the Reselect Hysteresis parameters adjusted appropriately.

11. SDCCH CONGESTION CAUSE

11.1 Location Updates

To be analyzed with OMC statistics first. If high, determine the source to target cell ratio**,** Drive around the suspected area in the Idle Mode Configure “Delta LAC < > Constant 0” alarms Optimize Location Updates

Interference: Analyze OMC statistics on “Idle Channel Interference” Carry out Uplink Interference Measurements using Viper.

Heavy Traffic: Verify from OMC statistics SDCCH Congestion Carry Call Setup Time measurements

Optimize set up time if high, else modify channel configuration

TCH Blocked – Causes Interference: Verify Idle Channel Interference reports from OMC If suspected, carry out uplink interference measurements

Heavy Traffic: Verify the TCH Holding time and no of attempts statistics from OMC during low traffic hours, Activate Cell barring in the cell Carry out Time slot testing, by setting Ignore Cell Barring.

11.2 SOLUTIONS TO BLOCKED CALLS

- Optimize coverage
- Optimize Cell loading
- Interference management
- Channel configurations
- Optimize neighbors

12. BLOCKED CALL – INTERFERENCE

- Base Station Measures Uplink Interference on Idle Timeslots
- At regular intervals, categorizes Timeslots into Interference Bands.
- There are Five Interference Bands.
- Each Interference Band has a range of interference level.

Example:

Interference Band1= -105 to -95 dbm
Interference Band2= - 95 to -85 dbm
Interference Band3= - 85 to -70 dbm
Interference Band4 =- 70 to -50 dbm
Interference Band5= -50 dbm and above

- Network will assign Timeslots starting from lower band
- Interference Band “5” Timeslots are considered as “BLOCKED”
- OMC reports Hourly average statistics for each timeslot.

12.1 Network Initiated Drops

Certain network features, like preemption, can kill an ordinary call to provide connection to an emergency class subscriber. A handover is the key to survival from dropping calls. But if there are problems in the Handover process itself, then this will not avoid a drop. Dropped calls can be effectively reduced by improving coverage, detecting and reducing interference, setting appropriate Handover Margins, thresholds for handovers and the correct selection of neighbors. Use of DTX and dynamic downlink power control will also reduce average interference which should lead to some improvements.

12.2 Drop Call - Troubleshooting

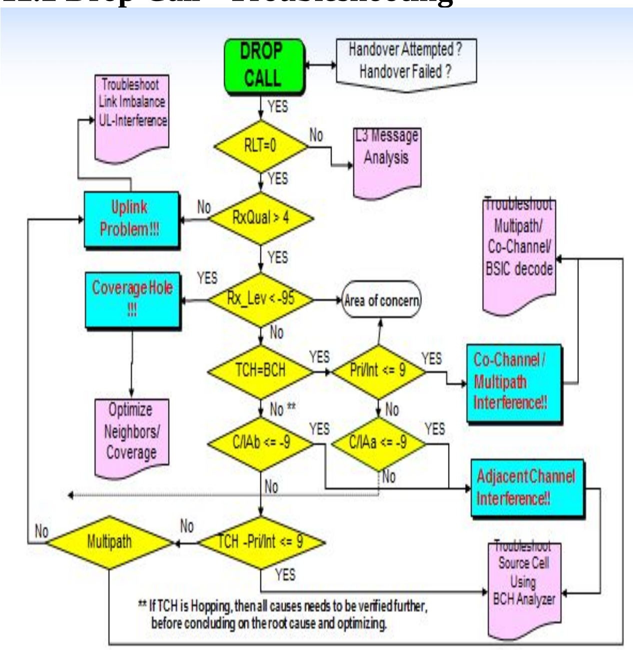

Fig. 13 Flow Chart of Dropped Call Troubleshooting

12.3 Poor Quality

Poor Speech Quality could be due to

- Patchy Coverage (holes)
- No Target cell for Handover
- Echo , Audio holes, Voice Clipping

12.4 Interference

- Co-channel
- Adjacent channel
- External
- Multipath
- Noise

12.5 Speech Quality Parameters

- RxQUAL: Measured on the midamble. Indicates poor speech quality due to radio interface impairments
- FER: Measured on the basis of BFI (Ping -Pong effect on speech) Preferred under Frequency Hopping situation
- Echo and distortion: Generally caused by the Transmission and switching system.
- Audio holes: Blank period of speech, due to malfunctioning of Transcoder boards or PCM circuits.
- Voice Clipping: Occurs due to improper implementation of DTX.
- Mean Opinion Score (MOS) : ITU standard for estimating speech quality.

Table-1 Representation of Speech Quality – Estimation

Spe ech	Rx Qual	FER	FH	DT X	Reason
BA D	HIGH	LOW	NO	NO	Air Interface impairment
BA D	HIGH	HIGH	NO	NO	Severer Air Interface impairment
BA D	LOW	HIGH	NO	NO	Transmission &Switching System, Transcoder
BA D	LOW	HIGH	YE S	NO	Air Interface impairment
BA D	GOOD	HIGH	YE S	NO	Transmission &Switching System, Transcoder
GO OD	HIGH	LOW	YE S	NO	Hopping Implementation
CLI PPI NG	LOW	HIGH	YE S	YE S	Hopping Implementation & VAD
CLI PPI NG	LOW	LOW	YE S	YE S	VAD
EC HO	LOW	LOW	Y/ N	Y/N	Transmission &Switching System, Transcoder

MOS up to a certain extent can easily estimate by configuring an algorithm using the Alarms in the HP E74XX systems for the following elements, an example of subset of which is illustrated above

- Rx Qual Full and Sub
- Rx Lev Full and Sub
- FER and RLT
- L3 Measurement Report
- L3 Handover specific messages

12.6 Troubleshooting Handover Problems

- Total Attempted Calls
- Total Dropped Calls
- Total Blocked Calls
- Rx Qual Full
- Rx Level Full
- RLT Current Value
- ARFCN
- Neighbor Cell Measurements
- RR Message
- Phone State
- Sequence Number
-

13. ANALYSIS OF CALL DROP PROBLEM IN 3G NETWORKS BY USING KPI REPORT:

13.1 Downlink Signal Level (Rx Lev, dBm):

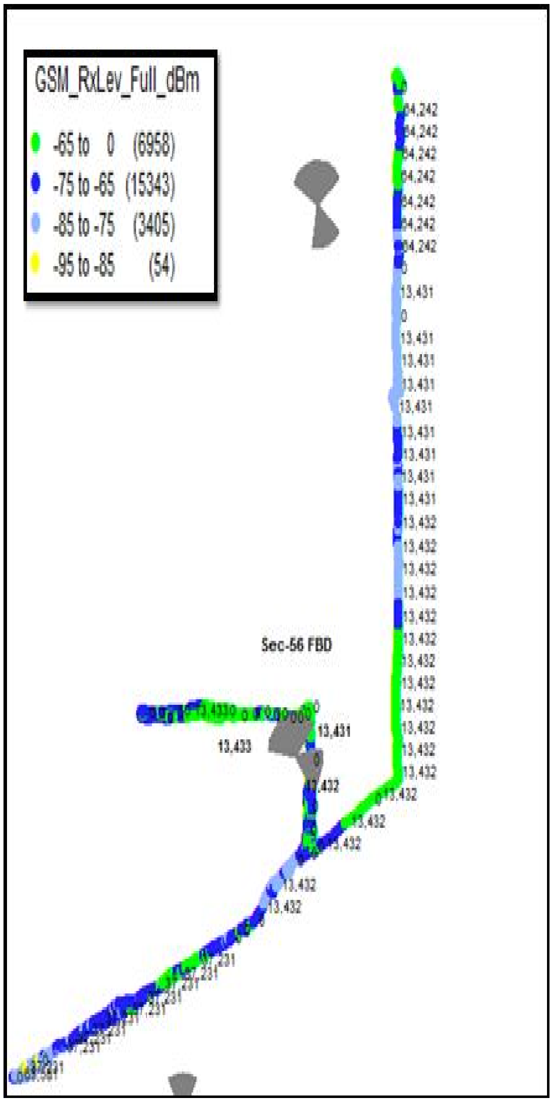

Fig. 14. Plots of Downlink Signal Level (Rx Lev, dBm)

13.2 Downlink Signal Quality (Rx Qual):

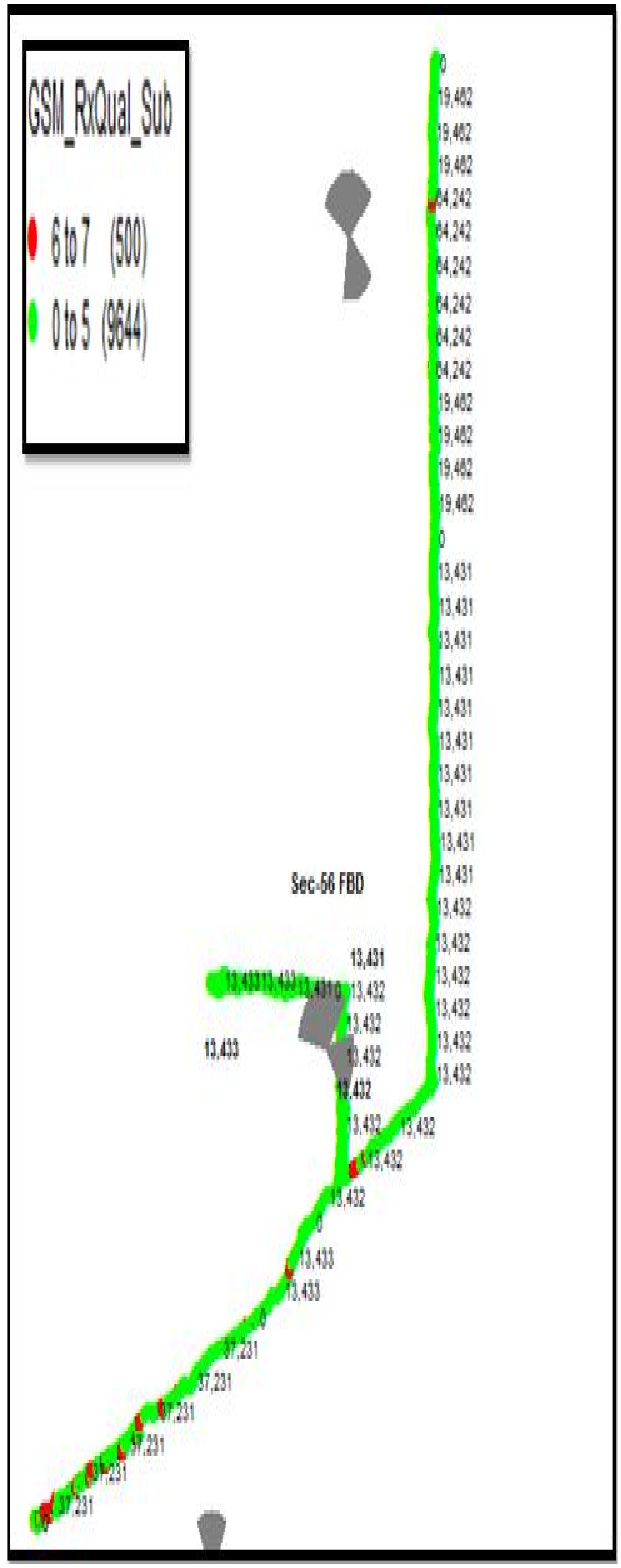

Fig. 15. Plots of Downlink Signal Quality (Rx Qual)

12.3 Downlink Signal Level

Table.2. Representation of Downlink Signal Level

Rx_Lev Samples distribution		
Range(dbm)	**Samples**	**% of Samples**
-35 to -65	**6958**	**27.01**
-65 to -75	**15343**	**59.56**
-75 to -85	**3405**	**13.22**
-85 to -95	**54**	**0.21**
-95 <	**0**	**0.00**

12.4 Downlink Signal Quality

Table. 3. Representation of Downlink Signal Quality

Rx_Qual Samples distribution		
Range	**Samples**	**% of Samples**
< =5	**9644**	**95.07**
6 To 7	**500**	**4.93**
other	**0**	**0.00**

Table. 4. Result of Call Event

Call Event		
Event	**Value**	**Comment**
Blocked Call	**0**	
Call Estabilised	**15**	
Call Attempted	**15**	
Call Attempted Retry	**0**	
Call End	**15**	
Call Setup	**15**	
CSSR	**100%**	**GOOD**
Droped Call	**0**	
CDR	**0 %**	
Hand Over	**17**	
Handover Failure	**0**	
HSR	**100%**	
Locatio Area Update	**4**	
Locatio Area Update Failure	**0**	

13. CONCLUSION

In this Paper, analytically proved that we can optimize an existing cellular network using optimization tools likes TEM'S, MapInfo and fine parameter tuning. By giving some input for planning and optimization we get these information from traffic Report, customer complain and drive test. After analyzing all required data we can know what steps we need to do. Each operator has their own KPI. Operator wants to fulfil their target according to their KPI Report and they must think about it within their bandwidth limitation. This study would help to plan operators to maintain coverage Level, improve quality and increase capacity. Every mobile operator should give attention towards better network dimensioning & topology, allocated bandwidth, traffic prediction & modeling. BAD Spot 1 has poor quality and Call Drop, this spot is covered by Cell 3459, Poor Coverage. Level below -85 dbm, but Call should not Drop, the other Problem is Interference, Co-Channel on BCH is very high.,95.7% of the time quality will be very Good,.

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