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# Improve GSM Network Call Drop by RF Optimization

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***Abstract***: All GSM Service Provider uses KPI (Key Performance Indicator) to monitor their quality of service (QOS) Performance. Nowadays major issue is call drop in GSM. So if optimization major issue is call drop in GSM. So RF optimization and drive test is tool to find reason of call drop. To improve the the performance of the service provide. In this research paper some practical cases and solutions are adopted to reduce the call and increase the customer and profit of the service. Major parameters Rxlevel, Handover failuer, Rxquality, C/A worst, etc. Drive test tool Ascom TEMS 16.3.1 and analyser mapinfo 9.3 used to perform drive test and analyse log files recoded in TEMS to find problem and give the si\olution of call drop. In addtion the RF drive test simulation results is attached which can clearly shows that call drop id reduced and imrovement in the parameter
***Keywords:*** *GSM; RF; TEMS; MAPINFO; C/I*

## I. Introduction

The GSM network is divided into two systems. Each of these systems are comprised of a number of functional units which are individual components of the mobile network. The two systems are:
• Switching System (SS)
• Base Station System (BSS)
In addition, as with all telecommunications networks, GSM networks are operated, maintained and managed from computerized centers.[5]

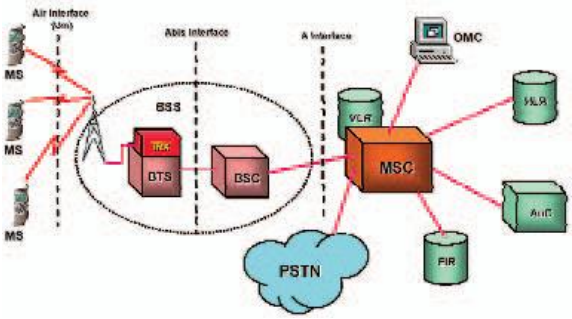

Fig-1 GSM Architecture

The Network and Switching Sub-system (NSS) – comprising an MSC and associated registers Several interfaces are defined between different parts of the system:

As there are limitation of frequency spectrum hence frequency reuse principle is adopted. In GSM we are using 890-915 Mhz and 935-960 Mhz Band[6].

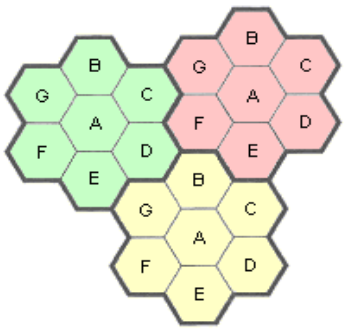

Fig-2 Frequency reuse

IN the research paper we have done pre drive test and post drive test and we analyses the no. call dropped, blocked call and handover failure are reduced.

## II. Methodology

### *A.* About software

Tems 16.3.1 is drive tset tool for measuring and monitoring the network parameter.

The supported networks for this tools are:

- GSM
- WCDMA
- HSPA
- LTE
- CDMA

Tems investigation is an effective for masuring and tmonitering the digital network . The data is collected by the Tems investigation is stored in laptop. The measurment results provides useful information for network optimization , verification, and maintenance purpose. The result can be easily viewed by using Tems analysis tool Mapinfo.But before start drive test tool kit should be ready.The drive test tools as follows

- TEMS software
- Drive test mobile phone (e.g. Ericsson TEMS)
- External vehicle mounted GPS
- Laptop with drive test software and GPS connection capability and data cables, multi-connector port etc.
- Car Inverter
- Car

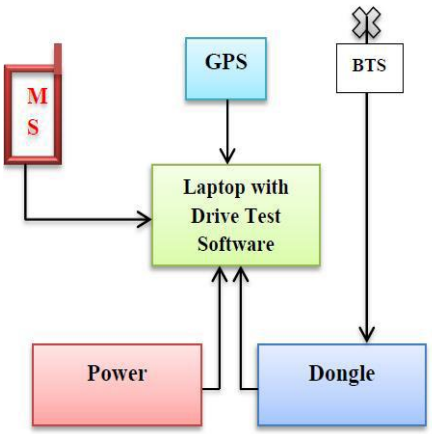


Fig-3 Drive test system

Connect the drive test kit properly as shown in figure. After connecting the drive test kit prepare the drive test route and then start drive test. The windows of tems software as shown in figure.

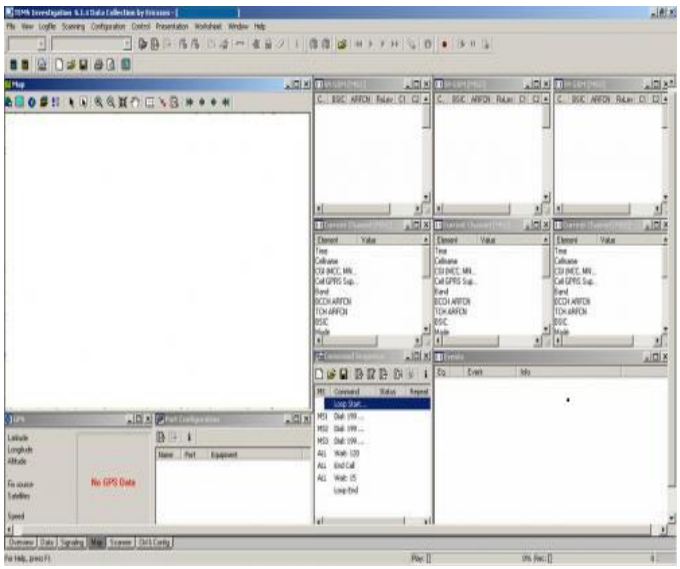

Fig4- TEMS SOFTWARE

Before state the drive test we should ensure that complete kit is connected properly, also ensure that all devices connoted are working properly.

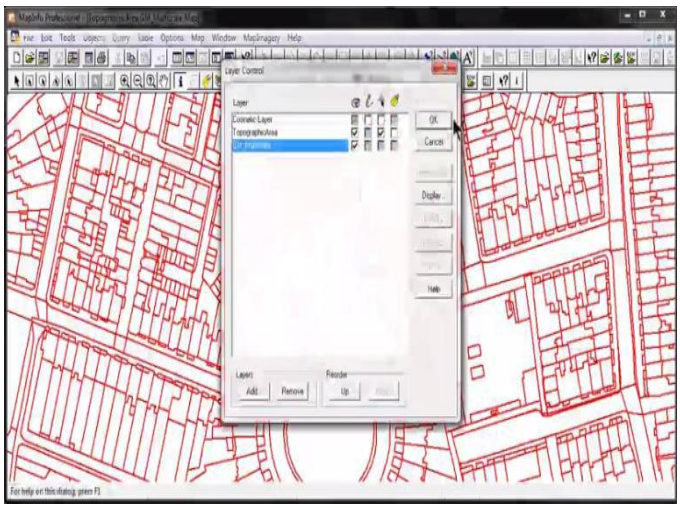

Fig5- MAPINFO PROFESSIONAL SOFTWARE

After measurement data has been analyzed which is recoded through TEMS software during drive test, the that data will converted to .tab file in order to allow it to be opened on Mapinfo Professional as shown in figure 5. Mapinfo professional used to perform the calculation such as percentage of coverage and quality. Mapinfo opens the .tab files converdet by the TEMS investigation. So if we want to open the file in mapinfo we need to convert it to the tab file first.

## III. Drive Test Route

Now after connecting and check the kit we start drive test , first we done pre drive test . in the pre drive test we analysis the network. In the drive test we record the files for the long call and short call. We will connect the sony ericsson TEMS handset. We will keep MS1 in idle mode MS2 in dedicated mode in short call and MS3 in also dedicated mode but for long call. For connecting call MS2 and MS3 we will run script which made MS2 and MS3 in dedicated mode. MS2 connecting in short call after a short period the call will be disconnected and again connected vice versa. The long call will be connected till the drive is over. The log files are saved in folder on laptop memory. the results of pre drive test recorded as follows

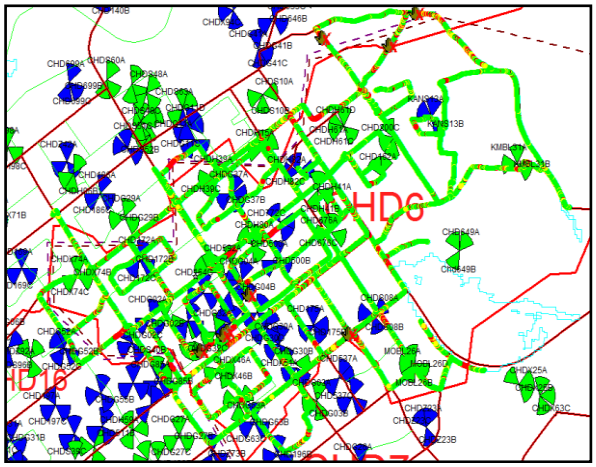


Fig6- Drive test route

Fig6 shows the drive test route where we have to find the call drop and optimize the call drop.

## IV. Analysis And Results

In this research paper we will discuss about the call drop in long call.Fig- shows the result generated by the TEMs from the log files saved during the drive test.

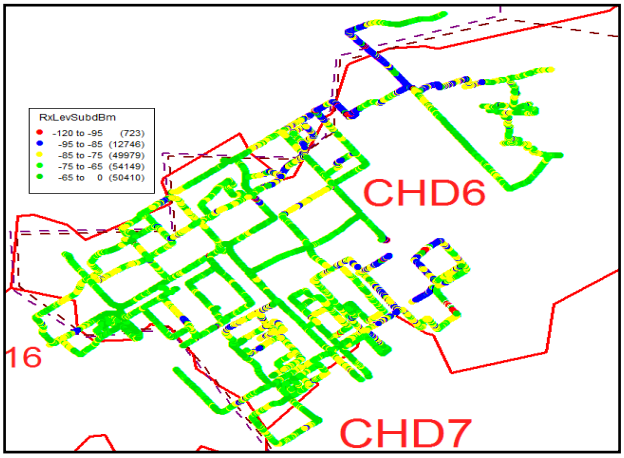


Fig7- RX LEVEL Before optimization

Fig 7 shows the Rxlevel before optimization. In this pre drive test there is somewhere is problem of poor Rxlevel. That poor Rxlevel might be the reason of call drop.

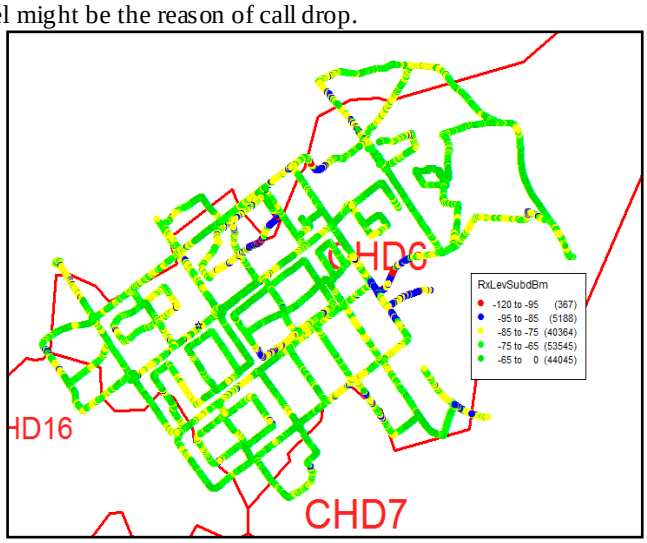


Fig8- RX LEVEL after optimization

Signal strength before and after optimization shows in fig7 and fig8. Red dodded in fig 7 iand fig 8 where the poor signal strength exist. We can see the difference before and after optimization.

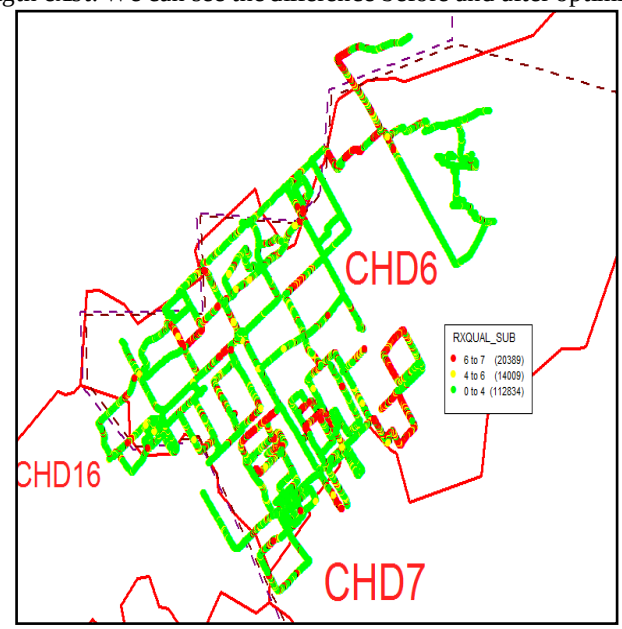


Fig9- RX QUALITY Before optimization

Fig -9 shows the rx quality before the optimization. Range for RxQual is from 0 to 7. From the range, best quality is 0 while 7 is the worst quality. Good quality is from 0 to 2. Based on red dotted in Fig. 9 and Fig. 10, it is proven that signal quality is improved afteroptimization.

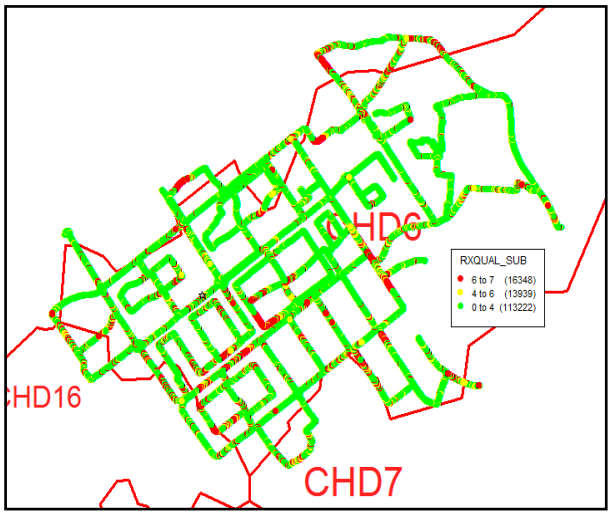


Fig10- RX LEVEL after optimization

In the fig 10 shows the improved quality after optimization

| Event | #[no.of] | Relationship | #Cell | #Log |
|---|---|---|---|---|
| Handover Intracell | 4 | - | - | 5 ,61 |
| Missing GSM Neighbor, GSM Symmetry | 2 | - | - | 36 ,61 |
| Blocked Call | 2 | - | - | 36 ,54 |
| Call Attempt | 22 | - | - | 9 ,22 ,31 ,36 ,39 ,44 ,45 ,47 ,53 ,54 ,61 |
| Call Setup | 12 | - | - | 9 ,22 ,31 ,36 ,39 ,44 ,45 ,47 ,53 ,54 ,61 |
| Dropped Call | 10 | - | - | 18 ,30 ,35 ,36 ,39 ,47 ,52 ,54 ,61 |
| Handover | 244 | - | - | 1 ,3 ,4 ,5 ,9 ,10 ,11 ,12 ,13 ,14 ,16 ,17 ,22 ,25 ,26 ,27 ,28 ,29 ,30 ,31 ,32 ,33 ,34 ,35 ,36 ,38 ,39 ,40 ,42 ,43 ,45 ,46 ,47 ,48 ,49 ,50 ,53 ,54 ,55 ,56 ,57 ,58 ,59 ,60 ,61 |
| Handover Failure | 10 | - | - | 18 ,29 ,39 ,42 ,43 ,45 ,47 ,61 |
| Routing Area Update | 16 | - | - | 18 ,20 ,22 ,30 ,36 ,39 ,47 ,52 |

Fig 11- events before optimization

In the fig 11 shows the report generated by the TEMS software fir the optimization purpose. In the figure shows the no. of dropped call no. hand of failure no. hand over ete. Which are helpful foe us for optimization purpose

Events

| Event | #[no.of] | Relationship | #Cell | #Log |
|---|---|---|---|---|
| Handover Intracell | 24 | - | - | 3 ,5 ,6 ,7 ,8 ,9 ,10 ,11 |
| Handover Intracell Failure | 2 | - | - | 11 |
| Blocked Call | 1 | - | - | 10 |
| Call Attempt | 5 | - | - | 3 ,10 ,11 |
| Call Setup | 4 | - | - | 3 ,10 ,11 |
| Dropped Call | 6 | - | - | 1 ,3 ,7 ,10 ,11 |
| Handover | 322 | - | - | 1 ,2 ,3 ,4 ,5 ,6 ,7 ,8 ,9 ,10 ,11 |
| Handover Failure | 5 | - | - | 2 ,8 ,9 ,11 |
| Routing Area Update | 4 | - | - | 3 ,10 ,11 |

Distribution graphs of all logfiles

Fig 12- events after optimization

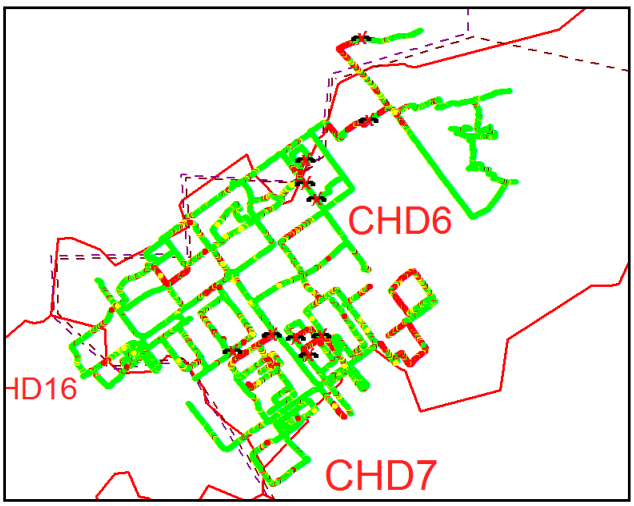


Fig 13- call drop area before optimization

Fig 13 shows the dropped call area where we have to optimize the network.

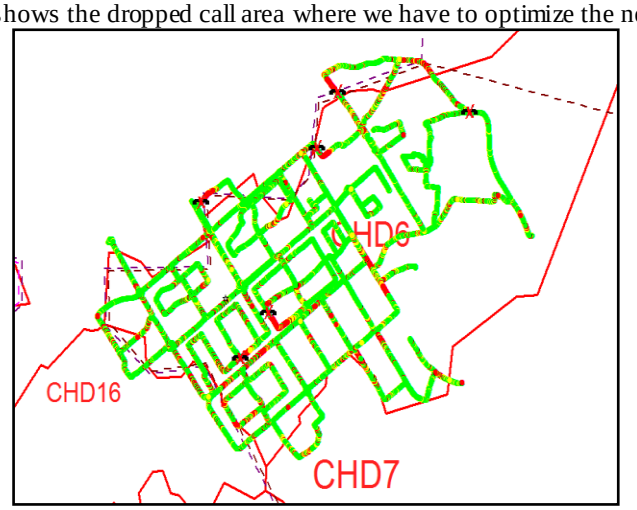


Fig 14- call drop area after optimization

Fig 13 and fig 14 shows the call drop before and after optimization. We can see tha the no. of call dropped after optimization are reduced as we have seen in the fig 11 and fig 12. We will discuss the reason of call drop and remedy action taken by the Rf engg.

## V. Reason And Corrective Action Of Call Drop

A: Call drop due to handover failure

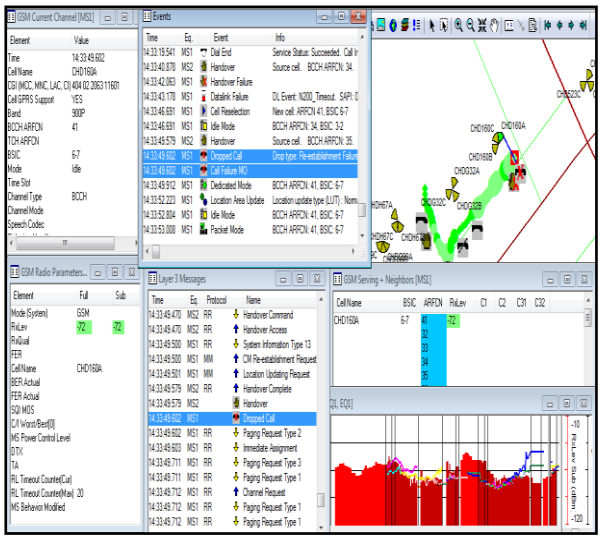

Fig-15 call drop before optimization

Fig -15 shows the call drop before optimization we to optimize that call drop. Call drop occure when we are moving from site CHD160 sector 2nd to the sector 3 of the same site.

Isuees Observed:

In the fig -15 there is call drop . the reason of the call drop is observed handover failure. There is no handover between the sector 2nd and sector 3rd. so call is droped now the challenge is diagnose this call drop.

## VI. Improvement Methodology:

After analysis the the reason of call we take the diagnosis action. There is no neighbor defined between sector 2nd and sector 3rd of site CHD160. After take the necessary action we found that there is no call drop as shown in figure 14

B: Call drop due to interference

**Isuees Observed:**

In the fig -16 there is call drop. The reason of the call drop is observed bad Rxquality. There reason of bad Rxquality is interference . Now the challenge is diagnose this call drop.

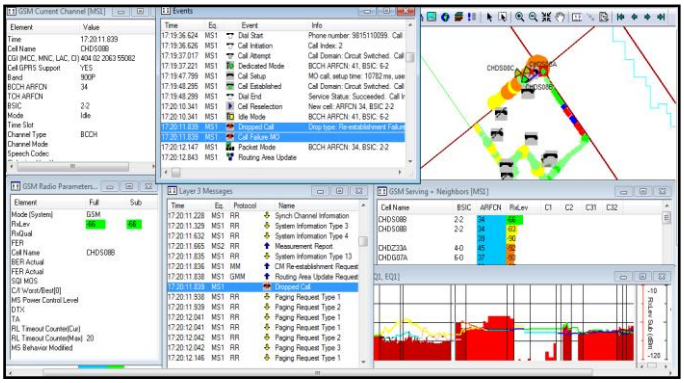

Fig-16 call drop before optimization

**Improvement Methodology:**

After analysis the the reason of call we take the diagnosis action. There is adjacent channel interference between the sector 2nd with the sector 1st and 3rd. the of the interference is same BCCH.

C: Call drop due to overshooting:

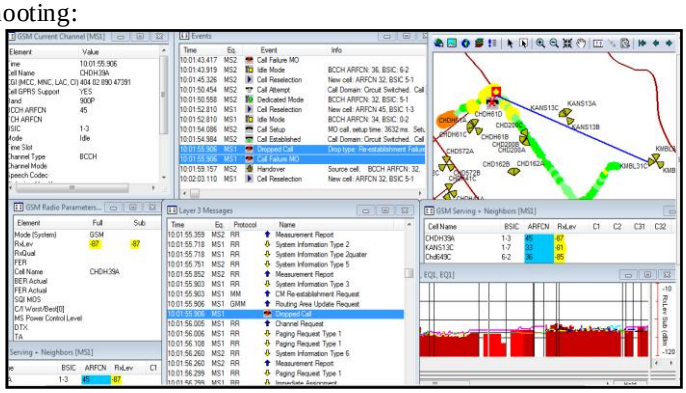

Fig-17 call drop before optimization

**Isuees Observed:**

In the fig -15 there is call drop . the reason of the call drop is observed overshooting. The call point where the call is droped mobile nearby sites are CHD31,CHD200,KANS13, should serve to the mobile station but the site KMBL33 overshoot so the call is droped. The reason of overshooting is zero mechanical tilt of rhe KMBL31 in sectopr 3rd.

**Improvement Methodology:**

After analysis the log files we found the reason is overshooting. We down tilt the antenna of sector 3rd by 2 mechanical remove the call drop.

Summary of the result, performance comparision for RxLev and RxQual for before and after optimization.

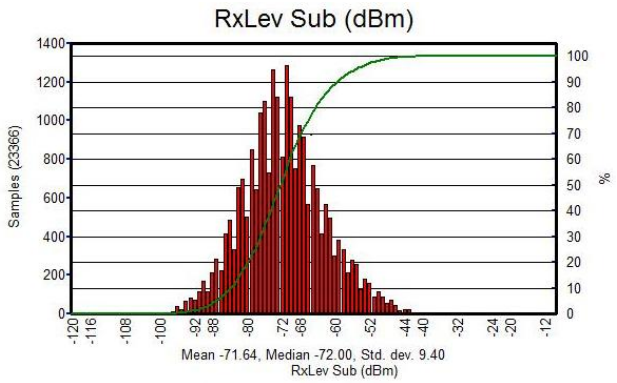


Fig-18 Rxlev before optimization

Fig-18 shows the Rxlev before optimization which shows somewhere bad Rxlev.which increase the call drop.

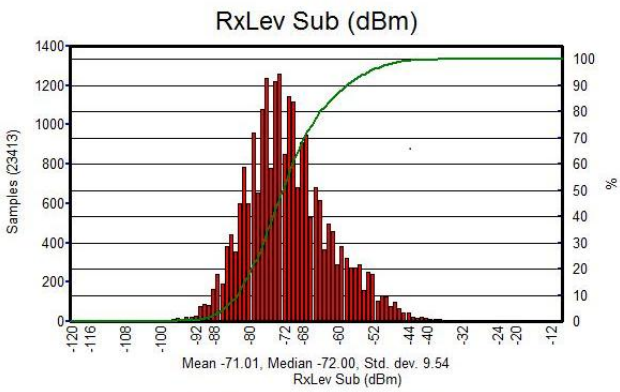


Fig-19 Rxlev after optimization

Fig-19 shows the Rxlev after optimization which shows improved Rxlev.which reduces the call drop.

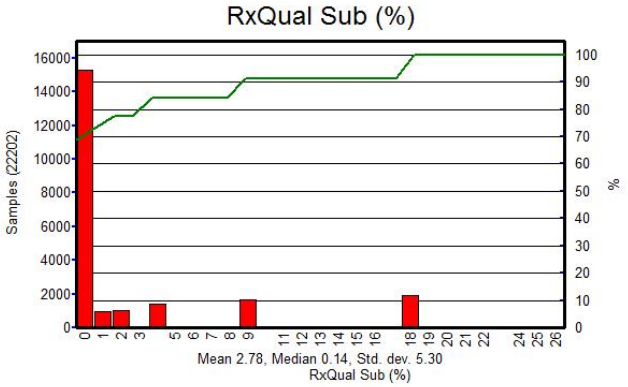


Fig-20 RxQual before optimization

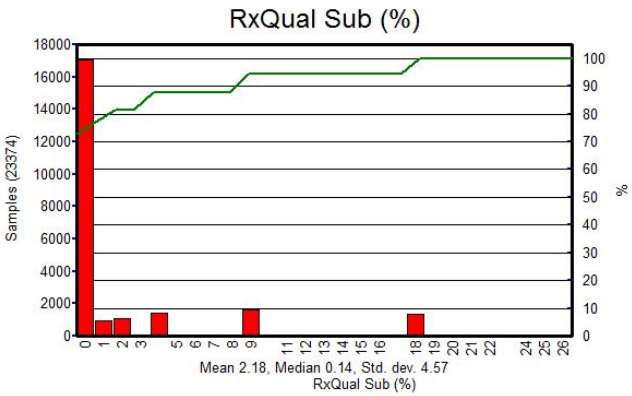


Fig-21 RxQual after optimization

Fig - 20 and fig 21 shows the comparison between the RxQual before and after optimization.

## VII. Conclusion

Telecommunication industry is moving so fast as to cater needs from user. Trends of lifestyle and mobile devices availability contribute to fast growth of telecommunication industry. Hence operator needs to comply the needs with less investment as well as giving the best services in term of coverage and quality. Based on analysis and result, it is proven that the call drop can be reduced by optimization.

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