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Analysis of LTE Network Optimization

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Abstract

This paper analyzes the key technologies of network optimization through the typical cases of actual LTE network engineering optimization, analyzes the causes of common problems in the network, finds out the factors that affect the network quality through parameter collection and data analysis, and makes the network reach the best operating state through technical means and parameter adjustment, finally meeting the needs of the customer market.

Keywords

Network Optimization; Communication Technology; Mobile Network.

1. Introduction

At present, China Mobile's 2G and 3G networks are built in large scale in the three major communication operators. So far, the total number of mobile users is 1.36 billion, and the number of Internet users is about 1.1 billion, and the data continues to increase. Mobile has established TD-LTE test network in multiple locations. However, the problems caused by the increase of this test point are becoming increasingly prominent, and the mutual interference between systems is becoming more and more serious. Therefore, the network optimization work is becoming increasingly arduous.

2. LTE Network Optimization Technology

Through the data analysis of the collected and executed traffic, as well as the overall test of the on-site software and hardware, find out the reasons that affect the network communication. Finally, through the modification of parameters, or the adjustment of the network structure, and the adoption of some technologies, maximize the use of existing architecture resources to maximize their use.

3. LTE Wireless Network Parameters

As with other network standards, besides user perception, parameters and indicators are also important factors to reflect network quality. Common parameters are:

(1) Network identification parameters. Identifier is a parameter used to identify users, cells, etc. in the network, mainly including: TAC: tracking area code; EARFCN: LTE system frequency point number; PCI: Physical cell ID.

(2) LTE network optimization parameters. RSRP/RSRQ/RSSI are three parameters used to determine the signal strength and signal quality in LTE. In addition, TM mode multi antenna technology is one of the key technologies of LTE. Different antennas have different coverage effects at the same location, so flexible use of antennas can greatly improve the optimization speed.

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(3) LTE network switching parameters. While the planning of each cell is balanced, the handover between cell signals of the same frequency and different frequencies also needs to be focused.

(4) LTE network reselection class parameter In LTE reselection, due to different network frequency bands, LTE reselection is divided into the same frequency and different frequency switching.

4. LTE Network Optimization Content

LTE optimization mainly includes PCI optimization, interference troubleshooting, coverage optimization, neighbor optimization and system parameter optimization.

①PCI optimization: PCI interference is prone to two common problems, such as easy dropped calls and slow download speed. In addition, three principles should be followed: for example, multiplexed PCI should be used to separate at least 4 layers of cells and be at least 5 times larger than the spacing, and the same PCI cannot exist in the same cell; The frequency positions of adjacent areas shall be staggered as much as possible.

②Interference troubleshooting: according to different interference sources, it is divided into internal and external interference, including GPS deviation, equipment stealth fault and antenna feeder system fault. Three kinds of external interference, such as stray interference, blocking and intermodulation interference.

③Override optimization: Common network coverage problems are caused by excessive coverage, insufficient coverage or uneven coverage, which in turn lead to access success rate, higher discard rate, lower handover success rate and lower download rate. The reasons for the wireless coverage problems are various, including the engineering quality of the antenna feeder system, antenna selection, the rationality of setting relevant parameters, and equipment failure.

The coverage optimization measures include checking the antenna feeder installation, adjusting the antenna direction and tilt angle, adjusting the beam shaping factor of the antenna sector, troubleshooting the equipment, checking the neighborhood relationship and adjusting the reference power.

④Neighbor cell optimization: It aims to increase the coverage, reduce the drop rate and improve the handover success rate. It also affects the timeliness of measurement, and it is very important to correctly and reasonably configure adjacent areas. In the optimization process, the adjacent areas shall be checked and adjusted according to the geographical location, wireless environment, KPI indicators and test conditions.

⑤System parameter optimization: At present, LTE optimization and adjustment mainly include power parameters, PCI parameters, switching parameters, interference avoidance algorithm parameters, antenna technical parameters, etc.

5. LTE Network Optimization Cases

5.1. Problem Description:

The VOLTE is disconnected due to the missing configuration of adjacent cells. During the network test of the operator of National Highway C, the main service cell occupies A -- LD at the problem section_ 2. When the test vehicle runs from west to east, the signal of the main service cell attenuates to less than - 100dBm and cannot be switched normally until the cross frequency handover is started, as shown in Figure 1:

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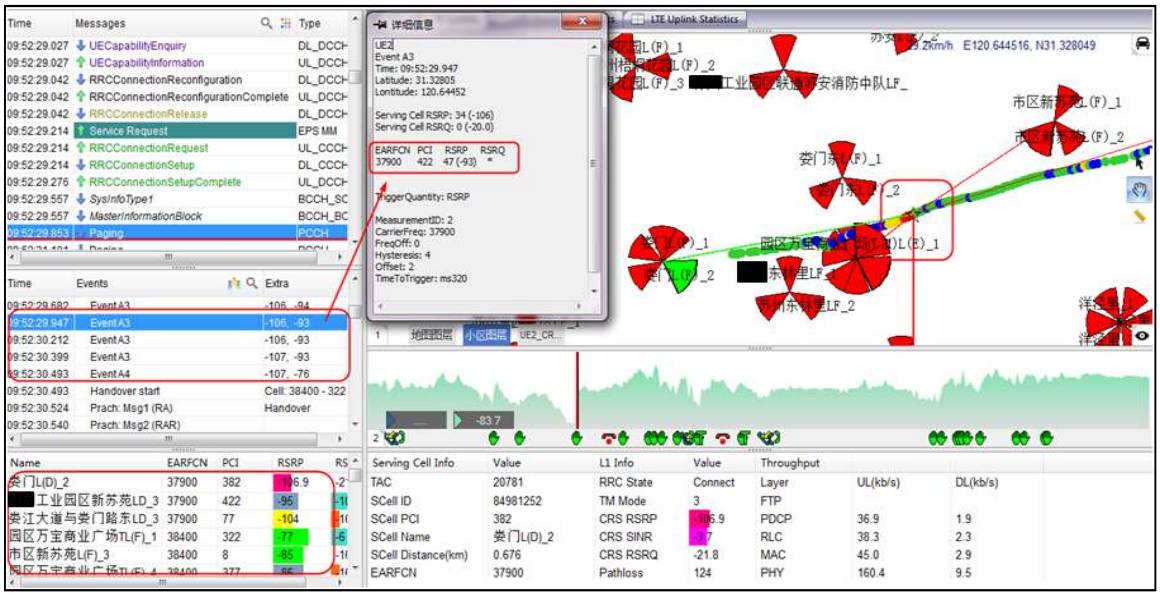

Figure 1. Screenshot of LTE Cell Handover Exception Test

5.2. Cause Analysis

When testing the VOLTE from west to east, the callee cannot switch normally, and the A3 event is always sent, as shown in Figure 2, which causes the caller and the callee to drop the call.

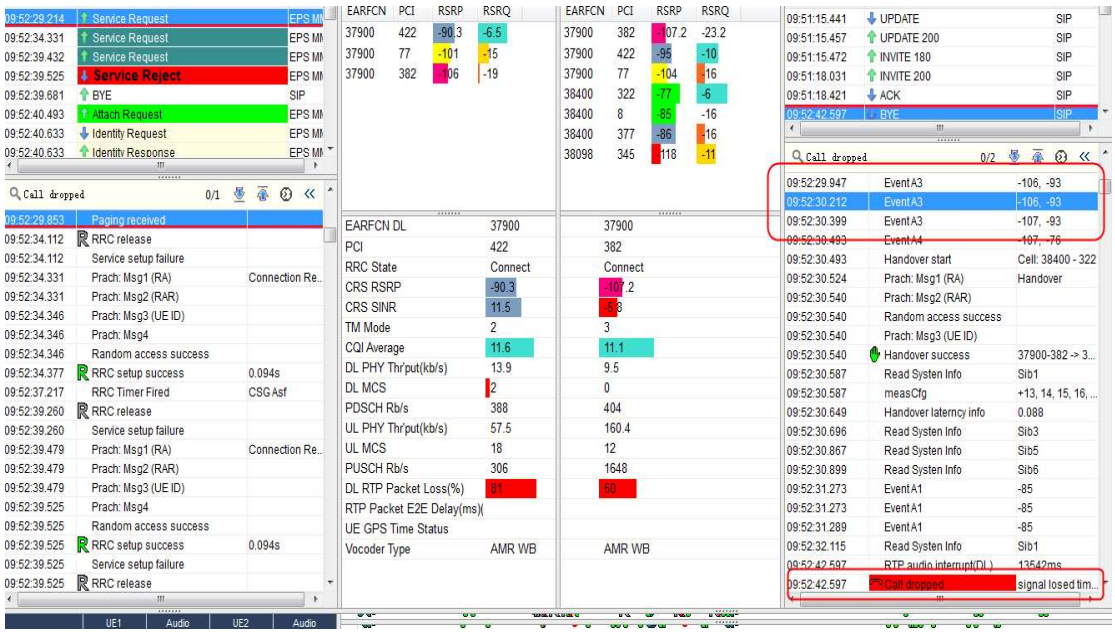

Figure 2. Screenshot of A3 Event Signaling Always Reported

The call drop during the VOLTE voice test is caused by the failure of the calling and receiving terminals to switch normally on the 4G network and dragging. Can judge A-L (D)_ 2 Unable to switch to B-LD normally_ 3. After querying the network management data, there is no adjacent cell relationship between the two cells.

5.3. Optimization Results

After optimization, the switching of this section is normal, and the problem section in the VOLTE test does not have call drop, and the calling and receiving terminals can switch normally, as shown in Figure 3 and Figure 4.

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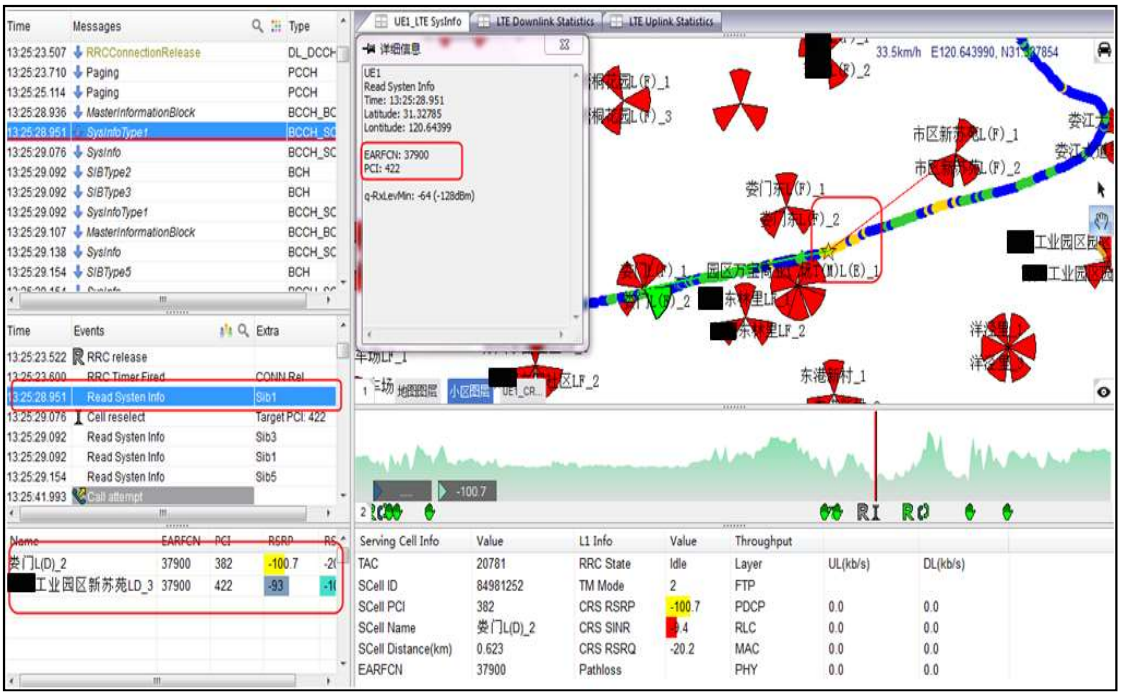

Figure 3. Screenshot of normal display switching after parameter modification

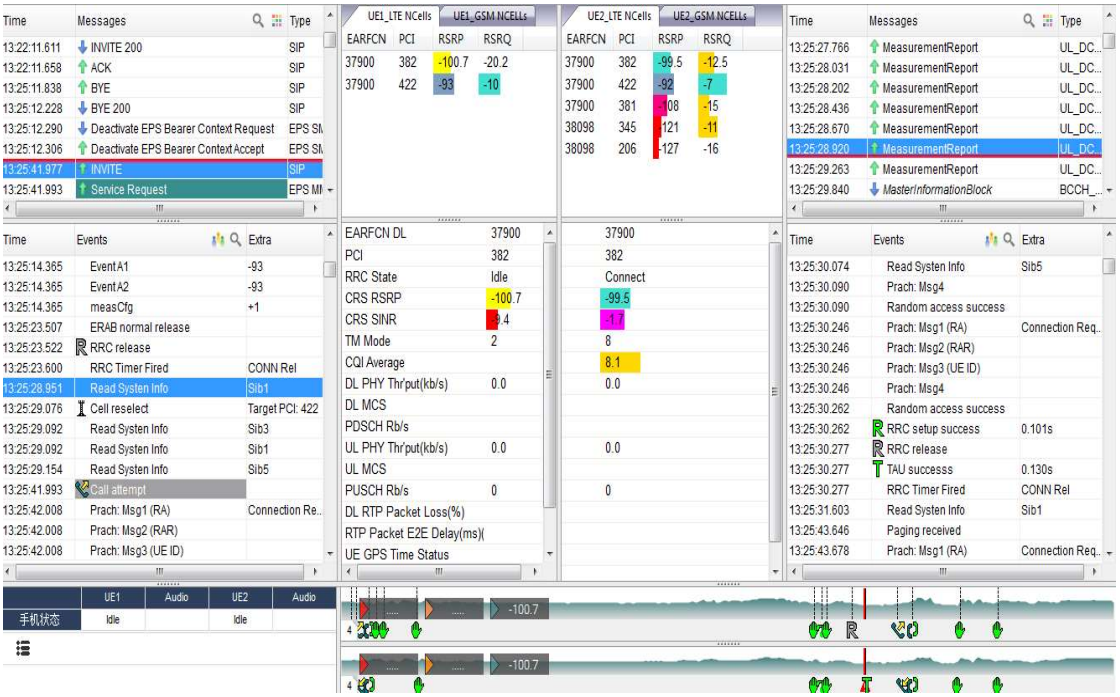

Figure 4. Normal screenshot of signaling after retest

6. Conclusion

Since the mobile LTE is an inter frequency network, the D-band signal is used to preferentially cover the roads in the current network. When there is a neighbor cell missed allocation, it will lead to dropped lines. The importance of network optimization lies in improving network coverage, connection rate, handover success rate between cells, reducing network congestion rate, and improving user perception and satisfaction.

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References

[1] Liu Xuewu, Wang Kai. Analysis of LET Network Optimization for WeChat Payment Business Failure [J]. China New Communications, 2022, 24(07): 51-53.

[2] Ding Hu. Research on Scenario based Optimization of Rural LET Network Coverage [J]. Changjiang Information Communication, 2021, 34(11): 109-111.

[3] Liu Wei. Big Data Intelligent Optimization Method Based on LET Network Measurement Report [J]. Electronic Technology and Software Engineering, 2021(11): 11-12.

[4] Zhou Chao, Xiong Renjie, Du Jie. Research on the optimization method of LET wireless network overlapping coverage [J]. Electronic Testing, 2020(19): 96-97.

[5] Chen Gang. Research on LET Network Optimization Method [J]. China New Communication, 2020, 22(09): 75.

[6] Zhang Senhong, Zhang Weifei. Discussion on the Strategy of Deep Optimization and Network Upgrade in the Maturity Period of LET Network [J]. Education Modernization, 2020, 7(28): 191-193.

[7] Xu Youbing, Deng Xianjun, et al. Research on Optimization Strategy of Residential Community Coverage under LET Wireless Network [J]. Electronic Components and Information Technology, 2020, 4(02): 33-34.