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Research on optimization method of same frequency ping pong handoff based on cell individual offset in TD-LTE system

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Abstract. In TD-LTE system, the handoff success rate has a direct impact on the quality of service and satisfaction of mobile terminals. The occurrence of Ping Pong switching will seriously affect the voice and data services of mobile terminals in the system. How to improve the success rate of handover is one of the problems of TD-LTE network optimization. In this paper, TD-LTE system was optimizated based on cell individual offset, which can effectively reduce the influence of the same frequency ping pong handoff on the TD-LTE system, and improve the quality of service and trust of the terminal.

Key words. TD-LTE System; Cell Individual Offset; Same Frequency; Ping-pong handover; Optimization.

1. Introduction

The aim of optimization of mobile communication network is to improve the quality of mobile communication service [1]. The network optimization needs a lot of automation, intelligent software operators and engineers to achieve, including switching technology, wireless communication technology, frequency configuration technology, handover technology and signaling, traffic statistics analysis exchange.

Ping-Pong handoff refers to the phenomenon that the mobile terminal carries HANDOVER back and forth in the service cell and adjacent cell [2]. Because the handoff process uses a frame stealing handover command, successive frames are stolen, which results in very low quality of voice and affects the use of end users [3].

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Table tennis handoff has a great influence on the communication quality of TD-LTE system, so it is necessary to optimize the network.

CIO (Cell individual offset) refers to the measurement report sent by UE (user equipment) through the application of positive deviation, which is an important parameter of UE in mobile system, which has very important application for handoff [4].

When the signal intensity of adjacent area is higher than a certain threshold or service area, service area signal is lower than a certain threshold, cell switching, and the cell individual offset value in Qoffset(sn) satisfies the following conditions: Qoffset(SN) + Qmeas(n) Rs Qmeas(s) by + Qhys(s) $>$ 0 on the premise of value the more conducive to cell switching [5].

In this paper, according to the table tennis handover in the TD-LTE system, the TD-LTE system is optimized by using the individual migration of the community CIO, and the satisfactory results are obtained.

2. An overview of ping-pong handover

2.1. Definition of handover

In the mobile communication system, handover is when the mobile terminal moves from one cell to another cell during a call, or due to external interference caused by the decline in the quality of call, must change the original voice channel and switching to a new idle words channel to continue to maintain the call the process [6].

The TD-LTE system has the ability of good signal coverage and relatively seamless handover. Because it can implement hard handoff fastly, the related handoff between different frequency bands and the interactive systems can be achieved. Soft handoff requires high complexity devices, difficult timing operations and high processing power, so it is not yet adopted by major operators.

Handover can be divided into Intra system handover and Intersystem handoff, Intra system handoff can be divided into two case of Same frequency Handover and Inter-Frequency Handover. The measurement standard is divided into the received power, the bit error rate and the link distance, and the corresponding calculation and processing.

2.2. Same frequency handover

The same frequency handover is based on the A3 event, as shown in Figure 1. When the neighborhood quality is better than the service cell, and the difference is over the specified threshold, namely the handover delay (HOM) and the state hold on. After a period of time, UE reports A3 event report to the network side. The report is sent to the network side, and a handoff decision is made after the report is received. If the decision is successful, it begins to switch to the neighbour. The A3 report can contain more than one neighborhood with multiple signal qualities, but at the same time, there may be multiple adjacent cells meeting A3 event reports at

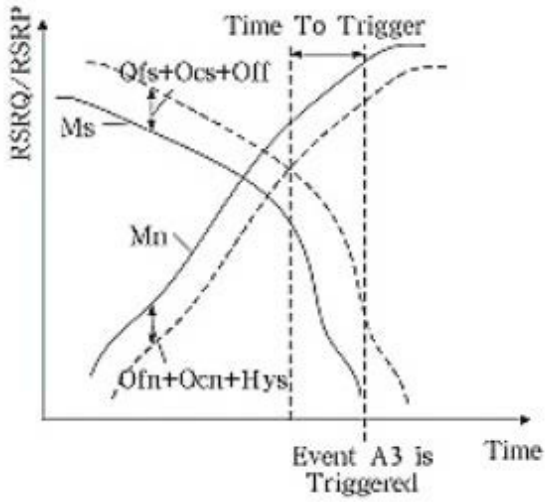

Fig. 1. A3 event diagram

the same time.

2.3. Reasons for the occurrence of ping-pong handover

In the TD-LTE system, the handover can be divided into: first, when the measurement report of the UE shows a neighbor cell that is better than the current service cell channel quality; Second, the UE loses the current wireless access technology (rat) coverage to connect to the other rats [7]; Third, when a given cell is overloaded, try to balance the load conditions between different rats that belong to the same operator.

In the TD-LTE system, the ping-pong handover is mainly in the first and third cases, where the quality of the adjacent area channel quality is very good, the mobile terminal will switch back and forth in the process of 4G service in the adjacent cell. this situation also includes the handover of 4g and 2G, 4G and 3G and 4G adjacent areas. When this occurs, the user will have obvious Caton or disconnection when using the 4G network.

2.4. Impact of with same frequency ping pong handoff on service

2.4.1. Impact on language services Ping pong handoff will have a great impact on the daily use of users and data transmission. The influence of the voice service mainly includes the success rate of handoff and the business interruption time in the process of handoff. Frequent ping-pong handover will have a great impact on the success rate of handover, which will lead to the instability of channel and the instability of channel reception. It is reflected in the users' voice, such as inter-

mittent voice calls, unclear calls and one-sided calls. Effect of common switching of voice service is mainly due to the down level handoff threshold value setting is not reasonable, switching power handoff parameter control is not reasonable the set problems, leading to the handoff failure, the probability of ping-pong effect become larger, resulting in poor voice services.

2.4.2. Impact on data services The effect of Ping pong handoff on data business should not be underestimated. The main effects include: one way packet delay in handover process, data packet delay jitter in handover, and packet loss rate during handover. Once the ping-pong switching phenomenon occurs, the problem of packet loss will appear in the use of data services, and then cause adverse factors to the use of the users.

3. The application of CIO in optimization of same frequency Ping pong handoff

The CIO (cell individual offset) means that by applying a positive shift, the measurement report sent through the UE is like the better XdB than the actual P-CCPCH. By modifying this parameter, the corresponding cell of the UE selection is changed.

The one-way cell personality offset CIO configuration has been widely applied in the current access network. The two cases of CIO greater than 0 and less than 0 are analyzed and explained respectively. In particular, the change of the CIO of the community's personality offset.

3.1. CIO is greater than 0

When the A cell is configured with one-way CIO greater than 0, the A cell one-way cut out switch point is moved forward and cut out in advance, which is generally used to solve dropped calls caused by fast fading. In this case, cell coverage effect is shown in Figure 2.

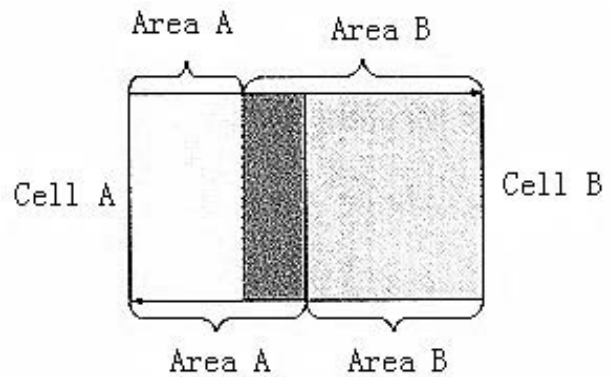

Fig. 2. Cell coverage effect map

In Figure 2, users move from A to B and users move from B to A, influenced by one-way CIO, and switching points cannot be unified, resulting in a black zone in the middle.

When the user enters the black zone from the A cell and is affected by the CIO, the user switches to the B. After the user takes up the B cell, the user meets the switching condition of the B to the A at this moment according to the switching rules of the B cell, and will switch to the A again. In this cycle, frequent switching is formed in the black zone.

From the count of the number of switching times per minute after opening CIO, the one-way bias of CIO is greater than 0, and it does cause frequent switching.

3.2. CIO is less than 0

In the configuration of one-way CIO less than 0, there will be no frequent switching due to the backdrop of the handoff band, but it will overlay the boundary in the orange area, that is, the over zone coverage.

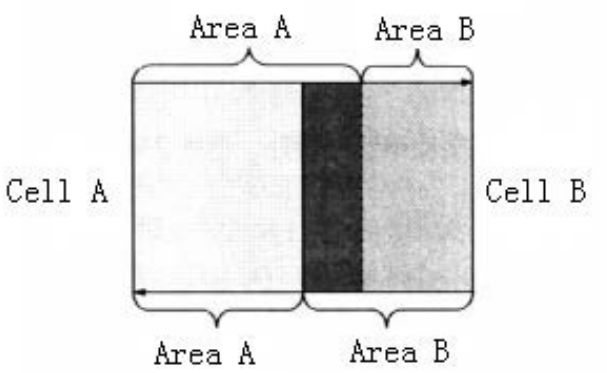

Fig. 3. Cell coverage effect map

As shown in Figure 3, in the black area, there exist both A users and B users, resulting in a larger overlapping area of users. In this overlapped area, users interfere with each other, and power increases and increases with each other, resulting in greater interference.

If CIO is greater than 0 or less than 0, it is necessary to make two-way compensation for unidirectional bias.

3.3. Configuring the impact of bi-directional CIO

The bi-directional CIO bias is mainly to verify the interference effect of overlapping coverage. The verification scene is that the two cell is all the compartment. In the test, the single user is maintained at the edge of the A cell under the different CIO configuration, and records the interference values of the A cell and the adjacent cell B, as shown in Figure 4.

From the Figure 4, we can see that when CIO is configured from 0 to -10, the A

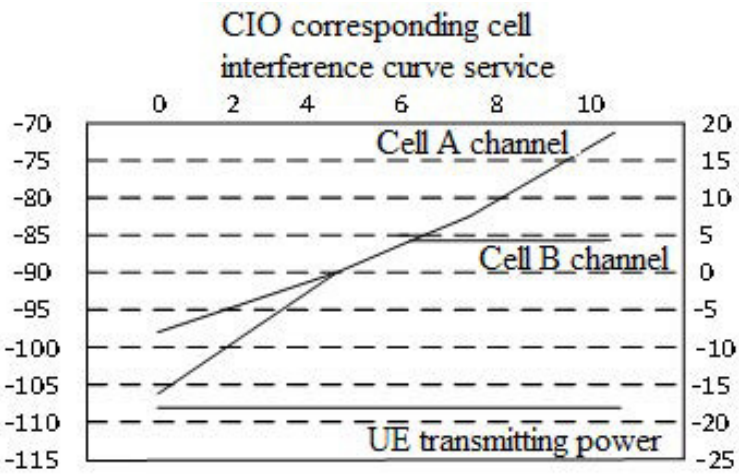

Fig. 4. CIO plot interference plot diagram

cell service range expands, occupying the edge of A cell, and the interference brought to the neighborhood B cell is enhanced with the change of CIO, and the transmitting power of terminal at switch critical point is also increasing.

Under different CIO values, the extended A cell edge single user call to cause interference in the adjacent area is more obvious, the measured data as shown on the right map. When CIO is -10, A cell edge users start calling, causing B cell to instantly interfere with -68dBm in one second, and the terminal transmit power reaches 18dBm, close to full power transmission.

Therefore, the change of CIO can effectively reduce the number of table tennis switching and the possibility of the occurrence.

4. Conclusion

In mobile communication, through data collection, data analysis, implementation and evaluation of the existing network to optimize the four important steps of network optimization, data acquisition through manual operation, sorting, classification, summary of all kinds of tools for data acquisition, data collection workload, but the difficulty is low. In TD-LTE system, the cell personality offset CIO is of great significance in improving and reducing the occurrence of the phenomenon of the same frequency table tennis.

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