

## **Direction to Public Radio Mobile Communications Base Station Construction**

From 1980s' wireless paging to analog wireless phone to digital wireless phone until the third generation mobile communications, it is acknowledged that China's public wireless mobile communications has realized a rapid development and wide application. During this period, China Mobile and China Unicom have constructed thousands of public mobile communications BS, by the way of cellular coverage, successfully served 400 to 600 million mobile subscribers in China. However, quick development of mobile communications brings problems in BS construction, especially the discrepancy between BS construction and existing construction management system, and it is in conflict with the construction of a harmonious and resources-saving society. Therefore, it produces the social phenomenon of BS construction dilemma.

In the face of the full launch of 3G traffic, telecommunications infrastructure should abide by the construction principle of co-constructing and sharing. It is necessary to formulate direction and strategy in public mobile communications BS construction on the basis of past experience, according to our national conditions and characteristics, and in line with technology and network development trend, such direction and strategy should be in favor of public mobile communications construction, national resources intensification and unified planning and management. This article tries to analyze the strategy in public mobile communications BS construction from technical characteristics and capacities of two different kinds of BS, resources intensification as well as social acknowledgement.

Currently, mobile operators generally use two different BSs with their own set of technical system to construct public mobile communications network: one is the outdoor BS which is installed on iron tower, pole, and support platform on the top of buildings erected by operators themselves, it is called outdoor macro BS which has antennas with big size and high

transmission power. The other kind of BS is just like the way cable TV transmission, that is using cable to allocate reception and transmission signals to many interfaces of applications environment to realize the signal connection between system and cell phone, it is called distributed BS. Following table is the characteristics comparison between these two kinds of BSs

<b>BS Category</b>	<b>Application Environment</b>	<b>Cost</b>	<b>Intensification Capacity</b>	<b>Signal Distribution</b>
Outdoor macro base station	It is applied in low-density application area and outdoor large areas.	Cost is Low counted in area method. Cost is high counted in channel method.	Weak, technically, its co-existent only to some degree.	Energy field distribution is uneven
Distributed base station	It is applied in high-density application area and indoor high-density coverage application areas.	Cost is high counted in area method. Cost is low counted in channel method.	Strong, technically can meet the demands of high capacity and multi-network co-construction and sharing.	Small energy field distribution is relatively even

Corresponding national condition analysis of mobile communications development

- Our country has a large population and vast land, compared with European and American, our people are highly densely-populated, plus the urbanization process, characters of modernization in large-medium cities, high-density living area and high buildings are becoming more distinctive, under such circumstances, to ensure communications, only by using outdoor macro BS is already difficult in many large-medium cities.
- With rapid economic development and quickened life pace in China, mobile users are growing swiftly in recent years, it goes the same with

mobile communications network demands.

In recent years, as the mobile communications charge was lowered, cell phone has become many people's "personal phone", indoor usage has become extremely common. Statistics from operators indicates that 70% of traffic comes from indoors.

Although operators are aware of the demands and importance of indoor coverage, their general way is to split macro BS to increase channels, and to penetrate buildings to realize indoor coverage, only about 10% of large buildings use indoor distributed BS coverage. According to related information, just between 2002 and 2006, China Mobile, China Unicom, and China Telecom have invested about 1123.5 billion yuan RMB in communications BS and other infrastructure construction. And the land taken by tower base station has already reached the total area of Macao, which is 23.6 square kilometers.

BSs in the cities are mounted on the top of buildings, this determines their parasitism, and the beneficial conflict causes social clash. What is more, outdoor BS signal distribution is uneven, traffic capacity is uncontrollable, frequency utilization rate is low, sharing and co-construction is hard, city looks is not agreeable, and have affected the rapid development of wireless communications, Which calls for urgent solution.

Therefore, relevant departments and companies have been carrying out positive explorations in recent years, and finally put forward intensive indoor multi-network-in-one distribution coverage system. Its working principle is to combine multi-system communications BS RF interfaces together through combining filter first, and then after distribution, send RF signal to many branches to equalize, after that, using high frequency feeder cable to transmit equalized RF signals to the proper points inside the building. Lastly, realize multi-point, minor-signal and even coverage through distributed antenna.

Multi-network-in-one distribution coverage system has been used in water cube and Shanghai F1 circuit, and has produced favorable economical and social benefits. Advantages of this technical solution lies in its capacity to cope with multi-network system sharing and co-building, make best use of frequency resources, and lower public communications network construction

cost, and its capacity to deal with many difficulties of outdoor construction.

If 70% of indoor traffic is served by multi-network-in-one indoor distribution BS, making outdoor macro BS coverage in accordance with territorial environment, and indoor traffic handled by multi-network-in-one indoor distribution BS, then in the following ten years, our public mobile communications development will be guaranteed, and outdoor macro BS construction burden would be lightened.

From above analysis, advantages of intensive indoor multi-network-in-one distribution system are obvious.

However, the promotion of this technology is in a struggled situation, below let's discuss the reasons.

First, it is the restriction of current system and mechanism of telecom operators, three large telecom operators are the main bodies in telecom market, the first thing they care about is their own market share, and the quality improvement of their own technical network. Therefore, obviously there is no momentum in investing and constructing indoor multi-network-in-one distribution coverage system by operators themselves.

Secondly, it is the parasitism of public communications facilities. As indoor multi-network combination distribution coverage system is attached to or even a part of city buildings and some public facilities. But among investors, users, and property owners, there is no well defined power, responsibility and benefit and clearly established ownership.

Third, it is devoid of technical standard, indoor multi-network combination distribution coverage system is still in its infancy. To reach perfect, more construction and practice is needed. Presently there is still no unified technical standard in wireless communications management and technical department.

Fourth, it is the absent of powerful coordination from relative departments and promotion from all walks of life. In the process of indoor multi-network distribution coverage system construction, a great many benefits in terms of planning, environmental protection, construction, telecommunications and

property owners demand government relative departments to coordinate and

define power, responsibility and benefit, and finally achieve consensus. Certainly, the promotion of this technology still relies on the support from all walks of life.

Fifth, it is the lag of relative laws and regulations. Existing laws and regulations in wireless communications management attaches more importance to the approval of frequency resources, assessment and decision are made on the basis of whether there is interference to radio system. Social public acceptance in respect to wireless communications facilities construction is not in the consideration of assessment and management. Relative laws and regulations of wireless communications management need to be mended gradually along with the ever advancing wireless communications technology and the rapid wireless communications development.

Promotion and application of every new technology lies not only in its advantages, but protections from laws and regulations, policy support, promotion from all walks of life and public opinions also play an equal important part in it. For more construction and more practice in intensive indoor multi-network-in-one coverage system, we strongly recommend following approaches.

First, reach ideological consensus that intensive indoor multi-network-in-one distribution coverage systems is in accordance with building a harmonious resources-intensive and environmentally-friendly society. It will not only improve frequency utilization rate, meet multi-system communications demands, realize resources sharing, but also drive operators to shift their operation mode from fighting respectively to co-construction and sharing, from extensive to intensive. Government departments of planning, construction and environmental protection, telecom operators, property owners and relative parties should understand the importance of building intensive indoor multi-network-in-one distribution coverage system from that point.

Secondly, take positive action. Intensive indoor multi-network-in-one distribution coverage system is a new technology. It has been applied in many

large buildings and important projects and has reflected its technical

advantages. Facts have proven the intensive indoor multi-network-in-one distribution coverage system is a win-win system. Government departments involves in planning, contribution and environmental protection, telecom operators, property owners and relating parties should actively take part in indoor multi-network-in-one distribution coverage system construction.

Third, support in policy, in new round of 3G BS construction, multi-network-in-one should be recommended first, guidance should be offered to direct operators to deploy BS planning and construction reasonably. In large project construction, consideration should be given to the possibility of integrating multi-network-in-one distribution system into public facilities.

Fourth, organize professional management, make a serious analysis of our experience in indoor multi-network-in-one distribution coverage system, and work out feasible and formal technical standard and execution rules for further promotion.

Fifth, Diversity in investment, in other words, the investor in intensive indoor multi-network combination distribution coverage system construction could be operator or the owner of the property or even could be the third party, as long as there is well defined responsibility, power and benefit, In that way, repetition in investment can be decreased effectively, utilization rate of communications BS can be improved, and common benefits can be really achieved. Projects in Macao and Hongkong are the best cases.

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