2G, 3G Network Planning and Optimization...

Archives

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1.4 Timing advance

Signal transmission has a delay. If the MS moves away from BTS during calling, the signal from BTS to MS will be delayed, so will the signal from MS to BTS. If the delay is too long, the signal in one timeslot from MS cannot be correctly decoded, and this timeslot may even overlap with the timeslot of the next signal from other MS, leading to inter-timeslot interference. Therefore, the report header carries the delay value measured by MS. BTS monitors the arrive time of call and send command to MS with the frequency of 480 ms, prompting MS the timing advance (TA) value. The range of this value is 0–63(0 –233 us), and the maximum coverage area is 35km. The calculation is as follows:

$1/2×3.7us/bit×63bit*c=35km$

3.7us/bit is the duration per bit (156/577); 63bit is the maximum bit for time coordination; c is light velocity (transmission rate of signal); 1/2 is related to the round-trip of signal.

According to the preceding description, 1bit to 554 m, due to the influence of multi-path transmission and the accuracy of MS synchronization, TA error may be about 3 bits (1.6km).

Sometimes a greater coverage area is required, such as in coastal areas. Therefore, the number of channels that each TRX contains must be reduced. The method is to bind odd and even timeslots, so there are only four channels (0/1, 2/3, 4/5, and 6/7) for each TDMA frame in extended cell. Allocate channels 0, 2, 4, and 6 to MS. Within 35 KM around BTS, the TA value of MS is in the normal range 0-63; for the area beyond 35 KM, TA value stays at 63. This technology is called extended cell technology. The maximum value of TA in BTS measurement report is 63+156.25=219.25 bit, so the maximum radius of coverage area is:

$1/2×3.7us× (63+156.25) ×3×108m/s=120km$

In real scheme, in order to improve the utilization of TRX, both common TRXs and dual timeslot TRXs can be included. BCCH must be in dual timeslot TRX to receive random access from any area. The calls within 35 km are allocated to common TRX; the calls within 35 km–120 km and the switched in calls are allocated to dual timeslot TRX. If the system detects the switched in call is within 35km, it will switch over this call to common TRX. If the MS in conversation goes beyond 35 km, an intra-cell switchover will be carried out. Therefore, both the capacity requirement for remote areas and the coverage requirement for local areas can be satisfied.
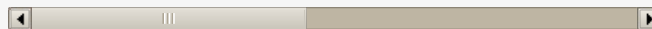
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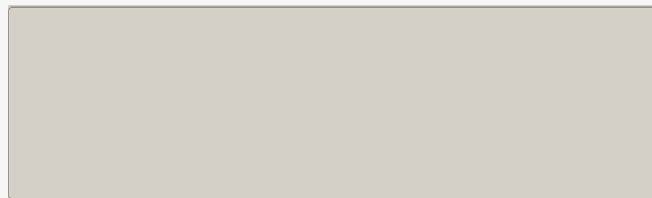
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