

التدريب الصيفي 2016



المصادر
الجديد



Wireless Concept

Wireless Concept

- Transmission problems:
 - Path loss
 - Shadowing
 - Multipath fading
 - Time alignment

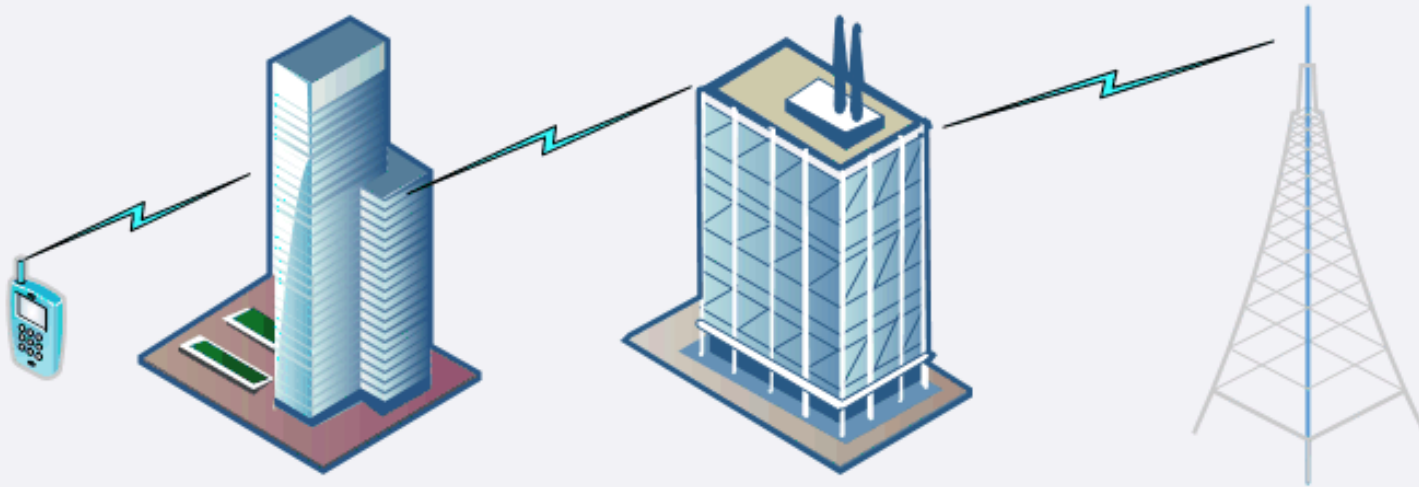
Path loss

- Path loss occurs when the received signal becomes weaker and weaker due to increasing distance between MS and BTS, even if there are no obstacles between the transmitting (Tx) and receiving (Rx) antenna.
- The path loss problem seldom leads to a dropped call because before the problem becomes extreme, a new transmission path is established via another BTS.



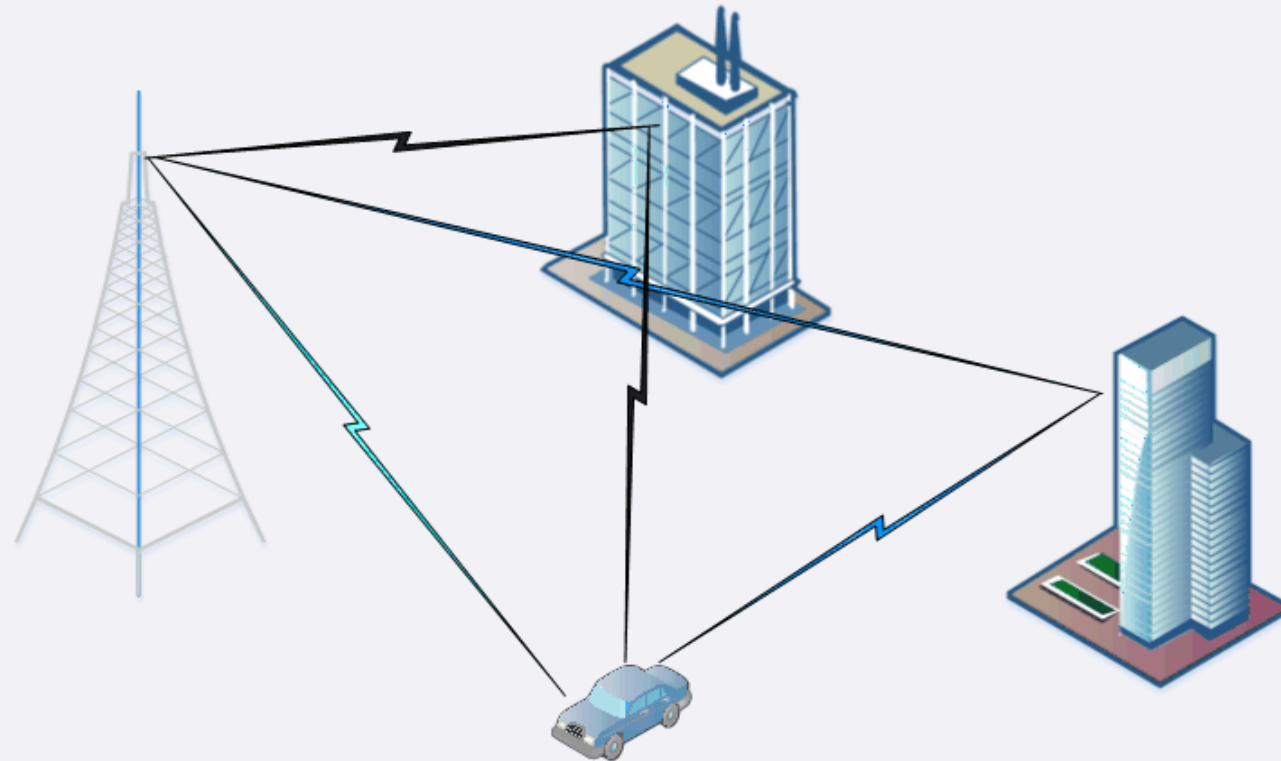
Shadowing

- Shadowing occurs when there are physical obstacles including hills and buildings between the BTS and the MS.



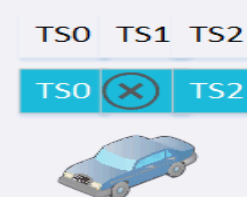
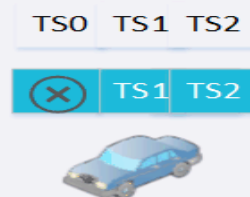
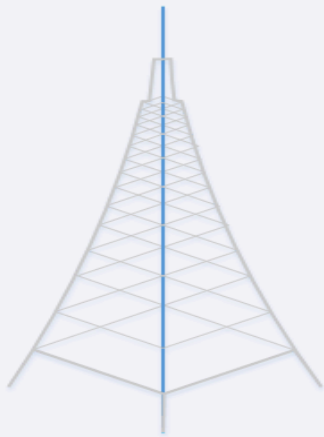
Multipath fading

- Multipath fading occurs when there is more than one transmission path to the MS or BTS, and therefore more than one signal arriving at the receiver.



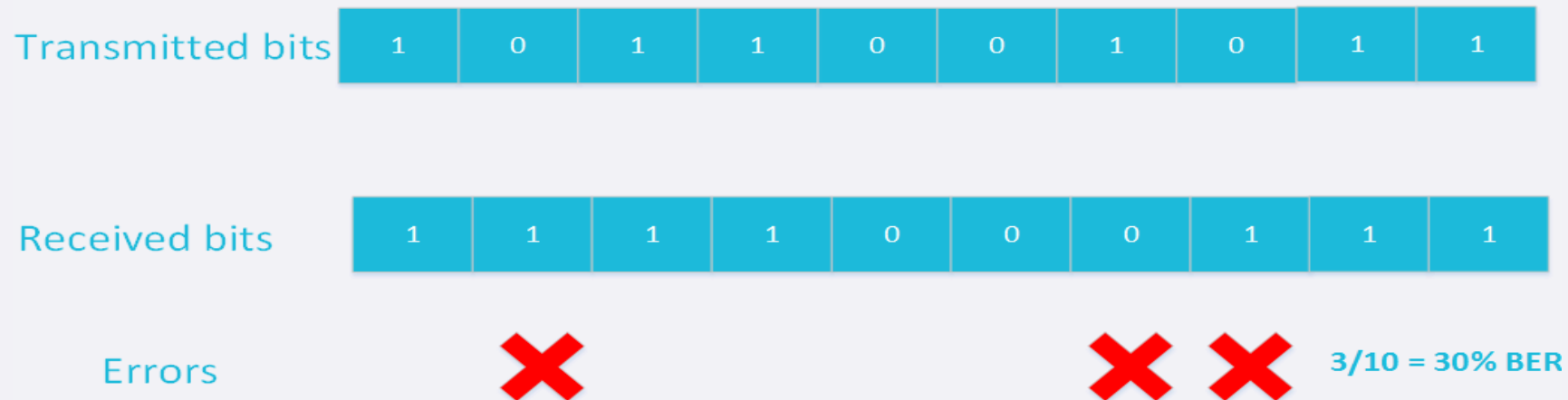
Time alignment

- Each MS on a call is allocated a time slot on a TDMA frame. This is an amount of time during which the MS transmits information to the BTS. The information must also arrive at the BTS within that time slot.
- The time alignment problem occurs when part of the information transmitted by an MS does not arrive within the allocated time slot.



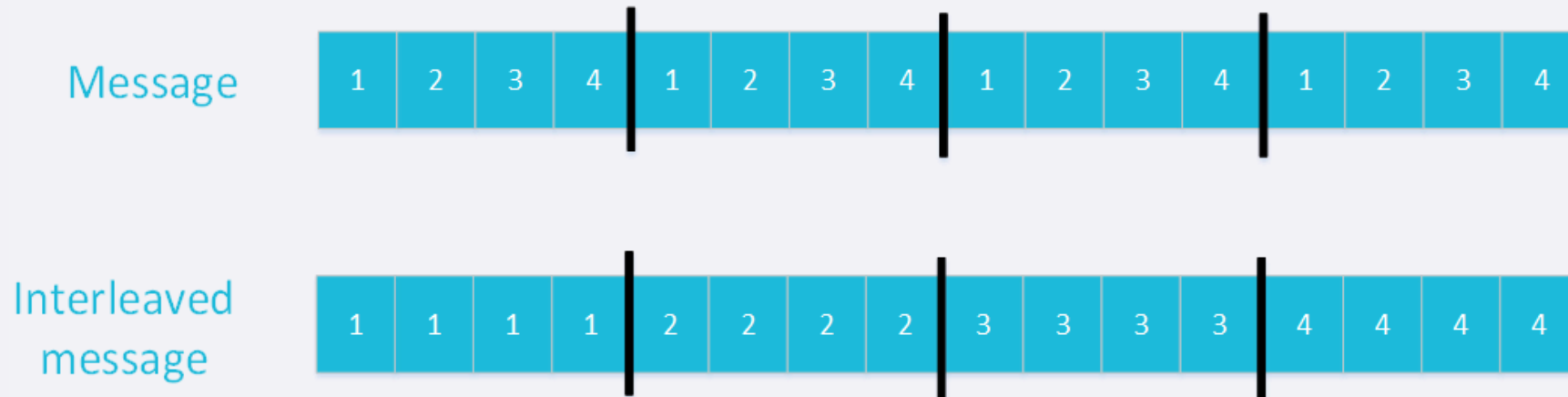
Solution to transmitting problems

- Channel coding: In digital transmission, the quality of the transmitted signal is often expressed in terms of how many of the received bits are incorrect. This is called Bit Error Rate (BER).
- Channel coding is used to detect and correct errors in a received bit stream. It adds bits to a message. These bits enable a channel decoder to determine whether the message has faulty bits, and to potentially correct the faulty bits.



Interleaving

- In reality, bit errors often occur in sequence, as caused by long fading dips affecting several consecutive bits. Channel coding is most effective in detecting and correcting single errors and short error sequences. It is not suitable for handling longer sequences of bit errors.
- For this reason, a process called interleaving is used to separate consecutive bits of a message so that these are transmitted in a non-consecutive way.

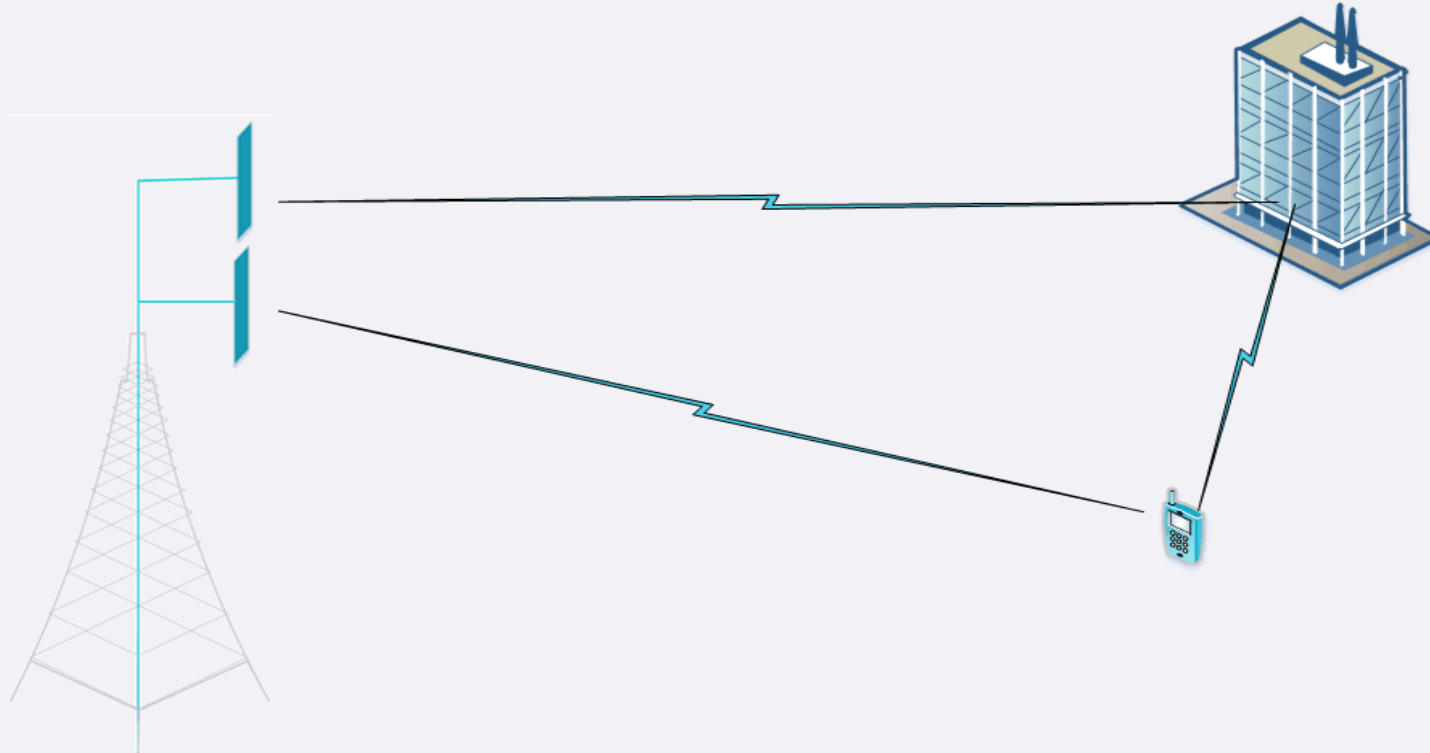


Diversity

- Antenna diversity increases the received signal strength by taking advantage of the natural properties of radio waves.
- There are two types of diversity:
 1. Space diversity
 2. Polarization diversity

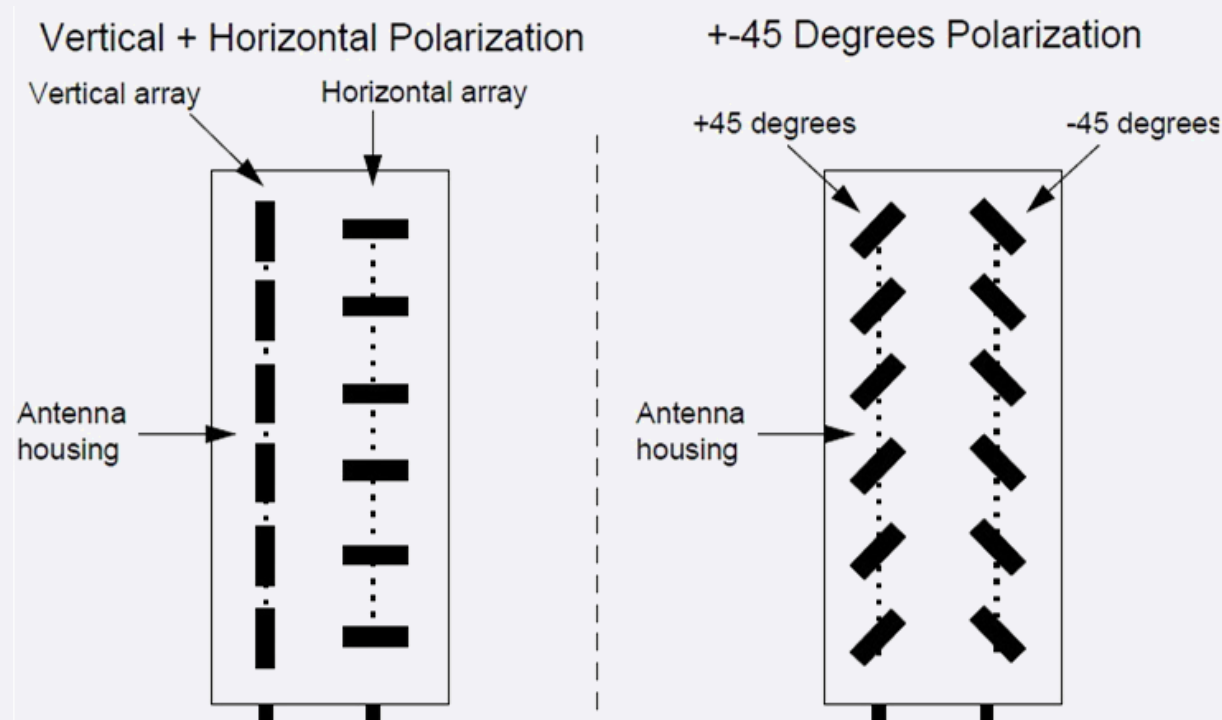
Space diversity

- An increased received signal strength at the BTS may be achieved by mounting two receiver antennae instead of one
- By choosing the best of each signal, the impact of fading can be reduced.



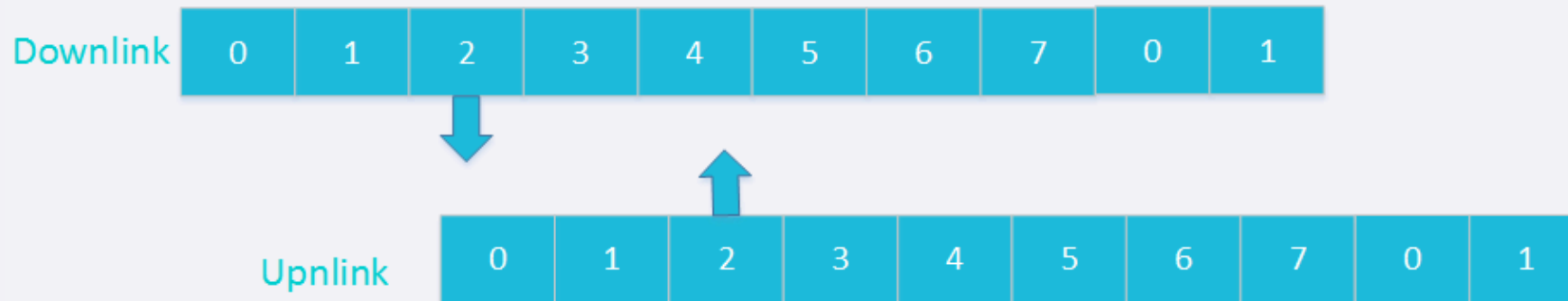
Polarization diversity

- With polarisation diversity the two space diversity antennae are replaced by one dual polarized antenna.
- The most common types are vertical/horizontal arrays and arrays in ± 45 degree slant orientation.



Frequency hopping

- Multipath fading is frequency dependent.
- This means that the fading dips occur at different places for different frequencies. To benefit from this fact, it is possible for the BTS and MS to hop from frequency to frequency during a call.



Timing advance

- To overcome time alignment.

