

Reading Comprehension Passage 22

This sample text has been prepared for the Master of Electrical Engineering entrance exam by Alpha Consulting Group.

When UMTs was designed, it was a bold approach to specify an air interface with a carrier bandwidth of 5MHz. Wideband Code Division Multiple Access (WCDM), the air interface chosen at that time, performed very well within this limit. On the other hand, if the bandwidth of the carrier is increased to attain higher transmission speeds, the time between two transmission steps has to decrease. The shorter a transmission step, the greater the impact of multipath fading on the received signal. Multipath fading causes the receiver not to see one signal but several copies arriving at different times. As a result, parts of the signal of a previous transmission step that has bounced off objects and thus took longer to travel to the receiver overlap with the radio signal of the current transmission step that was received via a more direct path.

This overlap is often referred to as inter - symbol interference (ISI). The shorter a transmission step, the more that overlap that can be observed and the more difficult it gets for the receiver to correctly interpret the received signal. With long term evolution (LTE), instead of spreading one signal over the complete carrier bandwidth (e.g.5MHz), Orthogonal Frequency Division Multiplexing (OFDM) is used that transmits the data over many narrowband carriers of 180 KHz each, and hence increasing the transmission step size. Instead of a single fast transmission, a data stream is split into many slower data streams that are transmitted simultaneously and according to LTE standard, it is possible to enjoy from a wider bandwidth than that of UMTS.

Questions

1. Which statement is not true in the context of UMTS & LTE?

1) In UMTS networks, ISI can become a more stringent drawback at wider bandwidths than 5 MHz.

2) OFDM is a new air interface technology capable of handling wider bandwidths than that of WCDMA.

3) The air interface used in UMTS networks has full capability of supporting higher data rates when the maximum bandwidth exceeds 5 MHz.

4) In an LTE network, the high-rate data-streams are divided into several lower rate streams to counteract the adverse effects of multipath fading channel.

2.LTE networks ...

- 1) are more robust to ISI than UMTS networks when both operating at similar bandwidths and within same propagation channel.
- 2) use a total of 180 kHz bandwidth which is allocated to many slower data streams for simultaneous transmission
- 3) are more resilient to negative effects of multipath channels only due to higher signal power at the transmitter side.
- 4) 1 & 3

3.OFDM

- 1) is only suitable for those bandwidths that are suitable for WCDMA
- 2) accomplishes its primary effect on increasing the transmission step size by changing the carrier bandwidth
- 3) cannot mitigate the ISI effect more efficiently than WCDMA when the underlying scenario remains the same
- 4) achieves slower transmission rates than WCDMA as it splits the data stream into low-rate sub-streams

Answers

1==> 3

2==> 1

3==> 2