

Mini-Assignment 1 : OFDM

Solution

True or False:

False 1. Consider a wireless channel that is frequency selective, i.e., different frequencies experience different attenuation and phase rotation. In this case, a scheme like 802.11b, which does not divide the bandwidth into sub-carriers but rather transmit each bit over the whole bandwidth is better than a scheme like OFDM which divides the bandwidth into sub-carriers and transmits different bits on different sub-carriers.

Why ? *Splitting into small frequency bands enables us to achieve the best possible bitrate supported by each individual sub-carrier and hence, potentially higher overall bit rate compared to a non OFDM schemes.*

True 2. Channel that suffer from more multipath requires a longer OFDM cyclic prefix than channels that do not suffer from multipath (e.g., line of sight channels).

Why ? *Because symbols experience greater spread in the time domain because of increased multipath and hence the need for a longer inter-symbol separation.*

False 3. One of the benefits of OFDM is that the receiver does not need to correct for sampling offset.

Why ? *The sampling offset has to be corrected regardless of whether or not a system implements OFDM.*

True 4. With OFDM, the transmitter can use a different modulation scheme (i.e., BPSK, 4QAM or 16QAM) for different OFDM sub-carriers.

Why ? *Each individual sub-carrier can be treated independently from the others in terms of the modulation (and coding) used. Thus, sub-carrier with more channel attenuation can use a more resilient modulation like BPSK or 4QAM while sub-carriers with better channel can use a higher modulation like 16 QAM or 64QAM.*