

1. A *white-FI* system (IEEE 802.11af standard) has a channel bandwidth of 6 MHz and the carrier frequency is 500 MHz. Assume that the maximum delay spread is experimentally measured as $T_m = 2.3 \mu\text{s}$ and that the symbol rate is 2.375 Mbaud.
 - (a) Is fading flat or frequency-selective?
 - (b) Estimate the maximum mobile speed for fading to be very slow.

2. A mobile wireless channel has baseband channel impulse response

$$c(t) = \frac{1}{\sqrt{3}} \delta(t) + \frac{1}{\sqrt{3}} e^{-j20^\circ} \delta(t - 0.5 \times 10^{-6}) + \frac{1}{\sqrt{3}} e^{j50^\circ} \delta(t - 2 \times 10^{-6}).$$

The modulation scheme is QPSK with bit rate 2 Mbps and SRRC filters of roll-off 20%. The center frequency is 2.4 GHz and the supported speed is up to 150 mph.

- (a) Plot the baseband channel frequency response $|C(f)|^2$ for $|f| \leq 10^6$ Hz.
 - (b) Is the channel flat or frequency selective?
 - (c) Is fading fast or slow?
3. BPSK modulation under flat Rayleigh fading

Download MATLAB script `bpsk_rayleigh.m` from Canvas. The script simulates the performance of BPSK modulation (polar mapping) under flat Rayleigh fading with interleaving.

 - (a) Run the script and sketch or attach the resulting figure
 - (b) Use the figure from part (a) to estimate the diversity order D