Exercises week 3

3-3. Consider a time-invariant indoor wireless channel with LOS component at delay 23 ns, a multipath component at delay 48 ns, and another multipath component at delay 67 ns. Find the delay spread assuming that the demodulator synchronizes to the LOS component. Repeat assuming that the demodulator synchronizes to the first multipath component.

3-6. Assume a Rayleigh fading channel with average signal power $2\sigma^2 = -80$ dBm. What is the power outage probability of this channel relative to the threshold $P_0 = -95$ dBm? How about $P_0 = -90$ dBm?

3-7. Suppose we have an application that requires a power outage probability of .01 for the threshold $P_0 = -80$ dBm. For Rayleigh fading, what value of the average signal power is required?

3-8. Assume a Rician fading channel with $2\sigma^2 = -80$ dBm and a target power of $P_0 = -80$ dBm. Find the outage probability assuming that the LOS component has average power $s^2 = -80$ dBm.

3-9. Consider a wideband channel with the multipath intensity profile:

$$A_c(\tau) = \begin{cases} e^{-\tau/0.0001} & 0 \leq \tau \leq 30\mu s \\ 0 & else \end{cases}$$

a) What is the maximum delay of any non-LOS components in this case?

b) Find the average delay spread and RMS delay spread.

c) How should we select our symbol period in order to avoid ISI?