EE 420
Design in Communications

Spring 2012

http://courses.washington.edu/ee420

Communication System Analysis Project
Part 3: Multipath Channels and QPSK

We are going to simulate a time-varying, two-path wireless channel. Write a Matlab script which includes adjustable parameters such as 1) the delay between the two multipath components, 2) the rate of variations, and 3) the strength of the two components.

A multipath channel can be modeled as

$$c(t, \tau) = b_1(t)\delta(\tau) + b_2(t)\delta(\tau - \tau_d)$$

where $b_1(t)$ and $b_2(t)$ are the multipath coefficients at time t.

- Generate $b_1(t)$ and $b_2(t)$ by passing white Gaussian noise through lowpass filters.

- Observe the time variations of $b_1(t)$ and $b_2(t)$ by adjusting the bandwidth of the lowpass filters.

- Let $s(t)$ be a QPSK sequence. Observe its output constellation within different time windows by passing $s(t)$ through the multipath channel $c(t, \tau)$:

$$y(t) = s(t) * c(t, \tau) = \int_{-\infty}^{\infty} c(t, \tau)s(t - \tau)d\tau = b_1(t)s(t) + b_2(t)s(t - \tau_d)$$

Generate representative plots for the above, explain, and document in a report which includes your code.