

Radio stations try to restrict the amplitude of the signal ***m (t)*** so that it is less than one in magnitude. The frequency ***fc***is very large compared to the frequency content of the signal. What we are concerned about here is not transmission, but reception.

1. The so-called coherent demodulator simply multiplies the signal x

(t) by a sinusoid having the same frequency as the carrier and lowpass filters the result. Analyze this receiver and show that it works. Assume the lowpass filter is ideal.

1. One issue in coherent reception is the phase of the sinusoid used by the receiver relative to that used by the transmitter. Assuming that the sinusoid of the receiver has a phase φ, how does the output depend on φ? What is the worst possible value for this phase?
2. The incoherent receiver is more commonly used because of the phase sensitivity problem inherent in coherent reception. Here, the receiver full-wave rectifes the received signal and lowpass filters the result (again ideally). Analyze this receiver. Does its

output difer from that of the coherent receiver in a signifcant way?

Let ***m (t)*** denote the signal that has been amplitude modulated.

**Problem 4.20: Demodulating an AM Signal**