

1. FM/PM-modulation - what are the differences and similarities?

Answer:

Similarities:

FM and PM are exponential modulations which are nonlinear modulation. Compare to linear modulation such as AM or DSB, the modulated spectrum is not related in a simple fashion to the message spectrum. Moreover, the transmission bandwidth is usually much greater than twice the message bandwidth. And the destination SNR can be much better than baseband transmission without increased the transmitted power.

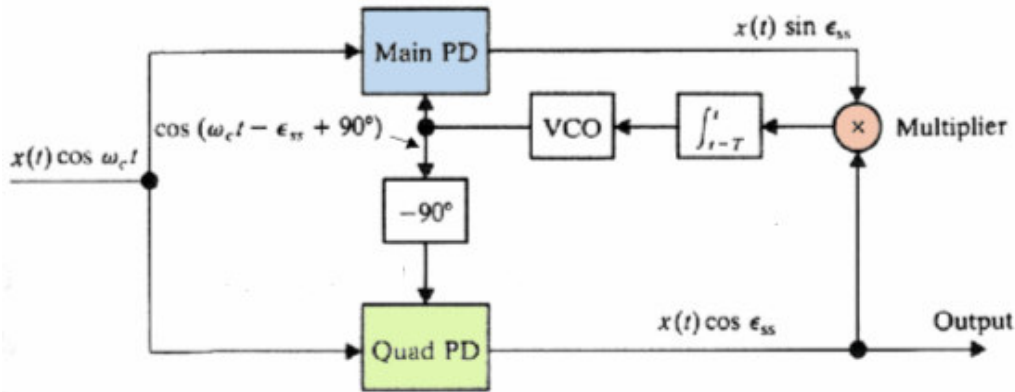
Differences:

The difference between FM and PM are derived from their definition formulas. The essential distinction is the integration of the message in FM. Furthermore, as shown in Tutorial 8, interference or noise behaviors at the output of detection are totally different.

2. Detecting DSB using PLL, at what situation the phase error 'e' will be large and cos(e) can not be approx to 1?

Answer:

In costas PLL systems, if frequency error $\Delta f \approx 0$, the PLL has $\epsilon \approx 0$ and the output of the quadrature discriminator is proportional to the demodulated message $x(t)$.



3. What does n order distortion mean?

Answer:

Nonlinear element in a system causes harmonic distortion. N-order distortion is corresponding to the nth harmonic distortion components.

4. What means M-ary?

Answer:

In digital signals and systems, M-ary means that the total number of symbols used is M. For example, a sequence of two binary digits can form four possible sequences:

11, 10, 01, 00

Furthermore

$$M = 2^n = 4$$

n is the number of bits in one sequence.

5. How the noise suppression works in FM system?

Answer:

According to Tutorial8, the interference increases linearly with interference frequency increasing in FM modulation.

Preemphasis and deemphasis filters are design to reduce the severe interference in the high frequency. At the transmitter, the weaker high-frequency components are boosted before modulation by a preemphasis filter. At the receiver, the demodulator output is passed through a deemphasis filter which undoes the preemphasis by attenuating the higher frequency components

6. FM demodulation: Mathematical basics and devices (components) used in demodulator?

Answer:

Please read the content on Lecture 4 and Lecture 6.

7. Baseband transmission system: What does PAM mean? Examples?

Answer:

Pulse amplitude modulation (PAM) is the simplest form of pulse modulation and is either transmitted by itself or, more commonly, is used to develop other pulse-modulated waveforms. In pulse-amplitude modulation, the signal is sampled at regular intervals to obtain a pulse whose amplitude is proportional to the amplitude of the signal at the instant of sampling.

Example is quantization process in Lecture 9.

8. Some example of PCM systems used in the World?

Answer:

PCM is the most useful and widely used of all the pulse modulations.

A/D conversion: PCM is a method of converting an analog signal into a digital signal.

PCM is used in digital telephone communication.

9. Matched filter: Convolution? How to realize?

Answer:

Matched filter is not a convolution. Matched filter is designed with given transmitter function.

10. Q-function: What does it mean, any formula? Is Q(A) so that A is sqrt (signal-to-noise ratio)? Is Q(A) = Pe = BER?

Answer:

The Q -function is a convenient way to express right-tail probabilities for normal (Gaussian) random variables.

The probability that a Gaussian random variable with mean m and variance σ^2 will have an observed value greater than $m + k\sigma$ is given by

$$Q(k) = \frac{1}{\sqrt{2\pi}} \int_k^{\infty} e^{-\lambda^2/2} d\lambda$$