AV332: Digital Communication Lab

Lab 3
Frequency modulation and demodulation using Emona DateX Kit Date: 25th and 29th August 2016

1 Frequency modulation and demodulation

1.1 Task 1 (Compulsory)

Prelab assignment (5 marks)

1. Study the direct generation method of frequency modulated signals using a VCO. Draw a block diagram of the direct generation system in your report.
2. For a single tone modulating signal $m(t) = Asin(2\pi f_m t)$ write down the spectrum of the frequency modulated signal $s(t)$ under narrowband and wideband modulation conditions.
3. Study the indirect generation method of frequency modulated signals. Draw a block diagram representation of the indirect FM generation method.
4. Using other sources (such as the Internet) write a short note on the zero-crossing method for FM demodulation. Draw a block diagram showing how the components on your Emona datex kit can be used for implementing FM demodulation using the zero-crossing method.

In lab tasks (5 marks)

1. Obtain the input output (control voltage vs frequency) characteristic of the VCO on your kit. What is the free running frequency of the VCO? What is the senstitivity of the VCO? Is the response of the VCO linear?
2. Suppose the modulating signal $m(t)$ is $Asin(2\pi 2000t)$. Obtain $s(t)$ which is the frequency modulated $m(t)$ using the direct generation method implemented on your Emona kit. What is β for this $s(t)$?
3. Observe and report on the spectrum of the modulated signal. Write down your observations on the spectrum for any two values of the maximum frequency deviation for single tone modulation.
4. Implement the zero-crossing method for FM demodulation and demodulate $s(t)$ obtained above (check if you can use any of the channel blocks to simulate a channel). Report the demodulated signal that you have obtained.
5. Suppose the free running frequency of the VCO was f_{vco}. So the FM signal is centered at f_{vco}. How will you generate a FM signal at $4f_{vco}$ with 4 times the β obtained above with the modulating signal $m(t)$ being the same using the components on your Emona kit.