CS M117

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Lab 1: Amplitude and Frequency Modulation

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**Observations**

This lab had us calculated some theoretical values in order to compare it with the results we got from doing the lab. I can make a conclusion based on how similar our measures results are with the theoretical values.

For part A1

Spectrum of carrier signal: the difference between my calculated value and the theoretical one is .126, which is decently good. For more details, look at page 21.

For part A2

Spectrum of baseband signal: Because the signal is rectangular, we can see the A\_rms = 0 for even frequencies. The difference between my calculated values and the theoretical values were pretty large (between .2 and 1). This is probably due to some user error when we were setting up the lab.

For part A3

Similar to part A2, because the signal is rectangular, we can see the A\_rms = 0 for even frequencies. For our odd frequencies, we got differences similar to part A2, which can be explained by user error, maybe.

For part B

For this part, I calculated K\_am to be 16.26. Our Error that we calculated wasn’t too far, with the max differenc of .1347. The least error we got was .015, which was great. For a detailed list of errors, look at page 25.

For part C

For this part of our lab, it seemed like our measured values were very different from the frequencies. This might be because we measured at the wrong frequency locations, as we heard the page had a typo. The numbers should have been similar to that of part B, but they were quite off.

For part D

For this part, we found the V\_rms for all the frequencies listed. You can view a better view of this on page 31 (or the Spectrum Analyzer screenshot of part D).

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| **#** | **Main goals** | **Results with error** |
| **1** | Find absolute and effective bandwidths of the carrier signal and baseband signal | EBW of carrier signal = 25kHz  EBW of baseband signal = 1kHz  ABW of carrier ≈ 25kHz  ABW of baseband ≈ 19kHz |
| **2** | The shape of AM and FM signals in time domain for rectangular baseband signal with sinusoidal carrier | For the shape of AM and FM signals in time domain, please refer to pictures on the right side of my LabVIEW printouts. |
| **3** | EBW of AM and FM signals; estimation of power requirements for DSBTC, DSBSC, and FM | P of DSBTC = 1.039W  EBW of DSBTC = 2KHz  P of DSBSC = 0.785W  EBW of DSBSC = 25.10KHz  P of FM = 8.071W  EBW of FM = 2.00KHz |
| **4** | Power spectrum for AM and FM (with sinusoidal carrier and rectangular baseband) signals and their BW | Please look at pages 21 and 23 of my submitted lab for power spectrum. Also, for the shape and BW please refer to pictures on the left side of the LabVIEW printouts. |
| **5** | Compare the results of FM signals with AM DSBTC with the same amplitude of baseband signals and carrier. Make conclusion about required EBW and power | AM DSBTC should have more power than FM to keep the bandwidth similar. |