**CS M117**

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**LAB 1: Amplitude and Frequency Modulation**

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**OBSERVATIONS**

This lab required us to have some pre-calculated theoretical results in order to compare with the real measured numbers obtained in laboratory. My observation is concluded based on how close or far my theoretical numbers are from actual measured results.

**For part A1** Spectrum of carrier signal: the difference between my calculated number and measured one is only 0.01 => the result is very good. For more detailed picture, look at the page 25 of my Lab.

**For part A2** Spectrum of baseband signal: based on my theoretical and measured numbers, I can observe that the error is about 0.05. Again, good result. For more detailed picture, look at the page 25 of my Lab.

**For part A3** Because the signal is rectangular, we can clearly see Arms = 0 for even frequencies. However, for odd frequencies, I got very close numbers to what I got for PART A2 and it is very reasonable. For more detailed picture, look at the page 27 of my Lab.

**For part B** In this part I calculated Kam = 16.2, and the measured result multiplied my Kam was supposed to be close to my theoretical calculations. My error is only about 0.05 again => satisfied. For more detailed picture, look at the page 29 of my Lab.

**For part C** For DSBSC AM the measurements should be similar to DSBTC AM’s numbers without carrier. If you look at pages 33 and 29, you can see that the numbers are almost exact.

**For part D** This part we did for K = 2, that is why the picture on the left side of LabVIEW printout on page 6 is similar to the graph in CourseNotes on page 233.

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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 on pages 4, 5, and 6. |
| **3** | EBW of AM and FM signals; estimation of power requirements for DSBTC, DSBSC, and FM | P of DSBTC = 0.962W  EBW of DSBTC = 25KHz  P of DSBSC = 0.525W  EBW of DSBSC = 24.50KHz  P of FM = 7.931W  EBW of FM = 25.10KHz |
| **4** | Power spectrum for AM and FM (with sinusoidal carrier and rectangular baseband) signals and their BW | Please look at pages 29, 33 and 35 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 on pages 4, 5, and 6. |
| **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. |