**CS M117**

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**LAB 1: Amplitude and Frequency Modulation**

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**OBSERVATIONS**

This lab required us to have some theoretical results already prepared in order to do the lab and compare with the real measured numbers. My observations are concluded based on how close or far my theoretical numbers are from actual measured numbers from the lab.

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

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

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

**For part B:** In this part I calculated Kam = 16.16, and the measured result multiplied my Kam;it supposed to be close to my theoretical values. My error is only about 0.05. For more detailed picture, look at the page 29 of Lab.

**For part C:** For DSBSC AM the measurements should be similar to DSBTC AM’s numbers without carrier. If we look at pages 33 and 29, we can see that those numbers are pretty close.

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

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| **#** | **Main goals** | **Results with errors** |
| **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, refer to pictures on the right side of 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 | Look at the pages 29, 33 and 35 of the submitted lab for power spectrum. Also, for the shape and BW refer to the pictures on the left side of 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 |