

EECS 306: Analog Modulation Report and Project

Due Date: **End of Week 10 [9th December 2023]**

1. Report

An Analog modulation consists of various types (amplitude, frequency, and phase), there is a wide range of applications using these techniques.

I. In this report, you should **discuss Two Applications**:

- A. Application for Amplitude Modulation.
- B. Application for Angle Modulation.

(Hint: Doesn't mention before in lectures)

II. The Report has the following specs:

- Core topic (AM & FM Applications), highlighting the main concept.
- Length: up to 4 pages, single-spaced, Font: Times New Roman, 12-point font.
- Any references used should be properly cited.

2. Project (Using MATLAB or Simulink)

i. Required tasks

(Part I – DSB LC & FM)

- 1) Generate an input modulating signal $m(t)$ shown in Fig. 1.
- 2) Generate **an AM DSB-LC** signal with $m(t)$ using a **carrier wave** $c(t)$ of 1 Volt amplitude and 10 KHz frequency $K_a = 0.5$. Comment on the result.
- 3) Repeat the previous steps for $K_a = 1$ and $K_a = 2$. Comment on the plots you obtain.
- 4) Generate an FM signal for the same carrier then Plot the FM signal and comment on it.
- 5) Repeat the previous steps for $K_f = 3000$ and $K_f = 5000$. Comment on the plots you obtain.

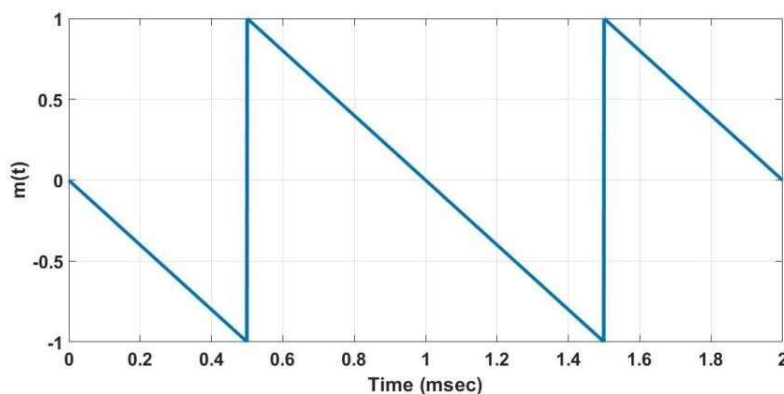


Fig. 1: Information signal $m(t)$

(Part II – SSB)

1. Generate the sinusoidal message signal $m(t)$, with an amplitude of 2 volts and a frequency of 2 KHz and plot it.
2. Generate the modulated signal, $s(t)$, output of the block shown in Fig. 2 using a **carrier wave** $c(t)$ of 1 Volt amplitude and 10 KHz frequency and plot USB and LSB.
3. Obtain the frequency spectrum of the modulated signal.
4. Implement a suitable demodulator to extract $m(t)$ from $s(t)$.
5. Investigate the output of the previous step if the generator carrier wasn't perfectly synchronized with the used one in modulator. Comment on the plots you obtain.

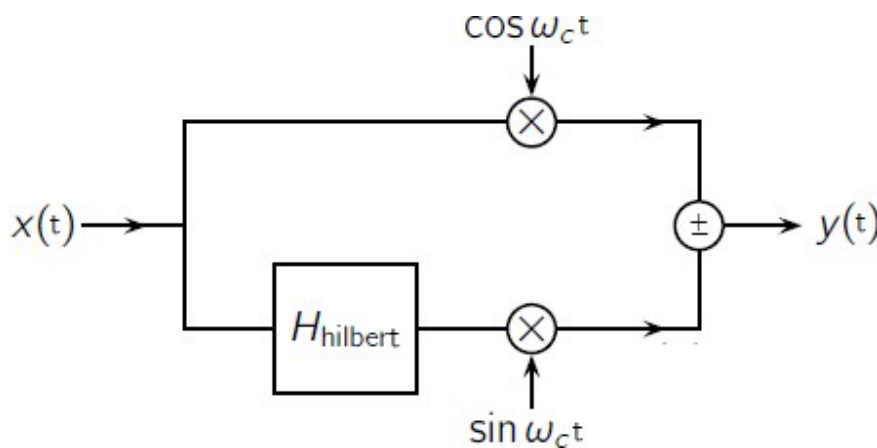


Fig. 2: Single Sideband Modulator

ii. Deliver the following in a .zip file

- 1) **Source codes** (.m files) to generate the required Modulation techniques.
- 2) **Figure plots** (.fig files) of the required Modulation techniques.
- 3) A **.pdf file** of complete Report, including the figures, properly labeled and titled. The Report should also include your comments.

Important Note:

- Report of your Modulation techniques is a **mandatory** requirement in this part.
(*The source codes submitted without a report will not be accepted*).
- The report should be explained clearly all your steps and their corresponding inputs, outputs, internal variables, etc., and how they map to the implemented task.
- The code should be readable and all the variable names are meaningful.
- The code should be commented to explain the functionality of your code.

3. Project Logistics:

1. This is an **individual** project.
2. Any **plagiarized** reports and codes, either fully or partially, will receive **zero points**.
(This applies to **both** the original and the copy)
3. Any references used should be properly cited.
4. Screen snapshots can be included in the report.
5. **No late submissions** are allowed.
6. A **single .pdf** report should be submitted.

7. **The Grading criteria** will depend on:
 - 40%: Completeness and correctness of every deliverable (as per the .pdf report and source codes)
 - 30%: AM and FM applications Report (as per the .pdf report)
 - 20%: Clarity of figures, and proper labeling (as per the .pdf report)
 - 10%: Report writing and organization.