

Birla Institute of Technology & Science, Pilani, Rajasthan

First Semester 2019-2020

Lab-5 (Tuesday)

Course: EEE F311 Communication Systems
Instructor-in-Charge: S M Zafaruddin

Date: 03-09-2019

Objectives

In this task, the objective is to get familiarity with real-time processing for some practical relevant problems.

- Generation of different tones in telephone systems
- Dialing a specific number
- FM modulation and demodulation.

Create a folder named with your Institute ID and first name in the Desktop to save your work. Always write code in *.m file. Keep the codes with you for next week Lab sessions.

Note: Use the mainyourIDFirstName.m file. You are required to call the individual functions from the main.m file only which will generate required plots.*

Tone Plan

- Dial tone is a continuous tone of the addition of the frequencies 350 and 440 Hz at a level of -13 dBm.
- Audible ringing tone is defined as comprising frequencies of 440 and 480 Hz at a level of -19 dBm and a cadence of 2 seconds ON and 4 seconds OFF.
- Low tone, also busy tone, is defined as having frequency components of 480 and 620 Hz at a level of -24 dBm and a cadence of one half second ON and one half second OFF.
- Reorder tone, also often called fast busy tone, is the same tone, but with a cadence of 0.25 of a second ON and 0.25 of a second OFF.
- High tone is a tone of 480 Hz at -17 dB.

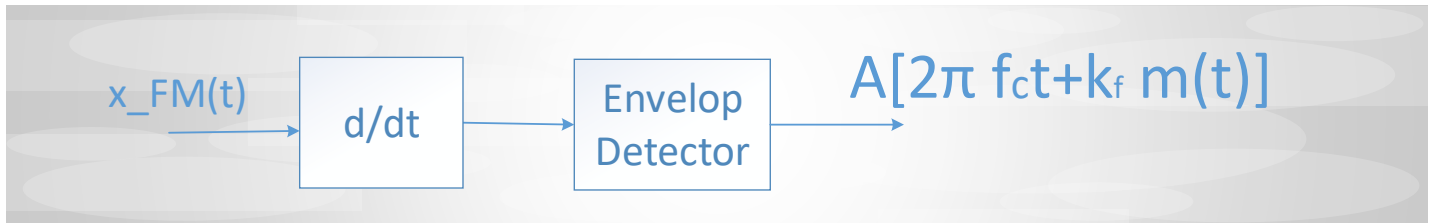


Figure 1: FM demodulator

Task 1

1. Use the tone plane to generate different types (dial, ringing, busy, recoding, high) of tones. Use a speaker to listen various tones by applying Matlab function sound. **Caution: Use amplitude of the carrier appropriately (less than 0.1 volt).**
2. Use the ITU-T Recommendation Q.23: Technical features of push button telephone sets to develop a code that takes any 10 digit phone number and creates the corresponding tones. Use a speaker to listen the dialed number by applying Matlab function sound. **Caution: Use amplitude of the carrier appropriately (less than 0.1 volt).**

Task 2

1. Frequency modulate the high tone of 480 Hz of amplitude 1 volt using a carrier amplitude 2 volt and carrier frequency 1000 Hz. Use frequency sensitivity $k_f = 1440\text{Hz/Volt}$. Plot the frequency modulated signal in time and frequency domains.
2. Demodulate the high tone from modulated FM signal using a differentiation followed by an envelop detector. For the differentiation use Matlab function diff. Plot the modulating and demodulated signals. Use the Matlab function sound to compare the transmitted high tone with the demodulated tone.

Backup Codes

1. Please keep backup of codes and figures by sending to your emails.
2. **Make a zip/rar folder of your codes and figures in .jpeg format and upload to (ONLY ONCE):**
<https://www.dropbox.com/request/KE4nT4scQcMiS9hx2WLK>

Project Task

We have started individual tasks with a bigger picture: to design an end-to-end simulator. Study the structure module in Matlab. Create a function of source signal as a structure and field values as the signals discussed so far: sinusoidal signal , rectangular pulse, audio file.