Assignment 7 - Radio-Frequency Communications Project - ABET

This Assignment aims at verifying and expanding, with design, simulations and measurements, your creativity and your knowledge and understanding of radio-frequency circuits.

This is a Project: you must design and build your circuit starting from specifications and constraints.

Please document each step with snapshots, pictures, and your observations. Also, please include a short video with audio to demonstrate proper operation.

1) Using the simulator, design and simulate a FM transmitter in the 90-100 MHz frequency band composed of one signal amplifier circuit followed by one oscillator circuit (**40pts**):

- voltage supply: +9V
- for the amplifier use one BJT 2N3904 to provide ~x10 signal amplification without next-stage load
- for the oscillator use one BJT 2N3904, one ~0.1uH inductor and two ~5-20 pF capacitors
- use a ~0.1uF to couple the input signal to the amplifier
- use a ~0.1uF to couple the amplifier to the oscillator
- simulate the oscillator
- try to apply a low-frequency signal (you may need to use a small "Max Timestep")

2) Prepare an experimental plan to demonstrate your transmitter *(ABET PI-61)*

3) Build the circuit at (1) and experimentally demonstrate the transmission of a song generated from the jack line of your cell phone or your desktop/laptop into the circuit at(1) to a FM receiver (e.g. car) (**160pts**) *(ABET PI-62)*

Helpful hints:

- use a 9V battery
- for the oscillator
    - use capacitors in series to achieve small values, and/or use adjustable capacitors
    - use/build an air coil inductor and adjust it to achieve the desired frequency
- for the antenna
    - use a ~12 long inch wire
    - AC-couple the antenna to the circuit
- filter the supply with tens to hundreds of µF
- place the FM transmitter close to your FM radio
- patiently tune the circuit and your FM radio until you receive the signal