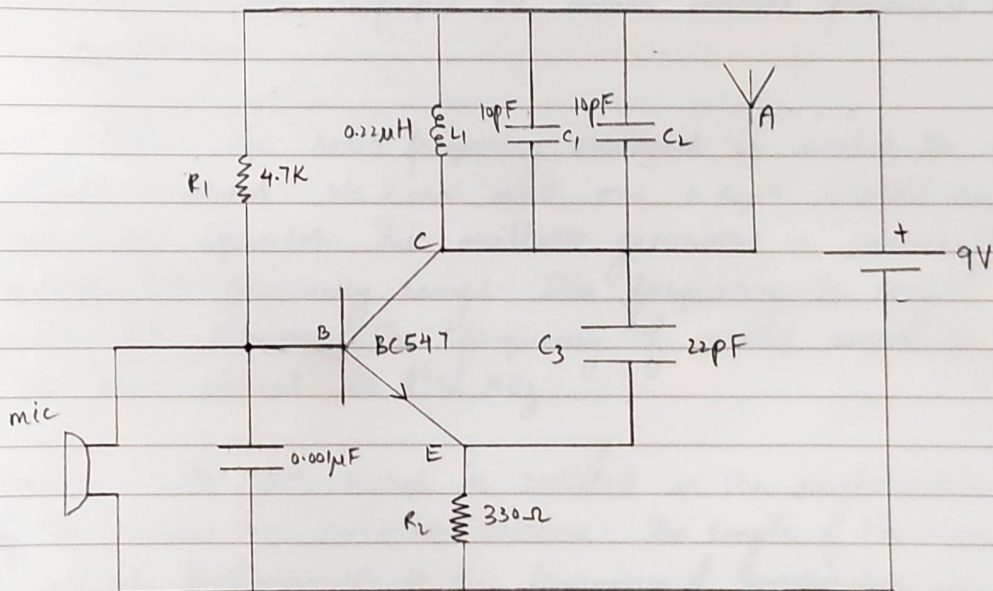


FM TRANSMITTER

Aim: To design and build a FM transmitter using a single transistor.

Components used: 330Ω , $4.7k\Omega$ resistors, $0.22\mu H$ inductor, $2 \times 10p$, $22pF$, $1nF$ capacitors, 1 microphone, antenna, 9V power source; BC547 BJT

Circuit diagram:



$R_1, R_2 \rightarrow$ Resistors

$C_1, C_2, C_3 \rightarrow$ Capacitors

$L_1 \rightarrow$ Inductor

mic \rightarrow microphone

9V \rightarrow power supply

A \rightarrow antenna

Microphone: A microphone converts sound into a small electrical current. The microphone contains a capacitor. In a condenser microphone, the incoming sound vibrates one plate of a capacitor. The varying capacitance is converted into a corresponding electrical signal. The current produced is small.

BC547 transistor: The transistor does the main work of creating modulated frequency of electric signal which is gained from electric mic as an analog signal. The BC547 is an NPN transistor. The maximum gain current of this transistor is 800 A. Its maximum transition frequency is 300 MHz and it operates at around 625 mW. The transistor also amplifies the small current produced by the microphone.

Tank circuit: The radio frequency oscillator is similar to a Colpitts oscillator. We have used one $0.22 \mu\text{H}$ inductor and two 10 pF capacitors. This oscillator generates a carrier frequency in the FM frequency range. This frequency is caught by the FM receiver. The frequency of carrier wave in the given circuit is 97.2 MHz .

Antenna: The FM signal is radiated in the neighbourhood of the transmitter using an antenna. The length of the antenna is inversely proportional to the frequency of modulating signal. Since the FM signals are high frequency signals, a considerable length antenna can be used. But this also reduces the range of the transmitter.

Passive elements: The $4.7 \text{ k}\Omega$ resistor prevents the tank circuit to produce large currents during resonance. The 22 pF capacitor controls the gain of the transistor. The 1 nF capacitor is connected in parallel to the mic.



Results:

Parameters	Value
Base-emitter voltage	0.6 - 0.75 V
Base-collector voltage	< 0 (active region)
Carrier frequency	97.2 MHz
Range of transmission	~ 4.5 m
Power consumption	0.7 W

Conclusion: The FM receiver successfully received the FM transmitter signal at 97.2 MHz. The audio quality was moderate. The range of transmission is 4.5 m.