FM-Transmitter

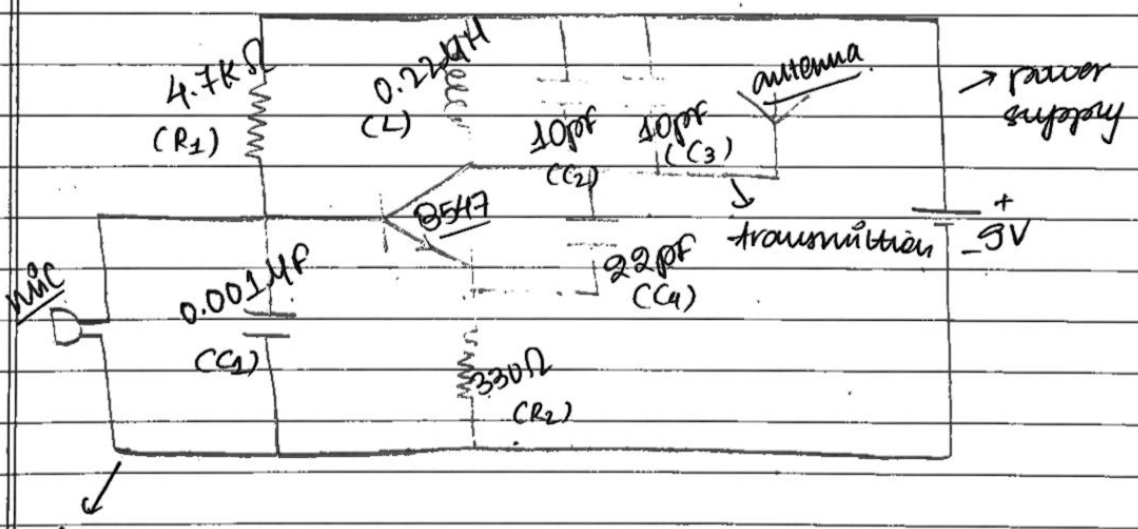
classmate
Date
Page

AIM: To build a FM transmitter which takes in an input audio signal through microphone and emits a specific frequency using 9V power supply.

APPARATUS:

1) Transistor: BC547
2) Capacitors: 0.001 μF (C_2), 10pF (x2) (C_2, C_3), 22pF (C_4)
3) Resistors: 4.7 kohm (R_1), 330Ω (R_2)
4) Inductor: 0.22 μH (L)
5) Input: Microphone
6) Output: (wire) antenna
7) Power Supply

CIRCUIT DIAGRAM:



THEORY : In theory, we typically are going to discuss about components.

1) BC547 : It is general-purpose NPN bipolar junction transistor (BJT) that is widely available and inexpensive. It is useful for a variety of low power applications, including amplifica?.

2) Microphone : It is typically used as an input device to capture audio signals and convert them to electrical signals.

3) Antenna : A wire is used as antenna, exploiting the principle of electromagnetism to ~~exploit~~ transmit RF signals.

WORKING / PROCEDURE:

1) Firstly, the audiosignal is input through a microphone. It contains a diaphragm that vibrates in response to sound waves. These vibrations can cause changes in the electrical resistance of the microphone's internal components, generating an electrical signals.

2) Now this input passes through capacitor (C_1). It serves the purpose of AC coupling & filtering.

AC COUPLING : The capacitor blocks DC voltage from the input which prevents any DC bias interfering with the transmitter.

FILTERING : It acts as high-pass-filter, because the low-frequency components contains noise & interferences.

3) This input is then fed to the base of transistor.

4) Now comes the function of resistors R_1 and R_2. Both the resistors are used for biasing the transistor as forward bias and setting up base and emitter voltages respectively and limiting the corresponding currents.

5) PTO.

5) The LC circuit here (C_L, C_1, C_2) is used for providing an oscillatory circuit, which is used in generating carrier wave using transistor. Here C3(22pF) acts as ~~negative~~ positive feedback.

6) Amplification: The input is amplified, by transistor to a level sufficient to modulate carrier wave effectively.
Modulation: This amplified wave modulates carrier wave. The frequency of carrier wave is directly proportional to amplitude of input.
Generation of modulated signal: The modulated signal i.e carrier wave which is modulated is then ready to transmit after amplification (again).

7) The collector of the transistor experiences voltage variations. By connected antenna to collector, it effectively "rides" on these voltage variations, allowing the transmitted signal to be radiated into space.

CALCULATIONS:

The frequency emitted can be calculated as
$f_{emitted} = f_{carrier} + \Delta f$.
[$f_{carrier} = 1/2\pi\sqrt{LC}$]
Δf: frequency caused by modulation

$f_{carrier}$ (theo) = 75.91 MHz.
$f_{emitted}$ (observed) = 88.3 MHz.

Testing / OBSERVATIONS:

1) You need to set up your device to scan the frequency that is emitted by fm transmitter. It was "88.3MHz" in our case.
2) Tap test: As you tap the mic, you can identify which frequency corresponds to your fm transmitter.
3) As you play a song through mic., you should be able to hear

P.T.O.

it from your device.

CONCLUSION:

We successfully designed a FM transmitter which emits a frequency of "88.3MHz".