Report on **Working model of FM transmitter**

Submitted to
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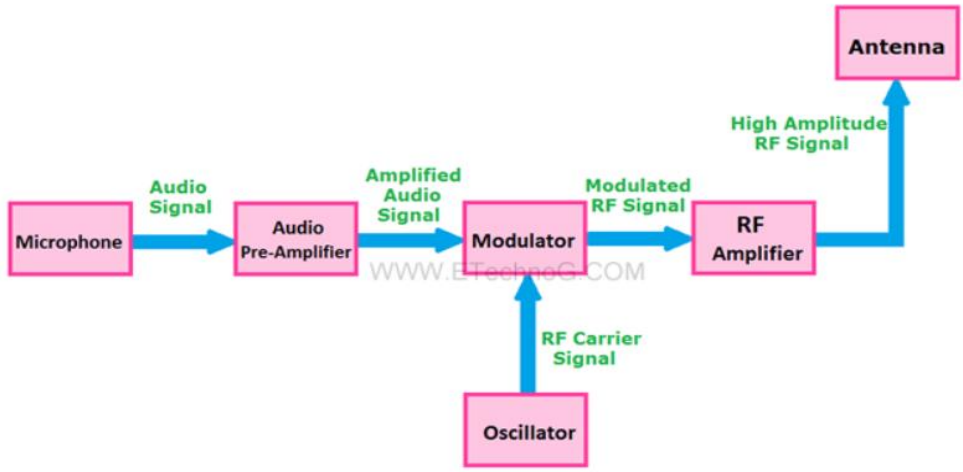
FM Transmitter

Aim:

To design and construct a working model of FM Transmitter and to observe the output.

Theory:

The working of FM transmitter can be explained as follows:
The FM transmitter is a low power transmitter and it uses FM waves for transmitting the sound, this transmitter transmits the audio signals through the carrier wave by the difference of frequency

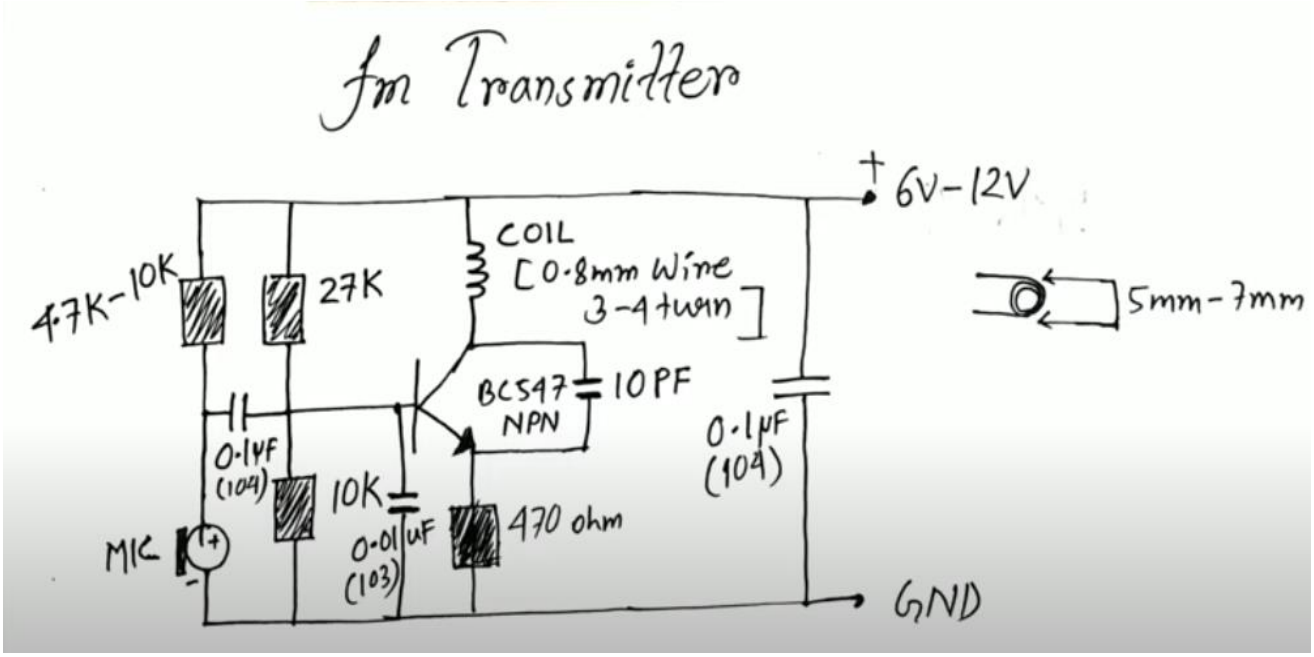


1. The audio signal from the output of the microphone is sent to the pre-amplifier, which boosts the level of the modulating signal.
2. This signal is then passed to high pass filter, which acts as a pre-emphasis network to filter out the noise and improve the signal to noise ratio.
3. This signal is further passed to the FM modulator circuit. The oscillator circuit generates a high frequency carrier, which is sent to the modulator along with the modulating signal.
4. Several stages of frequency multiplier are used to increase the operating frequency. Even then, the power of the signal is not enough to transmit. Hence, a RF power amplifier is used at the end to increase the power of the modulated signal. This FM modulated output is finally passed to the antenna to be transmitted.

Working principle:

The transmitter signal frequency Modulated (FM) which means that the carrier's amplitude stays constant and its frequency varies according to the amplitude variations of the audio signal.
The circuit involves three stages (2RF stages and one audio pre amplifier of the modulation).
The first stage is pre amplification stage
The second (RF) stage is an oscillator.
The last (RF) stage is a tuned amplifier that boosts signals from the oscillator.
Use of the additional RF amplifier increases the range of the transmitter.

Circuit Diagram:



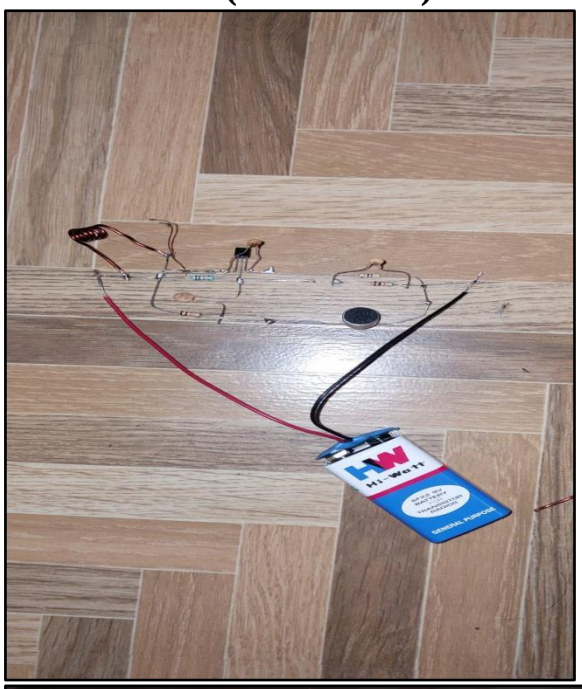
Materials Required:

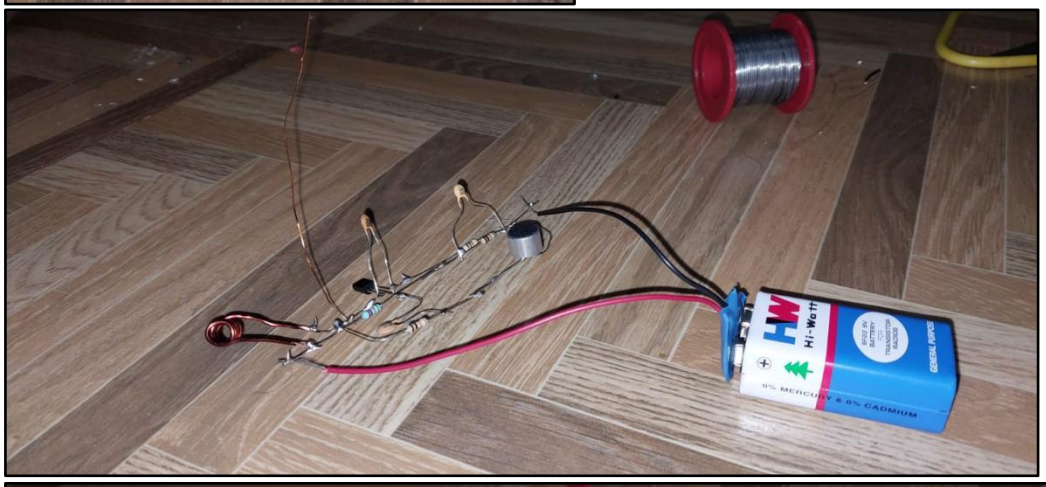
Quantity	Components	Specifications/Range
2	Resistor	10k Ohms
1	Resistor	470 Ohms
1	Resistor	27k Ohms
1	BC547 Transistor	
2	Capacitor (104)	0.1 microFarads
1	Capacitor (103)	0.01 microFarads
1	Electric Mic	
1m	0.8mm wire	4-5 turn
1	Battery	9 volts

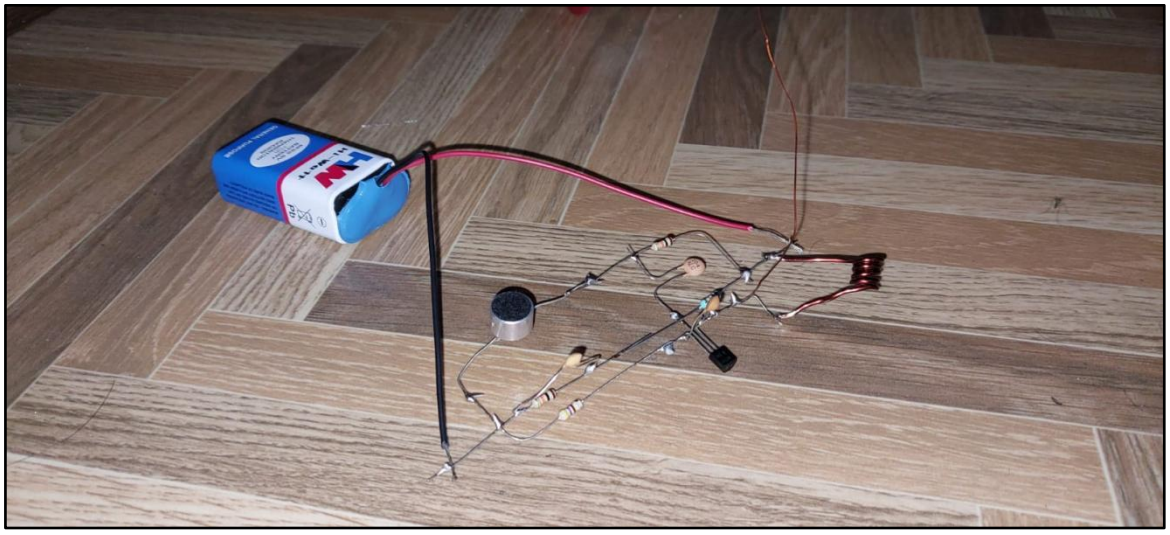
Procedure:

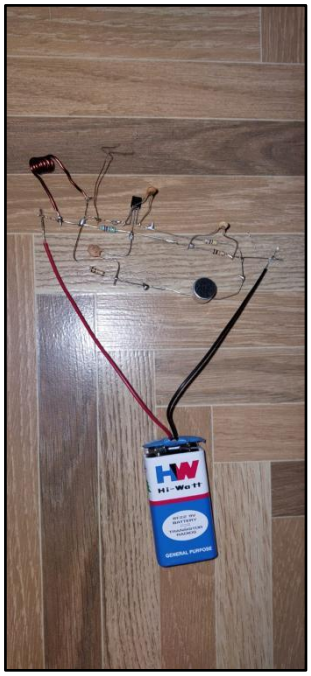
1. Taking the npn transistor (BC547), we solder 10pf capacitor to the collector-emitter ends of the transistor.
2. Connect one end of 27kΩ and 10kΩ resistors to the base of the transistor.
3. Connect one end of 470Ω resistor to emitter end and the other end of the resistor is soldered with the other end of 10kΩ resistor.
4. Connecting one end of the 0.01µf capacitor to the base of the transistor, the other end is soldered to the wire connecting 470Ω and 10kΩ resistor.
5. One end of 0.1µf capacitor is soldered to the base of the transistor whereas the other end is connected to one end of 10kΩ resistor. The other end of the resistor is connected with 27kΩ resistor.
6. The positive end of the mic is soldered to the junction of 0.1µf capacitor and 10kΩ resistor whereas the negative end is connected to the wire joining the components 10kΩ, 470Ω and 0.01µf. This wire acts as a ground.
7. An 0.8mm wire is used and turned around a core of approximately 5mm 5times to construct the antenna of the transmitter. This antenna is then soldered to collector end of the transistor and the wire joining 10kΩ and 27kΩ resistor. This wire is also connected to the voltage supply (battery).
8. A 0.1µf capacitor is connected to the ground wire and the voltage supply wire. The positive and negative of the battery is connected to the voltage supply and ground of the circuit.
9. After the circuit is constructed according to the above steps or as per the circuit diagram, we observe the working of the transmitter.

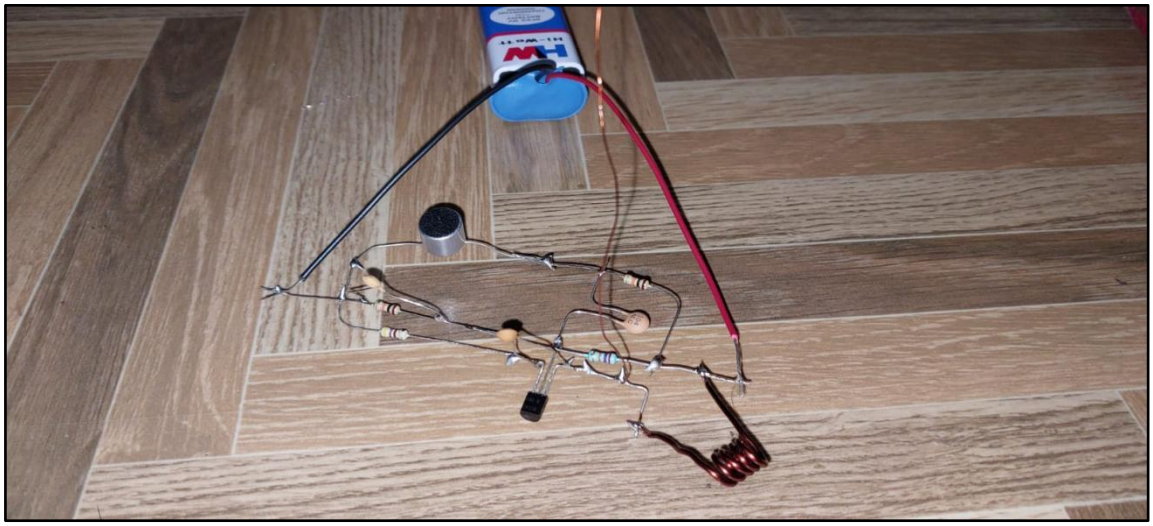
Observations (with circuit):











Video link:

https://drive.google.com/file/d/1qU0yLrnlTnS75AC9k9yzkMSVN14ZYtCb/view?usp=drivesdk

Applications:

When it comes to applications, fm transmitter has a wide variety of uses:

1) As we all know its used in car radios.
2) They are used as a workaround for the playing of portable audio devices on car devices that don't have the availability of "AUX" input jack or Bluetooth connectivity.
3) They are used for broadcasting a stationary audio source, such as a computer or TV

4) Their use is also involved in low power broadcasting and pirate radio(radio station that broadcasts without a proper license), but only to a very population in close by proximity.
5) They are used as talking signs in the real estate business.
6) They are used in places of worship and other important institutions and places like in correctional facilities or hospitals or fitness centers.
7) It also has diverse applications in military industry.
8) The correctional facilities have used in the FM transmitters to reduce the prison noise in common areas.

Problems faced:

1)Initially one of the problem we faced was in finding the proper circuit diagram for designing and making our fm transmitter circuit.
2)Another problem we observed while making the circuit was during soldering as we had to make sure that we soldered it properly while soldering the resistors and its wires were getting hot so we had very less time in connecting so that connections would be proper.
3) There was a difficulty in matching the frequency, we had to try around 15 to 16 different frequencies to finally get a proper matched frequency of 91.9Mhz.
4)Another problem we observed is adjusting the antenna to properly tune the frequency. Initially for inductors we used thin wires and we were getting very high frequency for tuning and to rectify that 14 gauge copper wire to get a lesser frequency for proper tuning.

5)Soldering of the inductor was difficult due to the wire being of copper coating so for soldering we removed the copper coating of the wire at the edges.

References:

https://youtu.be/5DbgnXWP2l0
For theory:

1. Steps of fm transmitter
2. Working principle
3. Class Notes.