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**Caution: Electrical experiments can be dangerous! By using this site you acknowledge that you are aware of this fact and want to proceed at your own risk!**

An FM transmitter circuit is a high frequency wireless device which is able to transmit voice signals into atmosphere so that it can be received by a corresponding FM receiver circuit for reproducing the voice signals in a loudspeaker.

RockChip RK3128 RK3288 RK3399

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WONGSHI

Here we'll discuss how to build small FM transmitter circuits using 10 different methods, one that consists of wire link from the transmitter to the receiver, and the other which is completely wireless and can be used to eavesdrop a particular conversation over a range of about 30 meters, over an ordinary FM radio.

All the FM transmitter circuits presented below are significantly powerful, hard to trace in their hidden positions, and equipped for grasping even the weakest of whispers in the vicinity. Moreover the designs are capable of transmitting the picked information upto radial distances exceeding 2 kms.

The above extraordinary capabilities have forced the legal authorities to enforce stringent laws against the use of these transmitters without permission, so before you make and use one of these make sure you have all the legal formalities completed.

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**Interested to learn how to detect these hidden Spy transmitters? The details can be found in this bug detector article (<https://www.homemade-circuits.com/bug-detector-circuit-rf-sniffer-circuit/>).**

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**2.7. Transmitting Music**

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## Wireless Design:

I will begin with a transmitter which I have actually built numerous number of times and tested it thoroughly. Subsequently I am going to discuss more such designs which were selected from other websites online.

The sent signals can be received over any standard FM radio, tuned accurately to the respective frequency.

The above shown wireless FM transmitter circuit is basically a small RF transmitter built around a single transistor.

The circuit functions quite like a Colpitts oscillator (<https://www.homemade-circuits.com/lc-oscillator-circuit-how-it-works/>) incorporating a tank circuit for the generation of the required oscillations.

The frequency mainly depends on the positioning and the values of the inductor, C1, C2 and C3. The coil turn distance and diameter may be manipulated a little for optimizing best response over the FM receiver.

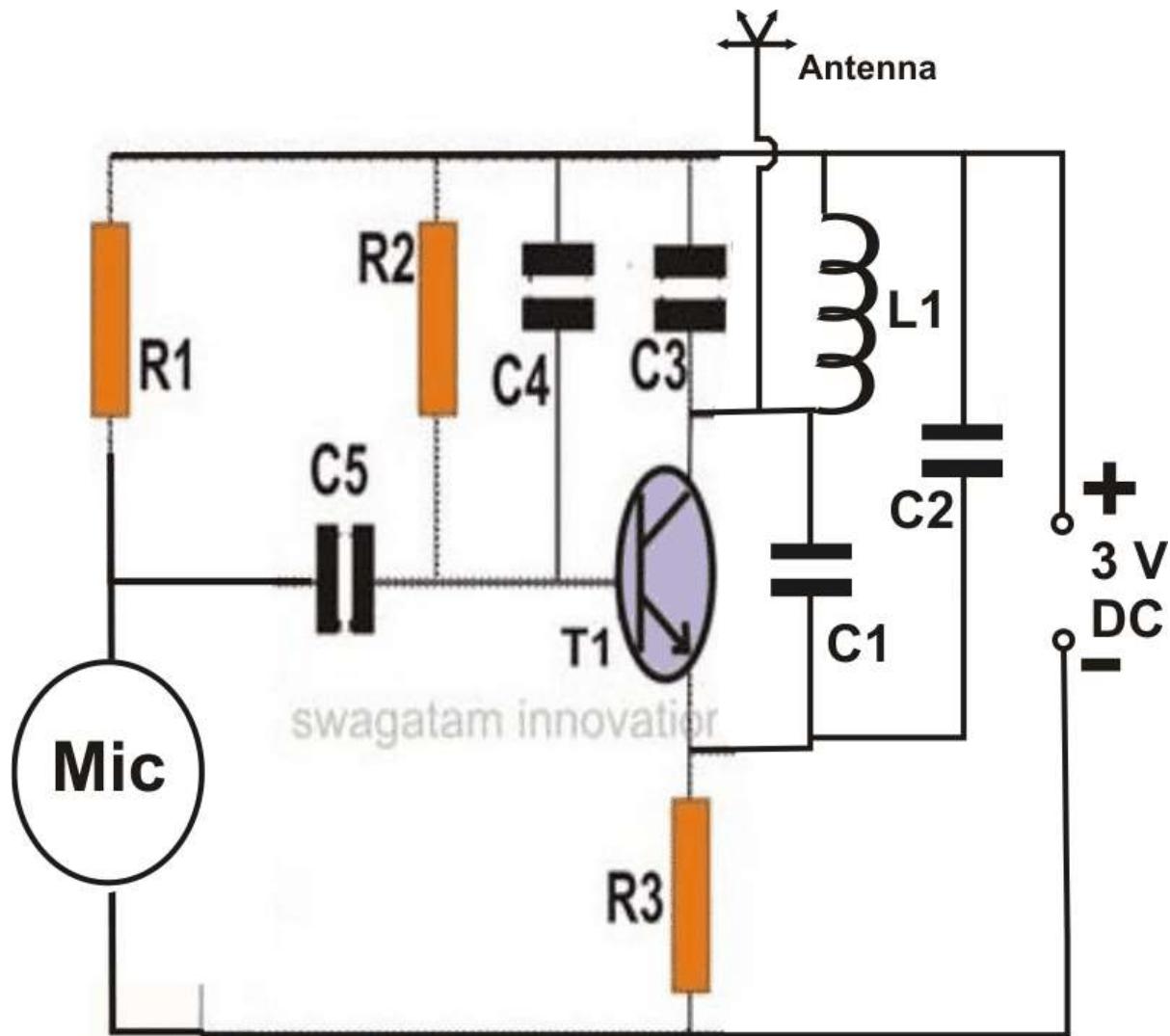
A small antenna in the form of a 3 inches wire may be attached at the shown point for making the “bug” highly responsive and generate distortion free signals.

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## Circuit Diagram



## Parts List

R1 = 3k3,

R2 = 100K,

R3 = 470 Ohms

C1 = 10 pF, C2 = 27 pF

C3 = 27pF,

C4 = 102 disc

C5 = 10uF/10V,

Mic = condenser mic

T1 = BC547

L1 = 3 to 4 turns of 22SWG super enamel copper wire, 5 to 7 mm diameter, air core  
Please refer the scanned image of the prototype for getting an idea regarding the coil dimensions.

Now let's discuss a few FM transmitter circuits which can be built using different configurations and features.

## One Transistor Design

You might have already come across a host of these extremely basic one transistor FM transmitter circuits, however these may incorporate certain drawbacks as mentioned below:

No substantial transmitting range.

No enhanced sensitivity range

Use 1.5V for operating which render limited capabilities.

Among the first in the line, which is probably the simplest is shown in the following circuit diagram.

Surprisingly it does not employ a MIC, rather the antenna coil itself performs a dual function of detecting sound vibrations and also transmitting it into the atmosphere.

The design is void of a frequency determining stage and thus does not come under tuned transmitter circuits (we'll discuss about these later on in the article).

## Circuit Operation

The following single transistor FM spy circuit may be understood as follows:

When switched ON, the capacitor 22n inhibits the transistor from switching until it gets charged. As soon as this happens the transistor switches ON via the 47k resistor forcing the pulse through the inductor which feeds back a negative pulse to the base of the transistor discharging the 22n capacitor.

capacitor.

This switches OFF the transistor until  $22n$  yet again charges fully. The procedures take place rapidly generating a frequency across the coil which is transmitted as carrier waves through the connected antenna.

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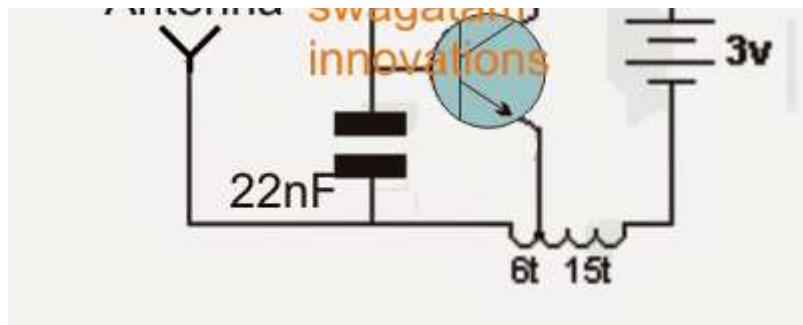
STMicroelectronics

L

In the course if the coil is subjected to an external vibrational pulse, it's forced to mount the above explained carrier waves in the air and could be received and retrieved over a standard FM radio (<https://www.homemade-circuits.com/make-this-simple-fm-radio-circuit-using/>) positioned and tuned at the same frequency nearby.

The circuit may be expected to work at around 90MHz frequency band.

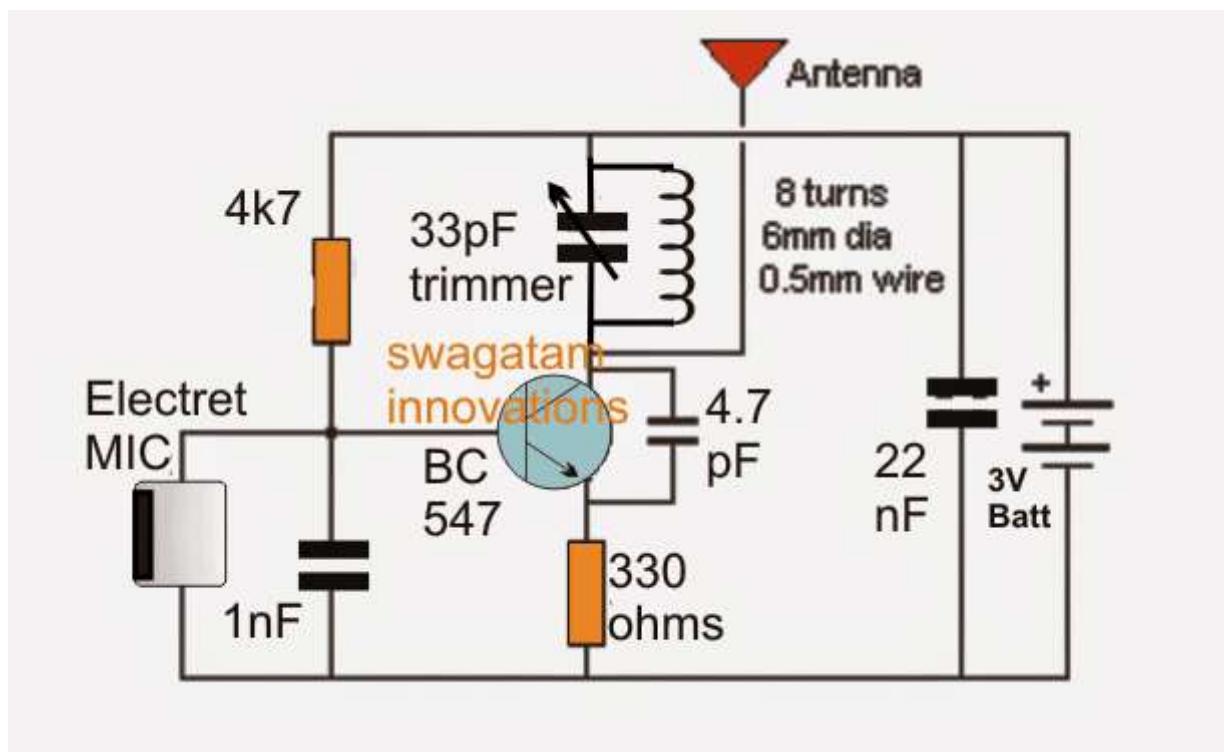




## Using Tuned Circuit

The second example below shows another single transistor FM spy circuit that incorporates a tuned circuit or a frequency determining stage in it.

In the original prototype the coil was created by etching a spiral track layout on the PCB itself, however for optimal gain and performance such etched antenna coil must be avoided and the traditional wire wound type of coil must be employed.



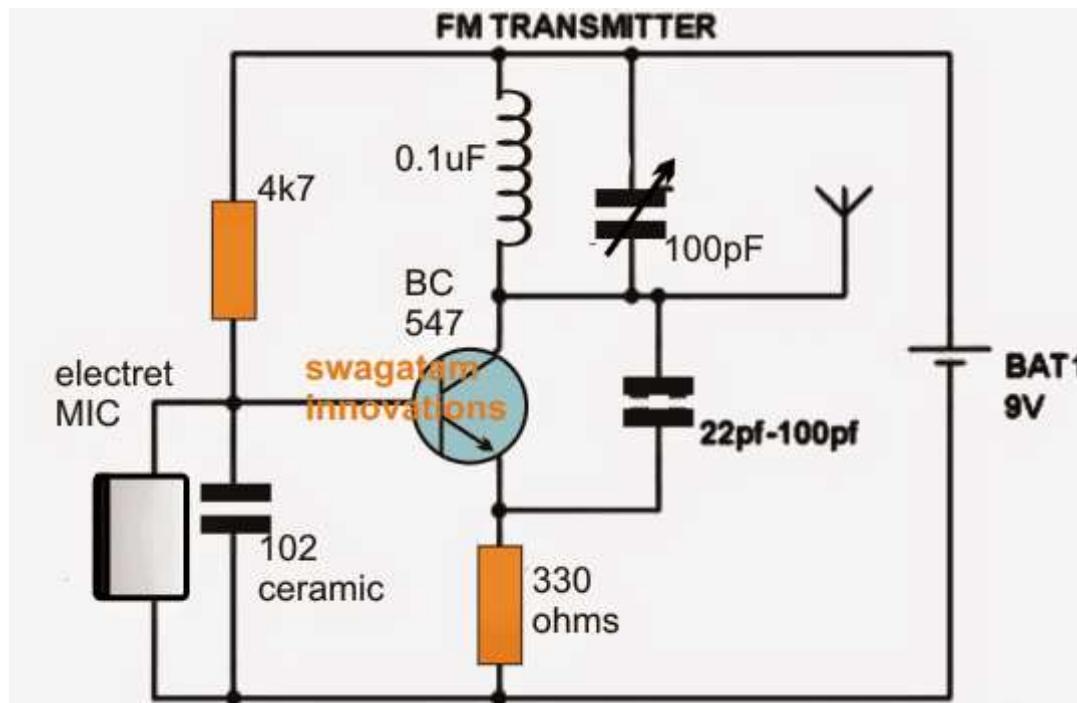
## Incorporating Q Factor

Below's another circuit you would like to know about. The circuit basically makes use of the "Q factor" of the tank network achieved from the coil and the capacitor for generating a relatively high voltage.

This stepped up potential attributes the circuit with a rather longer range of transmission (<https://www.homemade-circuits.com/long-range-transmitter-circuit-2-to-5/>).

For an improved performance make sure the coil and the capacitor are positioned as close as possible. Insert the coil leads as deep down the PCB as possible in order to make it tightly hugging the PCB. C2 value could be tweaked for achieving even better response from the circuit.

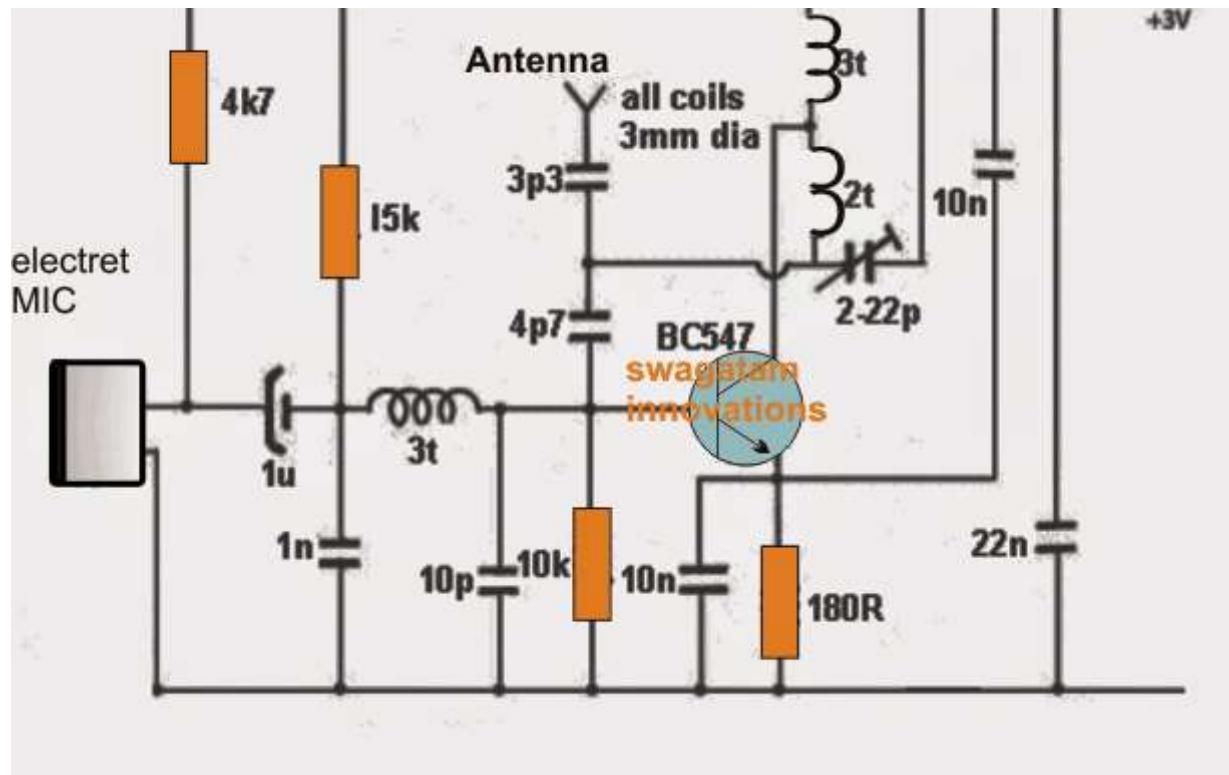
Preferably a 10pF could be tried. The coil is made of 5 turns of 1mm thick super enamelled copper wire, with 7mm diameter.



## Better Saturation Capability

The next FM transmitter design (<https://www.homemade-circuits.com/27-mhz-am-fm-transmitter-circuit-for-citizen-band-communication/>) is a bit different than the above types. Fundamentally the design could be classified as a common emitter type, unlike the others which are rather common base types with their design.

The circuit employs an inductor at its base which adds a better saturation capability to the device which in turn allows the transistor to respond in a much healthier way.



# Adjustable Coil Slug

The next design in the list is much superior to its previous counterparts since it uses a slug based variable inductor.

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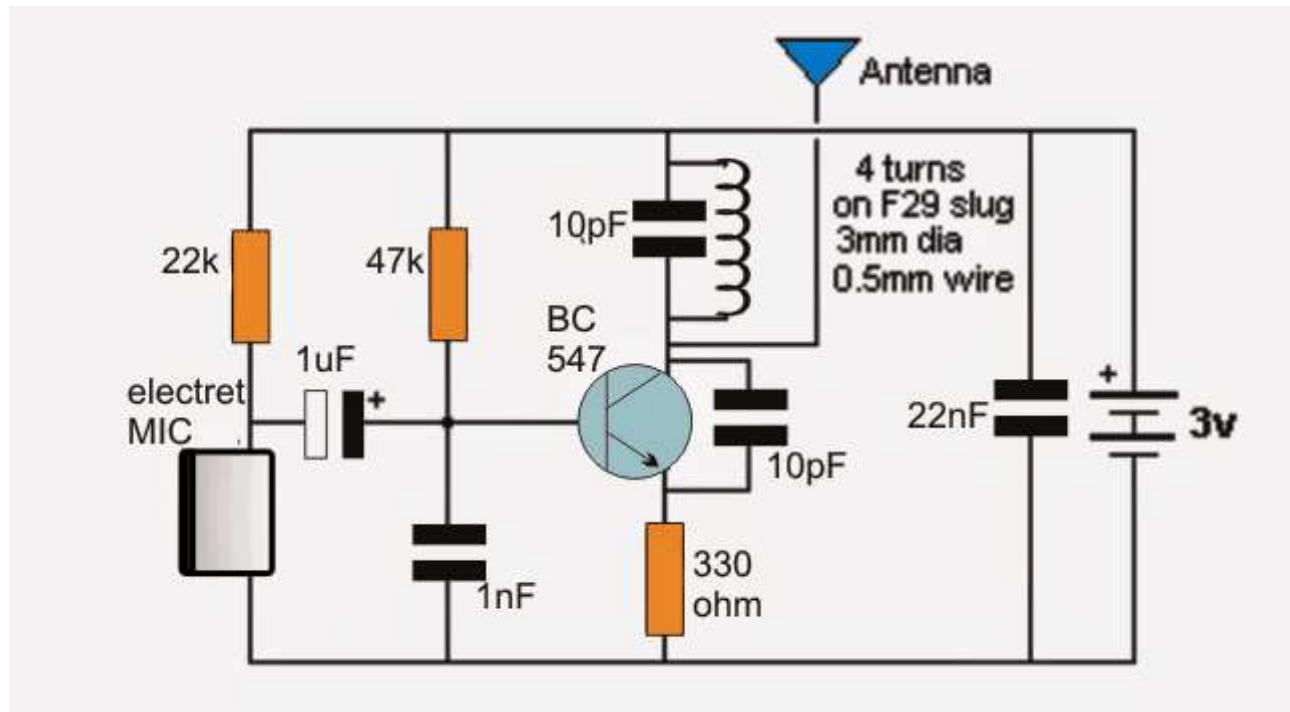
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This enables the transmitter to be tuned by adjusting the slug core (<https://www.homemade-circuits.com/simple-walkie-talkie-circuit/>) using a screwdriver. In this configuration we can see the coil being attached to the collector of the transistor which allows a massive 200 meters range (<https://www.homemade-circuits.com/homemade-walkie-circuit/>) to the design, with a current

(<https://www.homemade-circuits.com/homemade-walkie-talkie-circuit/>) to the design, with a current that may be not more than 5mA.

The MIC stage is isolated from the base with the help of a 1u capacitor and the gain of the mic could be well tweaked by adjusting the series 22k resistor.

This circuit could be rated as the best as far range is concerned however it may lack stability which could be improved, we'll learn how in the following explanation.



## Improved Stability

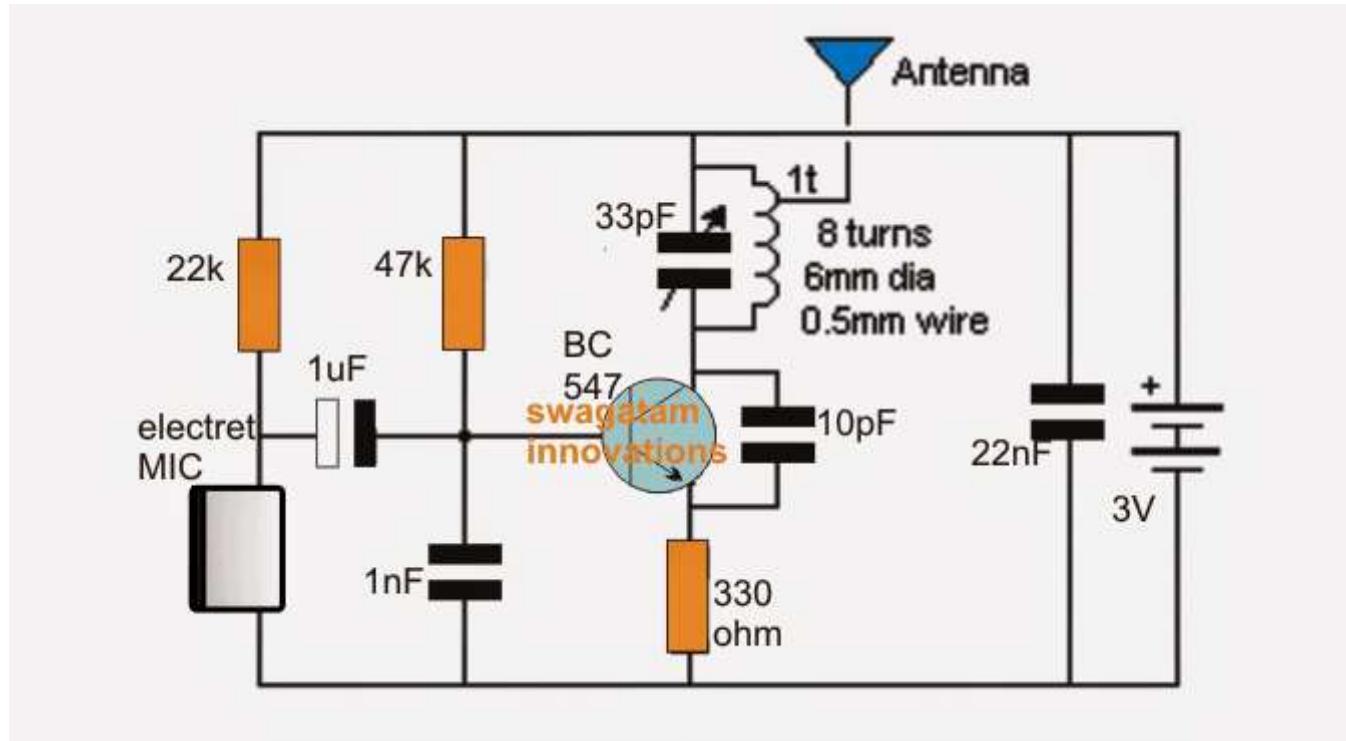
The stability of the above circuit could be improved by tapping the antenna from one top turn of the coil as shown in the following figure.

This actually enhances the response of the circuits due to a couple of reasons. The antenna gets aloof from the collector of the transistor allowing it to function freely without unnecessary loading, and the slipping of the antenna to the top further allows the relevant side of the coil to get a higher

stepped up voltage induced across itself and also the coil generating a higher concentration of transmission power on the antenna.

Although this enhancement may not actual increase the range of the device, it makes sure that the

circuit does not get rattled when hand held, or when the grip is encircled close over the circuit inside its enclosure.

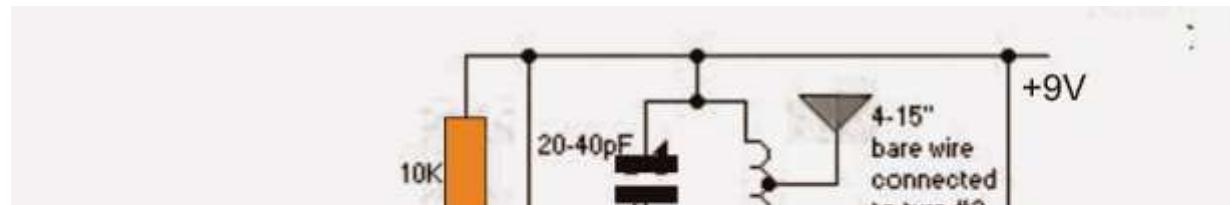


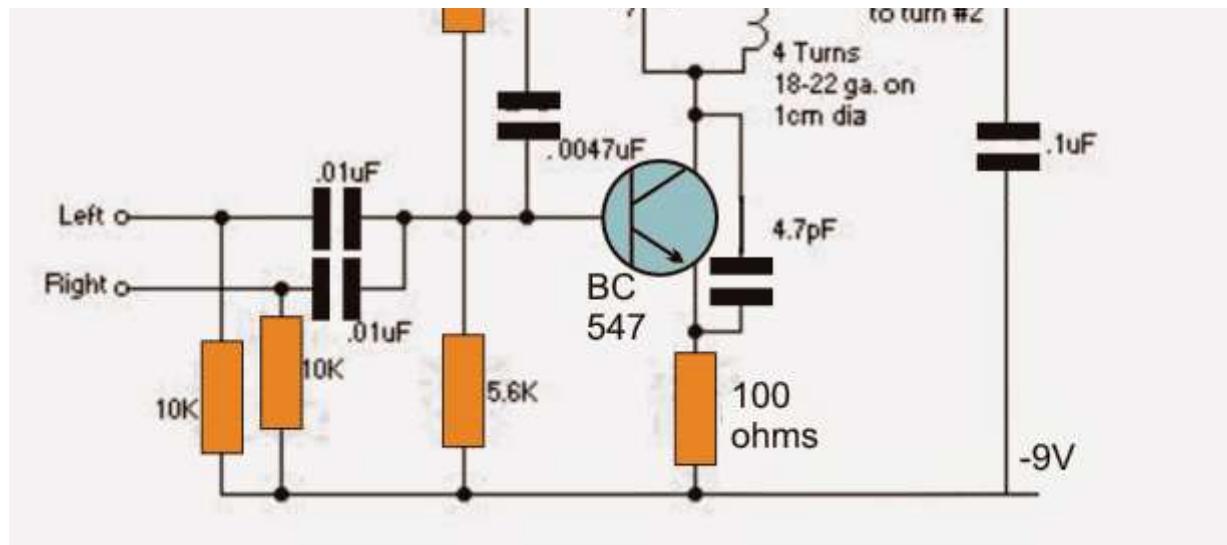
## Transmitting Music

If you want your tiny FM transmitter circuit to transmit music instead of spying or eavesdropping, you would probably find the following design interesting.

The proposed FM transmitter will allow combining a stereo input simultaneously from the source so that the info contained inside both the channels get into the air for an optimal reception.

The design configuration is quite identical to the one that's discussed above so does not need much of an explanation.





## Analyzing a Two Transistor Spy Circuit

Adding a transistor stage to the above discussed single transistor FM transmitters could enable the designs with extreme sensitivity.

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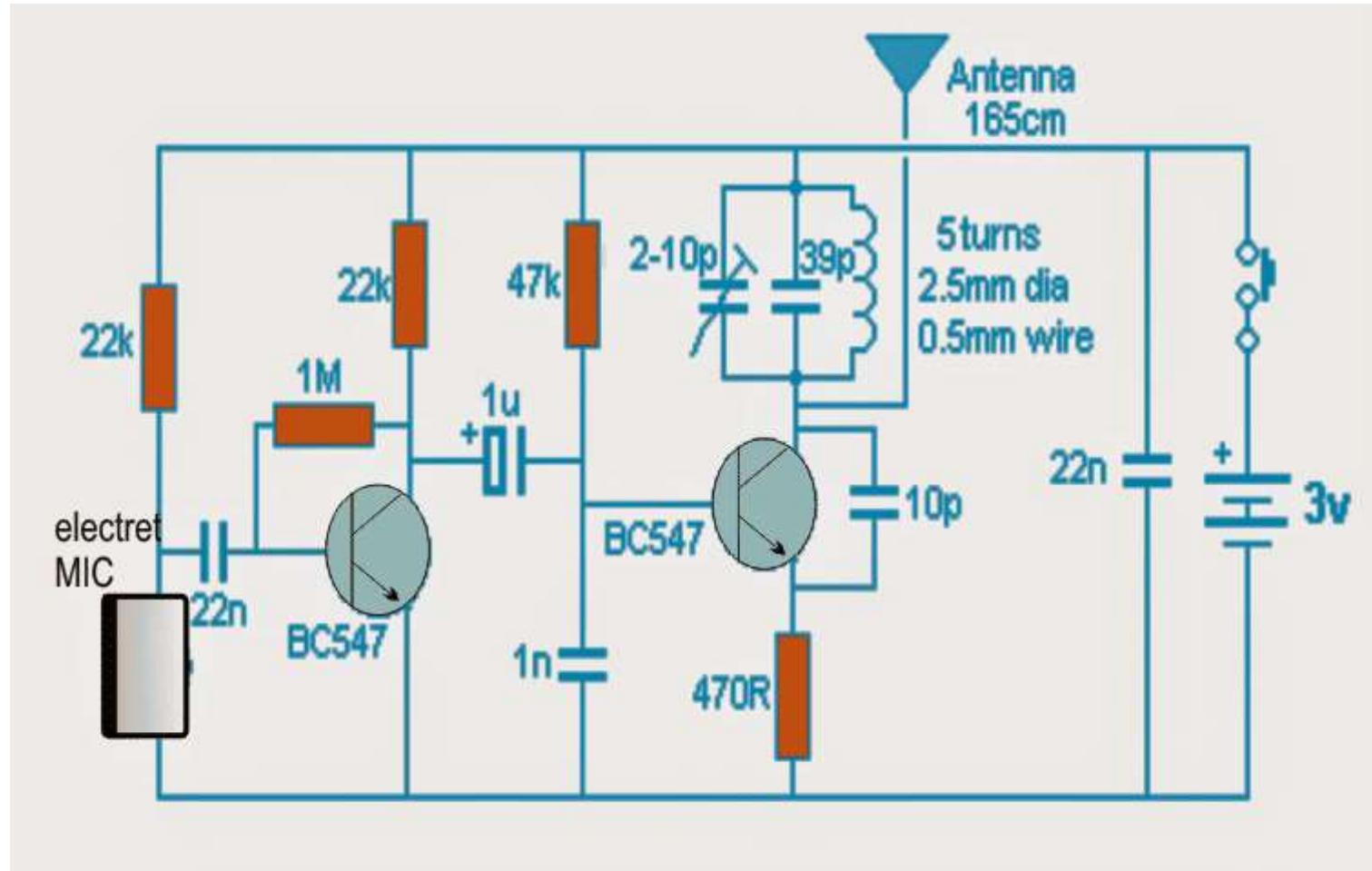
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An electret MIC (<https://www.homemade-circuits.com/how-electret-microphone-works/>) itself has a built in FET (<https://www.homemade-circuits.com/field-effect-transistors/>) which makes it very efficient and makes it a stand alone vibration amplifier device. Adding another transistor stage with it enhances the sensitivity of the device to overwhelming limits.

As may be witnessed in the following diagram, the involvement of an extra transistor stage adds up to the gain of the MIC making the entire unit highly sensitive such that it now picks even the sound as low as a pin dropping on the floor .

The extra transistor prevents excessive loading of the MIC thereby ensuring better efficiency to the sensitivity.



Five things that make the circuit extremely good with reception are:

1. The use of a fix capacitor in the tank circuit along with a adjustable trimmer.
2. A low value coupling capacitor with the MIC sufficient to handle the capacitive reactance of the MIC which may be around 4k at 3kHz.
3. A 1u coupler is included between the oscillator and the audio amplifier in order to make up for the low impedance rendered by the 47k base resistor.
4. The coil used is wound practically using super enameled copper wire which ensures higher efficiency than PCB etched type of coil.
5. The entire circuit could be compactly constructed over a small sized PCB for acquiring better stability and a drift free frequency response.

stability and a wide frequency response.

## IC 741 Transmitter Using Wire Connection

In the above section we learned about wireless FM transmitter, if you are also interested to know how to make wired transmitter, in which voice could be transmitted through wires into a loudspeaker, then the following design may help

The IC 741 if configured as a non inverting amplifier (<https://www.homemade-circuits.com/make-these-simple-ic-741-opamp-circuit/>) which performs the function of a pre-amplifier stage.

The gain of this IC 741 preamplifier stage may be varied as desired, using the pot across its input and output pin outs.

The gain setting is used to set the sensitivity of the amplifier and is set to maximum so that even low volume speech conversation may be picked through it.

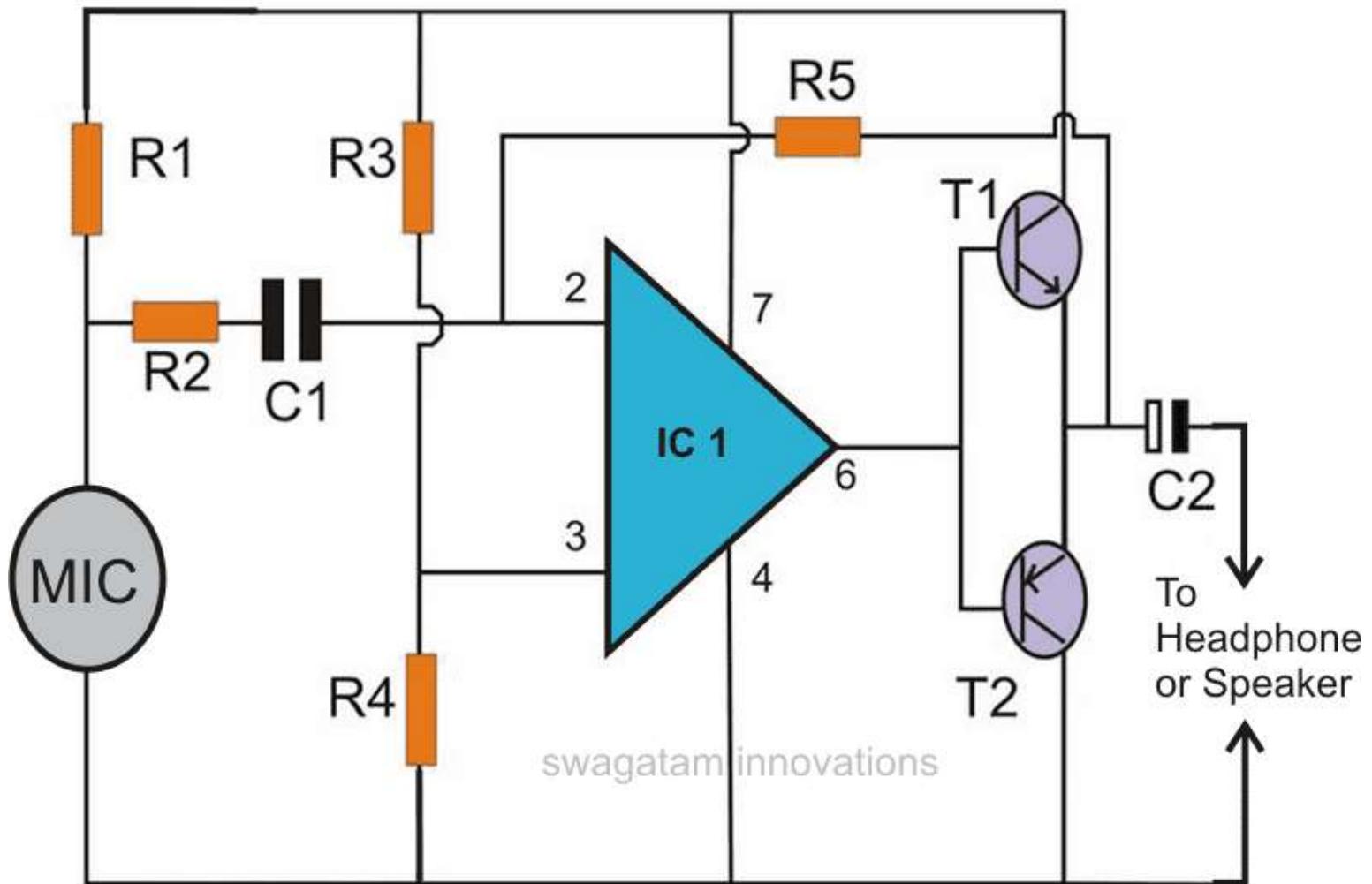
The mic at the input transforms sound vibrations into minute electrical pulses, which is further amplified by the IC 741 to suitable levels before applying it to the output amplifier stage consisting of a standard push-pull stage. This push pull stage is made using a couple of high gain transistors 187/188.

Here, the signal received from the 741 output is suitably amplified so that it finally becomes audible over the speaker.

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For the 741 circuit, the speaker is only positioned and used as the receiver and may be placed in some other room, where the eavesdropping may be intended to be carried out.

The linking of the speaker from the amplifier circuit may be done through wire connections, preferably

by using thin wires and escorting the entire length up to the speaker in some hidden way, probably by laying it under the carpet or across the corners of the room.

For the wireless spy transmitter circuit everything becomes pretty simple and you just have to hide the transmitter circuit in some suitable place, like under the table, couch, sofa etc.

## Parts List

R1 = 10K,

R2 = 10k,

R3, R4 = 27K,

R5 = 1.5 M,

C1 = 104,

C2 = 220uF/25V,

T1 = 188,

T2 = 187,

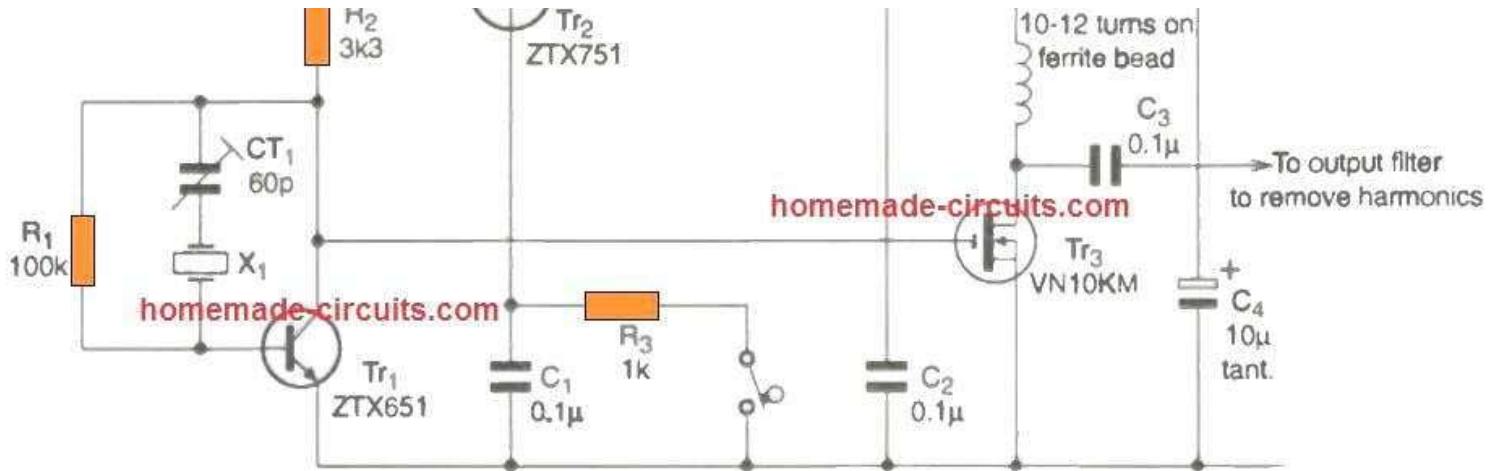
MIC = electret mic,

IC1 = 741, Power = 9 volt battery

Headphone = 64 Ohms, or a small speaker of 8 Ohms, 2 inches

## Morse Code Transmitter



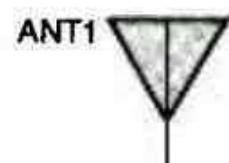
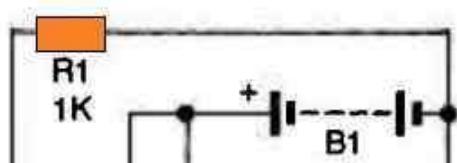


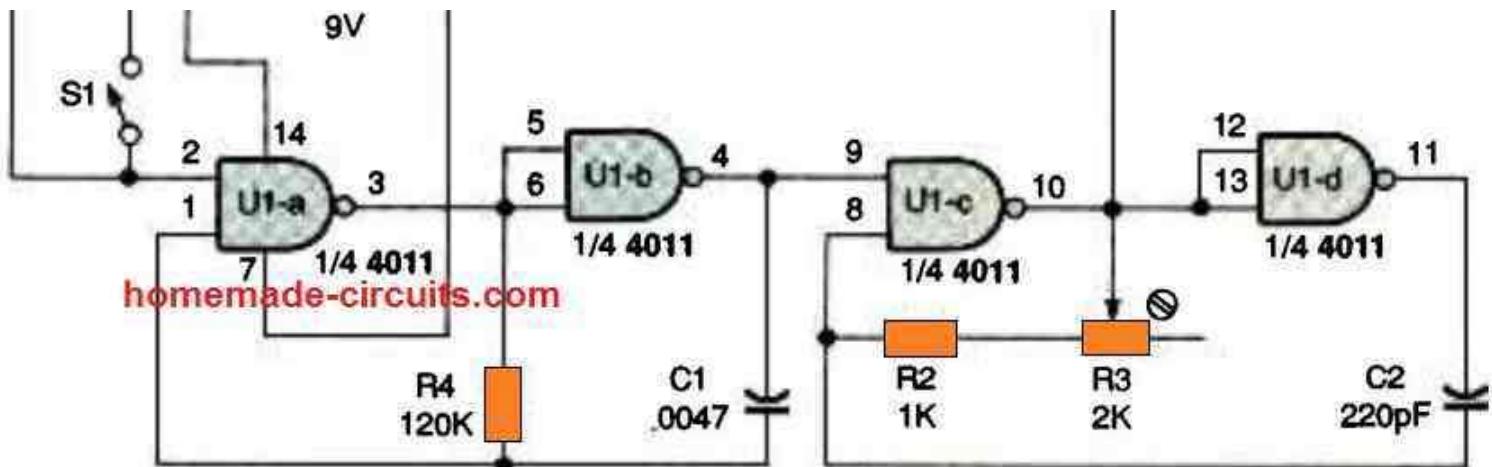
This morse transmitter circuit can be used for transmitting morse codes by tapping the switch associated with R3.

**The transmitter will be able to send the signal thousands of miles away which could be received by all VHF, UHF band receivers over a suitable station.**

## CMOS IC Transmitter Circuit

The project is a straightforward AM/FM transmitter using a single CMOS IC 4011, which could be used to broadcast audio into your AM or FM Radio, TV set, CB radio, police scanner, ham radio, or whatever nearby gadget that is able to catch and reproduce radio waves. The unit will not cause disturbance on your neighbor receiving units, since the Transmitter range is just enough to be restricted to an average-size room, but as long as nobody is standing between the transmitter and the receiver.





## Circuit Description

The circuit diagram for the CMOS Transmitter can be seen in the following figure. Power to the circuit is derived via B1, which is a 9 volt battery. A pair of 4011 NAND gate stages, U1c and U1d, are configured like a radio-frequency (RF) oscillator (carrier). The remaining a couple of CMOS gates, U1a and U1b, are utilized to build an audio frequency (AF) oscillator (modulator).

Switch S1 helps activating an deactivating the modulation process to enable the exchange of an complex information with the Transmitter. Once the switch S1 is pressed, the AF oscillator using U1a, U1b, R4, and C1, begins producing an acoustic signal. This signal switches ON and OFF the CMOS gates U1c, U1d, R2, R3, and C2. included in the the RF oscillator stages.

During the ON periods, the RF oscillator operates at 1 MHz frequency. This frequency output is delivered out to the ANT1 as an AM signal.

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In the switched ON position, the RF oscillator operates at 1 MHz. The frequency output is delivered to ANT1 in the form of AM signal. Remember that apart from R3, the AF and RF circuits are organized exactly in an identical manner. The function of R3 is to cause tuning to the RF oscillator.

As soon as the momentary-contact, pushbutton S1 is pressed and released, the AF oscillator is switched off. Resistor R1 causes the voltage at pin 2 of U1a to become low deactivating the circuit. When you press S1 again, pin 2 turns high. This allows the circuit to yet again begin flicking across its a couple of stable states.

The first of these states is the condition where the U1a output remains high and the U1b output is rendered low. The second state is that condition where the U1a output turns low and the U1b output turns high.

The function of capacitor C1 in this CMOS transmitter circuit is to regulate the speed at which the changeover happens between the two states. If the capacitor hadn't been used, would have caused the circuit to oscillate at an abnormal, and incredibly fast rate. This would have also caused the frequency to get unstable due to varying room temperature, the wire dimensions that join the circuit with each other, and even with the proximity of your body part to the IC.

This is exactly how C1 handles the frequency of the flipping states: As soon as U1a flips and attempts to switch the circuit through the 1st state to the second state, C1 holds the circuit within the first state for a short time, by doing so helps to reduce the frequency. The capacitor is able to do this since it is coupled to the input of U1a, in the same way as R4 is.

So long as C1 is in the charged up condition, it is able to "overpower" resistor R4, stopping it from modifying the U1a input. Now, as C1 begins losing charge by means of R4, this permits U1a to topple over to the second state.

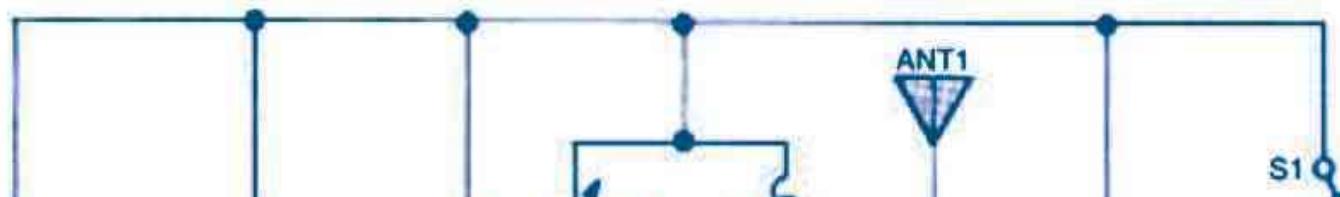
## More Transmitter Circuits

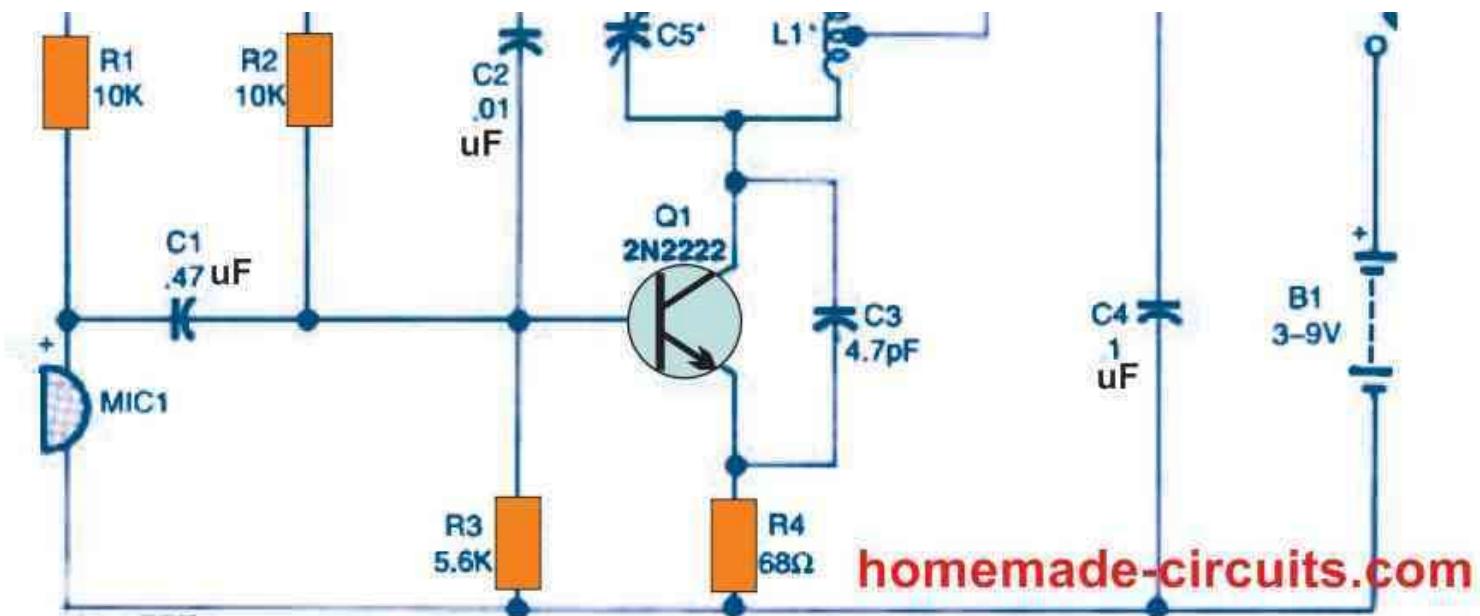
The transmitter coil L1 for all the following circuits are created by hand winding 4 turns of 18 to 22 SWG super enameled copper wire over a 1 cm air cored former, using card board or plastic for the former material. The number of turns of L1 can be manually adjusted so that FM transmitter circuits are able to transmit signals within the high VHF range using 2 or 3 turns for L1, or across the lower VHF range of 50 to 80 MHz using 5 to 7 turns for L1.

The variable capacitor connected parallel to the coil L1 in the all the following circuits can be a 33 pF trimmer or any FM gang capacitor.

## 150 Feet Range Transmitter

The below shown One-Transistor FM Transmitter circuit's output, which can be received by any FM receiver within approximately 150 feet or less of the transmitter, provides great functionality and is suitable for wireless mic usage.





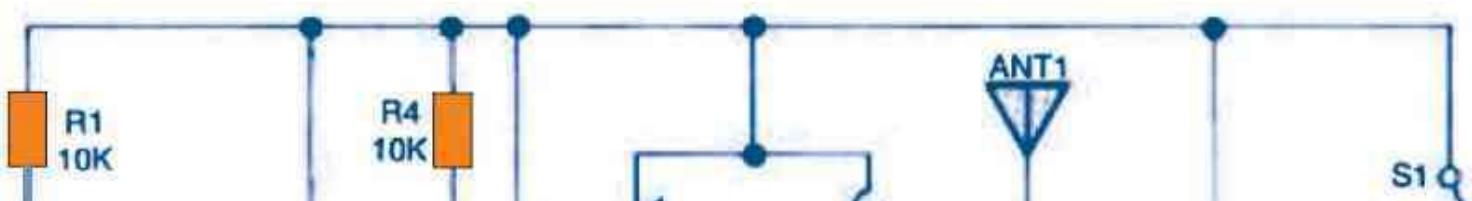
## 100 meter Range Transmitter

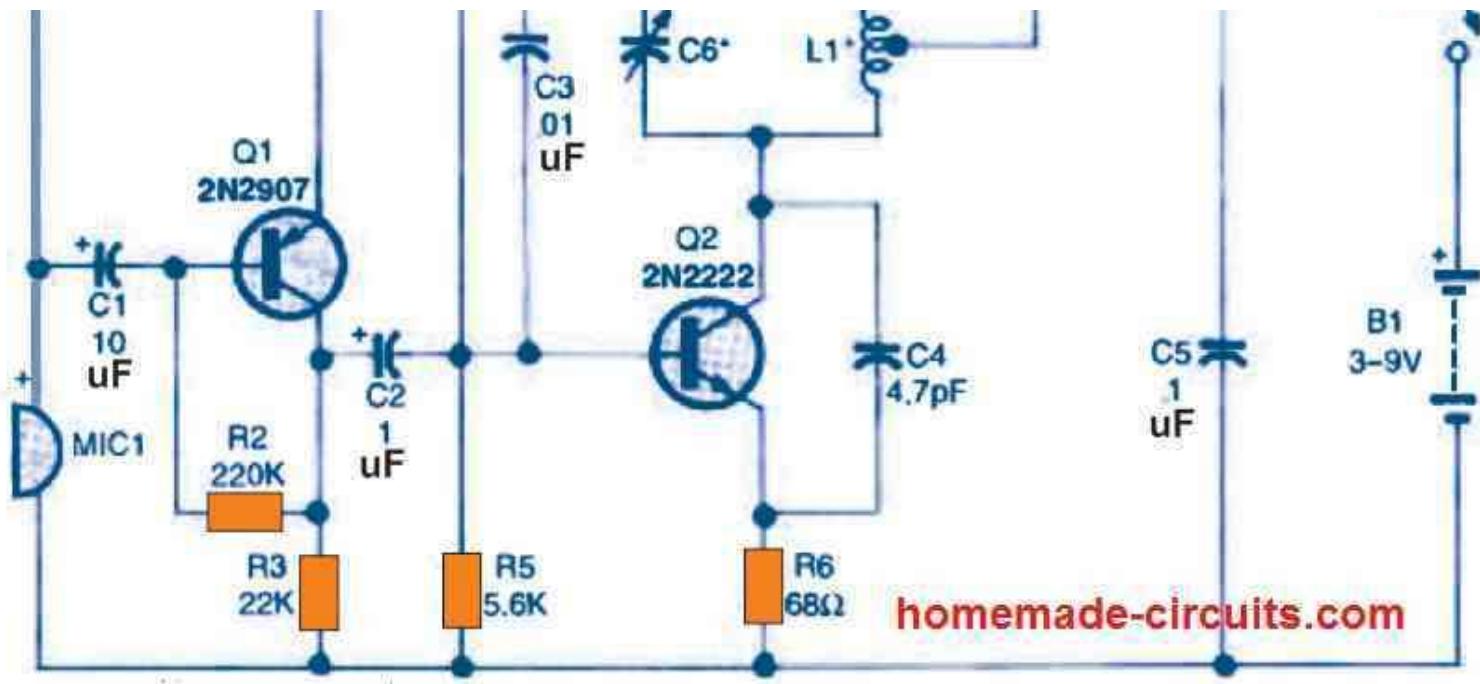
The next Two-Transistor FM Transmitter is essentially similar to the preceding design, with the exception of an additional transistor and a pair of resistor/capacitor values that have been changed to match the new circuit layout. The range of this transmitter is around 100 meters.

LCR meter

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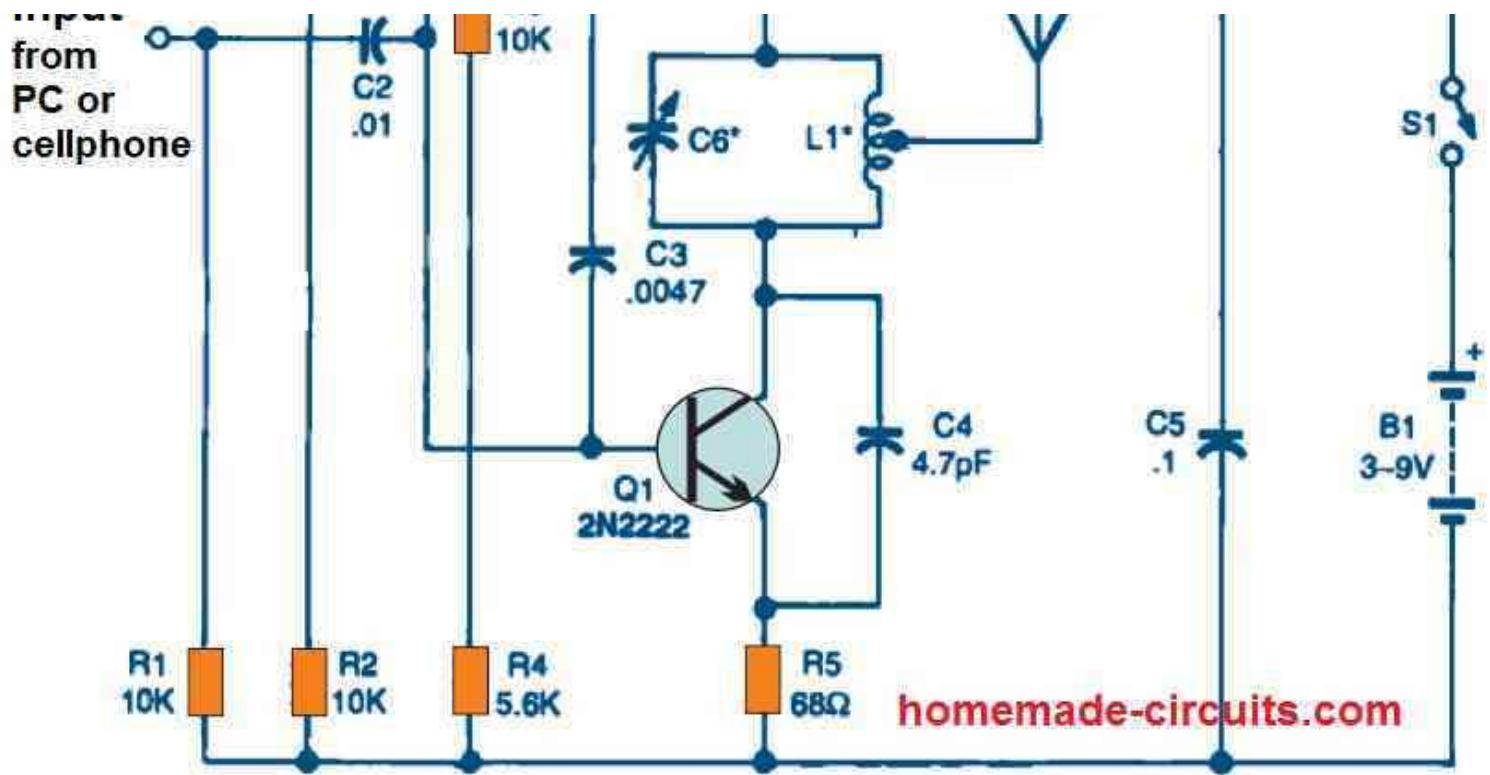




## Music Player Transmitter

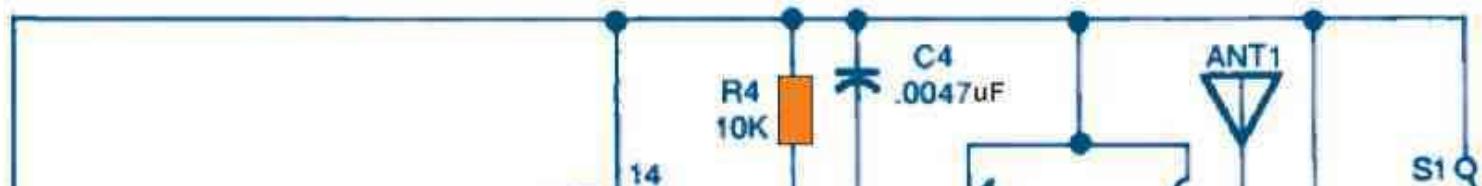
The next CD player, USB device, and mobile phone The Multimedia Transmitter sends audio signals from your PC, CD player, or smartphone to your FM audio system for playback through the system's loudspeakers without using connecting wires.

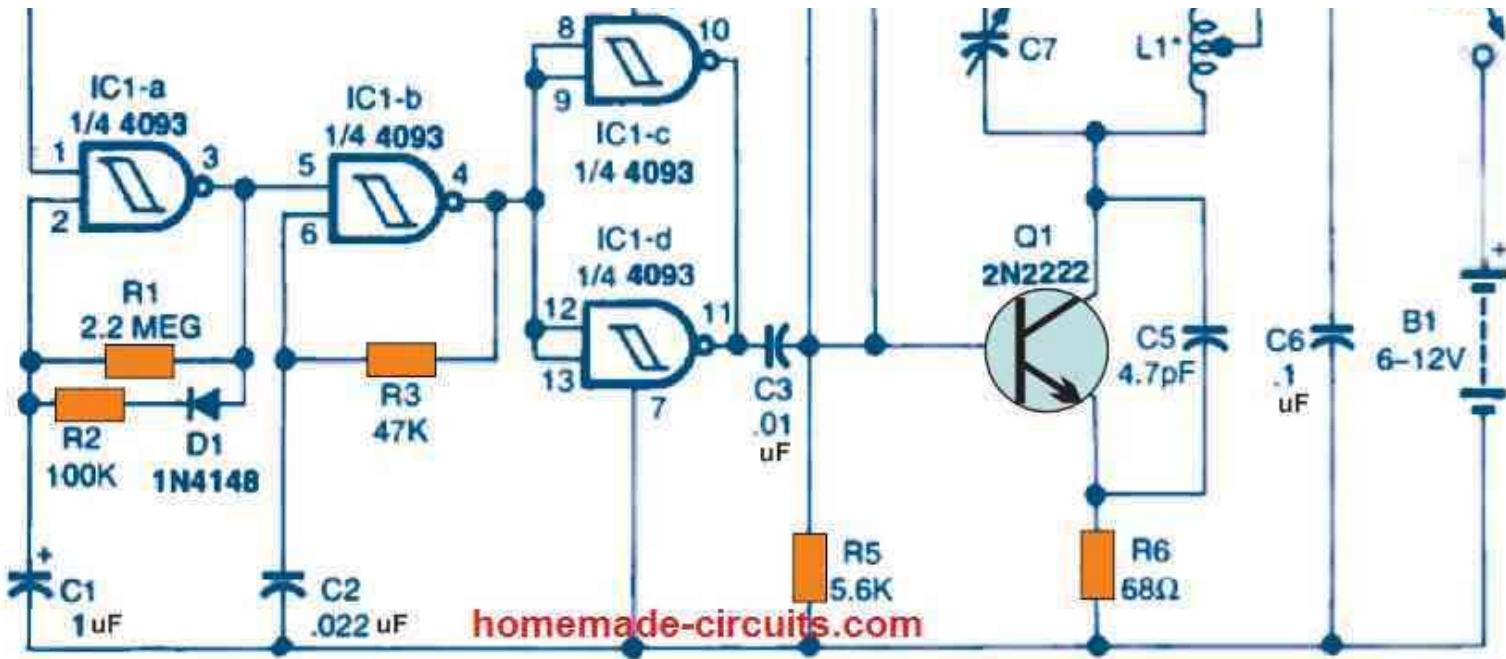




## Beeper Transmitter

The Beep Transmitter emits a series of intermittent beeping frequency that may be easily received and picked up by any FM radio within its range.





## You'll also like:

1. IC 555 Based Simple Digital Stopwatch Circuit (<https://www.homemade-circuits.com/digital-stopwatch-circuit/>)
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## About Swagatam

I am an electronic engineer (dipIETE ), hobbyist, inventor, schematic/PCB designer, manufacturer. I am also the founder of the website: <https://www.homemade-circuits.com/>, where I love sharing my innovative circuit ideas and tutorials.

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**sh reddy** 1 month ago

I assembled and tested the your music player transmitter circuit , i used battery power supply , but when i connectted it my TV AV output, i hear hum noise of power freqnency at the background in my head phone radio reciver. how to eliminate it .

Reply

Author

**Swagatam** (<https://www.homemade-circuits.com/author/swag/>) ⏱ 1 month ago

|  [Reply to sh reddy](#)

I am glad you could build it successfully. It can be perhaps solved if a 50 Hz hum filter or a notch filter is inserted between the TV AV output and the transmitter input.

You can also try increasing the C5 value to 100uF/25V and check the response.

<https://www.homemade-circuits.com/simple-hum-filter-circuit-for-amplifiers/>

(<https://www.homemade-circuits.com/simple-hum-filter-circuit-for-amplifiers/>)

 [Reply](#)

**Nivaldo Mathias** ⏱ 2 months ago

será que funciona esses circuitos e tem bom rendimento no audio

Reply

Author

**Swagatam** (<https://www.homemade-circuits.com/author/swag/>) ⏱ 2 months ago

|  [Reply to Nivaldo Mathias](#)

Yes, they will work with good audio performance.

 [Reply](#)

**Shrikar Tamirisa** ⏱ 9 months ago

What is the range of Two Transistor Spy Circuit?

Reply

Author

**Swagatam** (<https://www.homemade-circuits.com/author/swag/>) ⏱ 9 months ago

|  [Reply to Shrikar Tamirisa](#)

maximum 100 meters

 [Reply](#)

**Charis Young** ⏱ 11 months ago

Greetings sir, please sir is it possible to have two antennas on a wireless FM Microphone circuit base on diversity concept?

 [Text](#)

Thanks for your kind answer.

→ Reply

Author

**Swagatam** (<https://www.homemade-circuits.com/author/swag/>) ⏱ 11 months ago

| ↗ Reply to Charis Young

Hello Charis, as far as I know two antennas cannot be used in any FM transmitter circuit, because that won't make sense and would be technically inefficient.

→ Reply

**Charis Young** ⏱ 11 months ago

Thank you so much for these detailed and useful guidance,sir.

→ Reply

Author

**Swagatam** (<https://www.homemade-circuits.com/author/swag/>) ⏱ 11 months ago

| ↗ Reply to Charis Young

Thanks, and glad you liked it...

→ Reply

**Jonathan** ⏱ 8 months ago

| ↗ Reply to Swagatam

Hello sir, may I ask, for the two transistor spy circuit, in order to listen from a specific frequency, is it possible I use a fixed capacitor of my choice in place of the trimmer capacitor so as to transmit my signals at that frequency provided by the fixed capacitor?

→ Reply

Author

**Swagatam** (<https://www.homemade-circuits.com/author/swag/>)

⌚ 8 months ago

| ↗ Reply to Jonathan

Hello Jonathan, yes that is possible. You can use a fixed capacitor in place of the trimmer to transmit signals at a specific frequency.

→ Reply

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