International Journal of Engineering Research and General Science Volume 2, Issue 6, October-November, 2014
ISSN 2091-2730

Analysis of Jammer Circuit

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Abstract— Users of mobile communication devices have dramatically increased in the last twodecade. This proliferated the need of a more effective and secures signal scrambler for a cultured society. Mobile jammer circuits are used to prevent mobile phones from receiving or transmitting signals. Mobile jammer effectively disables mobile phones within the defined range zones without causing any disturbance/interference to other communication means. Mobile jammer can be used in any practically location, but generally are used in places where phone calls are disruptive like Schools, Churches, Libraries, Hospitals etc. Similarly with other radio jamming, mobile jammer sends the radio waves of same frequency that mobile phones uses to block the signal. This signalcauses interference with the communication between mobile phones and base stations to make the phones unusable. When mobile jammer is activated all mobile within the range willindicate "NO NETWORK" service**.** Design and study of Mobile jammer is discussed in this paper

Keywords— GSM, Radio Frequency, Antenna, RF Generator, RF Amplifier, Tuning Circuit, Voltage Controlled Oscillator

INTRODUCTION

Primarily, military developed and used communication jamming devices. Where tactical commanders used RF communications to block the hostile encroachment to their communication link. This idea comes from the fundamental area of not letting out the successful transport of the information from the sender to receiver. Mobile jammers were originally developed for law enforcement and the military to malign communications by rogues and terrorists to foil the use of certain remotely detonated explosives. The civilian applications came into account with growing public resentment over usage of mobiles in public areas on the rise & reckless intrusion of privacy. As a result, many companies originally contracted to design mobile jammer for government switched over to sell these devices to private firms. As with other radio jamming, mobile jammer block mobile phone use by sending out radio waves along the same frequencies that mobile phones use. This causes enough interference with the communication between mobile phones and communicating towers to render the phones unusable. When mobile jammer s activated, all mobile phones will indicate "NO NETWORK" service. Incoming calls to the mobile phone are blocked as if the mobile were off. When the Mobile jammers are switched off, all mobile phones will automatically reestablish their communication link and provide full service. Mobile jammer's effect can vary widely based on factors such as transparency of wall to signal, proximity to towers, presence of buildings and landscape, even temperature and humidity play a role. Size of mobile jammer can vary the required range starting with the personal pocket mobile jammer that can be carried along with oneself to ensure no disruption meeting with one's client or a portable jammer for a class room or medium power mobile jammer or high power mobile jammer for your organization to very high power military jammers to jam a large campuses.

JAMMER TECHNOLOGY

Five types of devices are developed (or being considered for development) for preventing mobile phones from ringing in certain specified locations [1].

A. Type "A" Device (JAMMERS): This type of device have several independent oscillators transmitting 'jamming signals' capable of blocking different frequencies used by paging devices as well as those used by cellular systems control channels for call establishment.

B. Type "B" Device (Intelligent Cellular Disablers): Unlike jammers, Type "B" devices do not transmit an interfering signal on the control mobile channels. The device, when located in a designated 'quite' area, functions as a 'detector'. It has a unique identification number for communicating with the cellular base station.

C. Type "C" Device (Intelligent Beacon Disablers): Unlike jammers, Type C devices do not transmit an interfering signal on the control channels. The device, when located in a designated 'quiet' area, functions as a 'beacon' and any compatible terminal is instructed to disable its ringer or disable its operation, while within the coverage area of beacon.

D. Type "D" Device (Direct Receive & Transmit Jammers): This jammer acts like a small, independent and portable base station, which can directly interact with the operation of the local mobile. The jammer is predominantly in receive mode and will intelligently choose to interact and block the cell phone directly if it is within close range of the jammer.

E. Type E Device (EMI Shield - Passive Jamming): EMI suppression techniques are used inthis to make a room into what is called Faraday cage. Although labor intensive to construct, the Faraday cage essentially blocks or greatly attenuates, virtually all electromagnetic radiation from entering or leaving the cage - or in this case a target room.

EXPERIMENTAL DETAIL, METHODS & MATERIALS

The effects of jamming depend on the jamming-to-signal ratio (J/S),range between transmitter and receiver, modulation scheme, channel coding and interleaving of the target system, bandwidth of transmitter and receiver. Generally Jamming-to-Signal ratio can be measured according to the following Equation.

$$J/S = \frac{(P_j G_{jr} G_{rj} R_{tr} L_r B_r)}{(P_t G_{tr} G_{rt} R_{jr} L_j B_j)}$$

Pj = jammer power
Pt = transmitter power
Gjr = antenna gain from jammer to receiver
Grj = antenna gain from receiver to Jammer
Gtr = antenna gain from transmitter to receiver
Grt = antenna gain from receiver to transmitter
Br = communications receiver bandwidth
Bj = jamming transmitter bandwidth
Rtr = range between communications transmitter and receiver
Rjt = range between jammer and communications receiver
Lj = jammer signal loss (including polarization mismatch)
Lr = communication signalloss

Mobile jammer circuit is shown in figure 1 below. Tuning Circuit, Voltage Controlled Oscillator, RF Amplifier combine to form the Jammer circuit.

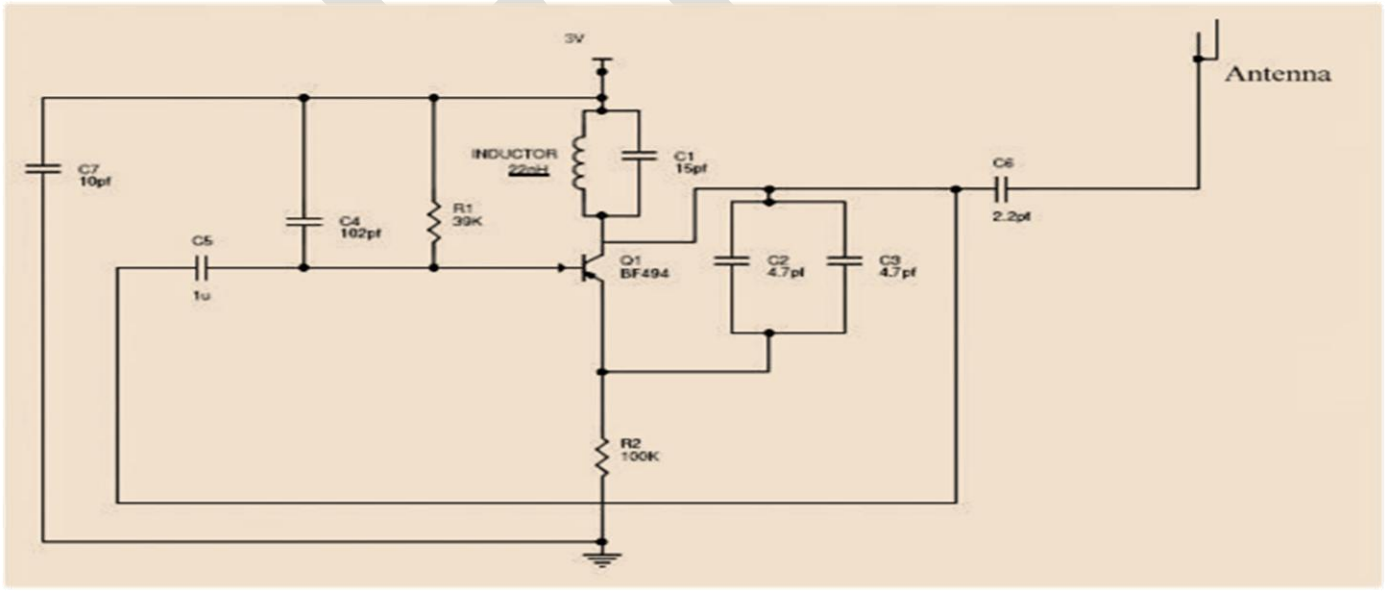

Figure 1

The transistor Q1, capacitors C4 & C5 and resistor R1 constitute the RF amplifier circuit. This amplifies the signal generated by the tuned circuit. Antenna receives the amplification signal from capacitor C6.Work of the capacitor C6 is to remove the DC and allow only the AC signal which is transmitted in the air.

When the transistor Q1 is turned ON, the tuned circuit at the collector will get turned ON. The tuned circuit consists of capacitor C1 and inductor L1, tuned circuit will act as an oscillator with zero resistance.This oscillator or tuned circuit produce a very high frequency with minimum damping. The both inductor and capacitor of tuned circuit oscillate at its resonating frequency.

Operation of tuned circuit operation is very simple and easy. When the circuit gets ON, potential difference came across the plates of the capacitor and the electrical energy is stored by the capacitor. Once the capacitor is completely charged, it allows the charge to flow through inductor. Inductor is used to store magnetic energy. When the current is flowing across the inductor, it will store the magnetic energy by this voltage across the capacitor will get decreased, as a result electrical energy of the capacitor is converted into magnetic energy stored by inductor and the charge across the capacitor will be zero. In a flinch of time, the magnetic charge through the inductor will decreased and the current will charge the capacitor in a reverse polarity. Again after some period of time, capacitor will be completely charged and magnetic energy across the inductor will be gradually reduce to zero. Again once more electrical energy will be converted in magnetic energy. After some time, inductor will give charge to capacitor and become zero and they will oscillate and generate the frequency.

This cycle will run until when the internal resistance is generated and oscillations get stop. Capacitor C5 gives the RF amplifier feed to the collector terminal before C6 for gain or like a boost signal to the tuned circuit signal. The capacitors C2 and C3 are used to generate the noise for the frequency generated by the tuned circuit. Electronic pulses in some random fashion (technically called noise) will be generated by capacitors C2 and C3.

These all entities, feedback back or boost given by the RF amplifier, frequency generated by the tuned circuit, the noise signal generated by the capacitors C2 and C3 are combined, amplified and transmitted to the air.

Normally, cell phone operates at the frequency of 450 MHz frequency. To block this frequency, we also need to generate 450MHz frequency with some noise that will act as simple rendering or blocking signal, since cell phone receiver are not able to understand to which signal it has been received. By this, we can able to block the cell phone signal from reaching the cell phones.

So the following circuit, we generated the 450 MHz frequency to block the actual cell phone signal. That's why the circuit shown below will act as a jammer for blocking the actual signal mobile signals.

Circuit shown below will work in 100 meter range that is it capable of blocking signals upto 100 meter range. Circuit can be used in TV transmission and remote controlled applications. To obtain more efficiency value of circuit components can be altered.

RESULT

The simulation results of various circuit components are observed and results are shown below. The first part of the Jammer is the Tuning circuit shown in the figure 2 and second graph is drawn between input power and output power as shown in figure 3. Both power calculations are in dBm.

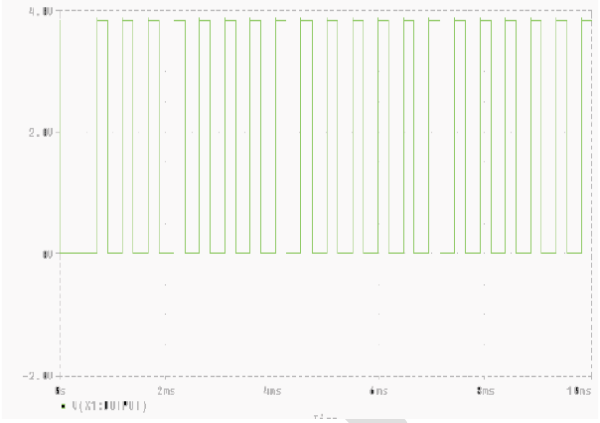

Figure 2

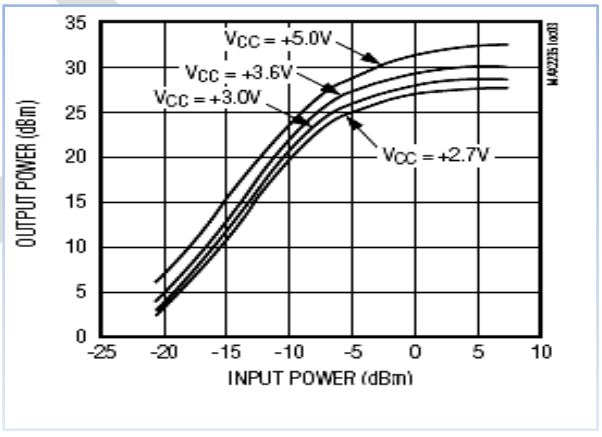

Figure 3

CONCLUSION

Mobile jammer circuits have both advantages and disadvantages, these can be considered as good and bad both depending on the signal intended to be jammed. Simple jammer circuits can be pretty easily constructed; however subtle circuit can be made for higher requirements.

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