Development of Frequency GSM Signal Jammer

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Abstract- This paper gives an explanation to the concept of mobile Jamming and explores jamming in the two popular mobile networks: Global system for mobile communication (GSM) and digital cellular network (DCS). The designed intelligent jamming system blocks the controller channel only, also it operates only if an active mobile is in the controlled area. The ADS - advance Design System for Agilent software package is used analyzed and simulated the mobile jamming system. The Mobile Detector Phone Jammer successfully jammed all the four operators but the radius of the range did not get as expected in the designed, this project only focuses on blocking the signal transmission between the ranges 935 to 960 MHz when tested and performed well. This can be effectively find its use in School Examination hall and religion worship centers.

Keywords- Jammer, Mobile Phone, Network, Signal, Frequency

1 INTRODUCTION

The mobile GSM jammer is a tool used to block unwanted calls and to prevent mobile phones usage (Kajal and Khuahboo, 2014). Different devices have various characteristics, high power, and large or short - ranged cell phone jammer. With the frequency jammer in operation, the blocker effectively restricts cellular phones. Mobile phone jammer can be used essentially in any location or domain, but are found mainly in places where a phone call would be found disturbing or silence is necessary (Ahlin, 2012). On the other hand, a Radio Frequency jammer is described as a device used to disrupt a communication through a broadcasted RF signal. This is an RF and GSM frequency disrupter which is generally known as wideband radio frequency (RF) and GSM cell phone jammer. Simultaneously, they can block all kind of commercial FM broadcast band (87.5 MHz to 108 MHz) and GSM signal transmissions within the jammer's transmission range. The frequencies can be blocked by transmitting a dirty signal (like noise) in to same frequency at which GSM and radio system operates. A Radio Frequency jammer is referred to as a device that transmits a radio frequency signal on the same frequency upon which the radio system operates. The jammer achieves a signal jam in an area at which the radio that is sets in such area are disabled (Anderson, 2003).

In recent times, criminals plant and detonate explosives via the GSM network or Radio Frequency signals. This signal jammer can prevent such act by jamming the signal required to detonate the explosive. According to Andren, (2000), currently, the GSM mobile jammer devices are becoming civilian products now rather than electronic warfare devices, subsequently, due to the increasing number of people using phone the need to disable mobile phones in special places where the ringing of cell phone would be unruly has increased. The designed system is of benefit to worship and religious places, lecture rooms, Schools libraries, concert halls, meeting rooms, and other places where silence is required Forrest, (2000). The solution to these irritating and disrupting noises is to install a device which can block the signal transmission from mobile phones and radio sets and thus, disrupt the triggering of bombs by these wireless signals.

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2 LITERATURE REVIEW

According to Gligor (2007) communication jamming strategies were first developed and used by military. This interest comes from the fundamental area of denying the successful transport of the information from the sender to the receiver. Currently, the mobile jammer devices are becoming a necessity owing to the great increase in the use of mobile phone and the important attached to it both for communication and for research purposes.

2.1 OPERATION

In the working system, jamming devices and method override cell phone by transferring a signal on the same frequency page as the cell phone and at a high output power that the two signals collide and cancel out each other. The cell phones are designed in such a way as to add power if they experience low-level interfering, therefore the jammer must identify and match the increased power from the phone. The cell phones in another way are full-duplex devices meaning they use two distinct separate frequencies, one for listening and one for talking at the same time. Some jammers used to chunk just only one of the frequencies been in use by cell phones, which then blocks both. The phone cannot access the network because of incomplete mobile signal. Less complex or intricate devices block only one group of frequencies, while sophisticated jammers can block/jam several types of networks immediately to head off dual - mode or tri -mode phones that automatically switch among different network types to find an open signal. Nearly some of the high-end devices block all frequencies immediately while trained personnel can tune others to specific frequencies Chirag and Nitin (2014).

In order to jam a cell phone, one need a device or means that programs on the right frequencies. However different cellular systems process signals otherwise, all cell phone networks use radio signals which the mobile jammer can interrupt. However, GSM, used in digital cellular operates in the 900-MHz and 1800-MHz bands in Europe and Asia and in the 1900-MHz (at times known as 1.9-GHz) band in the United State. Old- fashioned analogue cell phones and today's digital devices are equally susceptible to jamming. Disrupting a cell phone is the same as jamming radio communication. A cell phone mode of operation is by communicating with its service network provider through a cell tower or base station. Cell towers divide a city into small areas, or cells. As a

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GSM phone user move down street, signal transits from one tower to another tower (Kajal and Khuahboo, 2014).

A jamming system device transmits on the same radio frequency as the cell phone, when possible 900MHz, thereby disrupting the communication between the phone and the cell-phone base station in the town a phenomenon known as denial-of-service attack. In some cases the jammer denies service of the radio spectrum to the cell phone users within range of the jamming device. The design of previous jammers limits their operation analogue phones or first generation digital mobile phone standards. Latest models in use such as the double-band and triple-band jammers can block all widely used systems and are even very effective against the latest phones which trip to different frequencies and systems when obstructed. As the leading network technology and frequencies used mobile phones differ worldwide, some only work in definite regions such as Europe or North America. According to Sofia and Rupinder (2016), the power of the jammer's effect can vary widely based on factors such as proximity to towers, indoor and outdoor settings, presence of buildings and landscape, eve temperature and humidity play a role. Concerns that crudely designed jammers may disrupt the functioning of medical devices such as pacemakers subsist. However, like cell phones, most of the devices operate at low power output (less than one watt) to avoid causing any problems Horowitz (2005).

3 METHODOLOGY

To construct this project; authors split the system into 2-phases; the phase one as the jamming system and the phase two is to control the jamming system to be an intelligent jamming system. These subsystems and stages are coming from different functions of each small component, so let's discuss the purpose of each stage by explaining the operation of the system.
The blocking or jamming-system will produce the jamming-signal by mingling the noise with intermediate frequency and then modulate into UHF (Ultra High Frequency) range for mobile communication system as single side band (SSB). The switching/converting system will choose the mobile communication system to jam (GSM or DCS) then amplify and propagate the signal.

3.1 SYSTEM BLOCK DIAGRAM

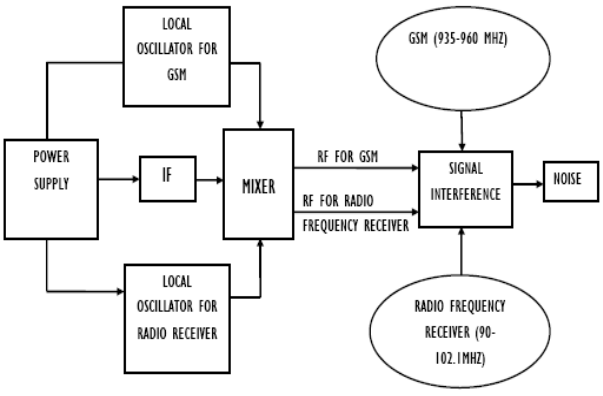

Fig. 1: System Block Diagram

Figure 1 shows the systems block diagram where the power supply energizes the local oscillator for GSM and Radio receiver. The frequency generated by the local oscillator (s) then mix with the frequency at the IF section and this produces two RF, one for GSM and one for radio receiver, and thus jams the GSM/ radio receiver signal to produce noise.

3.2 DESIGN CALCULATIONS

Power calculations:
Here, we determine the power it requires to transmit to jam any of the cell phone within 10-meters for GSM or DCS. From the above considerations, we can find the required output power from the device, as follows:
Using SNR = 9 dB and the maximum power signal for mobile receiver = -15 dBm, gives J = -24 dBm. But, the goal and aim is to get the power output from the device, so when we add the free-space-loss to power at the mobile receiver enable us to get our target and goal: Output power = -24dBm+58dB = 34 dBm.

Calculation for the minimum power required to block the GSM-900 and DCS (Jr):
For GSM - 900 the minimum signal to noise ratio (SNR min = 9 dB) and maximum signal power (SMAX = -15dBm).
Now ,

$$\mathbf{SNR} = \frac{S}{N} = \frac{S}{Jr} \quad (1)$$

So,
$Jr(dB) = -15 - 9 = -24\text{dBm}$
To cover area of 20 meter radius; the free, space power loss (FSPL) is calculated as follow:

$$\mathbf{FSPL = 20Log\frac{4\pi R}{\lambda}} \quad (2)$$

Where: R and λ in meter
For 960MHz

$$\lambda = \frac{3 \times 10^8}{960 \times 10^6} = 0.3125m$$

Substituting in FSPL equation gives:

$$FSPL = 58dB$$

Then $Jr = -24 + 58 = 34dBm$

For DCS,
SNR min = 9dB and S MAX = -23dBm
Repeating the calculations with f = 1880 gives

$$Jr = -32 + 63.9 = 31.9dBm$$

To meet this power, we need amplifier

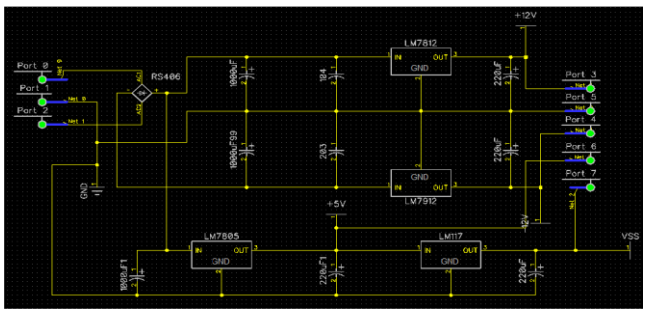

Fig. 2: Power Supply Circuit Diagram

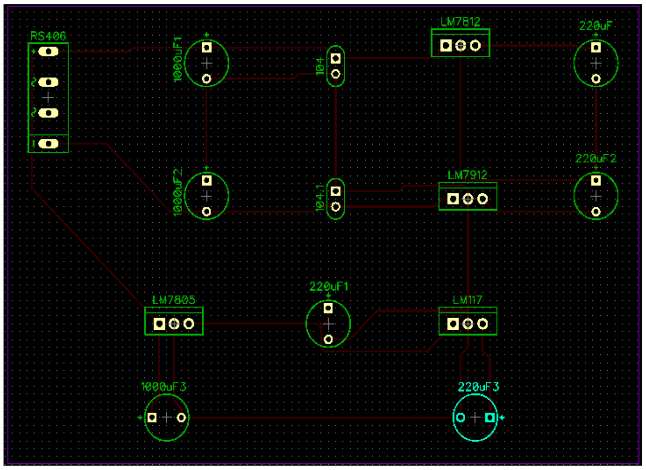

Fig. 3: Power Supply PCB Design

4 Results and Discussion

Authors used three mobile phone networks and radio frequency receivers to test the Radio Frequency jammer with circuit constructed on a Vero board. The Transistor used in the project cannot function with reasonable gain above 800MHz the gain as we found out and drops drastically thereby hindering the oscillations. The circuit's works very well from 300MHz to 750MHz, at this frequency it jams the Commercial TV stations from about 8 to 10 meters, and jams mobile phone frequency gradually from about 3 to 5 meters.

The jammer consists of three sections which are; power supply, IF section and RF section for easy troubleshooting. Since 5dBm output powers from the VCO do not achieve the desired output power of the GSM jammer, an amplifier with a suitable gain is added to increase the VCO output to 34dBm. The PF08109B has high gain of 35 dB. From the datasheets, IC is designed to work on dual band GSM & DCS. First design of the circuit is using only one power amplifier IC. Upon testing, the jammer didn't work properly because the amplifier IC did not work at the two bands simultaneously. Such a fact was not indicated in the datasheets. This result was really a big shock, but easily solved by changing the whole RF design.

4.1 Performance

In this work, a Mobile Detector for Smart Mobile Phone jammer was effectively and successfully used to jam three mobile networks: ETISALAT MTN and GLOBACOM. As soon as the jammer is ON, it will jam the mobile phones in that range using 2G GSM networks. This jammer did not function in 3G mobile phones which uses 2100MHz frequency while 2G only cover 815MHz to 925MHz.

The results show that this project functioned as intended. This testing is to see the duration of time taken by the jammer to jam the GSM phone between the operators. ETISALAT, MTN and GLOBACOM are the three mobile network used to test the developed mobile jammer. The result and testing of the Mobile Jammer, shows the objective of this project work is achieved. The Mobile Detector Phone Jammer successfully jammed all the three operators but the radius of the range did not get as expected in the designed. Results been obtained when the Development of Radio Frequency/GSM Signal Jammer was "ON", the mobile phone transmission signal will display "NO NETWORK"

4.2 Experimented Values VS Actual Values

Table 4.1 Experimented Values VS Actual Values
(Author's Results value compare to standard value)

Components	Experimented Value	Actual Value	Unit	Tolerance
Capacitor	10 10 30	10.20 10.15 29.82	µf µf µf	
Transistor	R_{be} 520 R_{be} 510	550 548	Ω Ω	
Transformer Voltage	12Vac at 240Vac Input	13.2 at 210	Volt Volt	
Regulator	5.00	5.20	Volt	

5 Conclusion

Based on the result and analysis, The Project could jam the commercial broadcasting TV networks which cover from 300 to 800 MHz, with the right Transistor 'I' then will be able to achieve the 900MHz to 1800MHz. Although the device can operate as expected, but the radius of the antenna did not meet the expectation. The radius should be more than 4 meter obtained in the result. The project work finds its applications in School Library, Examination and religion Centers.

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