

## SMART GSM PHONE JAMMER

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### Abstract

Communication jamming devices were firstly developed and used by the military to gain the control over electromagnetic wave spectrum while denying the friendly use of enemies' radio frequency (RF) communication.

At present the mobile phone jammer devices have become civilian products rather than electronic warfare devices. With the increasing number of the mobile phone users the need to disable mobile phones in specific places where the ringing of cell phones would be disruptive has increased. These places include worships, university lecture rooms, libraries, concert halls, meeting rooms, and other places where silence is appreciated. Conference halls and lecture halls are the example for places where a mobile jammer would be a great solution, although organizers or lecturers ask respectfully from the audience to disable their mobile phones during the conference or lecture, some people forget and the ringing of their mobile phones become very annoying especially during the conference or lecture time. Other than that, we can use the mobile phone jammer at places like prisons where mobile phone use is strictly prohibited. Moreover, there is high probability of secret leakage of defence meetings using technological means to target high value item or for terrorist activities.

Conventional mobile phone jammers emit signals on the same frequency at which a GSM system operates, and there by disables mobile phones operating in the area where a jammer operates. However, continuous emission of electromagnetic waves can be harmful for health of the people in the particular area. There for our research has designed a smart jammer which identify the presence of a mobile phone and emit electromagnetic wave only when a mobile phone seems is attempted to be used. So while helping to reduce health hazards caused by conventional jammers. The smart phone jammer drastically reduces the power consumptions required for operates.

### Introduction

Communication jamming devices are extensively used in military and Sri Lankan military forces used jammers during humanitarian operations for two purposes one to jammed enemies communication and to block enemies remote controlled IED detonations as bomb blocking jammers. This interest comes from the fundamental objective of denying enemies friendly use of communication effective use of enemies ESM (Electronic Support Measures). Today Sri Lanka is a country which uses mobiles phones extensively for communication and billions of people owes cellular phones within the country. Main service providers of the country are Dialog, Mobitel, Air Tel, Hutch and Eitsalat. All these service providers use GSM 900 and GSM 1800 system. Needless to say, the wide use of mobile phones could create some problems as the sound of ringing becomes annoying or disrupting. This could happen in some places like conference rooms, law courts, libraries,

lecture rooms and temples. In some important conferences and meetings enemy can use mobile phones for espionage. Especially in prisons though the use of mobile phone is banded lawbreakers try to use mobile phones secretly. One way to stop these activities and annoying phone ringing is installing device to inhibit the use of mobile phone. Such a device is known as cell phone jammer or "GSM Jammer" and it is basically kind of Electronic Counter Measures (ECM) device. Governing principles behind the cell phone jamming is very simple. Mobile communication links provide with two separate links call uplink (Cellular phone to base transmitting Station) and downlink (Base transmitting station to cellular phone) the jamming device broadcast a Radio Frequency(RF) signal in frequency ranges reserved for cell phone downlinks. Following chart indicates the frequency list of service provider operating within Sri Lanka:

Operator	900 MHz Band		1800 MHz Band		3G Band	
	Up Link	Down Link	Up Link	Down Link	Up Link	Down Link
<b>Air Tel</b>	880 - 885	925 - 930	1740 - 1747.5	1835 - 1842.5	1930 - 1940	2120 - 2130
<b>Mobitel</b>	885 - 892.5	930 - 937.5	1710 - 1717.5	1805 - 1812.5	1920 - 1930	2110 - 2120
			1747.5 - 1755	1842.5 - 1850		
<b>Hutchson</b>	892.5 - 900	937.5 - 945	1725 - 1732.5	1820 - 1827.5	1950 - 1955	2140 - 2145
<b>Etisalat</b>	900 - 907.5	945 - 952.5	1732.5 - 1738.5	1827.5 - 1833.5	1940 - 1950	2130 - 2140
<b>Dialog</b>	907.5 - 915	952.5 - 960	1717.5 - 1725	1812.5 - 1820	1970 - 1980	2160 - 2170
			1755 - 1762.5	1850 - 1857.5		

#### Uplink and downlink frequency bands of cellular operators within Sri Lanka

Many researchers documents can be find on the topic of effects of cellular phone operating frequencies to the human body hence continuous emitting of high power jamming signal in a cage any way not advisable [3]. Hence our endeavor on designing smart jammer which is activating only on attempting to call or receive a call from a mobile device became very useful and it's a new concept in mobile phone jamming.

#### Designing and Operation Concept.

We developed our mobile phone jammer with five modules namely:

- a. RF Detector modules (to detect incoming or outgoing calls link establishment)
- b. Transmitter Module (Voltage Control Oscillator and RF amplifier block)
- c. Power Supply Module
- d. Antenna system.
- e. Transmitter and Receiver Isolating processor module.

**RF Detector** comprise with sensitive receiver circuitry and it is tuned to detect signals are emitting from the BTS (Base Transmitting Station) as downlink for hand shaking with mobile receiver. In our prototype model we manage to have three RF detector



modules as distributed receiver systems since our detector circuit detecting area limited to 2m radius. For these detectors we used broad band antennas which can detect both 900 MHz and 1800 MHz range. It is a one possible reason which reduces system gain and it limited the detection range of the system.

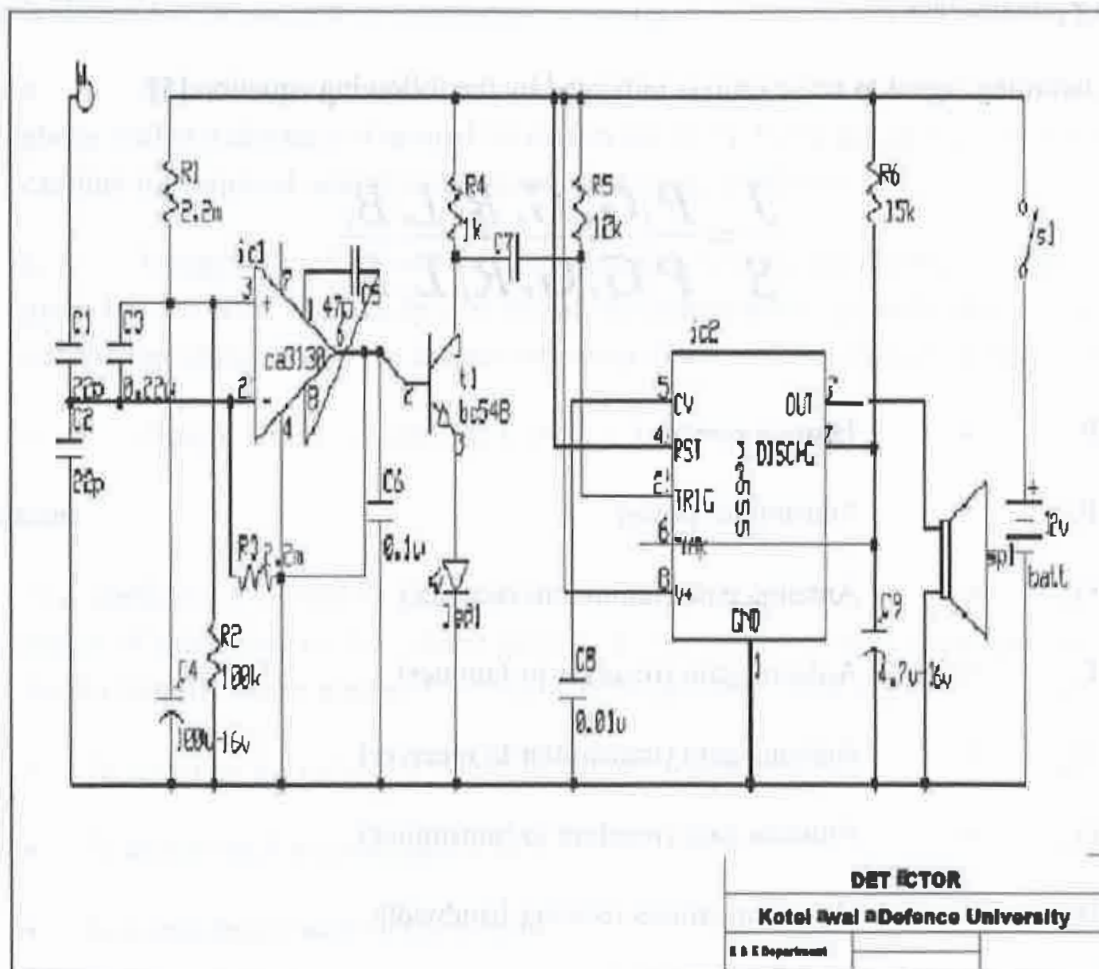
**Transmitter module** we developed using Voltage Control Oscillators of two frequency bands (900 MHz and 1800 MHz). We planned to incorporated RF amplifier to amplify and increased the jamming range. Since high power jamming signal may create extra burden for our proto type since it required approval from Telecommunication Regulatory Commission (TRC) of Sri Lanka. Considering above fact and since RF power dissipate from VCO is sufficient enough to test proto type module to prove the concept we directly connect two antennas to two VCOs which tuned to emit 900 MHz and 1800Mhze frequency bands.

To manage **power** requirement we used desk top computer power supply to obtained required voltages.

**Antenna subsystems** were developed separately for detectors and transmitter. Detectors connected with broad band antenna. Type of the antenna can consider as frequency independent antenna. Transmitter antennas made considering required two frequencies and there gains are in a acceptable level and found very low VSWR which are more suitable to use for transmitter modules.[4]

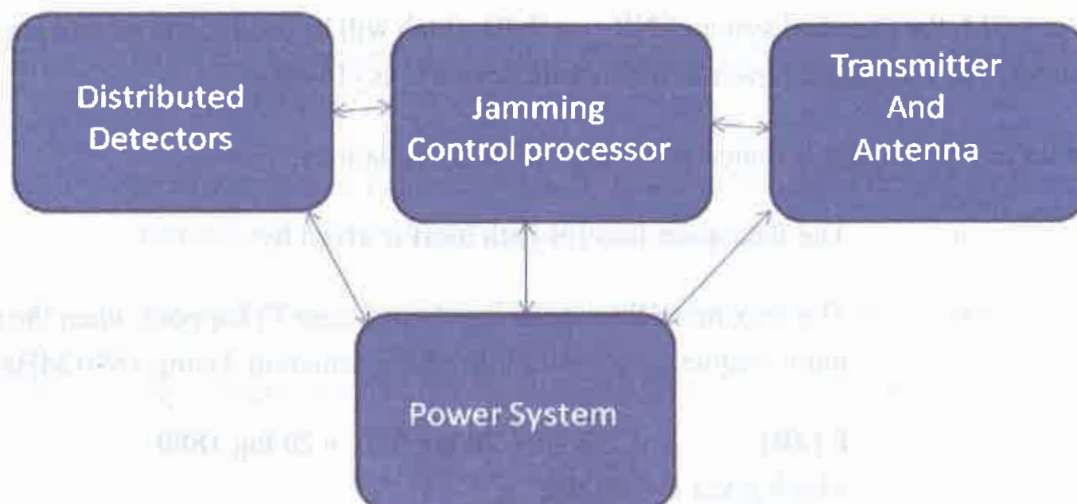
Isolating **receiver from the transmitted** own signals to prevent getting damaged as a protective measure, we used micro controller PIC 16F887 to initiate jammer (transmitter on circuitry) and at the same time to switch off the receiver and start emitting jamming signals. If any detector detects any mobile phone is attempting to call our smart jammer start emitting required jamming signals.[1]

We developed mobile phone jammer using VCO (Voltage Control Oscillators) POS -1000w and able to produce 1mW without final amplifier this amount of power level sufficient enough to jamm 10m x 10m area enclose room without much difficulty. As noise source we generated and insert a saw tooth signal. We incorporate RF detecting circuit which is tuned for 900 MHz and 1.8 GHz to detect mobile uplink and downlink frequencies of all the operators. Our detecting circuit is as appeared bellow:



Schematic of RF detecting circuitry

This detector can detect both the uplink and downlink of a cell phone calls, SMS and video transmission even if the mobile phone is kept in the silent mode. The moment the Detector detects the RF transmission signal from an activated mobile phone, it starts sounding a beep alarm and the LED blinks instead of buzzer alarm we fitted this signal to jammer to switch on and start emit jamming signal. This signal goes to the microcontroller through a comparator. After that that microcontroller programmed for turn on the jammer immediately for only 1 min. then if there is no signal from the detector microcontroller turn off the jammer.



System Block Diagram

### Designing parameters

Jamming signal to noise ratio is indicated by the following equation [5]

$$\frac{J}{S} = \frac{P_j G_j G_r R_r^2 L_r B_r}{P_t G_r G_t R_j^2 L_j B_j}$$

Where

$P_j$	=	Jammer power
$P_t$	=	Transmitter power
$G_{jr}$	=	Antenna gain (jammer to receiver)
$G_{rj}$	=	Antenna gain (receiver to Jammer)
$G_{tr}$	=	Antenna gain (transmitter to receiver)
$G_{rt}$	=	Antenna gain (receiver to transmitter)
$B_r$	=	Communications receiver bandwidth
$B_j$	=	Jamming transmitter bandwidth
$R_{tr}$	=	Range between communications transmitter and receiver
$R_{jt}$	=	Range between jammer and communications receiver
$L_j$	=	Jammer signal loss (including polarization mismatch)
$L_r$	=	Communication signal loss

For GSM, the specified system  $SNR_{min}$  is 9 dB which will be used as the worst case scenario for the jammer. The maximum power at the mobile device  $P_r$  is -15 dBm.

Free space loss of RF energy is indicated by the following equations:

- The free space loss (or path loss) is given by:
- The maximum free space loss (worst case F) happens when the maximum frequency is used in the above equation. Using 1880 MHz gives:
- F (dB) = 32.44 + 20 log 0.01 + 20 log 1880**  
which gives **F = 58 dB**.



Power calculation for the jammer is considered according to following considerations:

- a. Here, we need to find the power that is needed to be transmitted to jam any cell phone within a distance of around 10 meters for DCS. From the above considerations, we can find the required output power from the device, as follows:
- b. Using  $\text{SNR} = 9 \text{ dB}$  and the maximum power signal for mobile receiver =  $-15 \text{ dBm}$ , gives  $J = -24 \text{ dBm}$ . But, our goal is to find the output power from the device, so when we add the free space loss to the amount of power at the mobile receiver we get our target:
- c.  $\text{Output power} = -24\text{dBm} + 58\text{dB} = 34 \text{ dBm}$

### Applications

Few applications of mobile phone jammers are can be summaries as appeared bellow but the importance of this smart mobile phone jammer is low power consumption and possibility of reducing health hazards due to unwanted emission of high powered RF signals.

- To maintain the complete silence in library and lecture hall.
- To avoid fraud in examination hall.
- To avoid disturbance in class room.
- For providing security in conference, board of directors rooms, seminars, etc.
- For providing calm and peaceful atmosphere in Hospitals/Church/Temple/Religious establishment and Military establishment.

### References

- [1] Mobile & Personal Communications Committee of the Radio Advisory Board of Canada, "Use of jammer and disabler Devices for blocking PCS, Cellular & Related Services"
- [2] Sage, C, "Microwave and Radio Frequency Exposure: A Growing Environmental Health Crisis"
- [3] R. Maskani, S.M.P. Firoozabadi, B. Jalalian: Effects of GSM-900 Jammer's electromagnetic field on human electroencephalogram.
- [4] Wayne Tomasi, Electronic Communications Systems, fifth edition.
- [5] [http://library.enlisted.info/field-manuals/series-2/FM34\\_407/APPA.PDF](http://library.enlisted.info/field-manuals/series-2/FM34_407/APPA.PDF)