**REPORT OF THE SEMESTER LONG PROJECT**



**Cluster Innovation Centre**

**University of Delhi**

May 2017

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Hemant Singh

Deepak Gupta

Neeraj chuahan

May 2017

**Dissertation submitted in partial fulfilment for the degree of   
B.Tech (Information Technology and Mathematical Innovations)**

**CELL PHONE DETECTOR**

**APPROVED BY**

**SUPERVISING COMMITTEE:**

**Cluster Innovation Centre**

**Mentor**

**Dr. Swati Arora**

**Signature:**

**Certificate of Originality**

The work embodied in this report entitled **“Cell Phone Detector”** has been carried out by me at the Name of the organization. The manuscript has been subjected to plagiarism test by name of the software. We declare that the work and language included in this project report is free from any hind of plagiarism.

The work submitted is original and has not been submitted earlier to any institute or university for the award of any degree or diploma.

**Hemant Singh:**

**Deepak Gupta:**

**Neeraj Chuahan:**

**Abstract**

**Cell Phone Detector**

by

Hemant Singh

Deepak Gupta

Neeraj Chuahan

Cluster Innovation Centre, 2017

Supervisor: Dr. Swati Arora (Ph.D.)

In this project we have made a simple mobile phone detector. By using simple electrical components such as resistors, capacitors etc. we made this device which can detect radio frequency signals of mobile phones within a meter range and it beeps a buzzer ., the buzzer beeps until the phone is in range., if phone gets out of range buzzer stops .

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**I.BACKGROUND**

As increase in the technology in the world using the electronic equipment are being used in a wrong way like, in the examination halls and confidential rooms. To avoid this we are introducing a project called CELLPHONE DETECTOR.

This handy, pocket-size mobile transmission detector or sniffer can sense the presence of an activated mobile cell phone from a distance of one and-a-half meters. So it can be used to prevent use of mobile phones in examination halls, confidential rooms, etc. It is also useful for detecting the use of mobile phone for Spying and unauthorized video transmission.

## **I.2 CONTEXT**

## I.2.1 Components required

Resistors:

R1 \_\_\_\_\_\_\_\_2.2M

R2 \_\_\_\_\_\_\_\_100K

R3 \_\_\_\_\_\_\_\_2.2M

R4 \_\_\_\_\_\_\_\_1K

R5\_\_\_\_\_\_\_\_12K

R6\_\_\_\_\_\_\_\_15K

Capacitors:

C1 \_\_\_\_\_\_\_\_22pF

C2 \_\_\_\_\_\_\_\_22pF

C3 \_\_\_\_\_\_\_\_0.22µF

C4 \_\_\_\_\_\_\_\_100µF

C5\_\_\_\_\_\_\_\_\_47pF

Others:

IC CA3130

IC NE555

T1 BC548

LED

ANTENNA

PIEZO BUZZER

5 INCH LONG ANTENNA

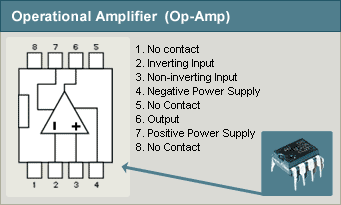
ON/OFF SWITCH

POWER SUPPLY

I.2.2 COMPONENTS ANALYSIS

**IC CA 3130**

This IC is a 15 MHz Bi MOS Operational amplifier with MOSFET inputs and bipolar output. The inputs contain MOSFET transistors to provide very high input impedance and very low input current as low as 10pA. It has high speed of performance and suitable for low input current applications.

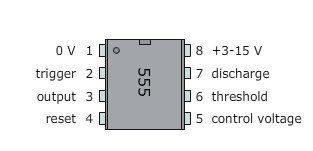


CA3130A and CA3130 are op amps that combine the advantage of both CMOS and bipolar transistors. Gate-protected P-Channel MOSFET (PMOS) transistors are used in the input circuit to provide very-high-input impedance, very-low-input current and exceptional speed performance. The use of PMOS transistors in the input stage results in common-mode input-voltage capability down to0.5V below the negative-supply terminal, an important attribute in single-supply applications.

A CMOS transistor-pair, capable of swinging the output voltage to within 10mV of either supply-voltage terminal (at very high values of load impedance), is employed as the output circuit.

**IC NE555 TIMER**

The NE555 IC is a highly stable controller capable of producing accurate timing pulses. With a mono stable operation, the time delay is controlled by one external resistor and one capacitor. With an unstable operation, the frequency and duty cycle are accurately controlled by two external resistors and one capacitor.



**PIEZO BUZZER**

Piezoelectricity is the ability of some materials (notably crystals and certain ceramics, including bone) to generate an electric field or electric potential in response to applied mechanical stress. The effect is closely related to a change of polarization density within the material's volume. If the material is not short-circuited, the applied stress induces a voltage across the material. The word is derived from the Greek piezo or piezein, which means to squeeze or press.

A buzzer or beeper is a signaling device, usually electronic, typically used in automobiles, household appliances such as microwave ovens, or game shows.

It most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button was pushed or a preset time has lapsed, and usually illuminates a light on the appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound.

I.2.3 Hardware Implementation

CONCEPT

Mobile phone uses RF with a wavelength of 30cm at 872 to 2170 MHz. That is the signal is high frequency with huge energy. When the mobile phone is active, it transmits the signal in the form of sine wave which passes through the space. The encoded audio/video signal contains electromagnetic radiation which is picked up by the receiver in the base station. Mobile phone system is referred to as “Cellular Telephone system” because the coverage area is divided into “cells” each of which has a base station. The transmitter power of the modern 2G antenna in the base station is 20-100 watts.

When a GSM (Global System of Mobile communication) digital phone is transmitting, the signal is time shared with 7 other users. That is at any one second, each of the 8 users on the same frequency is allotted 1/8 of the time and the signal is reconstituted by the receiver to form the speech. Peak power output of a mobile phone corresponds to 2 watts with an average of 250 milli watts of continuous power. Each handset with in a ‘cell’ is allotted a particular frequency for its use. The mobile phone transmits short signals at regular intervals to register its availability to the nearest base station. The network data base stores the information transmitted by the mobile phone. If the mobile phone moves from one cell to another, it will keep the connection with the base station having strongest transmission. Mobile phone always tries to make connection with the available base station. That is why, the back light of the phone turns on intermittently while traveling. This will cause severe battery drain. So in long journeys, battery will flat within a few hours.

AM Radio uses frequencies between 180 kHz and 1.6 MHz, FM radio uses 88 to 180 MHz, TV uses 470 to 854 MHz. Waves at higher frequencies but within the RF region is called Micro waves. Mobile phone uses high frequency RF wave in the micro wave region carrying huge amount of electromagnetic energy. That is why burning sensation develops in the ear if the mobile is used for a long period. Just like a micro wave oven, mobile phone is ‘cooking’ the tissues in the ear. RF radiation from the phone causes oscillation of polar molecules like water in the tissues. This generates heat through friction just like the principle of microwave oven. The strongest radiation from the mobile phone is about 2 watts which can make connection with a base station located 2 to 3 km away.

I.2.4 working of circuit

Ordinary LC (Coil-Capacitor) circuits are used to detect low frequency radiation in the AM and FM bands. The tuned tank circuit having a coil and a variable capacitor retrieve the signal from the carrier wave. But such LC circuits cannot detect high frequency waves near the microwave region. Hence in the circuit, a capacitor is used to detect RF from mobile phone considering that, a capacitor can store energy even from an outside source and oscillate like LC circuit.

I.2.5 circuit diagram

**Use of capacitor**

A capacitor has two electrodes separated by a ‘dielectric’ like paper, mica etc. The non-polarized disc capacitor is used to pass AC and not DC. Capacitor can store energy and pass AC signals during discharge. 0.22µF capacitor is selected because it is a low value one and has large surface area to accept energy from the mobile radiation. To detect the signal, the sensor part should be like an aerial. So the capacitor is arranged as a mini loop aerial (similar to the dipole antenna used in TV).In short with this arrangement, the capacitor works like an air core coil with ability to oscillate and discharge current.

To detect GHZ frequency signal in the range of 0-3.0GHZ the requires capacitance can be found using resonant frequency of the rc circuit as follows:

Let:

F= frequency

C= capacitance

L= inductance

Using the formula of resonant frequency in LCR circuit;

F =

Where L= 0

C=

C=

**How the capacitor senses RF?**

One lead of the capacitor gets DC from the positive rail and the other lead goes to the negative input of IC1. So the capacitor gets energy for storage. This energy is applied to the inputs of IC1 so that the inputs of IC are almost balanced with 1.4 volts. In this state output is zero. But at any time IC can give a high output if a small current is induced to its inputs. There a natural electromagnetic field around the capacitor caused by the 50Hz from electrical wiring. When the mobile phone radiates high energy pulsations, capacitor oscillates and release energy in the inputs of IC. This oscillation is indicated by the flashing of the LED and beeping of Buzzer. In short, capacitor carries energy and is in an electromagnetic field. So a slight change in field caused by the RF from phone will disturb the field and forces the capacitor to release energy.

**I.2 SCOPE AND OBJECTIVE**

This pocket-size mobile transmission detector or sniffer can sense the presence of an activated mobile cell phone from a distance of one and-a-half meters. So it can be used to prevent use of mobile phones in examination halls, confidential rooms, etc. It is also useful for detecting the use of mobile phone for spying and unauthorized video transmission.

FUTURE SCOPE

Trying to increase the detecting range of cell phone detector to few more meters for observing wide range of area.

## **I.3 ACHIEVEMENTS**

During the course of this project we learn time management and teamwork. Furthermore we learnt about LCR circuits, radio frequencies, and making a simple circuit. We applied our theoretical knowledge of electronics to this project and converted it into an experimental work with real time applications.