



Real-Time Mobile Phone Detection System

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Abstract: This study addresses the rapid proliferation in public and restricted areas of mobile phones that has led to security, privacy, and operational challenges, especially in places like schools, hospitals and sensitive facilities. To address these challenges, this research focuses on developing an efficient and reliable mobile phone detection system that can detect active mobile phones within a designated range. This detector operates by identifying the radio frequency (RF) signals emitted by mobile phones during communication with cellular networks, by leveraging techniques such as RF signal monitoring, electromagnetic field detection.

Index Terms – Radio Frequency (RF) signals, electromagnetic field detection, signal monitoring, signal interference, surveillance technology, device restriction.

I. INTRODUCTION

We live in a day and age where we cannot go a minute without our phones, we carry them with us everywhere. These tiny devices have brought both benefits and challenges, while mobile phones offer convenience and connectivity their presence in certain areas pose risk to privacy, and security. In settings like examination halls, hospitals, military installations, and government facilities unauthorized phone use can lead to leaked information, breaches of confidentiality.

For example, people with the medical condition called bradycardia (irregular beating of the heart) use a device called the pacemaker, a study done by Jhon Hopkins medical institute shows how mobile phone devices can cause electromagnetic interference with the pacemakers resulting in my accidents. These rf signals not only affect pacemakers but also other medical instruments. Another example includes how in academic institutions the presence of mobile phones can facilitate cheating and malpractices. Mobile phones are prevented in military and official government spaces as well, where phones can be sneaked in for spying purposes.

Addressing these concerns and more requires a reliable solution capable of detecting mobile phone activity. Our mobile phone detector is capable of detecting the rf signals emitted by the cell phone whilst making a call or sending a text, or any sort of data transmission. Existing mobile phone detectors vary in accuracy, range and power consumption, often struggling to differentiate between useful and unnecessary RF signals. Our study aims to develop an improved mobile phone detector that overcomes these limitations, offering a solution for real-time detection in a controlled environment. With a focus on detection accuracy, minimizing false positives and ensuring energy efficiency.

Our phone emits a sort of electromagnetic wave while making a call or sending a text. These waves start oscillating anywhere from 3Hz to 3000Hz which is when they are called RF signals. Our model uses an capacitor and the IC to capture the signal. This next section provides the construction, methodology, circuit diagram and the performance of our mobile phone detection system.

II. CONSTRUCTION

CONSTRUCTING A MOBILE PHONE DETECTOR INVOLVES CREATING A DEVICE THAT CAN SENSE THE ELECTROMAGNETIC SIGNALS EMITTED BY MOBILE PHONES, PARTICULARLY THOSE IN USE OR ON STANDBY. HERE'S AN OVERVIEW OF THE COMPONENTS, WORKING PRINCIPLE, AND STEPS INVOLVED.

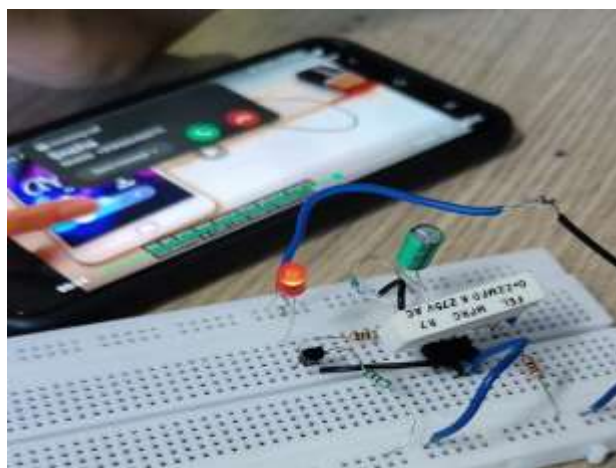
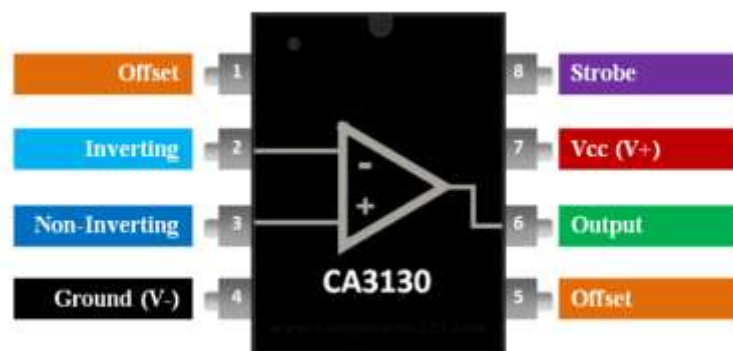
COMPONENTS AND ASSEMBLY

- IC CA3130: Is a high performance, differential amplifier combining the advantage of both CMOS and bipolar transistor, known for its high input impedance, low input current and fast response.
- 1kohm resistors: limits current flow by providing resistance, commonly used to control voltage and current levels in the circuit.
- 47 pf capacitor: known to regulate voltage by storing a small amount of electric charge, commonly used in high-frequency circuits for filtering, tuning, or coupling applications due to its low capacitance value.
- 100uf capacitor: stores a relatively large charge, commonly used in power supply circuits for smoothing and filtering to maintain steady voltage levels.
- BC 548: is a general-purpose NPN bipolar junction transistor (BJT) commonly used for amplification and switching applications due to its moderate current gain and low noise characteristics.
- LED: light emitting diode, is a semiconductor device that emits light used to indicate the output.
- 9v Battery: compact power source, used to provide steady 9v to the circuit.

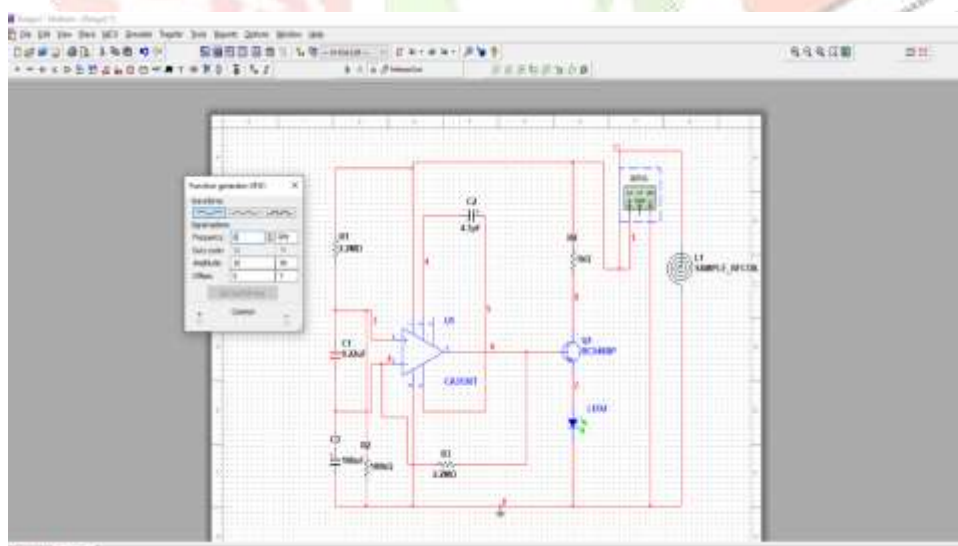
Circuit Construction includes:

- Place CA3130 IC into the circuit.
- Connect pin 7 of the CA3130 IC to the voltage source.
- Connect pin 4 of the CA3130 IC to the ground.
- Place the BC548 transistor into the breadboard.
- Connect Pin 6 of the CA3130 IC to the base of the BC548 transistor.
- Connect the collector of the BC548 transistor to the voltage source using the 1kΩ resistor
- Connect the anode of the light-emitting diode to the emitter of the BC548 transistor and the cathode of the light-emitting diode is connected to the ground.
- Connect pin 2 of the CA3130 IC to the base of the BC548 transistor using a 2.2MΩ resistor.
- Connect pin 3 of the CA3130 IC to the ground using a 100kΩ resistor.
- Place the 100μF capacitor to the breadboard.
- Connect the anode of the 100μF capacitor to pin 3 of the CA3130 IC, as well as, the cathode of the 100μF capacitor to the ground.
- Connect pin 3 of the CA3130 IC to the voltage using a 2.2MΩ resistor.
- Connect pin 2 to pin 3 of the CA3130 IC using a 0.22μF capacitor.
- Connect pin 1 to pin 8 of the CA3130 IC using a 47pF capacitor.

III. IC PIN DIAGRAM AND PIC



V. Circuit diagram (Multisim)



VI. Circuit working:

An ordinary rf signal detector circuit uses tuned LC circuits, which is not sufficient for detecting GHz frequency range. The transmission frequency of mobile phones ranges from 0.9 to 3 GHz with a wavelength of 3.3 to 10 cm. So, a circuit detecting gigahertz signals is required for a mobile bug. Here we can use a 0.22uf disk capacitor along with the IC3130 to create a small gigahertz loop that acts like an antenna to collect the rf signals that is transmitted. The ca3130 IC is a differential amplifier, and is used in circuits as a current to voltage converter with a capacitor connected to both its ends (inverting and non-inverting) It is a CMOS

version using gate-protected p-channel MOSFET transistors in the input to provide very high input impedance, very low input current and very high speed of performance. The output CMOS transistor is capable of swinging the output voltage to within 10 mV of either supply voltage terminal.

Capacitor in conjunction with the lead inductance acts as a transmission line that intercepts the signals from the mobile phone. This capacitor creates a field, stores energy and transfers the stored energy in the form of minute current to the inputs of IC. This will upset the balanced input of IC and convert the current into the corresponding output voltage. Capacitor along with high-value resistor R keeps the non-inverting input stable for easy swing of the output to high state. Another resistor provides the discharge path for the last capacitor. Feedback resistor makes the inverting input high when the output becomes high. Capacitor (47pF) is connected across 'strobe' (pin8) and 'null' inputs (pin1) of IC ca3130 for phase compensation. When the cell phone detector signal is detected by the capacitor, the output of the IC becomes high and low alternately according to the frequency of the signal. This leads the LED to start glowing.

NOTE: The disk capacitance (0.22uf) should have a lead length of 18mm with lead spacing of 8mm. This circuit should give a warning indication if someone uses mobile phones within the proximity of 1.5 meters.

VII. Conclusion

As mobile phone use continues to grow globally, so too does the need for effective, reliable detection technologies that can mitigate associated risks, such as distracted driving and security breaches. Further research should explore advancements in sensor accuracy, miniaturization, and cost-efficiency to expand the practical applications of mobile phone detectors. By continuing to improve this technology, society can achieve safer, more secure environments, making mobile phone detectors an essential tool in the ongoing effort to address modern safety challenges.

VIII: References

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