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DESIGN AND IMPLEMENTATION OF RESONANCE INDUCTIVE COUPLING BASED ON WPT SYSTEM FOR MOBILE CHARGER

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Abstract-Mobile phones becoming a basic part of life, the recharging of mobile phone batteries have always been a problem. The mobile phones vary in their talk time and battery standby according to their manufacturer and batteries. All these phones irrespective of their manufacturer and batteries have to be put to recharge after the battery has drained out. In this research, an innovative design of a WPT is implemented through the resonance inductive coupling between transmitter and a receiver, which is used to transfer power due to mutual induction of these coils and finally given to the load device. A laboratory prototype of the proposed wireless battery charger has been realized and tested to evaluate system performances. Recently, the wireless charging technology has been significantly advanced in terms of efficiency and functionality.

Keywords: *Wireless power transfer (WPT) (or) Transmission, Resonance inductive coupling, Mutual inductance, charging mobile phone.*

I. INTRODUCTION

In recent years, there has been increasing interest in research and development of wireless power technology to eliminate the “last cable” after Wi-Fi becomes widely accepted. Imagine sitting down for a cup of coffee, and placing your mobile phone on the table. The phone lights up, and starts to automatically charge without connectors or cables, you could simply grab your mobile phone on your way out in the morning, and charge it whenever you needed to at home, the office, the library, the local coffee shop. It would be even better if you did not ever need a charger. We could simply forget about USB

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cables, chargers and, when travelling, adapters. Resonance inductive coupling chargers are being used for wireless charging of mobile phones,MP3 player and other handheld devices such as wireless mouse, camera etc.

II. RELATED WORKS

The hardware mainly consists of solar cell, oscillator, resonance inductive coupling, and voltage regulator LM7805 and bridge rectifier. The software is basically a Matlab R2012b simulink.

A. HARDWARE SYSTEM

Let us discuss the functions of each and every hardware device is used. Following are the details:

I. Solar cell:

It is also otherwise known as photovoltaic cell. It is an electrical device that converts the energy of light directly into electricity by the photovoltaic effect. It typically ranges from 100 to 365 watts. It is cheaper than ordinary fossil fuels. The majority modules use wafer-based crystalline silicon cells or thin films cells based on cadmium telluride or silicon. The diagram of solar panel is shown in Fig 1.

Fig 1.Solar panel

II. Royer oscillator:

A Royer oscillator is an electronic relaxation oscillator that employs saturable-core transformer simplicity, low component count, rectangle waveforms and easy transformer isolation. It also minimizes the size and weight of the transformer. It produces the output as square wave. The circuit diagram for Royer Oscillator is shown in Fig 2.

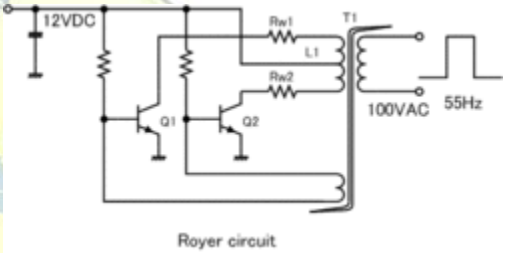

Fig 2.Royer Oscillator

III. Resonance inductive coupling:

It is the combination of inductive coupling and resonance. Resonance makes two objects interact very strongly. The inductance induces current. Capacitor is connected parallel to the coil. The energy will be shifting back and forth between magnetic field surrounding the coil and electric field around the capacitor. Radiation will be negligible. The functioning of resonance inductive coupling is shown in Fig 3.

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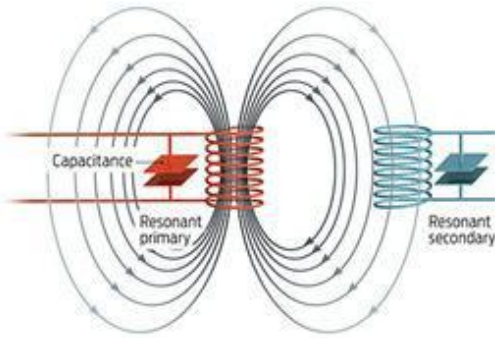

Fig 3.Resonance inductive coupling

IV. Voltage regulator:

Designed to automatically maintain a constant voltage. Voltage regulator IC helped to provide a constant limited regulated output to the load for charging the low power devices. Here we are using LM 7805 voltage regulator IC. It is used because the IC gives a regulated 5V as its output and it do not allow more than 5V to the output. The pin diagram of voltage regulator is shown in Fig 4.

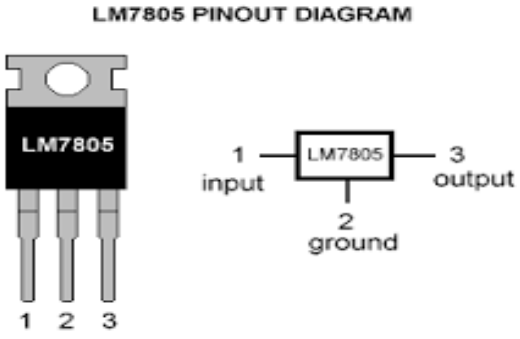

Fig 4.Pin diagram of voltage regulator (LM 7805)

V. Bridge rectifier:

A bridge rectifier is an arrangement of 4 or more diodes. In a bridge circuit configuration, this provides the same output polarity for either input polarity. It provides full-wave rectification for a 2 wire AC input, therefore resulting in lower weight and cost. The circuit diagram of Bridge rectifier is given by Fig 5.

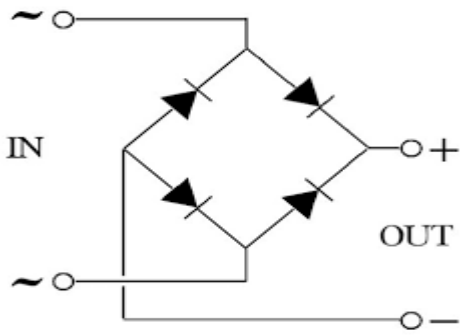

Fig 5.Circuit diagram for Bridge Rectifier

B. SOFTWARE SYSTEM:

Simulink is developed by mathworks, is a graphical programming for modeling, simulating and analyzing multidomain dynamic systems. Its characteristics are:

1) Simple to learn, understand, simulate and debug.
2) It can automatically generate C source code for real-time implementation of systems.
3) It is used for simulating and testing simulink and state flow models in real-time on the physical system.

III. BLOCK DIAGRAM OF THE WIRELESS POWER TRANSFER BASED ON RESONANCE INDUCTIVE COUPLING

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WPT can be divided into 3 parts components. First, transmitter, the transmitter electromagnetically transfers power via resonance inductive coils which supply a wireless transfer of power at same frequency to receiver units. Second resonance inductive coupling, the resonance inductive coupling in this case as the antenna and forward to the bridge rectifier which act convert the induced AC voltage to the DC voltage. Third, rectifier, the rectifier finally will supplies DC voltage to the load with the help of voltage regulator. The block diagram of wireless power transfer based on resonance inductive coupling as shown in Fig6.

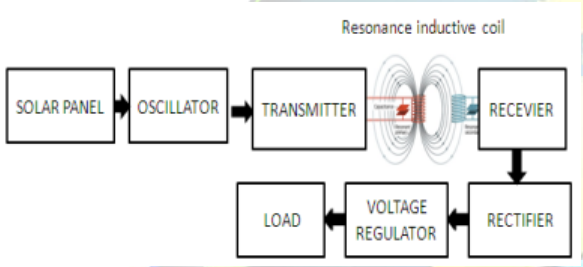

Fig 6.Block Diagram of Wireless power transfer based on resonance inductive coupling

Currently WPT is requirements to be implanted for gadget charger such as mobile phones,iPad,MP3 Player and other handheld devices, for example we could simply forget about USB cables, chargers and, when travelling, and will be efficiency.

IV. METHODOLOGY

1.1. Principle of wireless power transfer using resonance inductive coupling.

Experimental setup has been studied to get the performance of WPT. In this experiment a mobile phone devices is used as a load. The experimental set up of transmitter unit has been conducted. Energy transfer by mutual inductance to the receiver via resonance inductive coupling. The voltage sources to the transmitter was provide by solar cells.The resonance inductive coupling is used as the antenna to wireless power delivered from the transmitting to the input of a receiver. Receiver unit, the bridge rectifier is used convert AC voltage to produces DC voltage and produce DC output. A capacitor is included in the circuit to act as a filter to reduce ripple voltage.

VI. CONCLUSION

From conclusion, it is clear that resonant inductive coupling power transmission would be extremely beneficial to society if it were implemented in homes and home electronics. From a environmental standpoint, this technology could replace disposable batteries and cords, reducing dangerous chemicals and potential for poisoning communities. Resonant inductive coupling also has health benefits and with no need for cords life would simply become has easier. With the help of this technology As long as the device is in a room equipped with a source of such wireless power, it would charge automatically, without having to be plugged in. In fact, it would not even need a battery to operate inside of a such

room. In the long run, this could reduce our society's dependence on batteries, which are currently heavy and expensive. At the same time for the long range power transmission, power can be sent from source to receivers instantaneously without wires, reducing the cost. Thus by inductive coupling technique there will be reduction per unit cost of power transmission.

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