WIRELESS MOBILE CHARGER

A Project submitted in partial fulfillment of the requirements for the Award of Degree of
Bachelor of Science in Electrical and Electronic Engineering

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Certification

This is to certify that this project and thesis entitled "**Wireless Mobile Charger**" is done by the following students under my direct supervision and this work has been carried out by them in the laboratories of the Department of Electrical and Electronic Engineering under the Faculty of Engineering of Daffodil International University in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering. The presentation of the work was held on Decembetr 2018.

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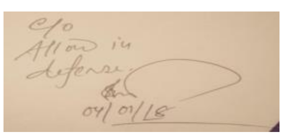

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The project and thesis entitled **“Wireless Mobile Charger”** submitted by **Sayedul Islam Tohin**, ID No:151-33-2595 and **Ahosan Habin,** ID No: 151-33-2594, Session: Fall 2018 has been accepted as satisfactory in partial fulfillment of the requirements for the degree of **Bachelor of Science in Electrical and Electronic Engineering** on December 2018.

Dedicated to

Our Parents

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First and foremost, I thank the Almighty God for His continual guidance throughout my academic work to the accomplishment of this project. The psychological and financial support and encouragement from my family greatly aided the accomplishment of this project and to them I am very grateful. Special thanks to my father and mother for their sacrifices and guidance. I am very grateful to my supervisor, Mr. Md. Mahmudur Rahman sir for his useful guidance and incites throughout the project, it has been a great pleasure for me to get an opportunity to work under the tutelage of you. My appreciation goes to all my lecturers, lab technologists in the department of Electrical and Electronics Engineering at the Daffodil International University who impacted knowledge in me and accorded me help. Lastly to my classmates and friends in the department thank you.

Abstract

Mobile phone battery life has always been a problem for the manufacturers. People are complaining about their mobile battery life, they do not have long battery life and they have to charge their phones multiple times. On this paper, your mobile phone charge is automatically shown using a new concept timer using a microcontroller circuit. Through this concept mobile will not be charged and battery life will be long and battery efficiency remains the same as previous. In this concept we have used two circuits one transmitter and other receiver circuits, the transmitter circuit is AC to the DC correction circuit and then it is controlled by pulse-width modular circuits. Foreshine mutation The secondary coil is connected to the primary coil in the transmitter, from Acid to DC Bridge Circuit, it is used to connect the charger pin to the mobile port. A microcontroller with timer circuits is used to avoid the height of the battery.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Wireless power transmission is a source of electrical energy from sources for a distance other than a wireless or cable. Every day, new technologies make our life easier. Wireless charging via resonance can be one of the next technologies that bring in the next future. In this project, it has been shown that low-power devices can be wirelessly charged with inductive coupling. This reduces the complications arising from the use of conventional cable systems. In addition, the project also exposes the new possibilities of wireless systems in our daily life uses.We live in a world of technological advances New technology raises every day to make our life easier. In spite of this, we still rely on our everyday low power devices such as mobile phones, digital cameras, and even on mid-power devices like laptops, on the classical and conventional cable systems.The conventional cable system creates a mess when it comes to charging different devices simultaneously. It accepts many electric sockets and each device has its own design for charging port. A question might arise at this time. If these devices are charged without using a single device with a single device, then there is no problem in the process? We gave it a thought and came up with an idea.

This is a simple and effective way of connecting the solution to these contexts in a modern, wireless way of transmitting electricity. Wireless Power Transmission (WPT): Electric energy efficient transmission in the atmosphere without using one vacuum or cable or any other substance from one point to another. It can be used for applications where an instant amount or continuous supply of energy is required, but where conventional cables are unreasonable, inconvenient, expensive, dangerous, unwanted or impossible. Using inductive coupling for small range, power can be sent using resonant induction for high-range medium-range and electromagnetic wave power transfer. WPT is a technology that can transport electricity in places, which is otherwise not possible or is inadequate to reach. Mid Power Devices can be the next big thing by charging low power devices and ending intermittent connections. The purpose of this project is to design and form a method to transmit wireless electrical power through space and charge a designated low power device. The system will work using resonator coils to transmit a resisting load power from an AC line. Different geometric and physical structure factors are investigated to increase connectivity between transmitters and receivers. Being successful in this way will stop the use of chairs in charging process, so it is easy and easy to charge a low power device. It will also ensure the protection of the device as it eliminates the risk of short circuits. The purpose is to use a single power outlet, which is likely to charge multiple low power devices simultaneously using single source.

1.2 Problem Statement

People use gadgets to improve their daily routine work every day. The gadget is using the power socket as their power supply. If they use many gadgets in their daily life, then this may be the reason for lack of power socket. Nowadays people are using smartphones to make their living easier. The problem they are experiencing is the rapidly dissolving smartphones using multi-applications on standby time or standby batteries. Wireless power transfer was invented by Nikola Tesla in 1839. Vacuum bulbs without using the cable. Wireless power transfer resonance is used for power exchange through coil. Figure 1.1 shows the comparison of using wire charging and wireless power transfer charging.

Figure 1.1: Comparison of using wire charging and wireless power transfer charging.

The difference is the wireless power transfer charging is more tidy and manageable, it also make user more confortable to using smartphone without charging using wires. The problem needs to be highlighted in this project, where wireless power transfers can be transferred to a long range or only for a short range. Then, the power of wireless power transfer can be effective from the components used in the coil. Wireless power transfer needs to be implemented in our lives. It will make people use gadget for better life.In this project, a test can be used analytical and proven wireless power transfer and get wireless power transfer skills. On the other hand, we need to consider the health conditions of radio radiation handover.

1.3 Objectives

The purpose of this project is to achieve various objectives Successfully.

1.Investigation of a wireless power transfer system using a resonant coil.

2.To develop and study the system and examine it to establish its effectiveness

3.Use the LabVIEW software to verify the wireless power transfer coil.

1.4 METHODOLOGY

This topic will consist:

i. Project flow chart

ii. Case study wireless power transfer using magnetic resonance coupled.

iii. Experiment on wireless power transfer coils

iv. Develop the system and validate the performance.

v. Analyse result

vi. Result and analysis

1.4.1 Project Flow Chart

Figure 1.2 show the project flow chart used to make sure this project is successfully done before the due date of this project.

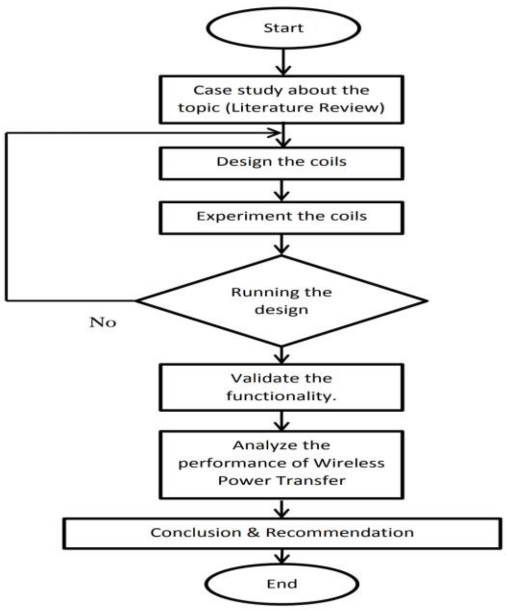

Figure 1.2: Flow chart for the methodology of the Project.

1.4.2 Operating Principles

Operation principles of wireless power transfer system are similar to the surface-based wireless power transmission system used for communication between robot swarms.

In a resonant system, the circular current in the resonant coil is greater that the drive coil by the quality factor, Q.Wireless power transfer system circuit uses the MOSFET power to get a desired transfer frequency. Figure 1.3 show the block diagram of wireless power transfer transmitter.

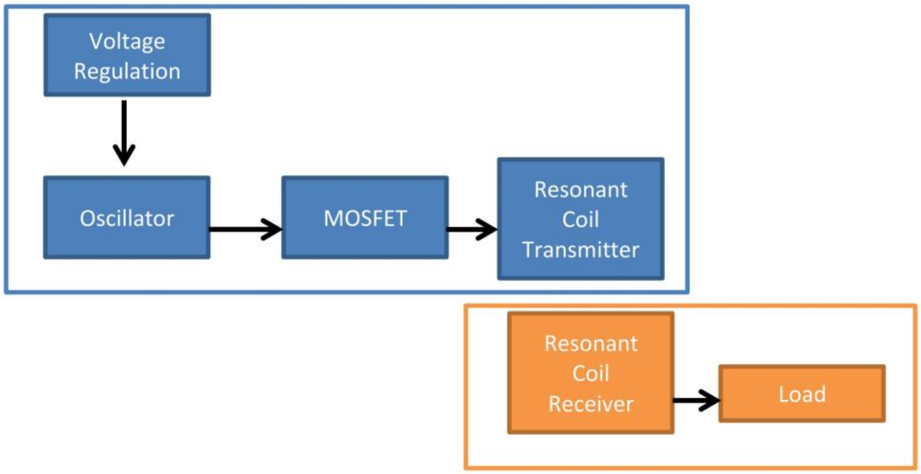

Figure 1.3: Block diagram of wireless power transfer system

During a change in the current flow in a coil transmitter, a resonance is added by the LC receiver coil. Current is induced in receiver coil at the transmission frequency, which set as resonance frequency.Resonance frequency can be calculated from the inductance and capacitance of the LC circuit.

1.4.3 Magnetic Resonance Coupling

Resonance is an event that takes place in the nature of a variety of types, it is associated with energy consumption in two modes. In a resonance system, it is possible to build up large energy stored on the system only due to weak tension and if it is more than the system's loss rate, then the power lost in the system. Figure 1.4 is the example circuit for resonator.

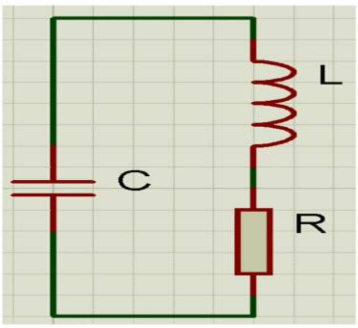

Figure 1.4: Example of a resonator

The behaviour of an isolated resonator can be defined by two fundamental parameters, its resonance frequency, and its intrinsic loss rate, . The ratio of these two parameters define the quality factor or Q of the resonator (Q = /2) a measure of how well it stores energy.

This wireless power transfer will use the magnetic resonance connection method, this method transmits an ability to transmit in long distance with a highly efficient and robustness and takes antenna or known coil positional transfer. The coil concept will be designed is solenoid.

1.5 Thesis Outline

In this section, the outline of project report is presented. This report includes of six chapters and each chapter is explained.

Chapter 1: Discuss the introduction related to Wireless Power Transfer Systems. The problem statement, the purpose and the project are remarkably brief and clear.

Chapter 2: Discusses the literature review on wireless power transfer systems. History of wireless power transfer.

Chapter 3: In this chapter the theory behind the design of the project is given.

Chapter 4: This chapter gives a detailed explanation on how the device once assembled operates. It also explains the components used and their role in the design of each part of the device.

Chapter 5: This chapter, the results obtained are explained and discussed. The modifications that were carried out are also explained in this section.

Chapter 6: This chapter gives the conclusion and recommendations after completion of the final year project. It covers assessment of whether project objectives and scope were achieved, a highlight of areas for future development, bibliography and appendices.

CHAPTER 2

LITERATURE REVIEWS

2.1 Introduction

Wireless power transfer system has been tried several times throughout the last few centuries. The conception ideas started in the experiment of Henrik Hertz and Nikola Tesla in the 1890s and continued until this day. Although Nikola Tesla was confident about the idea of his transfer, and nobody was able to verify this idea. Nowadays, wireless power transfer is widely displayed through induction. Even though the wireless power transfer through induction limits a very small distance. This chapter provides a literary review of wireless power transfer history.

2.2 History of Wireless Power Transmission

2.2.1 19th century development and dead end

In the nineteenth century, many theories of theory were developed and counter theory about how to send electrical power. The circular law of Andrée-Marie Ampere Amper in 1826 shows that electric current creates a magnetic field. In 1831, Michael Faraday described that electromotive power combines its induction with a time-changed magnetic floc to a conductor drive in a conductor loop. Without the wire, the transmission of electrical energy has been observed by many inventors and researchers, but lack of a coherent theory has suddenly led to the phenomenon of the electromagnetic index. A brief explanation of these events came from Maxwell's equation by James Clark Maxwell, 1860, which established the theory that electromagnetism combined the power and magnetism, which predicted the existence of an electromagnetic wave as the "radio" carrier. . Approximately 1884, Henry Poison Panning defined the vector and gave the theory of poning, which describes the electricity flow in an area of electromagnetic radiation and allows accurate analysis of radio energy transfer systems. theory followed the legitimacy of Henrik Rudolf Hertz's theory of 1888, of which there was evidence of radio waves.

At the same time, two schemes of wireless signaling were placed by William Henry Ward (1871) and Mahlon Lumis (1872), which were based on the false belief that there is an electric atmospheric layer at low altitude. Both the innovative patents mention that this layer connected with a return path using "Earth Currents" allows the wireless telegraph, as well as the telegraph supply power, to stay away with the artificial batteries and to be used for lighting, heat and purpose. Could power A more effective demonstration of radio transmission via Amos Dolbyer's 1879 magneto electric telephone came out, which operated the ground for transmitting more than a quarter of a mile.

2.2.2 Tesla

After 1890, inventor Nikola Tesla tested the spark-powered radio frequency resonant transformer with the help of modern and capacitive coupling with power, which is now known as Tesla Coles, which produces high AC voltage. Then he tried to develop a radio lighting system based on nearby producers and managed a series of capacitive coupling and public protests where he published bright light bulbs from gisler tubes and even a stage. He can increase the distance that can illuminate a lamp using an acceptable LC circuit connected to the transmitter's LC circuit with resonance. Using similar recurring pairs. Tesla failed to produce a commercial product outside of his research, but his resonant's modern joint machine is now widely used in electronics and is currently being implemented on low-range wireless power systems.

Tesla went on to develop a radio power distribution system, which he hoped would be able to send a long distance of electricity and electricity. Early on, he assumed borrowing from Mahlon Lumis, that the balloons created a system to suspend transmission of electrodes in altitude of 30,000 feet (9,100 meters) high and propose to supply electricity from where he feels that the pressure would send him high voltage. Will give (millions of volts) long distances.

In 1899, it established a test facility at high altitude in Colorado Springs, to study further the meteorological nature of low pressure air. He operated there in a large coil operating in the Megavolts range, and he examined the lightning strikes made from the electronic sound, he led there wrongly that he could use the entire world of the earth for the electrical power execution.

This theory involves the driving of its resonant frequency, instead of the existing branches in the world, working against a higher capacitance to create the probability of world's prosperity from the driving Tesla coil. Tesla thought that it would allow similar electricity with similar capacitive antenna to the current power anywhere with little electricity in any part of the world.

Figure 2.1:Tesla's unsuccessful Wardenclyffe power station.

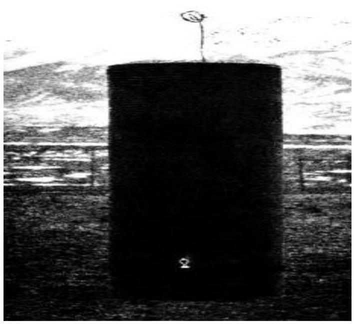

Figure 2.2:Experiment in resonant inductive transfer by Tesla

His observations believe that the high voltage used in a coil at some feet feet height will "break down the air layer", eliminating the need for balloon missiles to create its atmospheric return circuits. Tesla is the world's information and power broadcasts to offer "World Wireless System" in the following year. In 1901, he tried to build a large high-voltage radio power plant at Shorham in New York, which is now called the Wardenloft Tower, but in 1904 the investment dried it and this facility never ended.

2.2.3 Nearby fields and non-radiation technology

The modern power transfer was among the earliest wire cables, the first wireless power technology was developed, in the 1800s the transformer was available after it was developed. Induction heating has been used since the early 1900s. With the advent of cordless device, induction charging studies have been developed to overcome the dangers of electric shock for wet environment applications such as electric toothbrushes and electric razors. One of the first applications of formal transfers was the power of electric engines. In 1892, Morris Hutton and Maurice LeBalck patented a radio system for the power of train trains using Resouge Coils, which was connected to the 3KGJ track cable. The first passive RFID (Radio Frequency Identification) technology was invented by Mario Cardulo (1973) and Kouël et al. (1975) and used in proximity cards and contactless smartcards in the 1990's.
Recently, the expansion of portable wireless communication devices like mobile phones, tablets, and laptop computers has been developing mid-range wireless power and charging technologies to eliminate the requirements of connecting these devices to wall plugs during charging. Wireless Power Consortium was established in 2008 to develop standards for manufacturers throughout the world. Its Quive Inductive Power Standard, released on August 24, enables high efficiency charging and powering of portable devices up to 5 watts more than the distance of 4 cm (1.6 in). The wireless device is placed on a flat charger plate (for example, can be embedded at the top of the table in the cafe), and the charge is transferred from a flat coil to the device's equivalent one. In 2007, a team led by Marin Solizic in MIT used a dual resonance transmitter to transmit the diameter of 10 mhz with 25 mm diameter and 10 watts (6.6 ft) (eight feet) of the transmitter coil diameter). In 2008, Greg Leigh and Mike Kane's team of Nevada Lightning Lab used a fixed dual resonance transmitter, with a radius of 60 cm radius of 57 cm radius, and using a similar grounded dual resonance receiver, a 12-meter (39 ft) distance was transferred through an electrical return circuit. In 2011, Christopher A. Professor Kevin Warwick of Tucker and Review University, Tesla 1900 Patent Revitalized 0,645,576 small scale and demonstrated power transmission with a coil diameter of 10 cm (3.9 inches) on 4 meters (13 feet). Resulting frequency of 27.50 MHz with 60.5% effective efficiency.

2.2.4 Microwave and laser

Prior to World War II, there was little progress in wireless transmission. Radio was developed for communication purposes, but it can not be used for power transmission because at least the frequency radio wave spreads from all directions and reaching a little power receiver. In radio contact with the receiver, an amplifier intensifies a weak signal using the power from another source. For power transmissions, transmitters need efficient transmitters that can create high-frequency microwaves, which can be focused on narrow bees towards a receiver.

During the First World War, the development of microwave technology, such as closton and magnetron tubes and parabolic antennas, created for the first time the radiation (remote-field) method and the first long-distance wireless power transmission was achieved by William C. Brown in the 1960s. In 1964 Brown discovered Recta, which could convert the microwave into a DC Power efficiently, and in 1964 it was first shown with wireless-powered aircraft, a model helicopter powered by a microwave surrounded by soil. A major motivation for microwave research in the 1970s and 80s was the development of solar energy satellites. By Peter Glazer in 1968, it is assumed that it will collect energy from sunlight using solar cells and absorb the earth as a microwave in a large rectangle, which will convert electric power into electric power grids. As a technical director of the JPL / Reeththon program in 1975, 54% DC conversion expertise showed a long-range infection with a microwave out of microwave power 475 watt of Brown Microwave Power. In NASA's Jet Proposition Laboratory, he and Robert Dickinson sent the 30-meter DC output power from 1.5 mph to 2.38 gHz microwave, from 26 m to 7.3 x 3.5 m rectangular air. The incident-Rafiq's DC conversion efficiency was 80%. In 1983, Japan introduced the Microx (Microwave Eonosphere Alien Interaction Experiment), a rocket test to test the transmission of high-power microwaves through the entoafia.

In recent years, the focus of research has become a development of radio-propelled drone aircraft, which sponsored Brown's research with the Defense of Defense Rampe (Reithian Airborne Microwave Platform) project in 1959. Canada's Communication Research Center created a small prototype aircraft in 1987, known as the Stationary High Height Relay Platform (SHARP), which will restore the telecommunications information among the world's points, such as the communication satellite. Driven by a recta, it can fly up to 13 miles (21 km) high and may

stay high for several months. In Kyoto University, in 1992, a more advanced crafts were known, it is known as Mileax (Emacavove Lifted Airplane Apartment).
In 2003, NASA blasted the first laser-powered plane. Smaller model plane motors were powered by a ground-based laser from a bee of infrared light, powered by photocals, when a control system looked at the laser in the plane.

2.3 Basic Principles of Wireless Power Transfer

The radio was discovered by a person named Nikola Tesla who was "Father of Wireless", he is the one who the first person that conceived the idea of transmitting power through the air has been around for over century, with the Nikola Tesla's pioneer idea and his experiments attempts to do so. Most of the wireless power transfer systems use some electromagnetic (EM) fields that are sent to power. Figure 2.1 shows the simple block diagram of wireless power transfer.There are three type of wireless power transfer that can use in wireless power transfer that is radiative transfer, inductive coupling and resonant coupling.

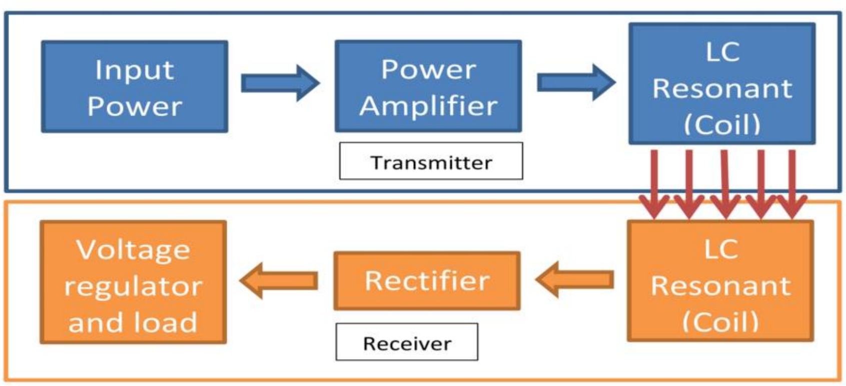

Figure 2.3: Basic Block Diagram of Wireless Power Transfer

There are three type of wireless power transfer that can use in wireless power transfer that is radiative transfer, inductive coupling and resonant coupling. Radiative transfer are suitable to exchange information and transfer a small power in miliwatts, most of it were wasted into free space. For inductive coupling, it can be transmitted the power with high efficiency but in very short distance.

Last type is resonant coupling, it can transfer high power at medium distance. Basic principles of resonance system based on the possibility of forming two separate coils with same frequency similar to high frequency magnetic coupling and high exchange capacity.

2.4 Justification for the Study

The capacity for wireless transmission capabilities has increased over the years. Currently a research is being conducted to obtain the appropriate method that can be used in lots of uses such as device development. The following are reasons why it is important:

a) Flexibility: WPT conductors and cable use will be removed. Instead, there are many wiring power running on power devices from power sources that can be sent wirelessly, so avoid mess created by wire and many more devices can be driven without having all their energy sources.

b) Safety: With the increase in electrification in the area, there are electric shock cases people even the animals have been rampant to end up touching the conveyor. WPT will be exhaust the conductors thus preventing electric shock.

c) Convenience: Convenient use of WPT application devices will be enabled. Fo example, the pacemaker in the medical field that uses the battery can be re-branded battery life is over when compared to having every surgical. For this, the cost will be saved surgery and more a convenient alternative.

d) Reliability: Many times people are using a device and it runs out of power yet one doesn't have a cord to charge the device or perhaps there is no source of power around. However with WPT the devices can be charged wirelessly hence the risk of low battery power will be eliminated.

2.5 Main concepts of wireless transmission of electric energy

As a result of the extensive research in WPT, various categories have arisen. WPT can be categorized in terms of efficiency, distance of transmission, power level and size. Classification based on distance of transmission however is more relevant.

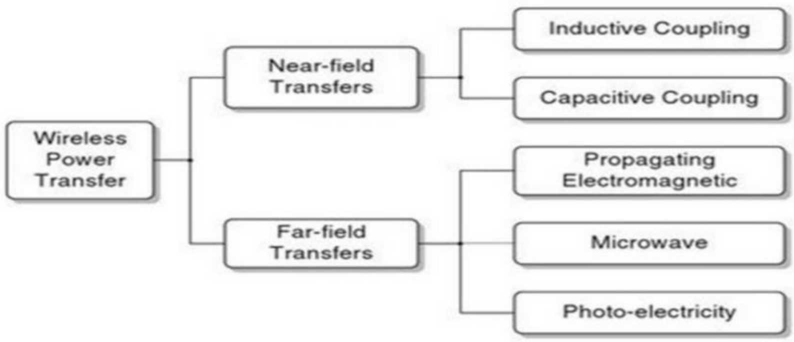

Figure 2.4: Classification of WPT

For both electromagnetic sources electric (e-fields) and magnetic (H-field) fields are created around it. These fields are characterized by radioactive and non-radiation components. Depending on the distance from the source they can be close to the field, near the transfer zone or the remote area. Transit area has both the transfer characteristics of nearby and far fields.
The area of adjacent field can be said to be found in the radius of the wavelength, where the fields are located outside the radius of two wavelengths. However, it is less than the wavelength for transmitters and receivers. Far field transfer is only one type, whereas all polarization types in the adjacent field movements are vertical, horizontal, elliptic and circular.
The study found a high efficiency during transfer time so far near the transfer place. This can be attributed to both reducing electrical and magnetic fields proportionally the distance from the source. In addition, the neighboring region allows higher division of the wave, resulting in a strong range of strong sharpness and weak direction. In all this light, more research has been done to improve the relocation of remote areas compared to remote field transfers.
Both near field transfer and far field are further categorized based on the method of operation of the transfer. Some of the methods are as follows:

Far Field Transfer:

a) Microwave Power transfer

In this method, the DC is supplied to the microwave generator, which is converted into microwaves. Radioactivity occurs through the coaxial-waveguide adapter and then through the waveguide circular, which reduces the radiation from external energy.

Finally, the radiation flows through the tuner and directional coupler device, which separates the signal according to the direction of the signal transmission. The radiation is then transmitted through the antenna on the air, Where it is obtained by antenna in rectennial, where microwave radiation passes through a low pass filter, then a matching network and then it is converted into DC as a rectifier.

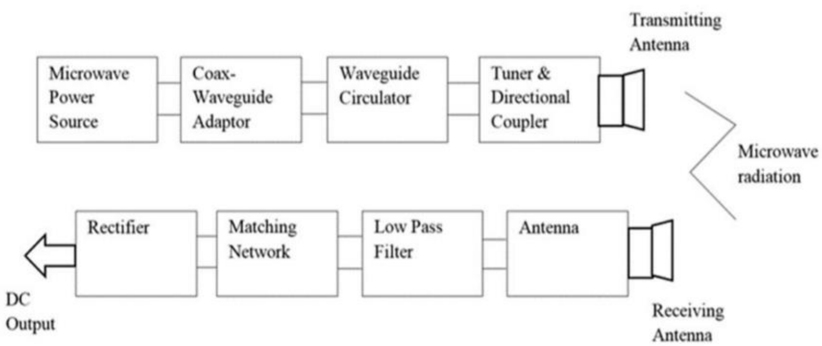

Figure: 2.5: Microwave Power Transfer

b) Photo electricity

c) Propagating electromagnetic waves

Near Field Transfer

a) Inductive Coupling

2.6 A summary of the main WPT Interface Standards and Alliances as of January 2015

Table 2.1: Summary of main WPT Interface:

Organization	WPC	PMA	A4WP

Established	2008	2012	2012
No. of members	203+	80+	140+
Transfer type	Inductive coupling	Inductive coupling	Magnetic resonance
Max. transfer power	5W (10-15W soon)	5W (10-15W soon)	up to 50W
Range	Short range	Short range	Mid-range
Transfer frequency	100 to 205 kHz	277 to 357 kHz	6.78 MHz
Latest version	1.1.2	PMA1.1	A4WP-S-0001 v1.2
Certified Products	684	24	-
Authorized test labs	10	3	2

2.7 Summary of the chapter

This section contains an assessment of current work with respect to the existing work. It is dedicated to critically reviewing technical and academic literature in previous work of Wireless Power Transfer (WPT).In this chapter we discussed about history of wireless power transfer, main concepts of wireless transmission of electric energy, basic principles of wireless power transfer,and the justification for the study.

CHAPTER 3

THEORETICAL MODEL

3.1 Introduction

In this chapter the main topics that will be discussed is the theoritical framework and approaches used to complate this project. In this experiment we used some components that are discussed in this chapter.

3.2 Wireless transfer by Inductive Coupling

Wireless transmission capabilities are based on the right reasons for electromagnetic field correctly electromagnetic induction. Biot-Savart's law, Which is similar to the laws of Coulomb, states that the magnetic field intensity *dH* at *r* due to the current element *Idl* at r' is *dR.* It gives the relation between the magnetic field and the length, direction, proximity and current length of electricity through which it has been created.

$dB = \frac{I\, d\mathbf{l} \times \mathrm{R}}{4\pi R^3}$

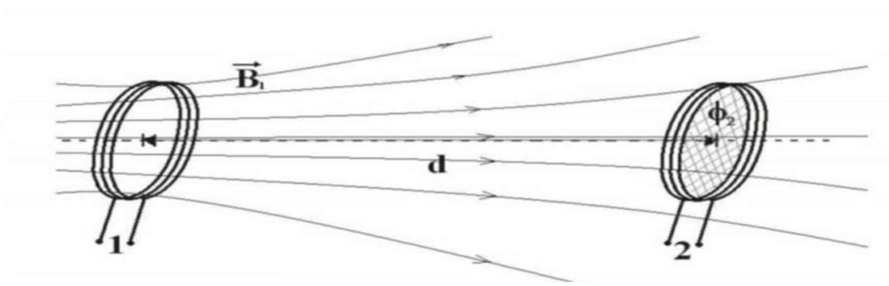

Figure: 3.1: Magnetic flux

Where R is the full displacement vector from the current source to the field point, *Idl* infinitesimal current source point in the wire. A magnetic field of **Br** is produced by the copper coil. The magnitude of the magnetic field is affected by r which is the distance of the field point from the center of the coil. Magnetic field B coil current i proportional. Suppose two copper laminated coils are located near the field while grabbing as well as combine one magnetic field is generated. However, only the transmitter coil is operated and current flows through it. This magnetic field created by TX coil at point x is being made in the RX coil.

$$B = \frac{\mu_o N I a^2}{2(a^2+d^2)^3/_2}$$

Where N is the number of coil spin, I is the current of the transmitter current, it is a radius TX quilts are the separation distance between D and TXX. Rx will be given by the magnetic flux that will pass through the coil:

$$\Phi = \iint_S B\, dS$$

:

Magnetic flux density generated by B transmitter and ST receiver coil surface area.

In the transmitter coil current is flowing, depending on the time the receiver creates magnetic flux variations in the coil. An electromotive force (emf) will be induced in RX coil.Which is obtained by applying Faraday's law of induction which states that "The induced emf ε in a coil is proportional to the negative of the rate of change of magnetic flux".

$$\varepsilon = -\frac{d\Phi}{dt}$$

For a coil that contains n loops, the total motivated MMF will be large

$$\varepsilon = -N\frac{d\Phi}{dt}$$

Where Φ is the magnetic flux. EMF tech coil is currently driving magnetic fields are opposed to the change in the timing of magnetic floc in accordance with Lenz's law. Therefore, the power is transferred from the TX quoy to the RX coil. An MMF can be launched in the following way:

(i) by varying the magnitude of B with time as in the figure below

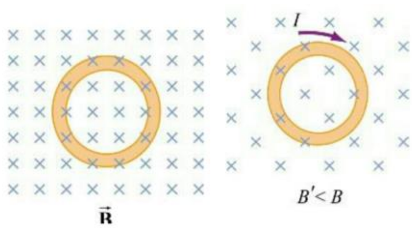

Figure 3.2: Magnitude of B

(ii) by varying the magnitude of A, i.e., the area enclosed by the loop with time

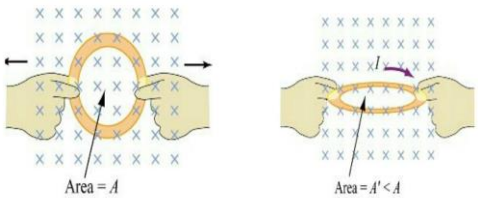

Figure 3.3: Magnitude of A

The property of self-inductance circuits opposes the current change of its own magnetic field circuits. Self-inductance of the coil can be defined as:

L=N Φ/I

Where N is the number of these magnetic flux and I have the coil current.

Therefore,

$$\varepsilon = -L\frac{dI}{dt}$$

Or

$$\varepsilon = -M\frac{dI}{dt}$$

Where L is self-inductance of the coil, M is mutual inductance of two coils, I is the current of the coil. So the emf induced in the coil directly proportional to the mutual inductance of the coils and rate at which the current is oscillating. Mutual inductance can also be given M=K(L1L2)^½

Where k is the coupling factor, L1 and L2 are TX and RX inductances. Coupling factor determines the grade of coupling, i.e. how much the total floc floc is entered inside receiver coil If the current option is, get:

$$\Phi = \frac{\mu_o N I \sin(\omega t) a^2}{2(a^2+d^2)^{3}/_{2}}$$

Therefore,

$$\mathcal{E} = -\frac{d\left(\frac{\mu_o N I \sin(\omega t) a^2}{2(a^2+d^2)^{3}/_{2}}\right)}{dt}$$

It clearly shows that the voltage introduced in the second coil depends on current and voltage in the primary coil, current and voltage frequency in the primary coil, the separation distance between coils and coil's surface area. As a result, two coil coupling systems are illustrated below.

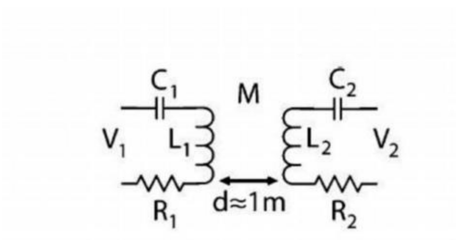

Figure 3.4: The two coil coupling system

Connectors representing C1 and C2 are tuning capacitors, L1 and L2 are mutual inductance M, R1 and R2 are composite resistance .d is the distance between the coils and V1 and V2 are input and output voltages. Second coil output can be defined as energy:

$$P_{out} = \frac{V_1^2 \omega^2 M^2 R_l}{(R_1(R_2+R_l)+\omega^2 M^2)}$$

Where ω is the operating frequency of the system, RL is load resistance. RL is load resistance. Thus the overall efficiency of the system depends only on transmission frequency, mutation, coils' parasite resistances and load resistance.

The Q factor which is defined as the proportional proportion of the resistance coil energy is performed and determines the overall efficiency of the system. A high Q factor a low power loss and so good means the transmission efficiency. Generally there are question factor values from 0 to 1000 for WPT coils. It is defined as

$$Q=\frac{\omega L}{R}$$

Where L is the inductance of the coil, R is its resistance and is the operating frequency of the system. Of course, increasing the operating frequency increases the Q factor. However, when it is reaching its peak value, it will decrease as the operating frequency continues to rise.

A higher Q factor means a narrow band-width, thereby allowing dropping coupling efficiency and a tuning circuit. Maximum transfer efficiency is defined by:

$$\eta = \frac{k^2 Q_1}{\left(1+\sqrt{1+k^2 Q_1 Q_2}\right)2}$$

Where k is the coupling factor between two coils, Q1and Q2are the quality factors of the transmitter and receiver coils. As a result, to reach maximum efficiency, developers should optimize their system coupling and quality reasons.

3.3 Advantages of Wireless Charger

1. Safe for human, simple implementation.

2. Charging multiple devices simultaneously with multiple capacities, high charging skills.

3. It improves user-friendliness as the hassle from connecting cables is removed. Different models of different brands and devices can use the same charger.

4. It increases flexibility, especially in devices for which batteries or replacement chargers for charging are expensive, dangerous, or disabled (eg body-implanted sensors).
5.It render the design and fabric of many smaller devices without battery attachments.

6. It provides better product durability (e.g., waterproof and dustproof) for contact-free devices.
7.If wireless communications are not acceptable or wireless charging is convenient and the product is embedded in the product or the product can not reach.Wireless charging is usually used in medical devices and food products where electric shock or bacterial layers should be kept to the lowest and no electrical contact is allowed.

8.Wiring charging can also reduce the amount of cables and power adapters you need to have custom manufactured for your device or application.

9.Wireless charging can be sized to deliver 5W or 10W of energy to the battery. It can be a good solution to charge your battery.It can charge your battery at a faster speed, depending on the size of the battery pack.

10. In most applications the distance between the two coils is typically 5mm.It is possible to extend the extent to at least 35 mm.

3.4 Disadvantages of wireless Charger

1. The main disadvantages of low efficiency and heat dissipation wireless charging. It has low efficiency and resistant heat is more than direct contact charging. Very slow charge of low frequency device. In the same case with older drive technology. It's smart steps to keep the device on the mat and keep it cool. It is easily charged.
2. One of the reasons that wireless charging has not been fully integrated is that it can still be slower and less efficient than a traditional charger. It is important to mention that this factor is technology based. Some wireless chargers can not only reach the same level of efficiency as traditional charging, so the process continues to be slow. In addition, the heat produced in certain

types of wireless charging technologies is generally more than the conventional method of charging.

3. Mobility. Must have mobile device pad for charge. It can not be moved around with it as with direct contact charger with cable. It can not be operated during charging.Though the signal transmitted between your smartphone and the charging station is wireless, it is still necessary to plug the charging station to the wall. Therefore, the devices currently available on the market are not portable and therefore do not allow you to 'continue'. If you have a plug for the human chain charging stations, then come with a portable battery that can be charged. Go till there is enough power to maintain its energy.

4. My biggest challenge was to adjust before. There is no real value of wireless charger yet. Losses are covered by the advantages of wireless charging and hence more people are going to buy at least one wireless charger. Still, I found a brand that was able to support 3 of my devices that I use for mobile photography (Samsung S5 and iPhone 6).

3.5 Summary of the chapter

This chapter elaborates on the method of wireless power transfer that was selected which is inductive coupling.Ending of this chapter we know about wireless transfer by inductive coupling, and advantages and disadvantages of wireless charger.

CHAPPTER 4

HARDWARE DEVELOPMENT

4.1 Introduction

The most efficient way to develop end applications for Qi wireless charging is to start with available evaluation kits (EVK) or evaluation modules (EVM).These tools show the designers easy and fast performance features and performance of potential devices, to speed up the development effort. Some tools even got Q certification by independent testing facilities, and can therefore be used as Qi-compliant reference designs. Mouser stocks both Qi Wireless Power Transmitters and Q Wireless Power Receiver Evaluation Modules. This complete transmitter-side and receiver-side solution, with all necessary components, such as allowing the coils to be evaluated promptly. The receiver needs to be installed in a Qi-compliant wireless charging pad to test the module and likewise, the transmitter evaluation module needs to be connected to a Qi-compliant receiving device.

4.2 General Principle of Design

The general principle of operation is designed using relative coupling and energy transfer is possible and ensure that the transfer between nearby fields is possible. Designed for versatile and optimization, battery charging circuits are power efficient and prevent damage.

Circuit has been divided into two categories:

1.Transmitter circuit

2.Receiver circuit

Transmitter circuit comprised of the power supply, boost converter, royar oscillator and copper laminated coils. The receiver side had the receiver coil, rectifier,etc.

The figure below shows the block diagram of the design:

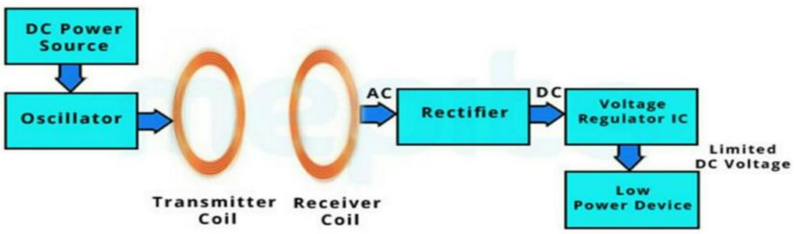

Figure 4.1: block diagram of the design

AC supplied from power supply and feeding electricity supply. It is down and then stepped corrected to give DC power. DC voltage is then passed through the voltage regulator LM7805, so give a constant 5V DC. A significant reason for this DC signal is not enough make a big emf that will cause the induction. 5V is then fed to DC booster converter increase the 30V voltage. 30V now becomes the input of the royar oscillator circuit. The oscillator then accepts AC voltage AC power with a high frequency change.

Working of transmitter circuit

Our project is made of a DC power source, an oscillator circuit, in the transmitter module (Commonly known as an electrode) and a transmitter coil. DC power source oscillator circuit inputs a fixed DC Provides voltage. until now, This DC power is converted to a high frequency AC power and the transmitter coil is supplied. Transmitter coil, energized by high frequency AC current, produces an alternative magnetic field.

DC Supply

DC power source consists of a simple step down transformer and a correction circuit. The Transformer moves the voltage to a desired level and the rectifier circuit AC voltage is DC. Converts.

Oscillator Circuit

Planned prototype oscillator circuit for the project is a modified rye oscillator. This oscillator circuit is incredibly easy yet a very powerful design. Extremely high recurring current semiconductor can be achieved with this circuit. Here the high current magnetic fields need to increase strength.

Oscillator circuit work

The circuit contains two chocons with labeled L1 and L2, two semiconductors (N-channel here enhancement power-mossafts), labeled C2 and an indicator (here the transmitter coil) with a similar capacitor Q1 and Q2 labeled. Cross-acceleration response diodes are supplied through D1 and D2, R1.The rising network for R3 and R2, R4 MOSFETS. When the force is applied, the DC flows through the current between the two coils of the coil and the drainage of the transistor. At the same time the voltage is displayed in both the gates and the transistor started to start. A transistor is going to be slightly faster and more than the other. Current coil (transformer) saturates will continue to grow up. Resonance Capacitor C increase the voltage across the private first and then fall into a standard sine wave pattern. Considering the turn of Q1, the drain voltage of Q1 will be bound to land, when the drainage voltage of Q2 will rise to a peak and then the tank made by the capacitor and coil the primary oscillator is formed through one half circle. Then, D1 will be advancing in advance by more voltage than D2 and so it will turn on Q2 and cycle repeat. Applying load secondary (source coil), defined by the coil, capacitor value and the addition of lower amounts, run in the Oscillator frequency.Known formula for operating frequency resonance,

$$\mathbf{F = 1/2 \times \pi \times \sqrt{(LC)}}$$

Transmitter coil

The transmitter coil for this project was built with 9 mm diameter, 17 swg copper wires and 100 turns.

From the inductance of a single layer air core coil, we inductance L = 8.1 uH.

Working of reciever circuit

The receiver module of our project consists of a receiver coil, a rectifier circuit and a voltage Regulator IC And additional wild converter get more current by reducing the 5 volt output voltage.

An AC voltage receiver coil is introduced. The rectifier circuit is DC. Transforms it and the voltage regulator helps in maintaining a fixed voltage in IC load.

Receiver Coil

The receiver coil for our project is designed as a transmitter coil with the same quality.

MOSFETS

MOSFETS is supplied copper coil which causes a large current. The

The image below shows the circuit of the transmitter section.

The transmitter circuit section has two power MOSFETs which are biased using the resistors R1, R2, R3, R4.There is also a choke made up of inductors L1 & L2.L2.The 8 capacitors C operate as resonating capacitors to ensure the coils are at resonant frequencies.

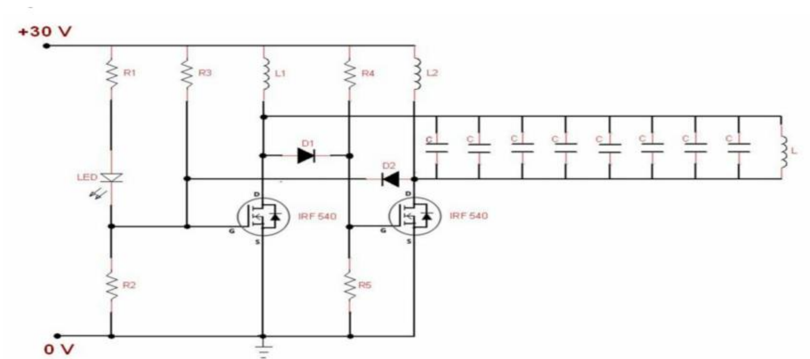

Figure 4.2: Transmitter section circuit

These two diodes provide cross-engined feedback in D1 and D2. Transmitter is the coil l which is essentially a promoter where electromagnetic induction occurs. The coil used in this case is 25. When power is given to the oscillator circuit, the DC current starts flowing through the two sidesof the coil (L1&L2) and also to the Drain terminals of the MOSFET. In the same instant time, both the transistors are shown voltage in the gate terminal and try to turn on transistors. Anyone of the transistor will be faster than the other and it will turn ON first. When the first Q1 is launched, its drain voltage will be stuck in the ground. Meanwhile Q2 will be closed state. Once Q2 is in place, its drain voltage starts to learn and immediately starts dropping due to the capacitor C and primary coil formed by the tank circuit.

In the receiver side the circuit was as below:

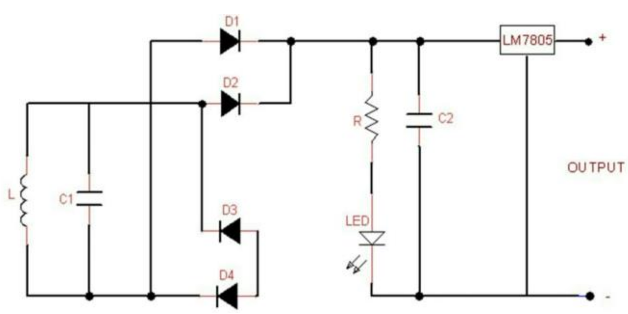

Figure 4.3: Receiver Circuit

When the receiver coil is placed in the field range from the transmitter coil, the transmitter extends magnetic field into the coil and generates it which induces an AC voltage the current flow in the wireless charger receiver coil. The transmitted AC voltage is then fed rectifier which it converts to DC. A capacitive filter is used to extract any wave. The voltage of the revised voltage controller is fed and the voltage is controlled and constant. Output 5V DC is controlled.

4.3 Components

Table 4.1: Requred components

Items	Quantity
TTC 5200 Transistor	1
Heat Sink	1
Resistor	1
25 Gauge wire	As required
1N4007 Diode	4 ,for making a bridge connection
5-8 cm round anything for coil winding	1
12 volt power supply	1
Bread board	1
Capacitors	As required
Charging put and	1

4.4 Hardware

4.4.1 Power Supply

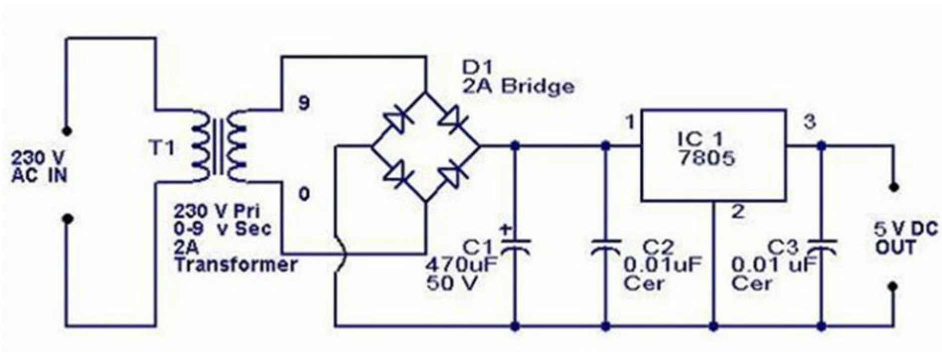

Figure 4.4: Power Supply

Oscillator supplies require 30V DC Used power supply unit gave an output 5V DC. There is a transformer reducing the 230V ACT supplied in the power supply 9V AC ocean. A full wave bridge correction is then fixed 9V AC. Full wave bridge half wave rectifier for a large, because the half of the wave bridge correction is preferred over the rectifier. If the capacitor exceeds AC cycle, the voltage will be retained during that gap.The bridge rectifier has 80% efficiency so the corrected output was less than the input. The output received was 7.2V DC. This voltage is still reluctant and thus pulsating anyway.Smoothening capacitors are needed. Charge as a smoothening capacitor supply. The correctional voltage is thus fall in any evening on the smoothened DC voltage.Then the voltage is fed stable LM7805 which ensures a stable output voltage of 5V.

4.4.2 Full Wave Bridge Rectifier

Receiver side receptive transmitted current is AC. But for battery charging purposes , DC needs correction. The design is a complete wave bridge rectifier instead of a half-wave rectifier. It is basically a full wave correction but instead of using four diodes.

Then there are two bridge corrections which form the weapon. It was used for the following reasons:

I. It does not require a center tap on secondary winding, so the AC voltage can be fed directly into the bridge circuit.

II. For its construction, the crystal diode can be used. Diodes are easily available
Market and cheap circuits are more compact.

III. Transformer use high power.

There are four diagonal arms. When the AC voltage is applied to one arm, the correction is DC voltage received from the opposite hand. The bridge rectifier performs positive and negative half-cycle. Point A is positive and point B is negative during positive cycle. In this case diodes D1 and D2 will take place when the D3 and D4 will be closed. D1 and D2 forward this point feeling and conducting a series with loads.The image in the current current as current down:

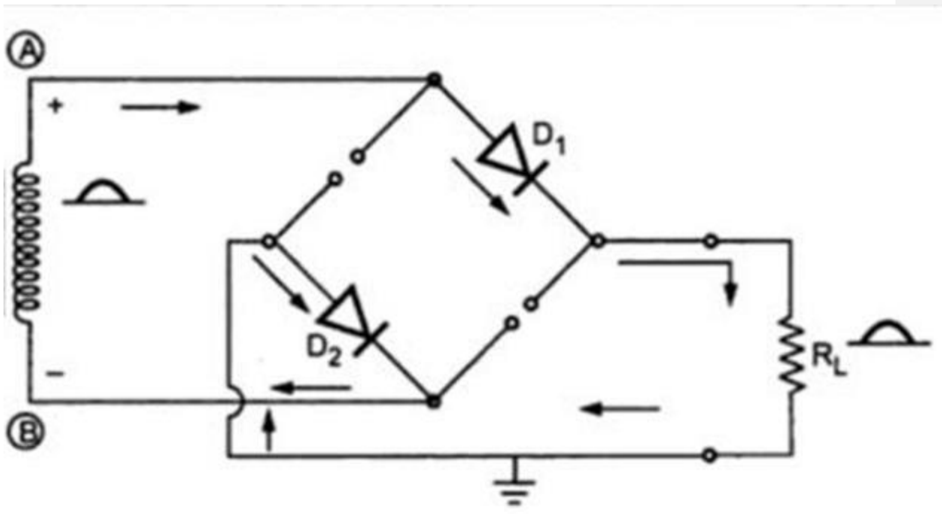

Figure 4.5: Flow of Current 1

During negative half-rounds, the AC voltage feeding constant is such as the opposite point B is now positive when the point becomes a negative. In this case Diodes D3 and D4 will be launched which means they can advance preferential, so it can be useful when D1 and D2 are closed reverse bias similarly for the positive AC cycle, the series will be run with D3 and D4 loads and the current will flow as the following image:

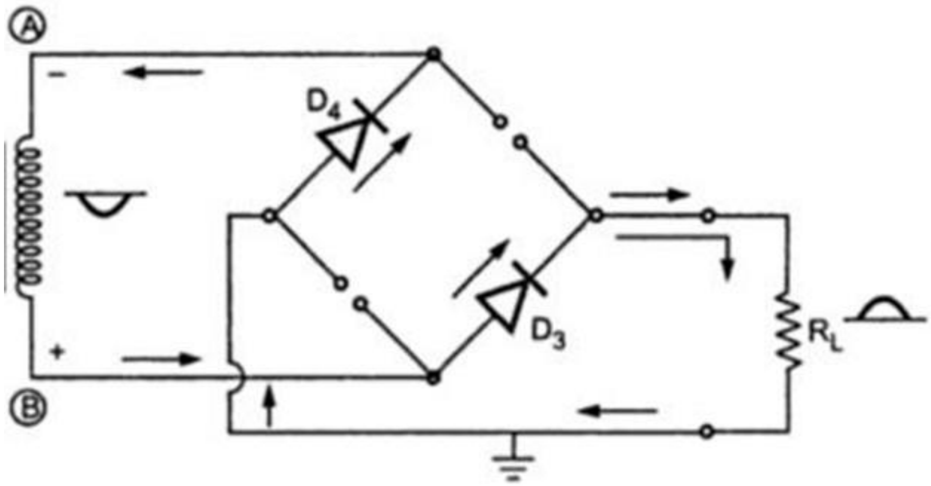

Figure 4.6: Flow of Current 2

It is worth noting that current in the load flows in the same direction for both ac cycles. For this reason the current wave current is unidirectional current. However the rectified dc voltage had ripples. The capacitor's response is much smaller than the resistive price, since a capacitive filter was added to the filter instead of joining.

4.5 Summary

This section gives a detailed explanation of how to combine devices once. It also explains the components used and their role in the design of each part of the device.In this we known about components which are requred for this project. Also learned about basic circuit diagram of a MOSFET and how it work.In this chapter also discussed about full wave bridge rectifier and working of receiver & oscillator circuit.

CHAPTER 5

RESULTS AND DISCUSSIONS

5.1 Results

The main purpose of the project was to develop a device for wireless power transfer. The device will be an electronic circuit. The objectives of achieving this goal were divided into specific objectives, which together helped to improve the device. Other objectives were as follows:

1. Design and assemble a power supply unit. Power supply provides high frequencies from 230V AC to 12V AC. 12V DC is then fixed to give 5V DC.

2. Step up DC supply. Using a boost converter, the DC voltage is raised to 30V DC.

3. Design and gather a suitable oscillator. For the project, a rye oscillator was found to be the most suitable. After combining the elements on Veroboard and fabricating it. The above three purpose consists of transmitter modules.

After assembling and fabricating the components on the veroboard.When assembled and fabricated it was as depicted in the figure below:

Figure 5.1: Primary coil & main circuit board

4. Develop transmitters and receiver coils. Electromagnetic induction occurs between two coils and an emf generated on the TX coil that induces a current on the RX coil.The coils were embedded on the fabricated casing of the modules.However the receiver coil is in the figure below:

Figure 5.2: Imbedded Coils or receiver coil

5. Design receiver module and rectify the AC voltage found in receiver coil.DC power output needed a correction that would be used for power Element.

5.2 Analysis and Discussion

5.2.1 Coil

To test whether the power was sent, we first sold a LED in the receiver coil. The test was there Oscillator power only succeeded with 5V DC. But power was also good enough battery charging circuit made of an LCD and microprocessor. Voltage step by step up to 30V DC uses a boost converter. Two used coils were used and each had an LED lamp. They both shine brightly. We then added a set of LEDs and the results below were the results. The acceptable cables were not separated from the transmitter coil. But as though increase the separation distance separating brightness. This proves that this is really the distance separation determines the current introduced into the receiver coil. Increase the distance, less the current flux is inspired from the changes. Tested LED bulbs lit up bright up to a separation their brightness decreases significantly after the distance of 5 cm in two kilometers.

Also, the gauze used in the coil is more effective. Currently the most common gauge in market is 26 and gauge 16. It was noted for gauge coils 16, the separation distance between the coils was small and also bright the bulb gauge was less than 26. Various objects were placed in the receiver heat dissipation. They were connected with them. Voltage stepped up to 30V DC at the primary level of the transmitter circuit The first MOSFET still did not flush fast. That is the reason that it has been discovered voltage is being fed to a short circuit power until it is very slowly growing. To solve this problem, a reset switch was introduced into power supply and oscillator circuits. Switch also MOSFETs are able to reset the circuits once heated. It is also noticed that as long as the voltage has been increased to the oscillator, the power is much higher Battery charging circuit strength obtained on the load coil was not enough. This was it Because the receiver coil is slightly out of resonance, it was not able to take it this way Power is good For this solution we are sure that the same number of coils and used capacitors were identical, so that the transmitter and receiver circuit were both the same resonated frequency.

5.2.2 Battery charging circuit

Battery Charging Circuit Amplifier is included, which converts AC to DC, a atomge 328 microcontroller, a 16X2 LCD and a CD 4066 switch. This section was originally there controlled by the microcontroller. The battery is initially used as a relay switch after it is full. However it is more current acting as drawing and thus loading. The CD 4066 became a good one as an alternative it consumed less current and was less bulky than single channel relay one of the challenges of modern chargers is to complete charging once; There is nothing like that charge closed user notification To solve this; A buzzer is used once charging it is complete listening. However this means that the input signal was run on the same as the fridge frequency and it consumes more energy. Instead there was an RGB LED has been used. Its operation is loaded coded and microcontroller. It was shown that once the battery started charging it loaded the correctional voltage significantly drops it happened. Battery is suspected to be the main cause of internal resistance of this.

5.3 Summary

The goal of this project was to develop and implement a wireless charger for low power devices through a resonant linkage connection. After analyzing the entire system for step-by-step optimization, a circuit was designed and implemented.Experimental results show that significant improvements in terms of power transfer skills have been achieved. As it was mentioned earlier, wireless charging could be the next big thing.and transmitter coil to protect sending power has an effect. It is observed that it was not any significant influence on the power that is transmitted. However when there was a magnetic element in Coils it was an effect to place within.

5.4 Oscillator

The royer Oscillator was elected due to its simplicity yet powerful design. It's capable
Which is necessary to increase the energy, which produces very high oscillating current
Magnetic field This is achieved by semi-conductor used. In this case, the power of IR 540
mosfets. However due to large current, heat exchanges have occurred in the MOSFET.

CHAPTER 6

CONCLUSIONS

6.1 Conclusions

The purpose of the project has been met. An electronic device that transmits electricity wirelessly and then the charge batteries were developed. We can design such discrete components as such the royer oscillator, coils and a full bridge voltage correction for the system design process.

The decisions collected from the project study are as follows:

1. The processor was based on the wireless charging theory through the introduction coupling used in the project, it can be seen that the various aspects such as distance, resonance frequency, quality factor; to determine the WPT efficiency of the coil turned ratio. There is also an addition exponential corrosion for power versus separation distance.

2.From the analysis it is seen that at the distance of 0 centimeters separation, there was power transfer the most efficient of the test lighting brightness seen by.

3. Due to small ranges or closest field from prototype, WPT is 5 cm away Which shifted significantly began to drop.

4. It can also be concluded that WPT can be used in other applications. We are in the project was able to charge a 9V battery from the power that was transmitted wirelessly.

5. Finally, we can conclude that WPT is not affected by non-magnetic materials shielding the two coils. Because of this it can effectively be used in medical field charge pacemakers and other devices.

6.2 Limitations of the Work

High power loss for the long distance of major damage to wireless power transfer. Even if the distance is too small, we can transfer power efficiently from one point to the other if the distance increases rapidly.

Some disadvantages:

1. Power Wireless transmission has some effect on human radiation, because its radiation.
2. Network traffic may cause problems in charging
3. Charging depends on network coverage
4. Rate of charging may be of minute range
5. Actual possibilities are not yet applicable as there is no progress in this field.
6. Process is of high cost

6.3 Future Scopes of the Work

Possible applications and future jobs

Applications:

1) Smart phones, portable media players, digital cameras and tablets.
2) Public Access Charging Terminal.
3) Computer system
4) Miscellaneous: The Wireless Charger finds its way into something with a battery inside of it. It includes games and TV remote, cordless power equipment, cordless vacuum cleaners, soap dispensers, hearing aids and even cardiac pacemakers. Wireless chargers are capable of charging super capacitors (super caps) or a device that is optionally powered by a low-voltage power cable.

Work in the future:

To transmit power to a greater distance, a high power radio frequency amplifier needs to be connected with an oscillator. But heavy RF power amplifiers require a lot of time and patience to build.

High power vacuum tube transistor amplifier system with high current will be more efficient.

A crystal oscillator circuit can be a good option for circuit transmitter because it can present a very high frequency AC.

More efforts on this same project can generate some real solutions that can solve the problem of this project. Knowledge of this project will help those who want to design wireless charging system.