VISVESVARAYA TECHNOLOGICAL UNIVERSITY

BELAGAVI -590018,KARNATAKA

Mini-Project Report

On

"WIRELESS POWER TRANSMISSION FOR MOBILE CHARGING"

Submitted in partial fulfilment of the requirement for the award of Mini project

BACHELOR OF ENGINEERING
IN
ELECTRONICS AND COMMUNICATION ENGINEERING

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Department of Electronics and Communication Engineering

CERTIFICATE

This is to certify that the Mini project work entitled "**WIRELESS POWER TRANSMISSION FOR MOBILE CHARGING**"Carried out by **SHREYAS S R (1SJ20EC136),SUDARSHAN G(1SJ20EC147),UJWALA H(1SJ20EC165)** ,are bonafide students of SJC Institute of Technology in partial fulfilment for the award of the degree of **Bachelor of Engineering** in **Electronics and Communication Engineering** of the **Visvesvaraya Technological University**, Belagavi during the year 2022-23. It is certified that all corrections or suggestions indicated for internal assessment have been incorporated and deposited to department library. The mini project report has been approved as satisfied academic requirements in respect of project work prescribed for Bachelor of Engineering .

Signature of Guide	**Signature of Coordinator**	**Signature of HOD**
Dr. S Bhargavi	Dr. C Rangaswamy	Dr. B N Shobha
Professor	Associate Professor	Professor & Head
Dept. of ECE,SJCIT	Dept. of ECE,SJCIT	Dept of ECE,SJCIT

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By seeking the divine blessings, we submit our humble pranamas to holiness of **Sri Sri Sri Dr. Nirmalandanatha Mahaswamiji.**

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ABSTRACT

The proposed system presents the conception and construction of a wireless mobile charger using inductive coupling. This system demonstrates the concept of wireless mobile charging system . The system allows user to wirelessly charge his/hermobile phone without plugging in the mobile adapter. The system is demonstrated using a charging pad where user just needs to place the adapter circuit to charge the mobile phone. For this purpose the advanced power transfer concept is used. The project consists of two circuits: A transmitter circuit and a receiver circuit. The transmitter circuit consists of DC source, oscillator circuit and a transmitter coil, and its function is to produce and transmit AC power. The receiver circuit consists of receiver coil, rectifier circuit and regulator. When the receiver coil is placed at a distance near the inductor Ac power is induced in the coil. This is rectified by the rectifier circuit and is regulated to DC 5V.

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CHAPTER 01

1.1 INTRODUCTION

As time goes by, emerging technologies are making humanity's life simpler As an example, there are of mobile phones, whose introduction has rapidly and greatly changed humans' lives. But although there is much advancement in the technology, there is still reliance on the wired battery chargers, in spite the fact that it presents some risks, such as power fluctuations.It was by thinking in the above-mentioned problem that the present project was chosen, a wireless mobile charger. This project falls in the categories of case study and solutions to real time social and economic problems.[1]

Wireless charging is the transmission of energy from a power source to a consuming device without wires or cables. This means that all wireless charging technologies are comprised of both a transmitter (or charging station) that transmits that energy and a receiver (integrated inside a device) that receives the energy to charges the battery of the device. In simpler terms, wireless charging is the transfer of power from a power outlet to your device, without the need for a connecting cable.[2]

It involves a power transmitting pad and a receiver, sometimes in the form of a case attached to a mobile device or built into the phone itself. It is cable- free, it is not quite, because the pad will have a cable going from the outlet into it as shown in fig 1.1.Wireless mobile charging circuit mainly works on the principle of mutual inductance. Power is transferred from transmitter to receiver wirelessly based on the principle of "Inductive coupling".

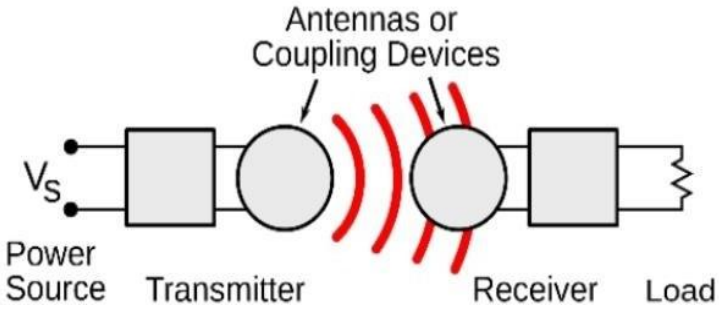

Fig 1.1:Wireless Charging Simplified Diagram[17]

1.2 OBJECTIVES

The objectives of this project are:

1. Implement a wireless mobile charger.
2. Delimitate the advantages, disadvantages and applications for the project.
3. Present possible solutions, if any, to solve or mitigate the impact of the disadvantages.
4. Replace cables and standardize on one interface, potentially being able to charge 1000mAh battery.

1.3 PROBLEM STATEMENT

One of the major problems in power system is the losses occurring during the transmission of electrical power. The loss of percentage during the transmission is approximated as 26%. The main cause for power loss during transmission is the resistance of wires used in the grid. Plugging phones into power cable regularly increases the risk of damaging phone ports, which can lead to costly repairs. No Risk of Overheating: Once a Qi-compatible phone is fully charged, it turns off the wireless charger, saving energy and preventing the battery from overheating.[3]

1.4 METHODOLOGY

In this project wireless charging technology enables wireless power transfer from a power source such as charger to a load such as a mobile device conveniently across an air gap by eliminating the bunch of wire. Wireless power transmission involves the exchange of power without the need for physical connections. The transmitter coil is connected to the power source. When the power source is on electric current will flow through the circuit. When the receiver coil is moved closer to the transmitter coil the electric current is induced by the receiver coil. A changing magnetic field generates electromotive force.[4]

1.5 LITERATURE SURVEY

Paper 1

Authors : Ignatius, Joe Louis Paul & Sooraj, Sasirekha & D, D Revanth
Research focus : A working model for mobile charging using wireless power transmission

Published on : 22 September 2022

Description : This paper [1] analyzes on wireless charging is the transmission of energy from a power source to a consumingdevice without wires or cables. This means that all wireless charging technologies are comprised of both a transmitter (or charging station) that transmits that energy and a receiver(integrated inside a device) that receives the energy to charges the battery of the device. In simpler terms, wireless charging is the transfer of power from a power outlet to your device,without the need for a connecting cable.

Paper 2

Authors : S.Y. Hui

Research focus : Planar Wireless Charging Technology for Portable Electronic Products andQi

Published on : 11 March 2021

Description : This paper [2] analyzes on Fulton Innovation revealed its bidirectional charging technology called e-Coupling. The technology would essentially allow someone to charge their mobile phone by simply putting it on the back of a tablet, or another device that has enabled Qi. FultonInnovation has modified Qi WPT technique that permits for the charging of mobile devices without plugging the mobile devices in, by simply placing them on a power station connected to an outlet

Paper 3

Authors : Eyuphan Bulut and Boleslaw K. Szymanski

Research focus : Mobile Energy Sharing through Power Buddies

Published on : 6 June 2021

Description : This paper[3] explains the working of chargebite which is so much different from the other entire wireless charger available in the market. Basically, chargebite is a device with which we have to connect another two iPhones and these two iPhones charge the third iPhone which is connected. It drains batteryfrom two iPhones and delivers the power to the third one.Chargebite is completely portable and can be attached to a keychain

CHAPTER 02

BLOCK DIAGRAM AND ITS DESCRIPTION

2.1 BLOCK DIAGRAM & ITS DESCRIPTION

In the Fig 2.1 the transmitter circuit and receiver circuit are placed one above the other.Here the transmitter coil is induced by the receiver coil. Hence the transmitter coil has already created a magnetic field in that available space. A changing magnetic field generates electromotive force. This makes an alternating electric current in the receiver coil which is converted to DC with a rectifier and then that DC voltage used to charge the mobile.[8]

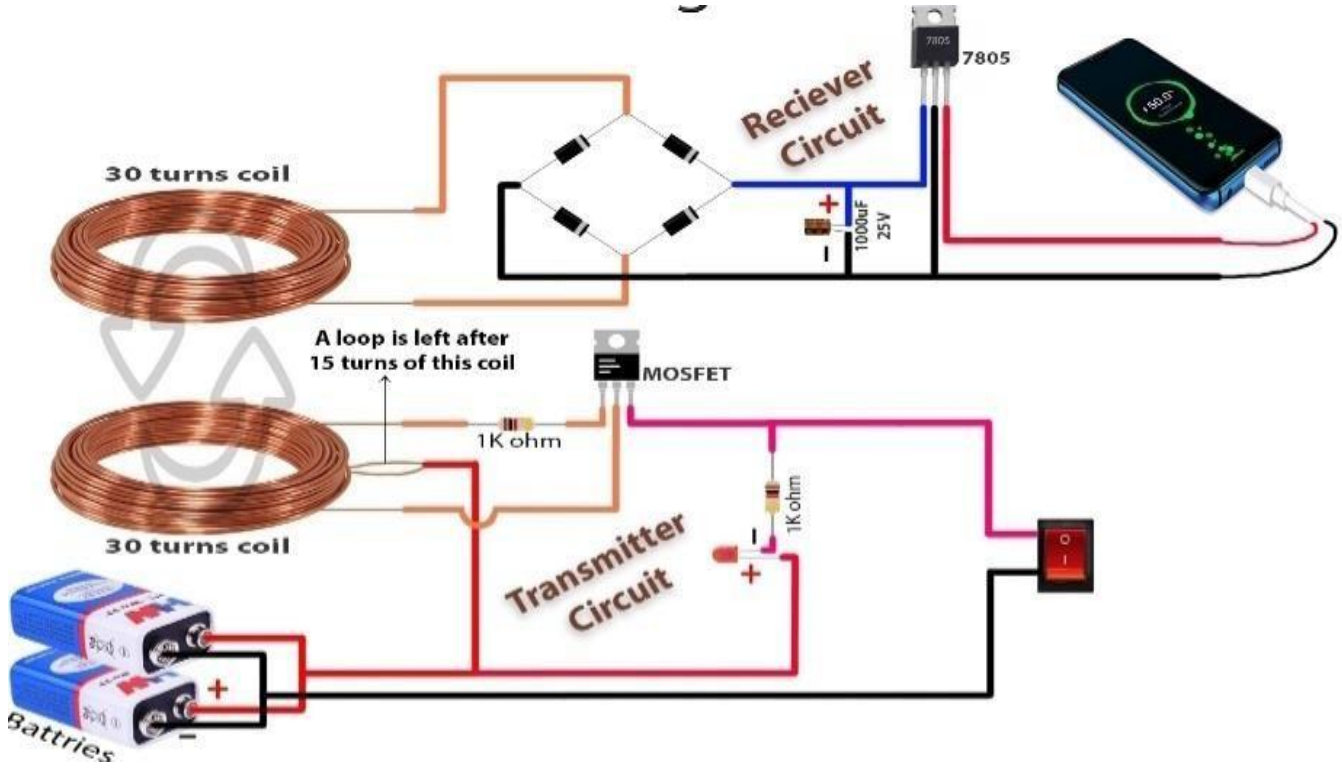

Fig 2.1:Block diagram of proposed system [1]

CHAPTER 03

HARDWARE REQUIREMENTS AND IT'S DESCRIPTION

1. Wireless Power Charging Coils

Single-tube copper coil (STCC) in near-field wireless power transfer (WPT) is presented in this study to operate low-power devices (LPDs) without depending on a connection to a power source or battery. The transfer distance was increased to 40 cm that facilitates the employment of the STCC system in a good area.

Fig 3.1:Copper coil for power transmission [17]

Copper is the most common of the electrically conductive wires and is most often used for solenoid coils. It has a low electrical resistance and allows current to flow easily. An inductor mainly used in power supply circuits is called a choke coil. It is used to adjust AC current to unidirectional current and to remove noise.[9]

The copper coil is produced under the material grade of C1220T and has a finishing of phosphorus deoxidized. Copper coil is deoxidized with phosphorus and so that the porosity can be cleared out and the copper oxide level can be decreased.[10]

2. Light Emitting Diode(LED)

A Light Emitting Diode (LED) is a semiconductor device, which can emit light when an electric current passes through it. To do this, holes from p-type semiconductors recombine with electrons from n-type semiconductors to produce light.

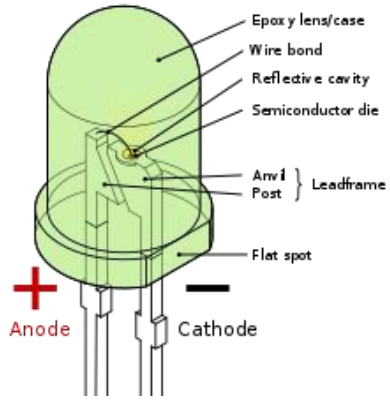

Fig 3.2: Light Emitting Diode [18]

The preferred semiconductors that are used in making the LED are Gallium Arsenide, Gallium phosphide or the combination of the two Gallium arsenide phosphide. The different materials of the semiconductors and doped with different impurities results in differentcolours from LED.[11]

3.
Resistor

A resistor is a passive two-terminal electrical component that implements electrical l resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses.

Fig 3.3: Resistor [19].

Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in electronic equipment. Practical resistors as discrete components can be composed of various compounds and forms. Resistors are also implemented within integrated circuits. The electrical function of a resistor is specified by its resistance.[12]

4. IRFZ44N MOSFET

IRFZ44N belongs to the family of N-channel Power MOSFETs, covered in plasteic body and uses “Trench” technology.

Fig 3.4: N-channel MOSFET [20]

Similar to other transistors, it has three terminals named as Gate, Drain and Source. They are denoted by the alphabets G, D and S respectively. Its features include very low on state resistance, high speed processing technology, completely avalanche rated etc. Push pull systems and full bridge are few of its real life applications.Capacitor[13]

5. 9V Battery

An electric battery is a device consisting of one or more electrochemical cells with external connections provided to power electrical devices such as flashlights, and electric cars.

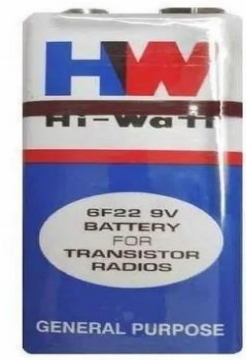

Fig 3.5: 9V Battery [20]

When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode. The terminal marked negative is the source of electrons that will flow through an external electric circuit to the positive terminal. When a battery is connected to an external electric load.[14]

6. Switch

A switch, in the context of networking is a high- speed device that receives incoming data packets and redirects them to their destination on a local area network (LAN).

Fig 3.6: Switch [21]

A LAN switch operates at the data link layer (Layer 2) or the network layer of the OSI Model and, as such it can support all types of packet protocols.

7. Diode

A diode is an electronic device which allows the current to flow in one direction only and blocks in other direction.

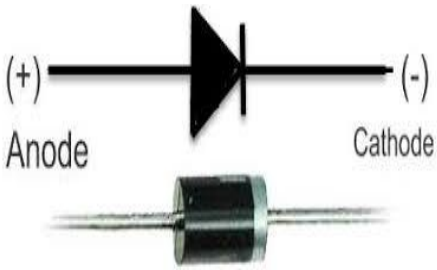

Fig 3.7: Diode [22]

It is a semiconductor device that comes with two terminals called anode and cathode. An anode is positive while the cathode is negative.

8.USB Cable

USB cables have a data wire and a charging wire within the cable itself.

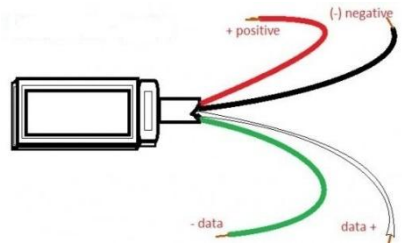

Fig 3.8: USB Cable[-23]

The resistance of a 3-5 ft cable is almost negligible assuming the cable isn't defective.So,charging cable length does not matter. But the wrong cable can slow down charging speeds.

9.1000UF Capacitor25 V

1000uF 25V Electrolytic Capacitor is a high quality electrolytic capacitor which offers long life and high reliability.

Fig 3.9:1000UF Capacitor25 V [24]

Electrolytic Capacitors are most commonly used type of capacitors in Electronic Circuits. Electrolytic Capacitors have 2 Polaris - Positive and Negative.

10. 5V Regulator

A voltage regulator is a component that gives you a stable output voltage, no matter if the input voltage changes. It's an integrated circuit (IC), usually with three or more pins. A typical example of when you need a voltage regulator is if all you have is a 9V battery, but your device needs 5V.

Fig 3.10: 5V Regulator [25]

This is the basic L7805 voltage regulator, a three-terminal positive regulator with a 5V fixed output voltage. This fixed regulator provides a local regulation, internal current limiting, thermal shut-down control, and safe area protection for your project.

A voltage regulator is a circuit that creates and maintains a fixed output voltage, irrespective of changes to the input voltage or load conditions.[15]

CHAPTER 04

RESULTS AND DISSCUSION

The Transmitter circuit of the Wireless Power Transmission System is shown in fig 4.1

Transmitter circuit

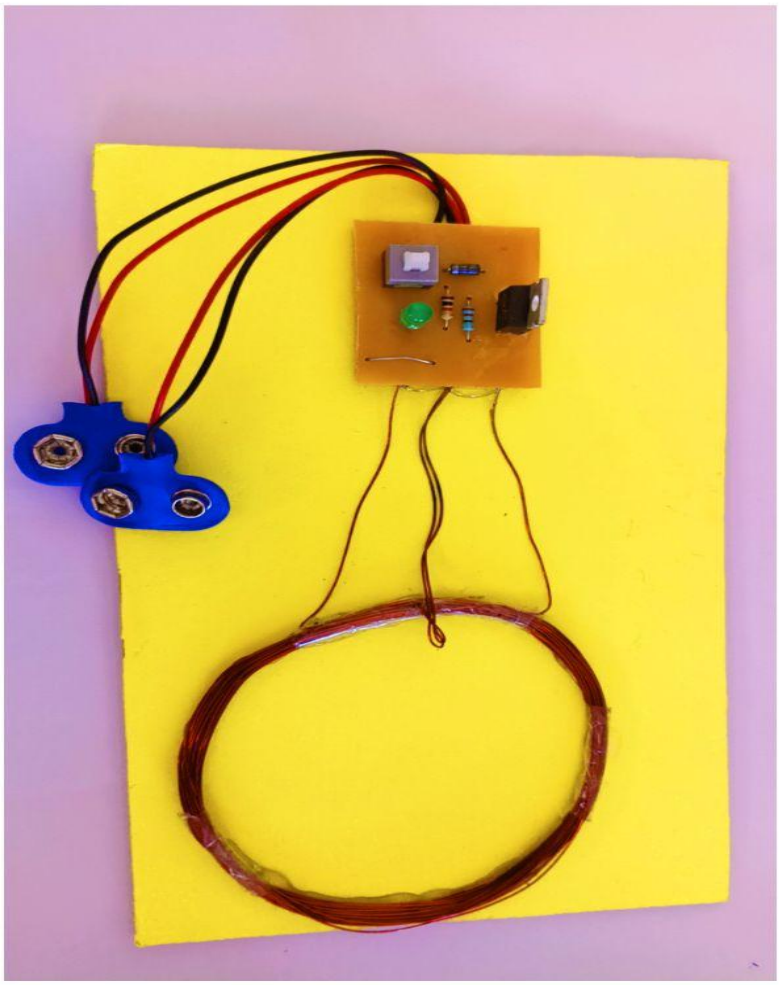

Fig 4.1 Transmitter circuit of the System

Receiver circuit

The Receiver circuit of the Wireless Power Transmission System is shown in fig 4.2

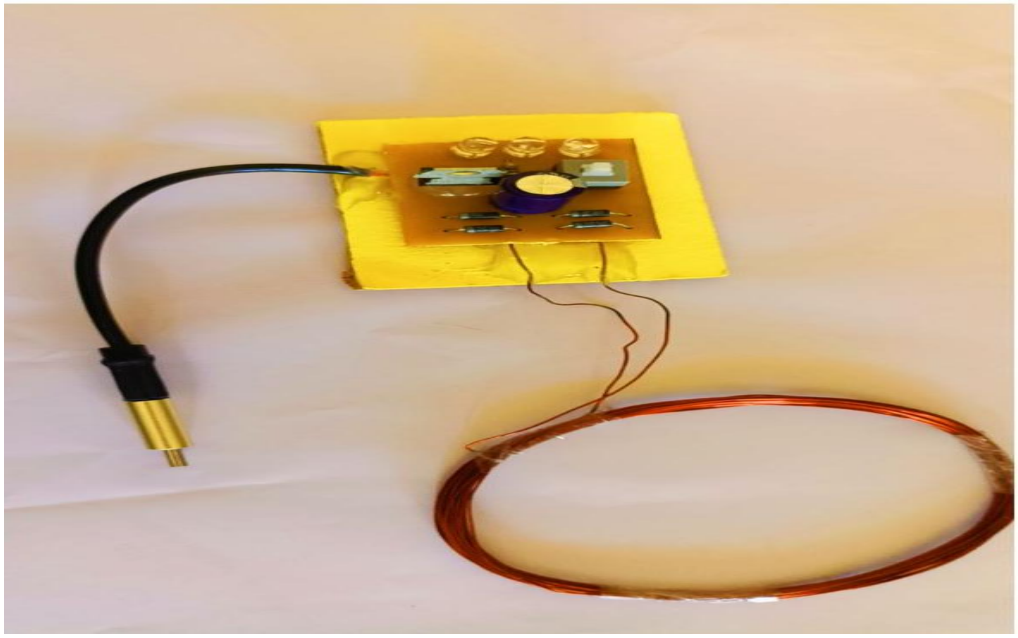

Fig 4.2 Receiver circuit of the System

Connections

The Connections wireless charger consists of two coils transmitter coil and receiver coil, rectifier circuit and shown in fig 4.3 Distance between the transmitter and receiver coil is 6cm. By using inductive charging it can charge the 1000mAh battery phone in just 30 min.

Fig 4.3 Hardware components are connected as per the Block diagram

4.4 PLAN OF ACTION AND EXECUTION

The Table 4.4 provides the timeline of the status of the progress made in the project.

Table 4.4 Plan of Execution

Sl.No.	Duration From	Duration To	Plan of Action	Execution
01	8/03/2023	14/03/2023	Domain and topic discussion	Completed
02	15/03/2023	23/03/2023	Preparation of Synopsis	Completed
03	30/03/2023	5/04/2023	Finalization of synopsis	Completed
04	6/04/2023	17/04/2023	Discussion about components	Completed
05	18/04/2023	1/05/2023	Purchase of components and designing of circuit	Completed
06	2/05/2023	9/05/2023	Preparation of ppt for 1st review	Completed
07	10/05/2023	14/05/2023	Finalized the 1st review ppt and preparation for IEEE presentation	Completed
08	15/05/2023	22/05/2023	Discussion about 1st review presentation and Finalized IEEE paper	Completed
09	23/05/2023	29/05/2023	Shown the ppt to the guide for national conference	Completed
10	30/05/2023	13/06/2023	Completed the hardware model and received the participation certificate	Completed
11	14/06/2023	21/06/2023	Executed the built model and verified the result	Completed
12	22/06/2023	23/06/2023	Show Mini project model and Draft copy project report to Guide	Completed

CHAPTER 05

Advantages and Applications

5.1 Advantages

1. The plastic, packaging and electronic waste associated with charges is greatly reduced. Since wireless is economic.
2. The way the technology works is simple.
3. It is of easy implementation and operation.
4. It requires low budget for it's implementation.
5. It is of safer use than wired charges.
6. The need for separate chargers for mobile phones is eliminated and makes charging universal.
7. Lower risk of ELECTRICAL SHOCK or shorting.

5.2 Applications

1. It is used in charging handheld device like phone.
2. Used In wirelessly charging or continuous wireless power transfer in implantable medical devices like artificial cardiac pacemakers.
3. Used in solar power satellites and wireless powered drone aircraft.

CHAPTER 06

CONCLUSION AND FUTURE SCOPE

6.1 CONCLUSION

Wireless charging is a much convenient and easier system to use for charging various devices. The wireless mobile charging system is connected using transmitter and receiver coils. The distance between the coils were varied to study the change in output voltage and hence the efficiency.The efficiency is observed

(i) decreases with increase in the distance between the coils

(ii) increases with the increase in no of turns.

Thus the predicted theoretical condition matches with the experimental results.

Even though wireless charging is still pretty much in its early stages, the technology is anticipated to evolve dramatically over the next few years.

6.2 FUTURE SCOPE

- Automatic wireless charging of mobile electronics (phones, laptops, game controllers, etc.) in home, car,office, Wi-Fi hotspots … while devices are in use and mobile.
- Direct wireless power and communication interconnections at points of use in harsh environments (drilling, mining, underwater, etc.) … where it is impractical or impossible to run wires.
- Automatic wireless charging for existing electric vehicle classes: golf carts, industrial vehicles.
- Automatic wireless charging for future hybrid and all-electric passenger and commercial vehicles, at home, in parking garages, at fleet depots, and at remote kiosks.
- Direct wireless power interconnections and automatic wireless charging for implantable medical devices (pacemaker, defibrilator, etc.)[16]

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