Review paper on Wireless Power Transmission by using Inductive Coupling for different application

Mayanka Saket

Assistant professor, ECE department, I.E.T. Khandari ,Dr. B.R. Ambedkar University Agra. Agra, India

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Abstract**—***Today we live in a fast changing world. In present modern era power is very important role in our live system. The purpose of this paper practically implement concept of power transmission without wire. Using inductive coupling concept an alternating current in transmitter coil generates a magnetic field which induces a voltage in the receiver coil. This voltage can we used to power a mobile device or charge a battery etc. We have also discussed the emerging technical developments in wireless power transmission. This paper briefly represents the practical results on different applications basically wireless mobile charger, LED Lighting and DC fan.*

Keywords**—**Wireless Power Transmission, Inductive Coupling, Nikola Tesla Experiment.

1. Introduction

There have been great discoveries in wireless transmission after invention of electromagnetic waves by Maxwell. Since then wireless have made the world small and fast.

Wireless power transmission is the transmission of electrical energy from a power source to an electrical load without interconnecting wire. This wireless transmission is useful in where interconnecting wire are inconvenient, hazardous, expensive or impossible. With wireless power the efficiency is more significant parameter. A large part of the energy sent out by the generating plant must be optimally received at the end.

In our present system where we use wire as the transmission media, it is not always efficient. There are power losses mainly due to transmission and distribution. This mainly account for transmission losses from power plant generator to the consumer. The resistance of the wire used in electrical grid distribution account for almost 26-30% of the energy generated. Thus our present system in electrical distribution is only 70-74% efficient [1]. Besides the heavy energy losses more resources, infrastructure , manpower, and expenditure involved makes present technique of wired transmission not an all- time business but find other alternate state of technology to transmit and distribute electricity efficiently and economically.

In the early period different scientist proved different approaches to transfer power without physical connection between source and appliance. Each type of wireless power transfer has its own characteristics and application[2]. There have been series of researches and experiments performed to take this very technology into reality. there are number of technologies that would be possibly used as means to felicitate the electrical power transmission without wires.

This paper briefly survey a variety of wireless power technology and compare them in different features. After introduction, wireless power transfer and inductive coupling reviewed in section II. Basic design and result discussion basis on different application in section III. Finally conclusion are presented in section IV and acknowledgment in section V.

2. Wireless Power Transmission by Inductive Coupling:

Wireless power transmission is capable of transmitting energy from one source to the distance destinations. WPT also known as inductive power transfer, can be used short range or even long range without cards. This technology provides efficient , fast, and low maintenance cast as compared to previous technologies[3]. It also allows portable electronics to themselves without ever being plugged electronics to charge themselves without ever being plugged in ubiquitous power wire. On the other hand, power loss of this technology is very less compared to wired electricity transmission.

The founder of AC electricity, Nikola Tesla, was first to conduct experiment dealing with WPT. In Tesla theory transmit the energy across a large distance and receive it at the destination with negligible losses[4]. There have been series of researches and experiments performed to take this very technology into reality electrical, there are number of technologies that would be possibly used as means to felicitate the electrical power transmission without wires.

Radio wave should really be called electromagnetic or EM wave simply because they consist of the magnetic field and an electric field. A signal from transmitter applied to an antenna generates the fields. The antenna is the transducer and interface to free space. As its turn out, an electromagnetic fields characteristics change depends on the distance from the antenna. This varying field is divided into two segments, which are far field transmission and near field transmission. The near - field techniques are measuring with appliance near from the power source it can be broken into three categories, which are electromagnetic radiation, inductive coupling , and magnetic coupling[5][6][7]. These techniques can be used eliminate problem due to weather and security concerns. The far – field techniques are measuring the electrical load far from the power source. These techniques aim at high power transfer and need line of sight. It can be separated into two categories, which are

microwave power transmission and laser power transmission [8][9].

The resonant inductive coupling is the near field wireless transmission of electrical energy between magnetically coupled coils, which is part of a resonant at the same frequency as the driving frequency.

Inductive coupling uses magnetic field that are natural part of currents movement through wire. Any time electrical current moves through a wire ,it create a circular magnetic field around the wire. Bending the wire into a coil amplifiers the magnetic field the more loop the coil makes, the bigger the field will be.

If we place a second coil of wire in the magnetic field are created, the field can induce a current in the wire. in this require for transformer essentially works. As an example alternating current in a primary coil that is connected to a source can produce a varying magnetic field that induces a voltage across the terminals of a secondary coil at the receiver. Primary and secondary coil are distinct coil in inductive coupling. Each of these connected wirelessly and the reason of its simplicity, convenience, and safety, inductive coupling has been an important and popular technology to transfer power without wire. With this technology application various kinds of electronic devices has been already made[7][10][11]. Therefore, it has successfully commercialized to a number of products, including charging pad for cell phone or laptop, LED light, DC fan, electric toothbrush, and medical implants.

3. BASIC DESIGN AND IMPLEMENTATION OF WPT USING INDUCTIVE COUPLING:

For the completion of this project, we were asked to wirelessly transfer the power of an AC oscillating waveform into a DC voltage on the receiving end which will be used to an LED to demonstrate the instantaneous power transfer. The frequency of oscillation of the AC signal must be not exceed 100MHz. the power transfer needs to be done over a two feet distance or greater. The transferred AC power needs to be converted to DC power and boosted up enough to drive a low power display design, such as an LED in continuous or pulsed mode.

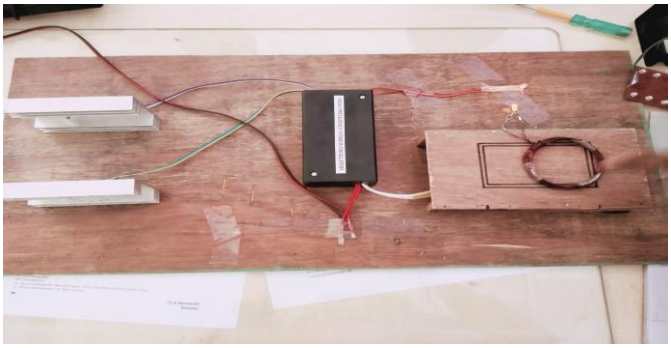

FIG.3.1: Practical Model

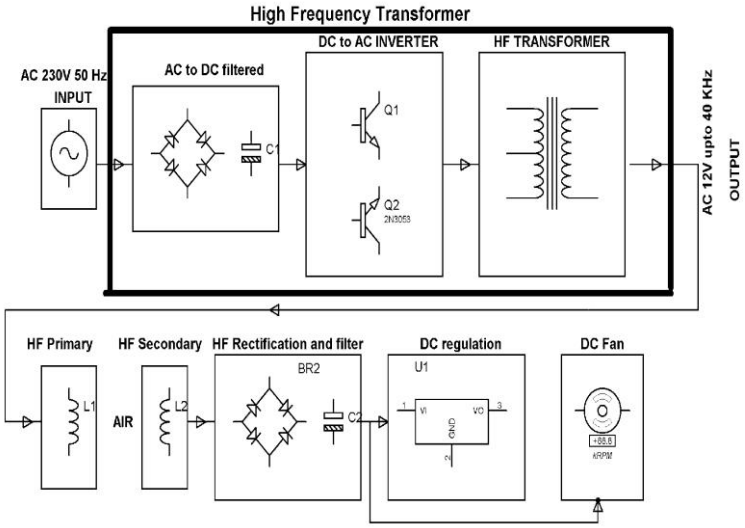

Fig.3.2: Block diagram of WPT system

Circuit Discription

AC Power Source: In the wireless power transmission the 230V AC supply is given. And this AC supply then given to high frequency transformer.

High Frequency Transformer: the 230V AC supply is then gives to the transformer which is high frequency transformer. As because the high frequency transformer transfer electrical power. The physical sise is dependent on the power to be transferred as well as the operating frequency. The higher the frequency the smaller the physical size is frequency are usually 20 and 100kHz. The transformer are often used to convert between high and low voltage to change impedance , and to provide electrical isolation between circuits.

Rectifier Circuit*:* The rectifier is convert the AC signals. In this we used the bridge rectifier because the bridge rectifier work in both positive and negative half cycle. That gives full wave rectification. The rectifier is takes the 12V AC supply from transformer and convert it into 12V DC that requires for the circuit.

Oscillator Circuit*:* In this project the oscillator circuit requiers for generating the frequency up to 1 MHz. As well as it convert the DC supply retern to AC

Transmitting coile*:* the transmitter coil are made up of copper coils, the supply is given from the oscillator is goes in this coils. Because step of down voltage the current is increases and this current is requierd for the produce the magnetic field. Due to the current the flux are produce surrounding the coils and because of this the magnetic flux is produce between the transmitter and receiver coil.

Receiver Coil: the receiver coil are also made up of copper , the receiver receives the electric current from the transmitter. There is AC supply is takes place. Then the

supply is given to the rectifier circuit that converts the AC signals to DC signals.

load: The 12V DC supply is comes from rectifier which having the wattage of 12 watts. The load is used are the LED's , DC fan and mobile charger.

4. RESULT DISCUSSEN BASIC ON DIFFERENT APPLICATION

In this section now we see our project successfully run and show different result in field of electronics devices, lighting system, and dc fan. Other then there are some applications not practically show here but used to WPT in there field ,such as medical devices, battery less passive devices ,contact less activation and detection, military and industrial application etc. are possible to charge or energies wireless transmission.

1. Fields of Electronics

Here we show that our mobile charged without wire connection

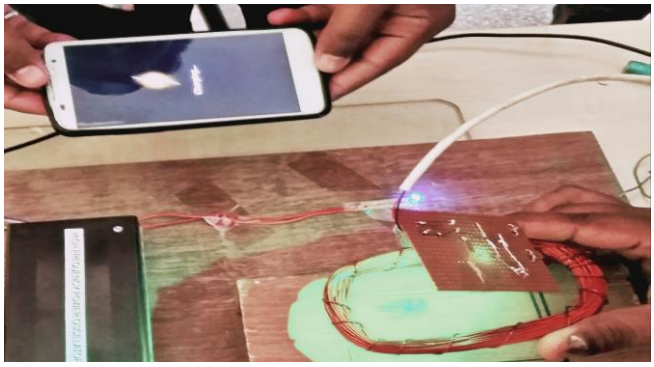

Fig. 3.3 : wireless mobile charger

2. LED Lighting

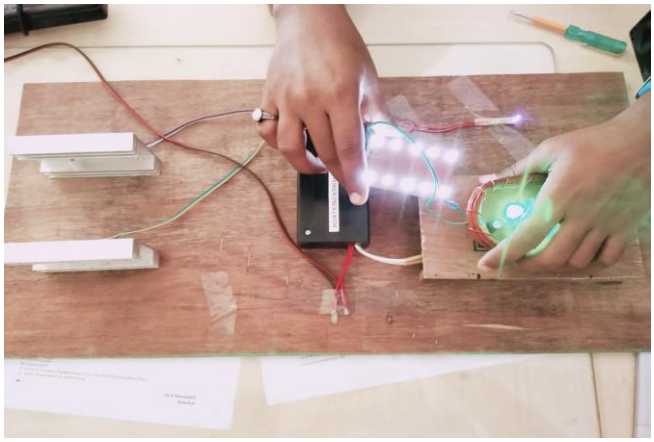

Fig. 3.4: LED Lighting

3. DC Fan

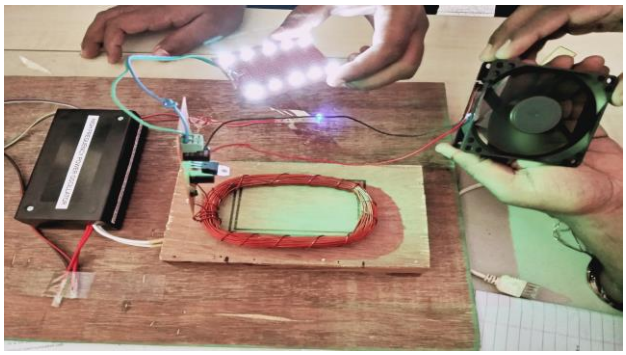

Fig. 3.5 : DC Fan and LED Lights

5. CONCLUSION

In this paper check the performance of wireless power transmission using inductive coupling over different devices has been observed. We practically observe mobile are charged, LED light and DC fan operated without wire connection and result find power transmitted without wired connection. From the result obtain it is concluded that power transmission very easily find over wired connection and this transmission losses are negligible over wired connection losses such as copper loss, corona loss etc. there for the efficiency of this transmission much higher than wired transmission. This mechanism is potentially robust means transmission of power wirelessly. In future the wireless power transmission would be the next big approach.

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