

Elimination of Charging Cables: Wireless Power Transfer

Ritik Kumar, Prashant Bhaskar, Mukesh Pathela
Department of Electronics and communication, DBIT, Dehradun

Abstract—Wireless charging is a phenomenon of transfer of power between two modules without supporting the cables or wires. The principle of wireless charging is based on mutual induction basically the mutual induction is an interaction of one coil magnetic field on another coil as it induces a voltage in adjacent coil. By this paper we are conveying a basic idea of wireless charging system and proposing an idea of transferring the battery between two mobile phones wirelessly. Wireless power charging support affordability and low loss of power transmission.

Keywords—Wireless Power Transfer, Mutual Inductance, Power Transmission, Power consumption.

I. INTRODUCTION

Wireless power transfer is a process of transferring the power between two devices without any physical interaction. Both the devices must contain power transmitter and power receiver.

One of the major issues of power transmission using physical interaction is power dissipation. As we are familiar with ratio of population increasing day by day, the production of power and the power distribution also increasing this is not economically suitable for living hood.

For resolving all these major issues of power transfer using the physical interaction, the wireless charging is proposed earlier also but not being considered in efficient manner yet. If it being considered earlier in appropriate and efficient manner it will be a revolutionary change in field of electronics.

Different techniques of (WPT) have been discovered earlier by different scientists each technique has its own characteristics and applications.

In 1893, Nikola Tesla demonstrated a model of wireless power transmission which consists of vacuum bulbs.

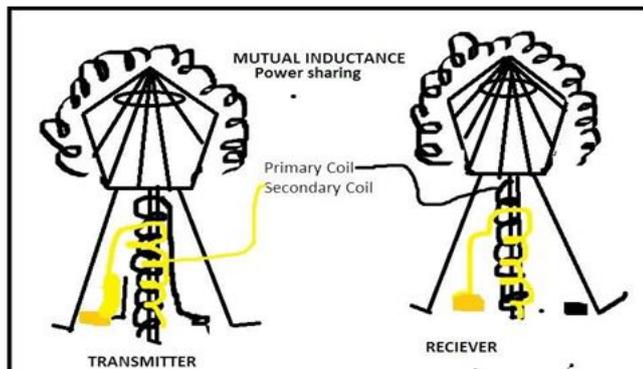


Figure 1

The main sub system of Wireless Power Transmission consists of solar devices, Electromagnetic waves.

Although it is a considerable fact that all the electronic devices nowadays are portable but also consumes energy.

Wireless Power Transfer technique falls into two approaches short distance power transmission and long distance power transmission. For long distance the power transfer between the transmitter and receiver is less efficient and causes more losses in power. But in case of short distance the efficiency can be maintained and there will be minimum losses of power.

So, (WPT) works more efficiently in accordance to the short distance approach.

Short field of (WPT) covers the range up to 40mm distance between transmitter and receiver.

Many mobile manufacturing companies like Samsung, Nexus use this type of methodology of charging the cell phones by transferring the power without using the cables or wires.

II. MORDEN TECHNOLOGIES

The two main standards which support the wireless charging are:-

1) Qi

In Qi system the phone must be kept on the top of the power transmitting pad which transfers the resonant inductive coupling and as a result phone gets charged.

2) PMA (Power Matters Alliance)

PMA stands for Power Matters Alliance which based on inducting coupling technology which provides inductive and resonant power.

3) Inductive coupling

Inductive coupling mainly consist of LC circuit with constant resonant frequency. In Inductive coupling two coils are used named as Primary coils and Secondary coils.

Whenever an AC is applied in primary coil then a magnetic field is produced in primary which induces the voltage across the terminals of secondary coils which works as receiver in wireless power transfer.

It is more convenient because of its simplicity and safety measurements.

4) Microwave Power Transmission

In this technology, the transmitter transfers the high power from the base station to the receiving station or mobile devices. In this technology the electrical energy first converted into microwave and it will receive through rectenna.

In MPT the AC first converted into DC and then into microwave because of direct conversion of AC into Microwave does not possible.

5) Laser Power Transmission

It is similar to Microwave Power transmission. In LPT the solar energy is converted into electrical energy and then converted into laser light which is used in power transmission. In LPT high power are produces which cannot be dispersed.

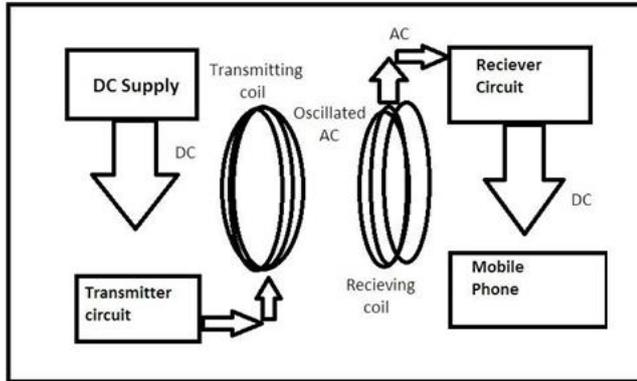


Figure 2: Block diagram of Wireless Power Transfer.

The above block diagram shows that the power being transmitted from the transmitter to the receiving end and received by the receiver by oscillating magnetic field.

To achieve this DC must be changed into AC by particularly designed electronics erected to the transmitter because of this AC the magnetic field is produced.

III. APPLICATIONS

WPT is able to eliminate the charging system which uses cable or wires, instead of using any kind of cable or plugging charger into power cord.

The main advantage of WPT will goes in the consideration of electronic vehicle.

WPT is an approach which includes the potential of renewing energy. Except these main applications, some applications are as follows-

A. Electronic portable devices

Electronic portable devices have their own internal battery but somehow their internal batteries need to charge at once for a finite duration but the use of WPT, the charging of electronic portable devices can be done anywhere at any period of time.

B. Military Application

WPT can help in terms of charging the useful electronic equipment carried by the soldier.

In night vision it is difficult to charge their helmet mounted lights again & again which can be replaced by wireless charging system.

The another main application is that the electronic communication devices needs to be plugged in power cords,

WPT justify itself better and in a fast way of charging those communication devices rather than carrying the cords and wires.

C. Electric vehicle

By keeping an idea about problem of global warming and greenhouse effect. The prevalence of electrical vehicle has been increasing day by day but one of the main drawback of electrical vehicle its battery which need to be plugged in for a couple of hours to get fully charged. WPT eliminate this problem as the battery charges itself wirelessly.

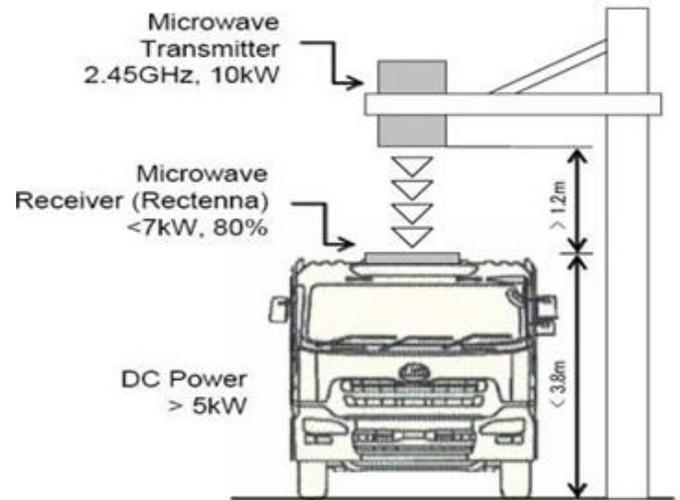


Figure 5

IV. PROPOSED METHOD

The concept of WPT plays a vital role in today's era, many of the devices using WPT methodology. By regarding the concept of WPT we can transfer the battery from one mobile to another mobile.

In emergency case of discharging of a battery we can easily share the battery from one mobile to another mobile wirelessly by using WPT concept.

For achieving this we must put the transmitting and receiving end pad on each mobile phones. At particular distance the charge must be transmitted by the transmitter and a receiver of the other mobile receives that charge which works as a operating power.

V. CONCLUSION

By this paper the concept of wireless charging is presented. Modern technology which reduces the complexity of electronics devices and also by supporting the agenda of electricity conservation.

Among many of the wireless charging technique the above discussed techniques Qi and PMA prove themselves to be most efficient as compare to all the other techniques like A4WP which is best suitable for large charging distances.

In future implementation of such kind of techniques of battery sharing between two mobile phones can come up with drastic change among chargeable electronic devices.

REFERENCES

- [1] Qi wireless power consortium www.wirelesspowerconsortium.com
- [2] Alliance for wireless power www.rezence.com
- [3] Power matter alliance www.powermatters.org
- [4] Nikola Tesla, "The Transmission of Electrical Energy without Wires as a means for Further Peace," Electrical World and Engineering, p. 21, January, 7 1905.
- [5] R.G.Medhurst. High frequency resistance and self-capacitance of single-layer solenoids. Wireless Engineer, 24(281):35-43, Feb.1947.

