

WIRELESS CHARGING TECHNIQUES FOR MOBILE PHONES

*Sandeep Kaur*¹
*Harpreet Kaur*²
*Sunaina Bhasin*³

Abstract:

Charging mobile phones is becoming important task in our daily life. In hectic schedule sometimes we forget to do so. But without cell phones or we can say cell phones with no battery is unacceptable thing these days as we and our work depends a lot on mobile phones.

It is difficult to carry battery chargers or any electronic gadget that can charge our mobile phone battery every time with us. As we know that the world is leading with the developments in technology. Today's world requires the complete technology and for this purpose we are proposing 'Wireless Charging of Mobile Phones'.

Keywords: Wireless charging, Inductive charging, Radio charging, Resonance charging, Microwave charging

1. Assistant Professor P.G Dept. of Computer Science & I.T, Lyallpur Khalsa College , Jalandhar
2. Assistant Professor Dept. of Mathematics, Rayat Bahra University, Mohali
3. Associate Professor, Dept. of Applied Science and Humanities CGC Technical Campus, Jhanjeri

INTRODUCTION

The principle of wireless charging has been around for over a century but only now are we beginning to recognize its true potential. First, we need to be careful about how liberal we use "wireless" as a term; such a word implies that you can just walk around the house or office and be greeted by waves of energy beamed straight to your phone. We're referring, largely, to inductive charging the ability to manipulate an electromagnetic field in order to transfer energy a very short distance between two objects (a transmitter and

receiver). It's limited to distances of just a few millimeters for the moment, but even with this limitation, such a concept will allow us to power up phones, laptops, keyboards, kitchen appliances, and power tools from a large number of places: in our homes, our cars, and even the mall.^[1]

TECHNIQUES OF WIRELESS CHARGING

The following techniques are used for wireless charging of mobile phones:-

- Inductive charging
- Radio wave charging
- Resonance charging
- Microwave charging

Let's discuss these techniques:

INDUCTIVE CHARGING

Inductive charging (also known as "wireless charging") uses an electromagnetic field to transfer energy between two objects. This is usually done with a charging station. Energy is sent through an inductive coupling to an electrical device, which can then use that energy to charge batteries of mobile phones or run the device.

Induction chargers typically use an induction coil to create an alternating electromagnetic field from within a charging base station, and a second induction coil in the portable device takes power from the electromagnetic field and converts it back into electrical current to charge the battery. The two induction coils in proximity combine to form an electrical transformer.^[2]

Functionality

For charging, phones are required to keep near the Charging Plate. It uses inductively coupled Power Transfer System.

A transmitter coil is positioned at the bottom (L1) and the receiver coil (L2) is situated at the top and these coils are embedded into different electrical devices. For example: the

following figure shows primary coil under charging mat is charging the battery of mobile by using electromagnetic field.

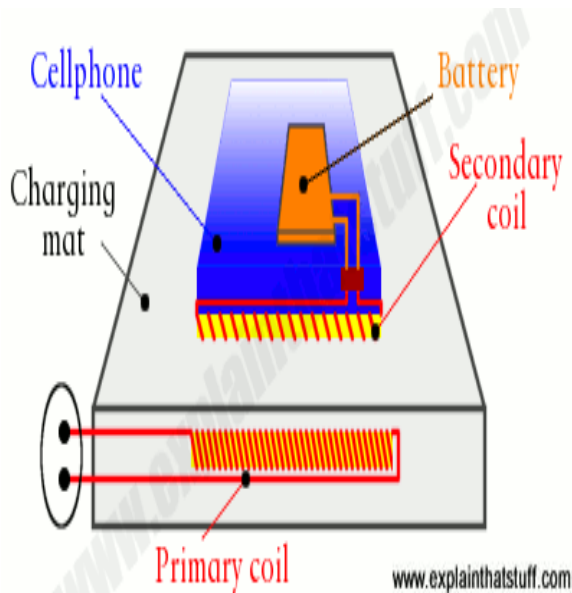


Figure1: Working of inductive charging of mobile phone [4]

RADIO WAVE CHARGING

Radio wave charging is only effective for small devices. The battery of a laptop computer, for example, requires more power than radio waves can deliver. The range also limits the effectiveness of radio charging, which works on the same principle as an AM/FM radio does: The closer the receiver is to the transmitter, the better reception will be. In the case of wireless radio charging, better reception translates to a stronger charge for the item.



Figure 2: Showing the radio wave charging^[5]

RESONANCE CHARGING

Resonance charging is used for items that require large amounts of power, such as an electric car, robot, vacuum cleaner or laptop computer. In resonance charging, a copper coil attached to a power source is the sending unit. Another coil, attached to the device to be charged, is the receiver. Both coils are tuned to the same electromagnetic frequency, which makes it possible for energy to be transferred from one to the other. A new method is developed in order to charge mobile phones, by using microwaves.

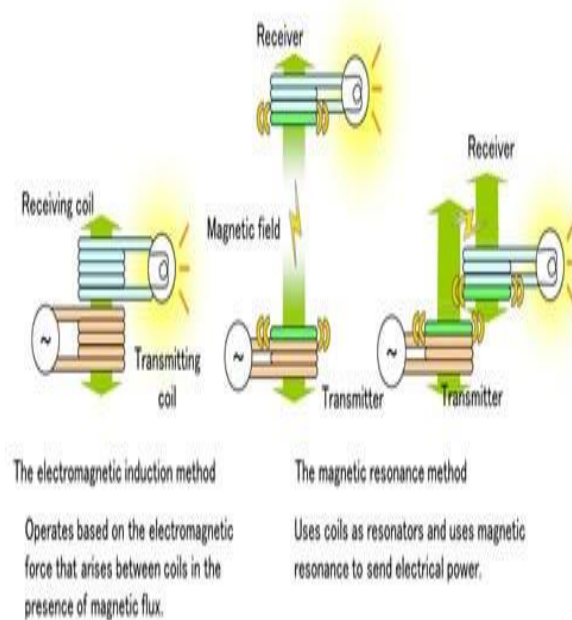


Figure3: shows the difference between inductive charging and resonance charging^[6]

MICROWAVES

Microwaves are radio waves (a form of electromagnetic radiation) with wavelengths ranging from as long as one meter to as short as one millimeter.

Microwave technology is extensively used for point-to-point telecommunications (i.e., non-broadcast uses). Microwaves are especially suitable for this use since they are more easily focused into narrow beams than radio waves, allowing frequency reuse; their comparatively higher frequencies allow broad bandwidth and high data transmission rates, and antenna sizes are smaller than at lower frequencies because antenna size is inversely proportional to transmitted frequency. With mobile phones becoming a basic part of life, the recharging of mobile phone batteries has always been a problem. This technology recharges the mobile phones automatically as you talk in your mobile phone. This is done by use of microwaves. The microwave signal is transmitted from the transmitter along with the message signal using special kind of antennas called slotted wave guide antenna at a frequency is 2.45 GHz.

Functionality:

The basic addition to the mobile phone is going to be the *rectenna*. A rectenna is a rectifying antenna, a special type of antenna that is used to *directly convert microwave energy into DC electricity*.

Its elements are usually arranged in a mesh pattern, giving it a distinct appearance from most antenna. A simple rectenna can be constructed from a Schottky diode placed between antenna dipoles. The diode rectifies the current induced in the antenna by the microwaves. Rectenna are highly efficient at converting microwave energy to electricity. In laboratory environments, efficiencies above 90% have been observed with regularity. Some experimentation has been done with inverse rectenna, converting electricity into microwave energy, but efficiencies are much lower--only in the area of 1%.

It also includes another important part of our receiver circuitry that is a simple sensor. The sensor circuitry is a simple circuit, which detects if the mobile phone receives any message signal. This is required, as the phone has to be charged as long as the user is talking. Thus a simple F to V converter would serve our purpose. In India the operating frequency of the mobile phone operators is generally 900MHz or 1800MHz for the GSM system for mobile communication.

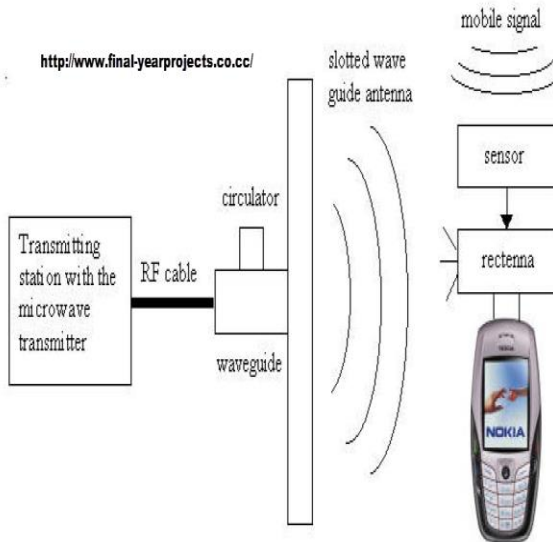


Figure4: shows the working of microwave charging of mobile phones [7]

ADVANTAGES OF WIRELESS CHARGING

These techniques have the following listed advantages:

1. Charging of mobile phone is done wirelessly.
2. We can save time for charging mobiles as these techniques charge the phones while they are in use.
3. Wastage of power is less.
4. Only one microwave transmitter can serve to all the service providers in that area.
5. The need of different types of chargers by different manufacturers is totally eliminated.

DISADVANTAGES OF WIRELESS CHARGING

Along with the advantages, there are some disadvantages too, they are listed as follows:

1. Wireless transmission of the energy causes some effects to human body, because of 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. Practical possibilities are not yet applicable as there is no much advancement in this field.
6. Process is of high cost.

CONCLUSION

In this modern era of Science and Technology, we do not have enough time to be constantly at one place and recharge our Mobile Phones, Laptops etc. Regardless of office, we work even when we are at home, then our Communicating media need sudden recharge without being interrupted. This paper demonstrates wireless charging techniques like inductive, radio, microwave and resonance. Each technique has its own suitability for usage. The advantages and disadvantages are also discussed showing that we need some more development in this area.

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