WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Wireless Power Transmission

Prof.P.H.Kadam, Janhavi Ambalkar, Prashik Mun, Yogita Giri, Neha Chaudante

Project Guide, Department of Electrical Engineering,Jagadambha College Of Engineering & Technology,Yavatmal-445001
Project Members, Department of Electrical Engineering, Jagadambha Collage of Engineering & technology, yavatmal-445001

ABSTRACT

Wireless power transmission is different from the traditional way of transmission, which can meet the needs of the development of science and technology. It can be widely used in electronic devices, implantable medical devices, industry and other fields, and has become a research hotspot at home and abroad. This paper introduces the development history and classification of wireless power transmission and the application field of it. Several methods of wireless power transmission were compared in this paper. This paper focuses on the current research status and the development trend of magnetic coupled resonance based wireless power transfer (MCR-WPT).

1.INTRODUCTION

Wireless power transfer involves the transmission of power from a power source to an electrical load without connectors, across an air gap. The basis of a wireless power system involves essentially two coils – a transmitter and receiver coil. The transmitter coil is energized by alternating current to generate a magnetic field, which in turn induces a current in the receiver coil (Ref 1).Wireless Power Transmission is a method for the transmission of electrical power from a transmitting source to a receiver (electrical load), such as an electrical power grid or a consuming device, without using manmade conductors like co-axial cable, twisted pair cable or copper wires. It is useful to power electrical devices in case where connecting wires are not possible. This is not same like the transmission of signal using electromagnetic is used in radio operating devices likes FM radio, cell phones, routers etc.

In this mode of transmission, power is transmitted in the form of magnetic flux. Electromagnetic waves causes harm to humans as well as other living beings, while magnetic rays do not cause harm to any living organism.

*2.*METHODOLOGY

Conventionally copper wires are used to supply electricity (AC Power) to residential buildings, schools and commercial buildings. Electrical stations produces AC power that is transmitted over a large geographical area using overhead wires which is then routed to electrical meter rooms and then finally distributed to individual homes and offices via transmission lines (copper wires) and step-down transformers. Most of our electrical devices have AC power wires/cords. If wired method is used, the totality of chords (wired connections) will increase which will just make a network of useless wires. This will make a complicated design.

3.LITRATURE URVEY

• In 1826, Andre-Marie Ampere developed ampere's circuital law that shows that the electric current flowing through a conductor will produces a magnetic field [1, 4].

• In 1831, Michael Faraday developed Faraday's law of induction, describing the E.M.F. gets induced in a conductor when it comes in contact with a time varying magnetic field [1, 4].

• In 1862, James Clerk Maxwell done some modifications in these laws along with some other observations, experiments as well as equations of electricity, magnetism and optics into a consistent theory, deriving equations called as Maxwell's equations.

4.WIRELESS POWER TRANSMISSION

Wireless power transfer (WPT) is the transmission of electrical power without wires and is based on technologies using time-varying electric, magnetic, or electromagnetic fields. WPT is useful to power electrical devices where are inconvenient, or not possible, as is the case of body embedded sensors, actuators, and communication devices. Power can be transferred over short distances (near-field transfer) by alternating magnetic fields and inductive coupling between coils, or by alternating electric fields and capacitive coupling between metal electrodes. Inductive coupling is the most common method of WPT and is used in charging devices such as smart phones, electric shavers, visual prostheses, and implantable medical devices.

4.1 INDUCTIVE COUPLING

In inductive coupling or inductive power transfer, IPT), power is transferred between coils of wire by a magnetic field. The transmitter and receiver coils together form a transformer . An alternating current (AC) through the transmitter coil (L1) creates an oscillating magnetic field (B) by Ampere's law. The magnetic field passes through the receiving coil (L2), where it induces an alternating EMF (voltage) by Faraday's law of induction, which creates an alternating current in the receiver. The induced alternating current may either drive the load directly, or be rectified to direct current (DC) by a rectifier in the receiver, which drives the load. A few systems, such as electric toothbrush charging stands, work at 50/60 Hz so AC mains current is applied directly to the transmitter coil, but in most systems an electronic oscillator generates a higher frequency AC current which drives the coil, because transmission efficiency improves with frequency.

Inductive coupling is the oldest and most widely used wireless power technology, and virtually the only one so far which is used in commercial products. It is used in inductive charging stands for cordless appliances used in wet environments such as electric toothbrushes and shavers, to reduce the risk of electric shock.Another application area is "transcutaneous" recharging of biomedical prosthetic devices implanted in the human body, such as cardiac pacemakers and insulin pumps, to avoid having wires passing through the skin. It is also used to charge electric vehicles such as cars and to either charge or power transit vehicles like buses and trains.

4.2MAGNETIC RESONANT COUPLING:

The last and most paramount category of WPT technology under the section of near field techniques is magnetic resonant coupling. This technology was developed by Kurs et al., which enable to make the interactions between two different objects very vigorously because of the coalescence of inductive coupling and resonance . In additament, energy will be shifting back and forth between magnetic field circumventing the coil and electric field around the capacitor. To the classical mechanical resonance the effect of magnetic resonance is analogous, under which a string when tuned to a certain tone it can be exhilarated to vibration by a faraway sound engenderer if there is a match between their resonance frequencies. In this technology, energy can be transferred efficiently from a source coil to a receiver coil with little loss of energy to alternating current in a primary coil (connected to a source) engenders a varying magnetic field that induces a voltage across the terminals of a secondary coil at the receiver. There are several advantages of this technology namely highly efficient, radiation loss will be negligible, provides much more preponderant range and directional as compared to inductive coupling.

4.3 CAPACITIVE COUPLING

Capacitive coupling has only been used practically in a few low power applications, because the very high voltages on the electrodes required to transmit significant power can be hazardous, and can cause unpleasant side effects such as noxious ozone production. In addition, in contrast to magnetic fields, electric fields interact strongly with most materials, including the human body, due to dielectric polarization. Intervening materials between or near the electrodes can absorb the energy, in the case of humans possibly causing excessive electromagnetic field exposure. However capacitive coupling has a few advantages over inductive coupling. The field is largely confined between the capacitor plates, reducing interference, which in inductive coupling requires heavy ferrite "flux confinement" cores. Also, alignment requirements between the transmitter and receiver are less critical. Capacitive coupling has recently been applied to charging battery powered portable device as well as charging or continuous wireless power transfer in biomedical implants, and is being considered as a means of transferring power between substrate layers in integrated circuits.

5.RECENT TECHNOLOGIES

Utilization of resonance has rapidly grown in recent years to enhance the3 efficiency of wireless energy transfer in a wide variety of applications. In additament, the indispensable core components of electronic product are being developed by electronic companies to avail speed the exordium of the technology into niche applications. This will boost our ingenious capacities to bring much more substantial transmutations in technology so that can be implemented in particular tasks. Some of these revolutionary applications have been launched into market, while others are not yare yet for the commercial market. For instance, automotive charging is a novel innovation but not available into market because of needing standardization in its charging infrastructure. On the contrary, a breakthrough innovation for traditional inductive charging in mobile electronic has already developed by a consortium company. To ascertain that multi-vendor products can charge anywhere in a mundane wireless ecosystem, the Standards Development Organizations (SDOs) is working to construct the interoperability standards in mobile contrivances for highly resonant wireless power transfer. All these efforts are paving the way toward incipient trend of wireless power technology, in which can be deployed in many applications.

A. Qi Technology This technology utilizes the minuscule inductors to transmit power over higher frequencies and additionally support a charging distance of a few centimetres at most. As a result, portable contrivances have to be placed quite categorically on the dock for evading the shortage of an astronomically immense magnetic field. Owing to its circumscription on charging area, Qi components can utilize multiple resonator arrays to engender a more astronomically immense charging area. However, it still does not mitigate the quandary and even wasting an abundance of puissance to have

individual coils switched on. In order to keep a vigorous enough connection, users consequently need to align their contrivances precisely with the magnetic fields.

B. Coalition for Wireless Power (A4WP) Technology A4WP is a next-generation of wireless power transfer enabling the efficient transfer of puissance to electronic contrivances. This is predicated on reference power transmitting and receiving resonators without the utilization of interconnecting wires. This technology sanctions multiple contrivances to be charged with differing power requisites from a single transmitter at any one time. Because this technology utilizes a more sizably voluminous electromagnetic field rather than the minute inductor coils, ergo it enables contrivances to be charged without having to line-up precisely with the coil. Albeit A4WP has not relinquished to the market yet the subsistence of this technology enables the electronic contrivances to be charged in any positions including Zaxis. A further advantage of A4WP is sanctioning charger to be embedded in the objects where the magnetic fields can still emit the energy from the objects.

C. PMA Technology This is the organization with the aim of forward cerebrating in an ecumenical, not-for-profit, industry where better power paradigm for battery equipped contrivances utilizing wireless charging technology has been working with a bunch of research group bellwethers. Recently more than 100 members across a diverse set of industries including telecommunication, consumer contrivances, automotive, retail, furniture, surfaces and more are working with this incipient standard of technology. PMA magnification and prosperity is attributed to a unique approach of making wireless charging ubiquitous in the places that consumers need it most as well as the strenuous exertion and dedication for members.

6.CONCLUSION

The concept of wireless power transmission is presented. There recent technological applications that make the human life more benign in the present world have been discussed. Three incipient standard of wireless power technology that is already in competition with each other is adscititiously one of the verbalizes of the topic in near future when other more standards are coming anon. Among these three wirelesses charging standards, which are going to be win in the race that will be defined by their recent great applications. From the comparison table it shows that A4WP standards which has the immensely colossal magnetic field and immensely colossal charging distance must be keep ahead this technology then other standards whereas Qi and PMA withal ameliorating very expeditious. More applications that are in under research with wireless power charging and in the field of robotics will be in our quotidian uses only if wireless power keeps ameliorating.

ACKNOWLEDGEMENT

The authors would relish to thank faculty of Jagadambha collage of engineering and technology yavatmal, for their constant encouragement, inspiration and able guidance.

REFERENCES

[1] Che B 2014 Research on omni-direction wireless power transfer based on rotation magnetic field Harbin Institute of Technology

[2] Kurs A, Karalis A, Moffatt R, et a1 2007 Wireless power transfer via strongly coupled magnetic resonances Science 317(5834): 83-86

[3] Nikola T 1914 APPARATUS FOR TRANSMITTING ELECTRICAL ENERGY US1119732

[4] Zhao Z, Zhang Y and Chen K 2013 New Progress of Mangetically-coupled Resonant Wireless Power Transfer Technology Proceedings of the CSEE 33(03):1-13+21

[5] Zhao Z, Zhang Y and Chen K 2013 New Progress of Mangetically-coupled Resonant Wireless Power Transfer Technology Proceedings of the CSEE 33(03):1-13+21

[6] CHEN L, ZENG R 2017 Study of Wireless Power Transmission System Based on Magnetic Resonance Communications Power Supply Technology 34(04):10-12

[7] Huang X, Tan L, Chen Z, et al 2013 Review and research progress on wireless power transfer technology Transactions of China Electrotechnical Society 28(10):1-11.

[8] Yang H 2016 Principle and application of wireless power transmission Wireless Internet Technology (16):16-18

[9] Fan X, Mo X, Zhang X 2015 Research status and application of wireless power transmission technology ZhongguoDianjiGongchengXuebao/proceedings of the Chinese Society of Electrical Engineering 35(10):2584-2600.

[10] Chen P, Liu X, Liu Z, Liu Z and Yang J 2017 Research on resonant coupled wireless power transmission technology Information Recording Materials 18(03):55-56