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IMPLEMENTATION OF NON-RADIATIVE MULTIMODE WIRELESS POWER TRANSFER VIA PHASE-CONTROL-BASED ENERGY USING BEAMFORMING TECHNIQUES

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Abstract:

Electromagnetic induction non-contact power transmission employs the phenomenon in which application of an electric current to one of adjacent coils induces an electromotive force in the other coil with magnetic flux as the medium. Wireless power transfer (WPT) is a breakthrough technology that provides energy to communication devices without the power units. With the remarkable progress being made recently, this technology has been attracting a lot of attention of scientists and R&D firms around the world. Recently, the usage of mobile appliances such as cell phones, PDAs, laptops, tablets, and other handheld gadgets, equipped with rechargeable batteries has been widely spreading.

Keywords – WPT, gadgets, PDA.

1. INTRODUCTION

Uses the conventional Series-Parallel (SP) & Parallel-Series (PS) combination WPT system where the energy transferred. It can easily be wasted due to leakage flux of non-directional fields. WPT behavior changes according to load variations based on impedance matching network in receivers. Rx is less sensitive according to load variation where the efficiency is affected.

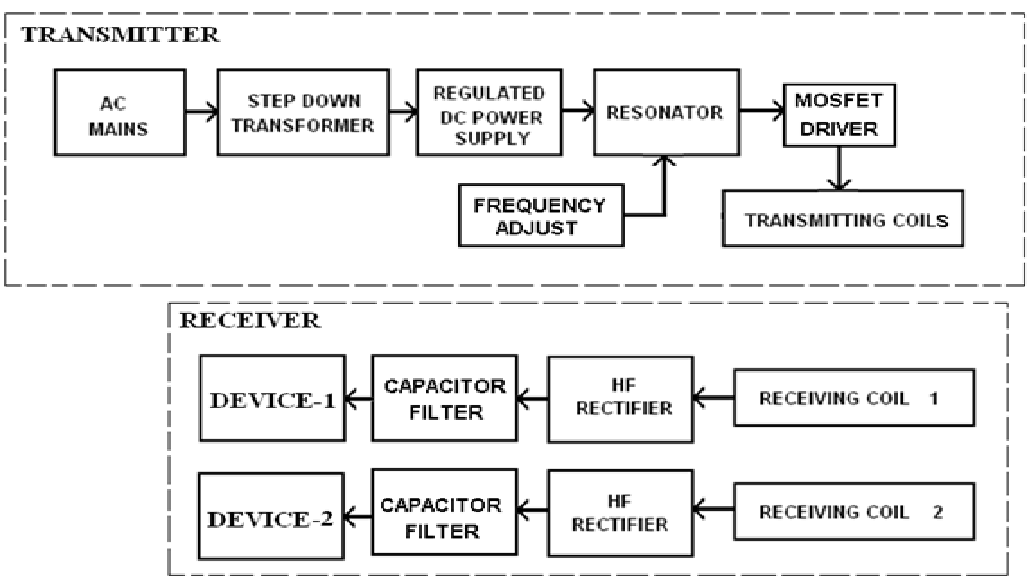

Fig.1.Block diagram of the system

It transmitted from a power source (such as a Tesla coil) to an electrical load, without interconnecting wires. Wireless transmission is employed in cases where interconnecting wires are inconvenient, hazardous, or impossible. Though the physics can be similar (pending on the type of wave used), there is a distinction from electromagnetic transmission for the purpose of transferring information (radio), where the amount of power transmitted is only important when it affects the integrity of the signal.Electricity is today a necessity of modern life. It is difficult to imagine passing a day without electricity. The conventional use of electricity is made possible through the use of wires.

2. LITERATURE REVIEW

Wireless power technology offers the promise of cutting the last cord, allowing users to seamlessly recharge mobile devices as easily as data are transmitted through the air. Initial work on the use of magnetically coupled resonators for this purpose has shown promising results. We present new analysis that yields critical insight into the design of practical systems, including the introduction of key figures of merit that can be used to compare systems with vastly different geometries and operating conditions. The operation of wireless power transfer systems with multiple transmitters (TXs) or receivers (RXs) is investigated. With multiple TXs or RXs in a limited space, couplings occur between TXs or between RXs. The frequency conditions for maximum efficiency and power transfer under such couplings are proposed. Effective resonant frequency of the TXs or the RXs is changed due to such couplings, and driving and/or resonant frequencies should therefore be adjusted accordingly. The amount and type of the required adjustments are provided. The efficiencies in these conditions are discussed. These concepts are supported by experiments with couplings between TXs or between RXs. The idea of transmitting power through the air has been around for over a century, with Nikola Tesla's pioneering ideas and experiments perhaps being the most well-known early attempts to do so. He had a vision of wirelessly distributing power over large distances using the earth's ionosphere. Most approaches to wireless power transfer use an electromagnetic (EM) field of some frequency as the means by which the energy is sent. At the high frequency end of the spectrum are optical techniques that use lasers to send power via a collimated beam of light to a remote detector where the received photons are converted to electrical energy.

3. WIRELESS POWER TRANSMISSION

Wireless power transmission is not a new idea. Nickola Tesla demonstrated transmission of electrical energy without wires in early 19th century. Tesla used electromagnetic induction systems. William C Brown demonstrated a micro wave powered model helicopter in 1964. This receives all the power needed for flight from a micro wave beam. In 1975 Bill Brown transmitted 30kW power over a distance of 1 mile at 84% efficiency without using cables. Researchers developed several technique for moving electricity over long distance without wires. Some exist only as theories or prototypes, but others are already in use. Consider an example, in this electric devices recharging without any plug-in. The device which can be recharged is placed on a charger. Supply is given to the charger and there is no electrical contact between charger and device.Previous schemes for wireless power transmission included attempts by the late scientist Nikola Tesla and the Microwave power transmission. Both Tesla's design and the later microwave power were forms of radiative power transfer. Radiative transfer, used in wireless communication, is not particularly suitable for power transmission due to its low efficiency and radiative loss due to its Omni directional nature. The principle of Evanescent Wave Coupling extends the principle of Electromagnetic induction. Electromagnetic induction works on the principle of a primary coil

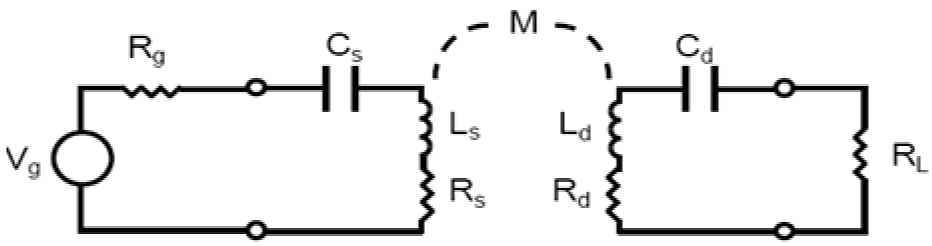

Fig.2. Equivalent circuit for the coupled resonator system

generating a predominantly magnetic field and a secondary coil being within that field so a current is induced within its coils. This causes the relatively short range due to the amount of power required to produce an electromagnetic field. Over greater distances the non-resonant induction method is inefficient and wastes much of the transmitted energy just to increase range. This is where the resonance comes in and helps the efficiency dramatically by "tunneling" the magnetic field to a receiver coil that resonates at the same frequency.

4. HARDWARE SYSTEM

With all the necessary background research completed it became clear what basic design components the entire system would require. First we needed a method to design an oscillator, which would provide the carrier signal with which to transmit the power. Oscillators are not generally designed to deliver power, thus it was necessary to create a power amplifier to amplify the oscillating signal. The power amplifier would then transfer the output power to the transmission coil. Next, a receiver coil would be constructed to receive the transmitted power.

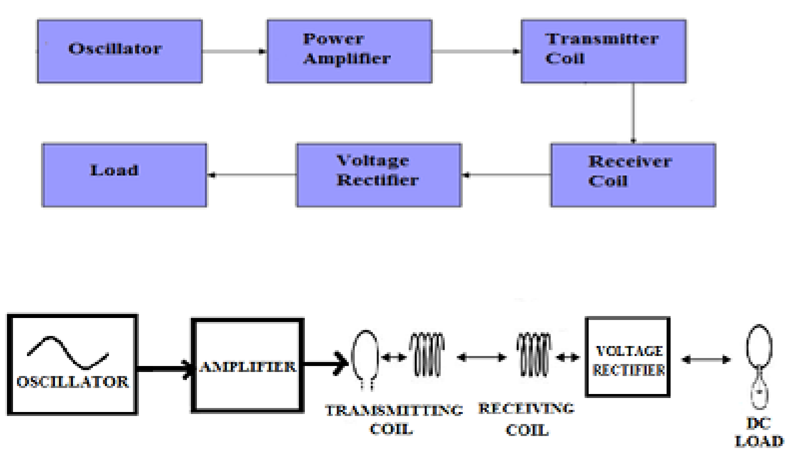

Fig.3.Transmitter and receiver unit

However, the received power would have an alternating current, which is undesirable for powering a DC load. Thus, a rectifier would be needed to rectify the AC voltage to output a clean DC voltage. Finally, an electric load would be added to complete the circuit design. A rectifier would be needed to rectify the AC voltage received from the receiver coil to drive a DC load. A type of circuit that produces an output waveform that generates an output voltage which is purely DC or has some specified DC component is a Full Wave Bridge Rectifier. This type of single phase rectifier uses four individual rectifying diodes connected in a closed loop "bridge" configuration to produce the desired output. The smoothing capacitor connected to the bridge circuit converts the full-wave rippled output of the rectifier into a smooth DC output voltage. In order to generate the maximum amount of flux which would induce the largest voltage on the receiving coil, a large amount of current must be transferred into the transmitting coil. The oscillator was not capable of supplying the necessary current, thus the output signal from the oscillator was passed through a power amplifier to produce the necessary current. The key design aspect of the power amplifier was to generate enough current while producing a clean output signal without large harmonic distortions. For this purpose, we utilized a simple switch-mode amplifier design whose design aspects are described below.

5. ANALYSIS

The transformer is based on two principles: first, that an electric current can produce a magnetic field (electromagnetism), and, second that a changing magnetic field within a coil of wire induces a voltage across the ends of the coil (electromagnetic induction).Changing the current in the primary coil changes the magnetic flux that is developed. The changing magnetic flux induces a voltage in the secondary coil. An ideal transformer is shown in the adjacent figure. Current passing through the primary coil creates a magnetic field. The primary and secondary coils are wrapped around a core of very high magnetic permeability, such as iron, so that most of the magnetic flux passes through both the primary and secondary coils.The simplified description above neglects several practical factors, in particular, the primary current required to establish a magnetic field in the core, and the contribution to the field due to current in the secondary circuit.Models of an ideal transformer typically assume a core of negligible reluctance with two windings of zero resistance. When a voltage is applied to the primary winding , a small current flows, driving flux around the magnetic circuit of the core.

The changing magnetic field induces an electromotive force (EMF) across each winding. Since the ideal windings have no impedance, they have no associated voltage drop, and so the voltages V_P and V_S measured at the terminals of the transformer, are equal to the corresponding EMFs. The primary EMF, acting as it does in opposition to the primary voltage, is sometimes termed the "back EMF". This is in accordance with Lenz's law, which states that induction of EMF always opposes development of any such change in magnetic field.The ideal transformer model assumes that all flux generated by the primary winding links all the turns of every winding, including itself. In practice, some flux traverses paths that take it outside the windings. Such flux is termed *leakage flux*, and results in leakage inductance in series with the mutually coupled transformer windings.

CONCLUSION

When a light-emitting diode is forward biased (switched on), electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence and the color of the light (corresponding to the energy of the photon) is determined by the energy gap of the semiconductor. An LED is often small in area (less than 1 mm^2), and integrated optical components may be used to shape its radiation pattern. LEDs present many advantages over incandescent light sources including lower energy consumption, longer lifetime, improved robustness, smaller size, faster switching, and greater durability and reliability.

REFERENCES

1. Alanson P.Sample and David A.Meyer.(2011),“Analysis,Experimental Results,and Range Adaptation of Magnetically Coupled Resonators for Wireless Power Transfer,”IEEE Trans.Ind.Electron.,Vol.58,No.2,pp.544-554.
2. Dukju Ahn and Songcheol Hong.(2013),“Effect of Coupling between Multiple Transmitters or Multiple Receivers on Wireless Power Transfer,”IEEE Trans. Ind.Electron., Vol.60,No.7,pp.2602-2613.
3. Juseop Lee and Yong-Seok Lim.(2014),“Wireless Power Transfer System Adaptive to change in Coil separation,”IEEE Trans.Antennas and Propagation., Vol.62,No.2,pp.889-897.
4. S.Hasanzadeh, S.Vaez-Zadeh,and A.H.Isfahani(2012),“Optimization of a Contactless Power Transfer System for Electric Vehicles,”IEEE.Trans.Veh. Technol.,Vol.61,No.8,pp.3566-3573.
5. Yongseok Lim and Hoyoung Tang.(2014),“An Adaptive Impedance Matching Network based on a Novel Capacitor Matrix for Wireless Power Transfer,”IEEE.Trans.Power.Electronics.,Vol.29,No.8,pp.4403-4413.
6. Yong-Jin Park,and Do-Hyeon kim,(2015),“Capacitive Impedance Matching Networks for Wireless Power Transfer,”IEEE.Trans.Ind.Electron.,Vol.62, No.5.pp.2807-2813.