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RESEARCH ARTICLE

WIRELESS POWERED MOBILE DEVICE MODULE

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ABSTRACT

This document deals with the concept of a wireless charging and power transmission for the portable devices. The proposed concept is based on the wireless power transmission by means of microwave radiations using the "Rectenna".

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INTRODUCTION

Power transmission through the cable has become a cumbersome task these days due the usage of various ports by different companies. Wireless power can prove to be the ultimate solution for a world free of wires. It can make possible the true terms of portability.

Early milestone Tesla theory

Nikola Tesla is one who invented radio and shown us he is indeed the Father of Wireless‖. Nikola Tesla is the one who first conceived the idea Wireless Power Transmission and demonstrated the transmission of electrical energy without wires" that depends upon electrical conductivity as early as 1891. In 1893, Tesla demonstrated the illumination of vacuum bulbs without using wires for power transmission at the World Columbian Exposition in Chicago. The Wardenclyffe tower was designed and constructed by Tesla mainly for wireless transmission of electrical power rather than telegraphy (Bernard Carlson, 2013).

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This was to be the first broadcasting system in the world. Tesla wanted to transmit electricity from this Tower to the whole globe without wires using the Ionosphere. The source of the transmitted electricity was to be the Niagara Falls power plant (Bernard Carlson, 2013). The most popular concept known is Tesla Theory in which it was firmly believed that Wardenclyffe would permit wireless transmission and reception across large distances with negligible losses (Bernard Carlson, 2013; Tomar and Anuradha, 2014). In spite of this he had made numerous experiments of high quality to validate his claim of possibility of wireless transmission of electricity (Bernard Carlson, 2013; Tomar and Anuradha, 2014). But this was an unfortunate incidence that people of that century was not in a position to recognize his splendid work otherwise today we may transmit electricity wirelessly and will convert our mother earth a wonderful sphere full of electricity (Bernard Carlson, 2013; Tomar and Anuradha, 2014) (Bernard Carlson, 2013) (Bernard Carlson, 2013).

Methods of wireless power transmission

Laser Method

In the case of electromagnetic radiation closer to visible region of spectrum (10s of microns (um) to 10s of nm), power can be

transmitted by converting electricity into a laser beam that is then pointed at a solar cell receiver. This mechanism is generally known as "power beaming" because the power is beamed at a receiver that can convert it to usable electrical energy Units (Bernard Carlson, 2013; Tomar, Anuradha, 2014).

Fig. 1. Wardenclyffe tower

Electric Resonance

Electromagnetic radiation has been used, typically, for information broadcasting. But that is not the only possible application, however. It is possible to transfer power using electromagnetic radiation. In Particular, using microwaves the energy can be directed to a specific point. This scheme has two drawbacks. The first oneis the self-resonant frequency is a coil that depends on its parasite capacitance, this cause that such frequency be high (in the range of GHz). Therefore, to achieve a low self-resonant frequency (< 10Mhz) is necessary to employ thick copper wire and be placed in such a way to achieve a high parasite capacitance reducing the self-resonant frequency to the megahertz range. In fact, it is reported an experiment using cable with radius of 3 cm and the second drawback is efficiency on the power transfer sharply declines as the separation between coils in-crease, then it is necessary to employ big coils in order to achieve longer separation distances. This is the reason why the new experiments have coils radius of about 30 cm.

Transmitter

The most common transmitters for microwaves are the travelling wave tube (TWT), klystron and magnetron.

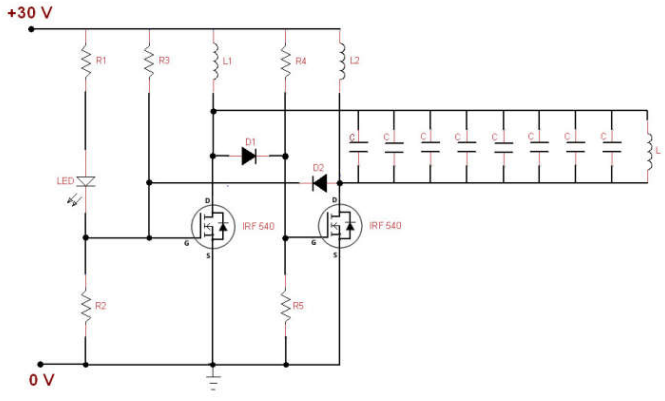


Fig. 2. Transmitter layout

The TWT is far too expensive and power restrictive making it impractical for the task of power transmission. The klystron has been the DC to microwave converter of choice however it is also somewhat expensive. Many researchers are looking to use magnetrons instead because they are cheap and efficient. Magnetron frequency output is not as precisely controllable as the klystron or TWT but power transmission is more lenient to frequency fluctuations than communication systems are. One of the more common proposals would be for an array of magnetrons to be used as the transmitter.

Rectenna

Rectenna (Brown, 1969) is a term that is given to a device layout which results after the combination of a rectifier and a RF antenna. This device is capable of generating DC voltage. The amount of current generated depends on the signal density and the efficiency of the rectifier. We use the schottky diode instead of the regular P n junction diode. Several researchers reported the successful design and implementation of rectenna. J. Hagerty have developed a new approach for construction of efficient rectenna arrays for arbitrarily polarized incident waves with broad spectral content.

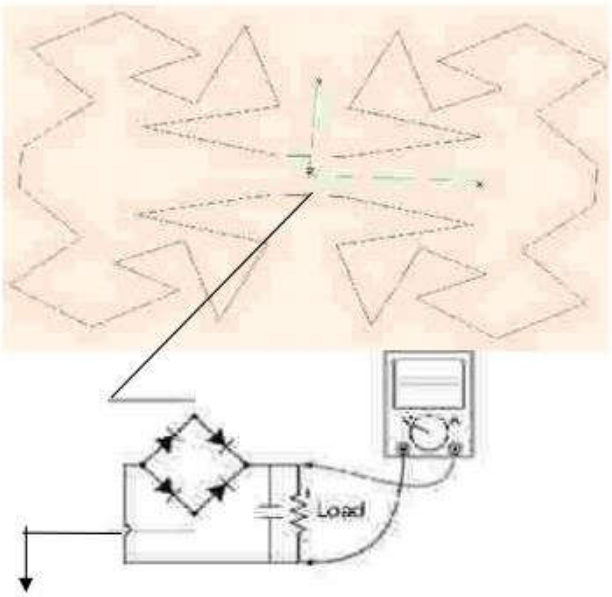


Fig. 3. Rectenna layout

The two operate from 4.5to 8GHz and 8.5to 15GHz and have maximum open circuit voltages of 3.5 and 4.0V, respectively. Their efficiencies increase above 35% and 45%, respectively, for higher incident powers. The grid of rectifiers has excellent reliability and graceful degradation. The limiting factor on the size of the grid rectifier is the current rating on the diodes.

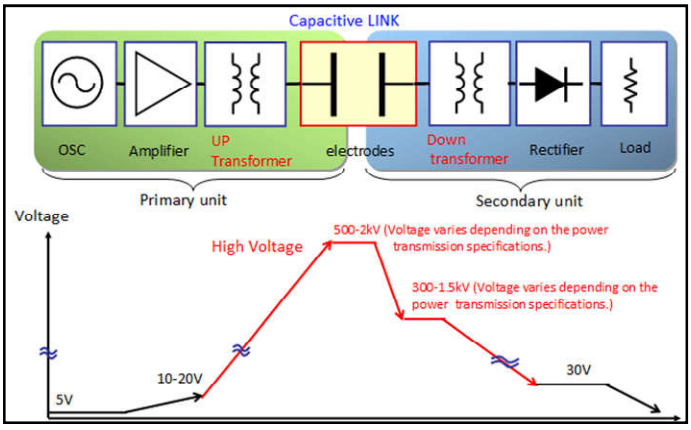
Telemodulo

This is a modular communication unit which will be a very low power and low cost communication module. This will be a GSM module handset with prime objective of portability and affordability. The module will be powered with an efficient rectenna and will not require any internal battery.

Fig. 2.Telekase(https://www.kickstarter.com)module

Similar product is a telekase but has an internal battery. By implementing the wireless power transmission process we can eliminate the constant need of a smartphone to charge the mobile module.

The output voltage transition



Though the distance is one such drawback for wireless charging solutions for mobile devices. By optimising power needs in the device we can very well use the limited power.

Advantages of wireless power transfer

No manual recharging or changing batteries. Eliminate unsightly, unwieldy and costly power cords. Never run out of battery power. Reduce product failure rates by fixing the 'weakest link': flexing wiring and mechanical interconnects. Reduce use of disposable batteries. Use efficient electric 'grid power' directly instead of inefficient battery charging.

Conclusion

Introduction of wireless powered devices will lead to less pollution which is caused because of the hazardous chemicals used in the batteries. The application of mobile devices can be made absolutely wireless. Though there is an impact on the environment we can still minimize the environmental interference by proper regulations. There is also a need to develop some standards for wireless power applications to ensure safety for the living organisms around us.

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