Journal of Engineering and Applied Sciences 13 (1): 231-234, 2018
ISSN: 1816-949X

Wireless Power Transmission Between Efficiency and Health Effects

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Abstract: In this study, an investigation of "Exposure to electromagnetic fields" "EMF" and its effectiveness on health in this study case the range of frequencies, that was included with the extent of the wireless communication including low power to high power, i.e., from "Wi-Fi" to "satellite" communication and microwaves. Also, this study a discussion on the wireless power transmission "WPT" that is based on an oscillation circuit was included. From the scientific studies and survey the power of "EMF" which considered less than "3 GHz frequency" does not affect the human health.

Key words: WPT, wireless oscillators, EMF, EMF power, human health, considered

INTRODUCTION

The daily use of electronic equipments and automated machineries increased compared to last decades, the development in technology sector improve the interaction among equipments and consumers. Bush (2014). There are many challenges, ones them of technology among communication is the remote connection through wireless communication that deals with the electromagnetic filed which has health effects since the frequency-ranges in the wireless communication from "0"-"300" GHz. Studies have shown that, although, extensive research has led to potential health effects of exposure to many parts of the spectrum, all analyzes have shown the same result that longer exposures fall short of the limits recommended by "INRIP", Lu and Wing-Hung (2017) covering full frequency bands "0-300 GHz" this limited range of exposures does not effect on health. But more frequent exposures to "EMF" can be harmful. The international guidelines have led to exposure levels to "EMFs" frequencies such as "ICNIRP" to limit the power levels of any wireless devices to a certain range, so, it is surprising that any wireless devices exceed "ICNIRP" guidelines. These guidelines only take into account thermal effects.

The attitude adopted by the British Health Protection Agency is that there is no credible evidence so, far that "WiFi" and "WLANs"adversely affect the health of the general population but also that it is a senseless approach to protectionism. To keep the situation below the ongoing review.

Literature review: In 2006, exactly 100 years after the Tesla coil invasion, a proposal to send energy through an air called wireless energy was published and the idea was to drop beneficial amounts of energy wirelessly using the known electromagnetic induction phenomenon since, Michael Faraday described it once in the early 19th century (Sun *et al*., 2013).

In 2007, the Soljacic team developed and deployed a descriptive device that can illuminate a 60 W incandescent bulb using a force transmitted between two files separated by just over two meters. Operating mechanism in any power adapters. The flow of AC to a single coil of wire, the basic creates a magnetic oscillating field which in turn stimulates the AC voltage in another secondary file (Shinohara, 2014; CQ Publishing, 2011).

The magnetic lines of the force are routed in the typical transformer, connecting the primary and the secondary through the iron and maintain a tight coupling which maintains the energy loss to a minimum. When the main file is separated from the secondary file by air space, those mount losses and becomes an ineffective transfer. The main part of the power transferring id the resonance which enables efficient energy transfer.

MATERIALS AND METHODS

Exposure difference to cell-phones: Users of wireless devices are much longer exposed to radiation than users using cellular phones and the capability of wireless devices is not less convincing (Carr, 1997). The 3G mobile UMTS mobile power range is "21 dBm 125 mW" for the power category "4-33" dBm 2 W" for the class "1" power. While the wireless router can range from "15 dBm 30 mW" power to "27 dBm 500 mW". The Health Protection Agency (HEPA).

However, if the user spends a year near the Wi-Fi hotspot, he will receive an equal dose of radiation as if he had made a "20 min" call with a mobile phone (HEPA) says that according to smart cell phones "adaptation of

power capability" (DECT) wireless phones can basically bypass the radiation of the "smart mobile phone (HPA) shows that DECT has a typical production capacity of "10 mW", essentially "100 bursts per second" of "250 mW", a similar intelligence-cell phone.

Wireless power transfer: Wireless transmission is a form of electromagnetic filed transmission that transfers electrical energy into unguided media. "WPT" technologies use a time-varying "electric", "magnetic" or "electromagnetic-fields" Abdel-Salam *et al*., 2000 Wireless-transmission is proper to power-up electrical devices where joining wires are "inopportune", "hazardous" or it's not possible. The "WPT" have two categories, the "non-radiative" and "radiative". In "non-radiative" technique "near-field", the "EMF" use "inductive-coupling" between coils to transfer power but power could be transferred by "capacitive-coupling" between "metal-electrodes". "Inductive-coupler" is the most used wireless technology; its serve the application including recharging handheld devices like cell-phones and "electric toothbrushes", "RFID-tags", "medical devices charging". In "far-field" or radiative technique or "power beaming" the power moves in form of beams consist of electromagnetic radiation such as "microwaves" or "laser beams". These techniques can transport-energy with extended distances which causes some updates into the receiver device.

Modeling resonant coupled wireless power transfer system: In the resonant coupling "WPT". The following simulation shows how to build up and analyze it with concentration on concepts like "resonant mode", "coupling influence" and "magnetic field pattern". This analysis is depends on a system consisting of two elements of helical resonance.

System parameters and design frequency: We chose "30MHz" to be the design frequency because that is normal for compacted "WPT" design of the system. Determine a frequency of "broadband analysis" with "points in space" for near-field planning.

Spiral resonator: Vortex resonator is a common engineering in the resonance coupling type of wireless transmission system because of it is compacted size and high-narrow magnetic field. A spiral can be used as an essential part in this study.

Spiral geometry creation: This helical engineering is determined by the internal and external radius and the number of rolls. The expression of engineering by the

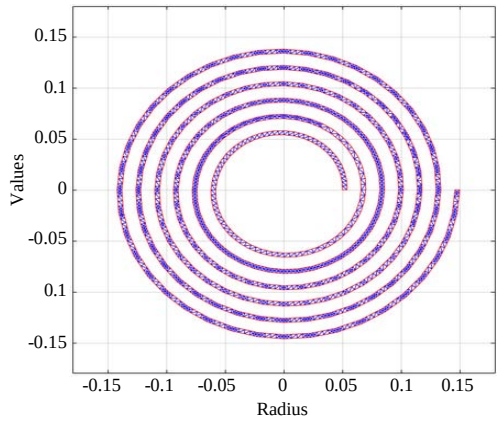

Fig. 1: Internal and external radius

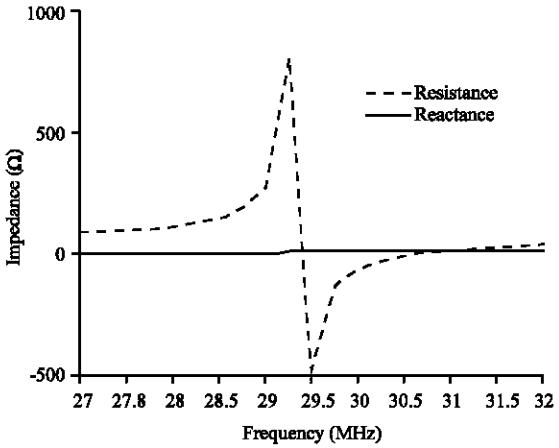

Fig. 2: The calcutated impedance

border points and then the import of border points to the "Peditol". A network created in "pdetool" exported as a file. The network is defined by triangles and points (Fig. 1).

Frequency and mode resonance: There is good way to detect "frequency resonance" by studying the resistance of a "spiral resonator" which is very important to find a "resonance frequency" spiral geometry diagram. Resonance frequency used to study the resistance of the "spiral resonator". Since, the helical is a "magnetic resonator", the "Lorentz" reactors in the form of value and experimental in the result of calculated impedance (Fig. 2). We can also call the spiral resonator by magnetic resonator. The limited magnetic field is strongly experimental when the near field is designed (Fig. 3).

Creation of spiral to spiral power transmission: The complete radio transmission system consists of

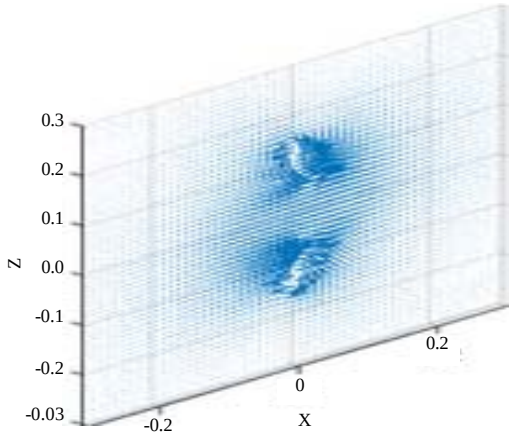

Fig. 3: The magnetic field

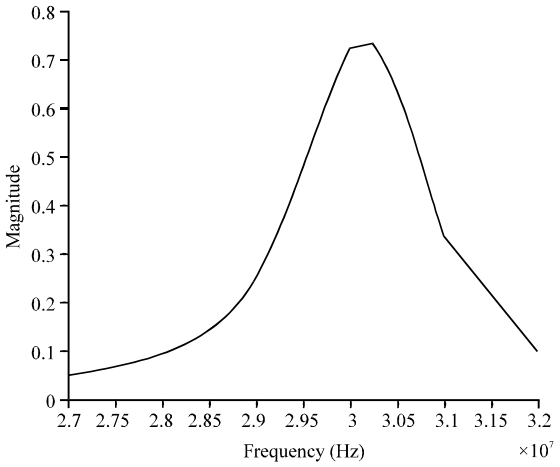

Fig. 5: Parsing results of parameters

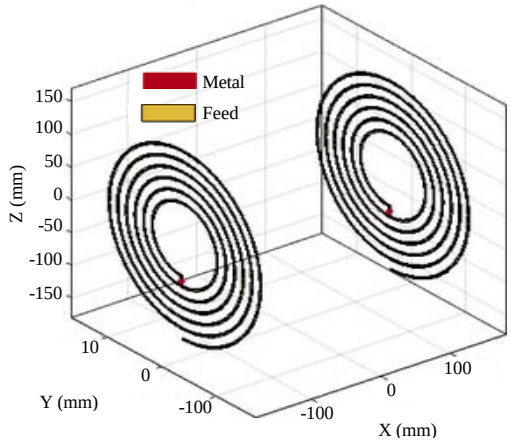

Fig. 4: Linear array of custom antenna mesh antennas

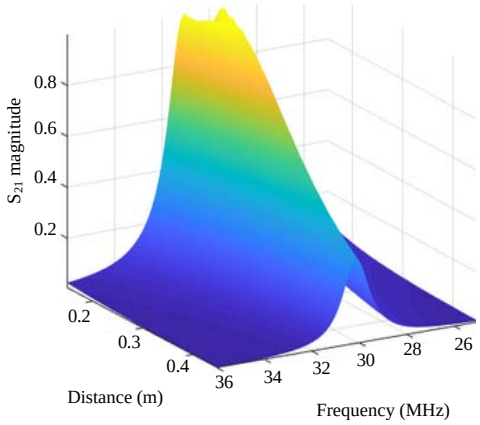

Fig. 6: The critical coupling point

transmitter and receiver parts. Our choice of resonators is identical for both parts to achieve the greatest transfer efficiency. The following figure shows the wireless power transmission system as a linear matrix (Fig. 4).

RESULTS AND DISCUSSION

The difference in system efficiency with the transmission distance: To evaluate S21 the system efficiency parameter should be known. The difference in system efficiency is represented by speed with the operating frequency and the coupling power between the transmitter and receiver resonator. When the two flexors are coupled strongly and the system operates in it resonance frequency we will have peak efficiency. The parsing results of parameter s were then recalculated and stored in the MAT file (Fig. 5).

Critical coupled point: In the case of low distance between two spirals this trend is roughly proportional to $1/d^3$. The efficiency of the system goes up with a shorter transmission distance until it holds the associated critical system. The efficiency of the system is still at its peak when two more helices are coupled, exceeding the critical coupler threshold. Figure 6 during system modeling we discover this serious coupling point and more effect. The border study of the s-parameters system is completed as a function of transmission area. The transmission distance varies by correcting the spacing element. The half-dimension of helical is varied to one and a half times after spiral double radius of the outer spiral. The frequency ranges from 25-36 MHz (Fig. 7).

Coupling mode between two spiral resonator: Through the magnetic field and between the two spiral resonators

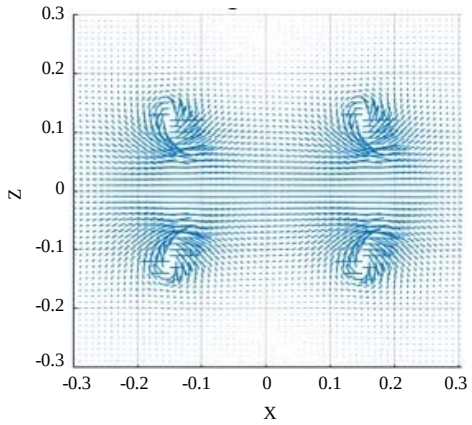

Fig. 7: Strong magnetic fields

the dominant energy exchange mechanism. The strong magnetic fields between two helices represent the resonance frequency.

CONCLUSION

From the results we conclude that the "ICNIRP" frequency range has a limited distance in meters thus the problem is the radiation power and frequency should exceeds the "ICNIRP" range from "0-300 GHz" thus the problem of effecting health occurs.

REFERENCES

Abdel-Salam, M., A. Hussein, E.M. Ahdab and R. Roshdy, 2000. High-Voltage Engineering: Theory and Practice. 2nd Edn., Marcel Dekker, New York, USA., Pages: 715.

Bush, S.F., 2014. Smart Grid: Communication-Enabled Intelligence for the Electric Power Grid. John Wiley and Sons, Hoboken, New Jersey, ISBN:978-1-119-97580-9, Pages: 570.

CQ Publishing, 2011. Wireless Power Transfer Technology and Practice: Transmit Electric Power in a Non-Contact Manner to Improve Convenience and Safety. CQ Publishing, Paris, France, ISBN:9784789848367, Pages: 127.

Carr, J.J., 1997. Secrets of RF Circuit Design. McGraw-Hill Education, New York, USA., ISBN:9780070116726, Pages: 568.

Lu, Y. and K. Wing-Hung, 2017. CMOS Integrated Circuit Design for Wireless Power Transfer. Springer, Berlin, Germany, ISBN:978-981-10-2614-0, Pages: 73.

Shinohara, N., 2014. Wireless Power Transfer via Radiowaves. John Wiley and Sons, Hoboken, New Jersey, USA., ISBN:9781118862964, Pages: 256.

Sun, T., X. Xie and Z. Wang, 2013. Wireless Power Transfer for Medical Microsystems. Springer, Berlin, Germany, ISBN:978-1-4614-7701-3, Pages: 181.