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Wireless Power Transfer Using A Tesla Coil

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Abstract-Electrical power plays a very important role in today's modern age. For many applications from micro to macro devices, power transmission is done through transmission lines such as small sensors, satellites and, oil platforms, etc The voltage, current are drawn as output for the coils nothing but air coiled transformer with high frequency. It mainly tells about the advantages of dc over ac. Tesla coil gives the complete study of a wireless transformation of power. As tesla coil is one type of transformer that can be able to produce hundreds and thousands of voltage range levels. It should be able to transfer power without any wires or transmission lines. Telsa coil is also able to use in the places where usage of wires are seemed to be difficult such as wet areas (snow areas, hill areas). We can use this type of coils in telecommunication applications. It transfers power by selecting the medium for it as space.

Keywords:

Power transmission, tesla coil, high voltage, high frequency, electromagnetic field, end spectrum.

I. INTRODUCTION

The power transmission through the medium air is introduced in the year 1981 by Nicholes tesla is in one century ago. His enormous ideas and his experiments are very useful to take as a reference to early attempts. His main motto is to transform the power for long distances in the earth through the air as a medium. Now tesla's inventions are very useful in many applications except his invention transfer of power over long distances. Many of his inventions in his time are passed out as his talent has not seemed in his ages. Transmission of this wireless power for long distances in an efficient manner is not possible. so that we should use the principles of complicated pointing and tracking mechanisms between transmitters and receivers to maintain proper alignment.

To transmit power from one place to another place mostly we use an electromagnetic field of some frequency to transmit power efficiently. For high-frequency energy transmission purposes .the end spectrum uses optical techniques that are lasers to send power through a collimated beam of light to detect where the protons are present which can be used to transmit the power. he invented for the purpose t transmit high power that is high voltage, high-frequency high current over long distances, but his invention does not applicable for long transmission without wires. That is used for short energy transmission station called the warden cliff tower. It is a small-scale wireless power transmitter system with a prototype transmitter that starts a worldwide wireless system that was to transmit both information and power world widely. But it was not accepted by the investors and they pulled out his work and it is not implemented at that time.

Scientists are hoping to make a breakthrough with not only wireless technology but also portable wireless technology, which is less bulky and more powerful, thanks to the invention of the dc tesla coil. The issue of tapping the high voltage output emitted by the tesla coil is still being researched. the papers show some of the results that have been obtained through continuous testing of the formed coil. To test the coil, a series of tests were conducted, and several

variables were changed to achieve the highest possible performance. Some of them are particularly intriguing, and they open up new avenues for researchers all over the world to investigate the technology and contribute to its advancement. transmission purposes, radios, television, etc. He began his work on a large high-voltage wireless

II. BASIC THINGS ABOUT TESLA COIL

Tesla coil is a high-frequency oscillator that uses a spark gap or a transistor to drive an air-core doubled tunning resonant transformer to generate a high voltage at a very low current. The tesla coil can produce output voltages ranging from 50KV to several million volts, depending on the secondary turns of the transformer. The high voltage is made up of a rapid string of pulses that alternate at radiofrequency. Tesla coil is a high-frequency oscillator that drives in an air-core doubled-tunned resonant transformer to produce high voltage at a very low current. We can use a spark gap or a transistor to produce the oscillations.

III. MAJOR COMPONENTS INVOLVED IN TESLA COIL

The circuit represents every of the tesla coil with a rating of ac line voltage with 200 volts into 5000 volts. this high voltage is used.

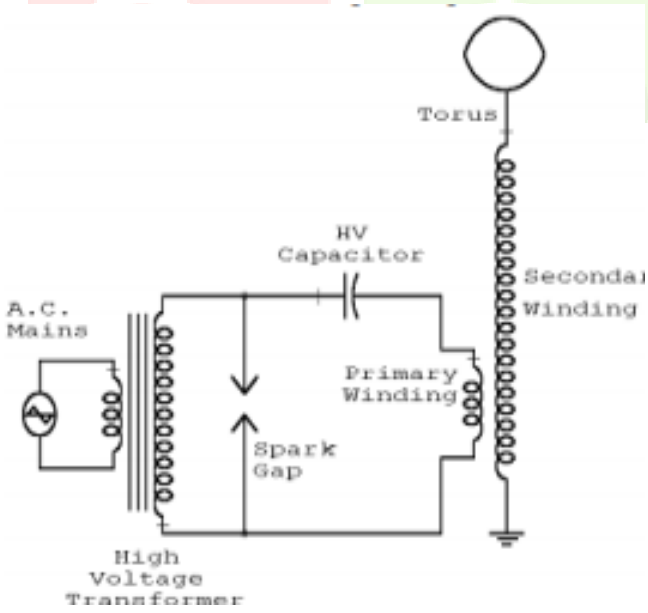

Fig1: curcuit to calculate capacitance

The capacitor is connected in series with the output transformer's primary coil. A spark occurs when the voltage is high enough to sever the spark gap. By shorting the transformer, it will fill the spark gap and complete the circuit between the capacitor and primary coil. The primary coil is used to channel all of the energy Abstract-Electrical power plays a very important role in today's modern age. For many applications from micro to macro devices, power transmission is done through transmission lines such as small sensors, satellites and, oil platforms, etc The voltage, the current is drawn that has built up in the capacitor. The capacitor will be charged quickly, and the spark gap will be fired quickly. An electric field covers the secondary coil as energy is transferred to the primary coil. This energy is absorbed by the secondary coil, which amplifies the voltage. As a result, there is a high level of volatility.

IV. CALCULATIONS TO MEASURE CAPACITANCE

Vpeak=5000 volts

*Vpeak=root(2)*5000*

Vpeak=7071.06 volts

*C=1/2*Pi*f(V/I)*

*C=1/2*pi*50*(5000/0.02)*

*C=1.90*10-08*

C=0.019 micro farad

Number of capacitor=7071.06/415

Number of capacitor=17.03nus

Capacitance=0.5/17 micro farad

That is,c=0.029 micro farad

V. HISTORICAL PERSPECTIVE ABOUT TESLA COIL

In 1864, James C. Maxwell used a mathematical model to predict the presence of radio waves [3].

John H. Poynting recognized in 1884 that the Poynting Vector would be useful in quantifying electromagnetic energy. Heinrich Hertz demonstrated experimental proof of radio waves with his spark-gap radio transmitter in 1888, aided by Maxwell's theory. The beginning of wireless power transmission was the prediction and evidence of the radio wave at the end of the nineteenth century. Nikola began working on wireless transmission in 1891 at his Colorado "experimental station".A small resonant incandescent circuit that was grounded on one end was successful.

Tesla constructed the Wardenclyffe tower to demonstrate wireless electrical power transmission as well as transAtlantic wireless telephony. William C. Brown made significant contributions to the modern world.

Today's research and development of wireless communication are dominated by microwave power transmission. Brown developed the rectenna in the early 1960s, which converts microwaves

directly to DC. In 1964, it demonstrated its capability by powering a helicopter exclusively with microwaves. At the Massachusetts Institute of Technology (MIT), a physics research group led by Prof. Marin Soljacic demonstrated wireless powering of a 60W light bulb.

In 2007,[6] two 6ocm-diameter coils were used to achieve 40% efficiency at a distance of 2m (7ft). The power was transmitted wirelessly using resonant induction. Additionally, the community is working to develop the technology. The technology is now known as WiTricity, and WiTricity Corp. was established to bring this technology forward from the MIT laboratories.

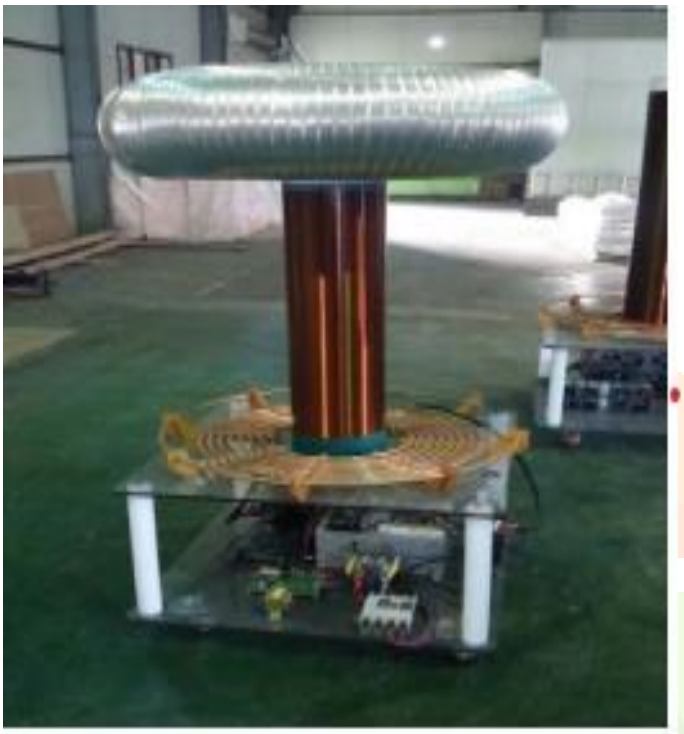

Fig2:Real-time image of tesla coil

Fig3:tesla coil real time working

VI. METHODS TO TRANSMIT POWER THROUGH AIR AS MEDIUM

6.1 Induction

The mutual induction theory can be used to transfer electrical power between two coils without any physical contact. The most basic example of how the power is transformed without transmission lines is as follows.

The transformer, which has no physical interaction between the main and secondary coils, is where mutual induction operates. Electromagnetic coupling between the two coils allows energy to be transferred.

6.2 Evanescent wave coupling

Non-radiative electromagnetic energy resonant tunneling is used in this process. Since electromagnetic waves travel through the air, energy is absorbed by them.

Electronic systems are not affected and are not disturbed. It is not considered hazardous to the human body, unlike electromagnetic radiation.

6.3 Air ionization

The ionization of the air as a result of the electromagnetic field generated is the idea here. This technique is found in nature, and its application necessitates high fields of about 100 feet.

2.11 millivolts per meter A California inventor, Richard E. Vollrath, has created an innovative sand-storm generator that sends blasts of dust-laden air through copper tubes, producing energy that can be stored in a sphere and used later [8]. Nature lightning is an example of this technique.

6.4 Electrodynamic induction

This approach, also known as "resonant inductive coupling," solves the key issue with non-resonant inductive coupling in wireless applications.

The dependency of efficiency on transmission distance in energy transfer. The transmitter and receiver inductors are tuned to a mutual frequency while the resonant coupling is used, and the drive current is changed from a sinusoidal to a non-sinusoidal transient waveform. Pulse power is transferred over several cycles. This allows substantial power to be transmitted over distances up to a few times the transmitter's size.

6.5 Electrostatic induction

This technique is often referred to as "capacitive coupling." It's a difference in capacitance or electric field gradient between two elevated electrodes over a conducting substrate.

a plane for transmitting energy wirelessly It entails the transmission of high-frequency alternating current potential variations between two plates or nodes.

Fig4: Gaint tesla coil in 21st-century technology

VII. TUNNING OF WIRELESS COIL

To get a decent power output from the SSTC, you'll need to tune it properly. A high-Q RLC circuit serves as the resonator. The driver would perceive it as a high-impedance reactive load if it is not

powered at the correct frequency. More significantly, proper tuning has a significant impact on performance.

The tuning of both the Primary and Secondary Coils is the most important feature. There are many methods for tuning the coil, but the most basic is to ensure that the Primary Coil's resonant frequency matches that of the Secondary Coil by using low-power oscillations and gradually growing and decreasing it until maximum power is achieved.

VIII. APPLICATIONS OF TESLA COIL

- *Radio transmitters with a spark gap.*
- *Induction and dielectric heating (vacuum tubes and radio transmitters with a spark gap).*
- *Heating by induction and dielectric (vacuum tube and spark gap types).*
- *The only difference between induction coils and transformer cores the transformer core material. Medical X-ray machines (which are typically driven by an induction coil).*
- *Medical devices made by quacks (violet-ray).*
- *Generators of ozone.*
- *Particle accelerators are a type of particle accelerator.*
- *Electrified stage shows and other forms of entertainment.*
- *Very high voltage generation with relatively high power levels.*
- *Tesla coil fans, which are used to produce artificial lighting and music-like effects, are used as attractions at electronics fairs and science museums in the entertainment and education industries.*
- *These coils are used to ignite spark plugs in automobiles.*
- *It is also used in an aluminum welding application.*

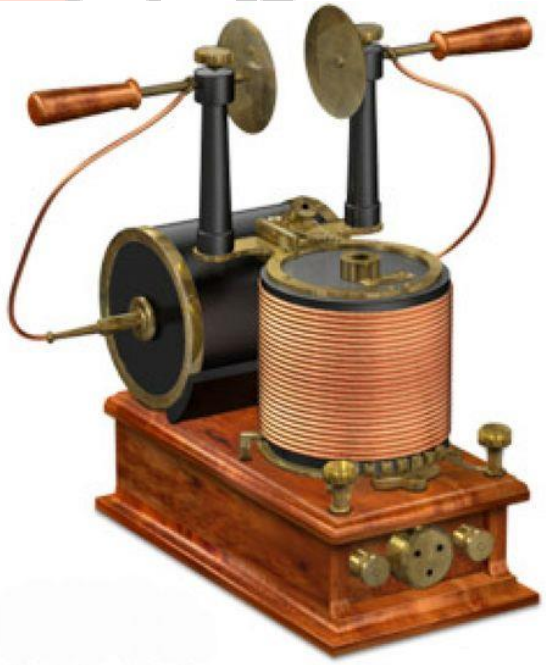

Fig5: first tesla coil

First introduced tesla coil in 1981

- *It is also used in radios.*

Fig6 : Radios application of tesla coil

- *It's the main application in the world's wireless system.*

Fig7 : World's wireless system

- *It is also used in the tesla turbine.*

Fig8: Tesla turbine

- *It is also used in the tesla oscillator.*

Fig9:Tesla oscillator

- *It is used in a neon lamp.*

Fig10:Neon lamp

- *It is used in violet-ray applications.*

Fig11: Violet ray

CONCLUSION

This project aimed to broaden our understanding of electrical electronics engineering and shed light on the technological and artistic essence of the tesla coil, all while attempting to keep the project within budget.

to make a one-of-a-kind tesla coil The coil that was produced was capable of generating a spark, and the lack of properly operating equipment was the only thing that kept it from doing so. While there are a few things that could be improved, the project accomplished its goal of producing a coil that can act as a power source and illuminating the finer points of making one. We learned a lot from our high voltage concepts while developing the Tesla coil, and it also helped us brush up on our skills.

The Tesla coils will be powered by a full-wave inverter.

This would reduce losses because full-wave inverters do not have the same losses as half-wave rectifiers.

Instead of using a cable, a better feedback system can be used. To receive feedback, a small current-transformer on the secondary coil may be used instead. This is made by wrapping 50 turns of wire around a small ferrite core and passing the secondary wire through the ground side of the loop. To ensure proper phasing, caution must be exercised.

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