ANJUMAN-I-ISLAM'S

M.H.SABOO SIDDIK COLLEGE OF ENGINEERING

ENGINEERING PHYSICS – 1

FOR THE FULLFILMENT OF PROJECT WORK IN

SEMESTER – 1

# TITLE:- WIRELESS ENERGY: THE FUTURE OF ELECTRICITY

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# LITERATURE SURVEY


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# ABSTRACT

The objective: For this science experiment, we built a Tesla coil and proceeded to experiment with different uses including wireless electricity, spark gaps, energy transmission and other high voltage experiments

The Tesla Coil is an air-core resonant transformer. It was made by the great inventor Nikola Tesla in order to create high-voltage, low current, high frequency, alternating current electricity. Tesla also experimented with different configurations in order to find out if he could use it to wirelessly transmit electricity as a replacement to the alternating current power system he had just set up to provide power to the ordinary citizens of the world. Tesla was, in our opinion, the greatest mind of history, and the man who essentially created the modern world

# Purpose

We decided to try and build a Tesla Coil by ourself and try to see if we could use it to actually transmit electricity wirelessly as claimed by Tesla. we also wanted to see what kind of range we could achieve with a small, table-top Tesla Coil. And finally, we wanted to discover if a Tesla Coil is a practical way to replace wires in your home.

# Hypothesis

Going into this project, we knew it was already very dangerous. The simple presence of such high voltage made it a dangerous feat, one which is not helped by the fact that the corona discharge ( the lightning ) is also extremely dangerous and must only be used in areas with no dangers of fire. Also the Coil could fry nearby electronics with ease. That is why we do not think that we will ever use this in a home setting, but we still believe that the coil will be able to light up a fluorescent bulb from a distance of at least 12 inches.

# Materials

This project requires a lot of materials, and you should spend at least a day or two researching each part before you begin any construction. Also, you would have to buy quite a few of the things online because they are not available in physical stores.

• A high voltage source: We used a Neon Sign Transformer rated at 7,500 Volts and 30 mA. This amount of electricity is extremely LETHAL. Direct contact without High Voltage Gloves will be deadly.

• A secondary coil: We used a and a half inch diameter PVC pipe with about 750 turns of 26-Gauge Magnet Wire.

• A primary coil: We used 1/4 inch copper tubing and wound it into a spiral shape.

• A spark gap. We used two copper fittings placed in close proximity inside a T-shape PVC fitting.

• A series of capacitor: We used both home-made ones with glass bottles, and store-bought ceramic doorknob capacitors.

• High-Voltage Wire

• A top load: We used a door-knob made of brass with the base removed.

• High-Voltage safety gloves.

# Construction

To begin the construction of my Tesla coil, we had to spend a few days researching and collecting parts.

For the actual construction, we started by winding my copper tubing into a spiral pattern. This is my primary coil. We then made my secondary coil. This was a painstakingly long process which involved carefully winding the extremely thin wire around the diameter of the tube. This part must be executed extremely precisely. You cannot overlap any of the wires and you can not leave even the smallest of gaps. This process can take up to 2 or 3 hours, depending on how many mistakes you make.

Next comes the construction of the spark gap and the assembly of the capacitors. Now, you take your two conductors and put them in close proximity to each other, and wire them according to the schematic. Assemble the capacitor(s) in series ( if required ) and wire it up in the circuit. Connect the NST to the spark gap and capacitors and attach the output from the capacitors to the primary coil. Then connect the final part of the wire on the secondary to the top load. You DO NOT connect the secondary coil to the primary coil.

For operation, simply turn on the NST. What happens is that the current travels throught the NST into the capacitors with the spark gap acting as a kind of switch, allowing energy to pass through the setup into the capacitors and charge them up. The spark gap and capacitors may not seem important, but without them the whole system would not work. Capacitors store charge for much higher amounts of voltages than the NST itself can provide, and the spark gap acts as a kind of switch. The current goes to the capacitors and when they discharge, a huge pulse of current hits the primary coil. The amount of times this happens per second is very high. When the current enters the copper primary coil, it creates an electro-magnetic field which

causes a voltage to appear in the magnet wire on the secondary. This is where the name air-core resonant transformer comes from. The core of this transformer is air rather than the iron ones found in traditional transformers. The current gathers at the top in the top load, where it gathers and is released as a corona discharge. In this process, another electric field is made which gives off enough energy to light a fluorescent tube or light bulb.

# Procedure

If you have not guessed by now, the Tesla Coil is an extremely dangerous machine. It should not be built or operated unless you have experience with, or are with a person with, high voltages. TO show you just how dangerous this project is, here is a list of safety concerns that we are aware of at the moment:

• Tesla coils use high voltages, and the risk of death or injury is significant. The following general guidelines are suggested:

• Never adjust tesla coils when the power is turned on.

• High voltage capacitors may hold a charge long after power is turned off. Always discharge capacitors before adjusting a primary circuit.

• Make sure the metal cases of transformers, motors, control panels and other items associated with tesla coils are properly grounded.

• Make sure that you are far enough away from the corona discharge so that it cannot strike you. Do not come in contact with metal objects which might be subject to a strike from the secondary.

• The low voltage primary circuit is extremely dangerous! These voltages are especially lethal to humans. Make sure these circuits are well insulated so users cannot come in contact with the A.C. line voltage.

• A safety key should be used in the low voltage circuit to prevent unauthorized use.

• Use adequate fusing of the primary power and/or circuit breakers to limit the maximum current to your control panel. Do NOT count on your home circuit panel to provide adequate protection!

• Never operate a tesla coil in an area where there is standing water, or where a significant shock hazard exists.

• Do not operate a tesla coil when pets or small children are present.

• Spend some time laying out your circuits. Hot glue, electrical tape and

exposed wiring are quick and easy, but could be lethal

• Tesla Coils are potentially dangerous devices and precautions must be taken before every operation to help prevent possible damage to property, injury, or death. Unqualified persons should never be.

• Tesla Coils can damage or destroy hearing aids and cardiac pacemakers in the proximity of the unit. This means that Tesla Coils are capable of killing a person wearing a pacemaker. It is imperative to verify that anyone using one of these devices maintains a good distance from an operating Tesla Coil.

# Observations

Because of their dangers around other electronci devices, we did not wish to take any pictues of my Tesla Coil while it is in operation, as we do not wish to ruin any of my electronics. So that is why we can only provide a written description of my experiments

TO start off with, We wanted to know how large the sparks would be on my Tesla Coil. To my surprise, the Coil only produced sparks about 1 to 1.5 cm long. We then decided to see if the coil would be able to wirelessly turn on a fluorescent light bulb. It did, but only to a distance of about 2 feet. To adjust the distance of the light bulb, we turned the coil off and then moved the light bulb.

# Conclusion

In conclusion, we can say the Tesla Coil is capable of lighting up a fluorescent light bulbs wirelessly. However, we can say that it is not a practical solution. It is extremely dangerous, and you can not touch anything involved because of the lethal nature. Also the machine is extremely loud. You simply can not use it at home. The high voltages required can easily back fire and cause deadly disasters including fire or electrocution