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Induction Measurement of Extra High Voltage Air Duct

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ABSTRACT

Extra high voltage air duct is cables connected to a very high tower. Extra high voltage air duct transmit electrical energy with the power of 500 kV. In channeling electricity is an induction. Induction detection is possible by using a solenoid. The solenoid detection results in the form of voltage and current, then converted into magnetic field and electric field. Magnetic field and electric field produced by Extra high voltage air duct vary, depending on the thickness, number of coil, and length of the solenoid and the distance and altitude during the measurement of the extra high voltage air duct. The largest magnetic field occurs at a distance of 15 meters altitude of 3 meters using a solenoid with a diameter of 1.9 mm copper thickness of 1, 22173E-06 Tesla. As for the largest electric field occurred at the time 20 meters from the Extra high voltage air duct altitude of 3 meters using a solenoid with a diameter of copper thickness of 2.5 mm is 0.002645 KV/M.

Key words : Induction, Measurement, Extra High Voltage, Magnetic Field, Solenoid, Electric Field

1. INTRODUCTION

The risk of electrical sensitivity [1-3] in population residing under extra high voltage air duct 500 kV is 5.8 times greater than that of a resident who is not residing under extra high voltage air duct 500 kV.

Various concerns arise will impact the extra high voltage air duct radiation on the health of people living in areas where the transmission channel is passed [4] .So many opinions are issued experts on the dangers of extra high voltage air duct radiation on human health.

Extra high voltage air duct is an electric distribution media by State Electricity Company in the form of cable with its power voltage reaches 500 kV, which is aimed at channeling electricity from the center of electricity to the center of the load is very far.

Induction is an electrical power generation [5-6] process in the circulation covered by magnetic currents through rotary motion. Electromagnetism is the magnetic field inflicted by the electrical flow flowing through a coil of the electric conductive wire.

Electromagnetic induction is the result of electric current generated due to changes in magnetic field. While induction current is the current resulting from electromagnetic induction. If a conductor cuts the style lines of a constant flux, then the conductance will result in an induction voltage. The change of magnetic field flux in a series of conductance material will cause induction voltage in the circuit.

Magnetic field [7-9] is the environment around magnets that are influenced by magnetic force. The magnitudes that state the style experienced by other magnets of the ferromagnetic material around the magnetic field are called strong magnetic fields. Strong magnetic fields have units of Gauss Tesla and Weber. Around the wire-arising magnetic field, magnetic field by current wire is called magnetic induction.

Electric field [10-13] is a space around electrically charged objects where other electrically charged objects in this space will feel or experience electrical style. The unit of the electric field is Newton/Coulomb or Volt/meter.

2. MATERIALS AND METHOD

The variables measured during the study are thickness diameter of copper (mm), a lot of copper coil, copper coil length (m), altitude (m), distance from extra high voltage air duct (m), current (A), and Voltage (kV). The research tools consist of copper wires, connecting cables, digital multimeters, pipes, and ruler.

Data retrieval of extra high voltage air duct radiation using electromagnetic induction method. Solenoid are used in copper because it is the best conductor. Diameter for all solenoid at the same time as the same is 20 mm. thickness and lot of twist and length of the solenoid after being wrapped varies, namely:

- Solenoid 1 : thickness 1.9 mm, coil 70, length 0.18 m
- Solenoid 2 : thickness 2.5 mm, coil 68, length 0.246 m
- Solenoid 3 : thickness 2.7 mm, coil 71, length 0.233 m

Data retrieval is performed on all three solenoids with an altitude of 1 2, and 3 meters from the ground surface. Data retrieval distance is10,15,and 20 meters from the center point.

3. RESULTS AND DISCUSSION

Data on observation results

Table 1: Solenoid Observation 1 on the East

No	Height(m)	Distance (m)	Current (mA)	Volt (V)
1	1	20	0.12	3.702
		15	0.03	1.644
		10	0.00	0.126
2	2	20	1.09	21.32
		15	0.20	4.440
		10	0.01	0.780
3	3	20	1.99	41.00
		15	2.50	14.85
		10	0.05	2.300

From the calculated results it is known that each solenoid has a different value.

East

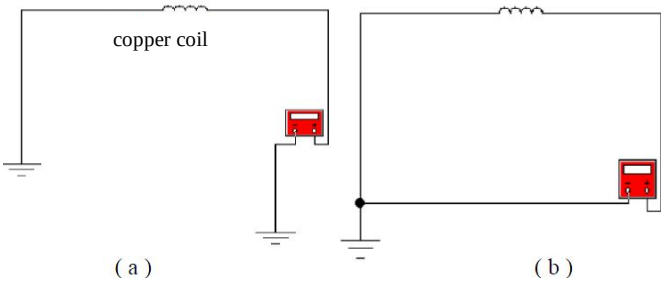

Figure 1: (a)Current Data Retrieval Scheme
(b) Voltage Data Retrieval Scheme

Figure 2: Data Retrieval Point
of Extra High Voltage Air Duct Radiation

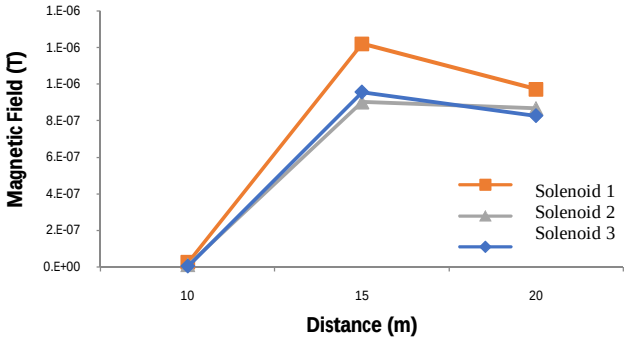

Figure 3: Magnetic Field for Solenoid Altitude 3 Meters East

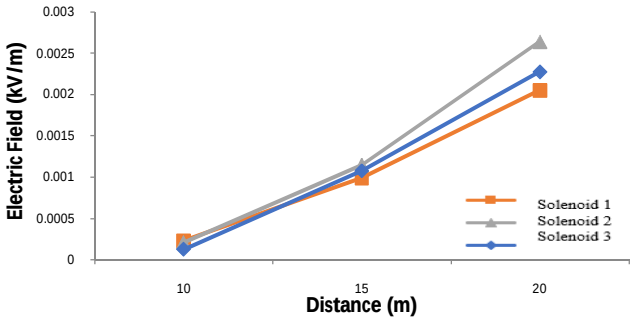

Figure 4: Electric Field for Solenoid Altitude 3 Meters East

South

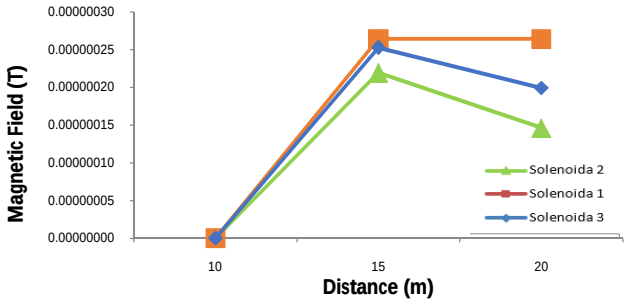

Figure 5: Magnetic Field for Solenoid Altitude 3 Meters South

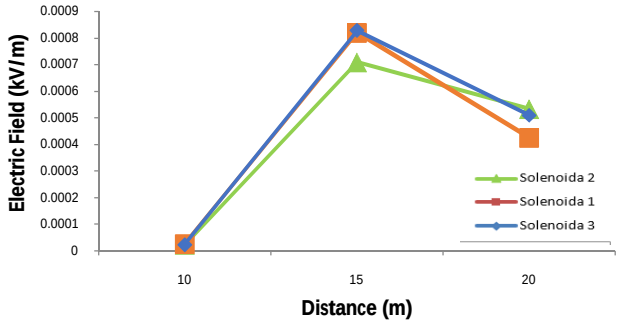

Figure 6: Electric Field for Solenoid Altitude 3 Meters South

The exposure limit for the WHO recommended magnetic field is 100 µt. Meanwhile, the WHO recommended electrical field exposure limit is 5 kV/M.

East

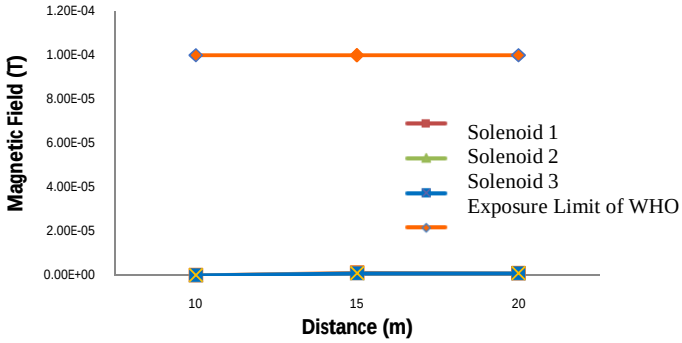

Figure 7: Magnetic Field for Solenoid Altitude 3 Meters East with Exposure Limit of WHO

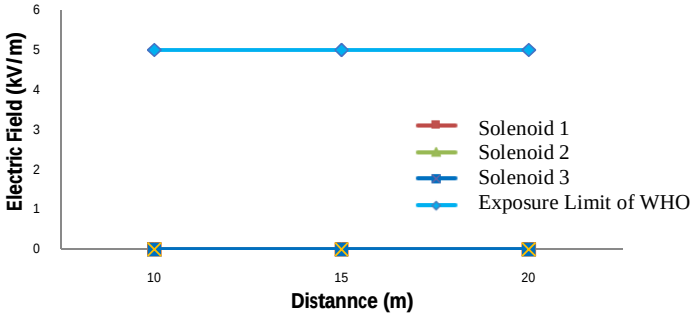

Figure 8: Electric Field for Solenoid Altitude 3 Meters East with Exposure Limit of WHO

South

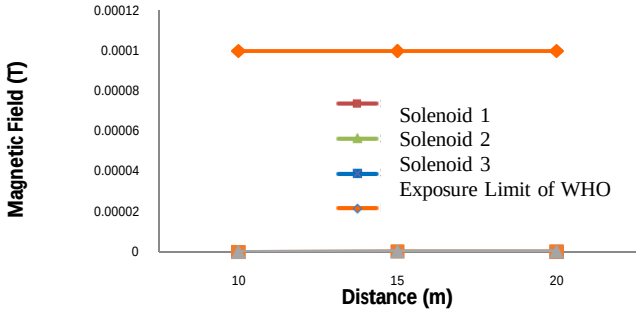

Figure 9: Magnetic Field for Solenoid Altitude 3 Meters South with Exposure Limit of WHO

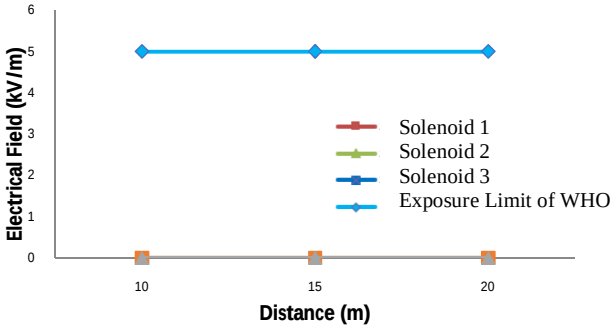

Figure 10: Electric Field for Solenoid Altitude 3 Meters South with Exposure Limit of WHO

From the overall graph between the exposure limit that has been set by the WHO with the data of the measurement result using the method of copper coil conducted by the authors, it can be concluded that the data of the results of extra high voltage air duct induction measurement in the form of magnetic field and electrical field that the author is still within the limits of exposure that has been established.

4. CONCLUSSION

In summary, a solenoid measurement tool can measure the induction occurring in the extra high voltage air duct, which is a magnetic field and electric field. The largest magnetic field is at a distance of 15 meters altitude of 3 meters using a solenoid with a diameter of copper thickness of 1.9 mm, namely, 1.22173E-06 Tesla. The largest electric field occurred at the time 20 meters from the extra high voltage air duct altitude of 3 meters using a solenoid with a diameter of copper thickness of 2.5 mm that is 0.002645 kV/M. Magnetic field and electric field nothing that exceeds the exposure limit established by the WHO. From this data can be concluded that extra high voltage air duct induction is a magnetic field and electric field Still within safe boundaries.

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