UNIVERSIDAD CATÓLICA DE CUENCA
CARRERA DE INGENIERÍA ELÉCTRICA

EFFECT OF ELECTROMAGNICAL RADIATION IN CULTIVES

Kevin Matute, Matías Ochoa, Diego Pañi.

kamatutea32@est.ucacue.edu.ec, electrical engineering, Cuenca, Ecuador
amochoac17@est.ucacue.edu.ec, electrical engineering, Cuenca, Ecuador
dmpanis50 @est.ucacue.edu.ec, electrical engineering, Cuenca, Ecuador

I- Introduction

- Electromagnetic radiation are waves that travel at the speed of light, generated by the sources of the electromagnetic field.
- These can manifest in various ways such as radio waves, microwaves, infrared radiation, visible light, ultraviolet radiation, X-rays or gamma rays.
- It is the grouping of electromagnetic fields that are present in our lives in multiple ways that propagate in space, which travel in a straight line in a vacuum experiencing reflections, diffractions and attenuations.
- There are artificial electromagnetic radiation created by man, these are emitted by devices such as high voltage lines, mobile telephony, appliances, appliances and industrial machinery, etc.
- Electromagnetic radiation is classified as ionizing and non-ionizing, these can be very harmful to the biological system, if it were to concentrate on values higher than allowed
- They can cause cancer, insomnia, change in behavior, anxiety and various alterations in growth with respect to plants

II. Effects of electromagnetic radiation

- The high concentration of artificial, non-ionizing electromagnetic radiation causes considerable alterations.
- A static magnetic field is measured in amps per meter (A / m), but also in terms of magnetic induction, which is measured in teslas (T) or milliteslas (mT).
- On the Earth's surface, the natural geomagnetic field varies between 0.035 and 0.07 mT.
- The devices can have intensities 1000 times higher than the natural magnetic field of the Earth.
- A transformer, a sodium lamp, an LED reflector and an access point emit different radiation values.

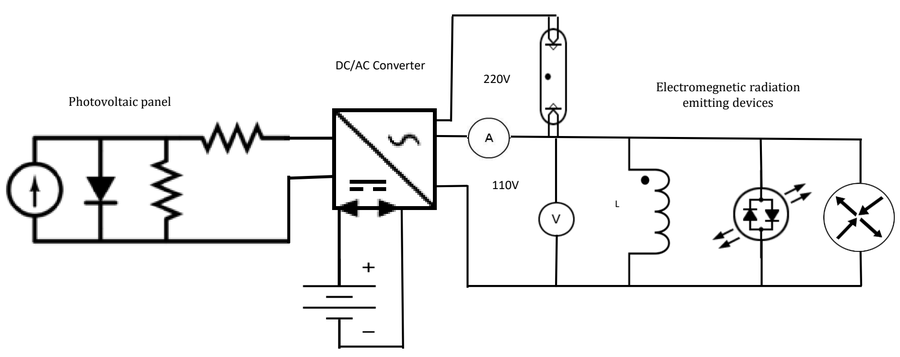
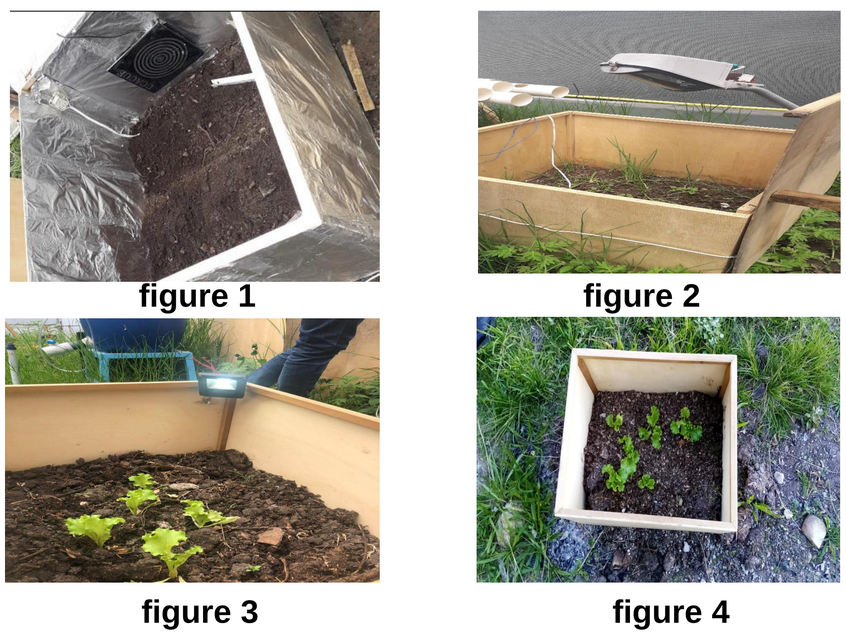


Diagram of the installation of electrical devices

- Each equipment is installed in different sites, but with the same type of culture, to analyze the reactions that cause artificial radiation
- To concentrate the large part of the radiation produced by the transformer, we install inside a box simulating a Faraday cage.
- One of the cultures analyzed was exposed to normal ambient conditions.
- For constant monitoring of the growth process, recording cameras were placed.



GREENHOUSE. **Figure 1**. Faraday Cage. **Figure 2**. Sodium Lamp. **Figure 3.** Led Light **Figure 4.** Natural Light

III. Simulation/Experimental Results

- The result of the analysis on the development of the cultures intervened with the radiations, show significant differences in size.
- Radiation in large concentrations, is capable of altering the biological order of living beings.
- Radiation in large concentrations is capable of altering the biological order of plants, in favor, or against.
- To perform radiation calculations of installed devices, it is necessary to use Matlab and Smarphone applications.

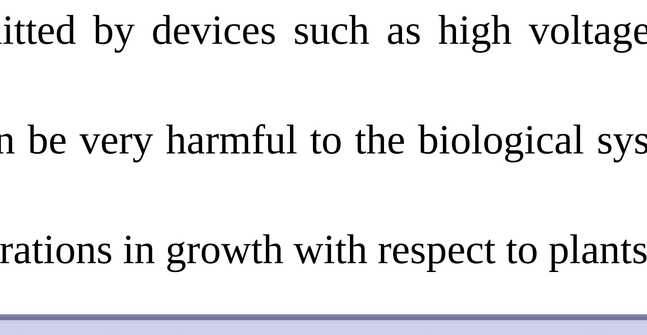


Figure 5. Gauss Curve

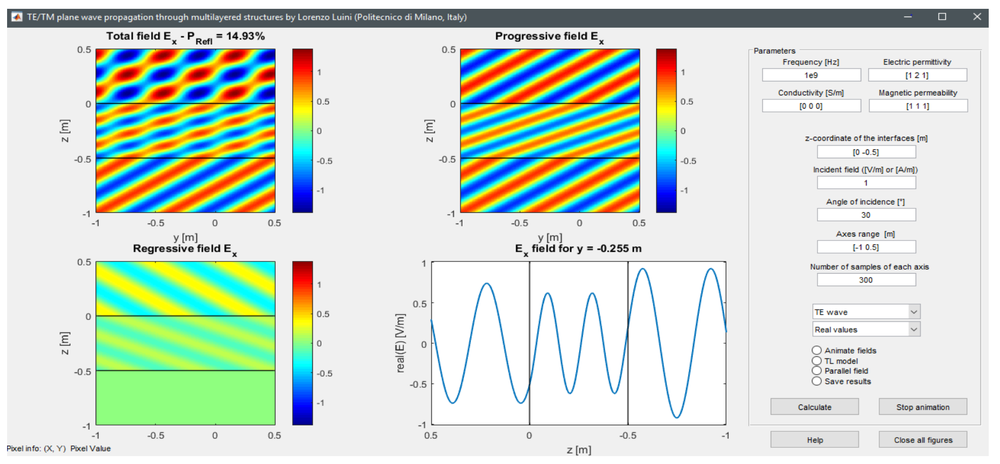


Figure 3.electromagnetic field effects,

(a) wave spectrum , (b) crop contaminated with electromagnetic fields.

IV. Conclusion

- The artificial electromagnetic fields are generated when the electric current intervenes.
- If the radiation exceeds normal conditions, the risk is greater in living beings.
- The transformer and the routers turned out to be the most damaging for the crops.
- The sodium lamp slows plant growth, the opposite happens with LED lamps.
- Technology is increasingly advancing to improve the life condition of man, but also increases the consequences.
- The results obtained, as a suggestion, reduce the continuous use of electrical and electronic devices, which are affecting the balance of our ecosystem.