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Investigating a Suitable Method for Prediction of Lightning

Samarasinghe K. P. B., Maduwantha W. C., Fernando W. I. N. R. and
Ranaweera P. S.*

*Department of Electrical and Information Engineering, Faculty of Engineering,
University of Ruhuna*

* Corresponding Author: pasika@eie.ruh.ac.lk

Lightning can be defined as a transient, high-current electric discharge in air whose length is measured in kilometers. Modern world smart features are invading the concepts of technology. Thus, domestic smart concept requires protection and awareness of a suitable lightning detection system. Lightning is a natural phenomenon which cannot be controlled by anyone. Due to that reason, low cost accurate lightning prediction systems are necessity. In this research, a novel system of lightning prediction for domestic usage is researched using three techniques with the help of an Electric Field Mill (EFM), inductor and a VHF antenna. EFM consists of a non-rotating slotted sensor plate and slotted rotor plates which are exposed to an electric field developed using a DC high voltage. In order to reduce the loss caused by lightning, it is necessary to study a lightning prediction method. Considering the electric field exerted during the abrupt weather, conditions can be found during lightning occurrences for conducting the experiments.

The three methods being proposed were tested in a high-voltage laboratory, where EFM's output current increased linearly with applied high-voltage and was tested up to 52 kV. For the inductor coil; 4.3 mH coil's output fluctuated between 23-33 mV while 9.5 mH coil's output fluctuated between 30-40 mV. The tests conducted for the VHF antenna revealed that the E-field is fluctuating in the range of 3.4-3.7 mV, which does not specify a significant dependency. The obvious choice was the EFM for lightning prediction as other two techniques weren't giving promising relationships with a changing electric field.

Keywords: electric field, electric field mill, high voltage, inductor, lightning, VHF antenna