

Simulation of Side Flashes and Earth Potential Rise Effect on Human Body

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Lightning refers to a massive electrical discharge that occurs either in the atmosphere or between the atmosphere and the ground. In this circumstance, air acts as an insulator which enables a massive current to flow between positive and negative charge in the cloud or cloud to cloud (CC), cloud to ground (CG), Ground to cloud (GC), intra cloud (IC) and Cloud to air (CA). When the differences in charge become too large, the insulating capacity of the air breakdown, resulting in a rapid discharge of electricity known as lightning. About 20,000 people around the world are struck by lightning every year, with thousands dying because of their injuries. It is possible that the number of people living with long-term injuries, temporary impairments, and internal trauma is several times higher. Most lightning deaths occur in open spaces, with earth potential rise (EPR) being the most common cause of injury, followed by side flash. As a response, an effective understanding of lightning protection and safety measures must be disseminated down to the hamlets as well to reduce the death number and other threats to humans and livestock. Although the scientific community has made a significant effort in recent years to educate the public about the prevention of lightning dangers, the number of deaths and injuries caused by lightning in this nation remains unacceptably high. Due to the massive number of injuries caused by side flash and EPR events, a proper investigation of the electromagnetic response toward human body parts is required in this study. Hence, to study the effect of side flashes and earth potential rise effect on human body, ANSYS software used to simulate the model of human bodies and lightning events. The measured body parts are legs, chest, hand, and head. For contact voltage mechanism, the influence between the height and the diameter struck object is varied to human body. A 5-meter gap is considered as a gap distance between struck object and the person. The severity of injuries of each body part is determined in this study based on the value of magnetic field distribution, magnetic flux, current and energy. The results of EMF distributions across the human body are depicted to highlight the parts of the body that are most affected by side flash and EPR.

Keywords: *Earth Potential Rise (EPR), EMF Distributions, Lightning, Side Flashes*