

Investigation of the influence of the electromagnetic field in the vicinity of high voltage overhead line

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Abstract. The magnetic and electrical field in the vicinity of overhead power line for high voltage - 220 kV is investigated. FEM model is created. Simulations of normal and emergency mode of the power line are made. The electrical intensity at idle mode in some areas, close to overhead power line, creates a high voltage level for humans. It can create also disturbances in the electrical equipment and the vehicles. These surges violate electromagnetic compatibility. The magnetic induction at emergency mode – short circuit and lightning strike in the areas around the towers could give a disturbing reaction of humans, animals and sensitive electronic devices. One solution for decreasing of the magnetic flux density to acceptable values is offered.

Introduction

The surrounding area around tower of HV power lines - 230 kV [3] is considered.

These lines are used in the power transmission system in. Investigations are carried out on normal and emergency mode as a short circuit or lightning strike [4]. In some cases in vicinity of line are located buildings as farm or cottages - Fig.1.

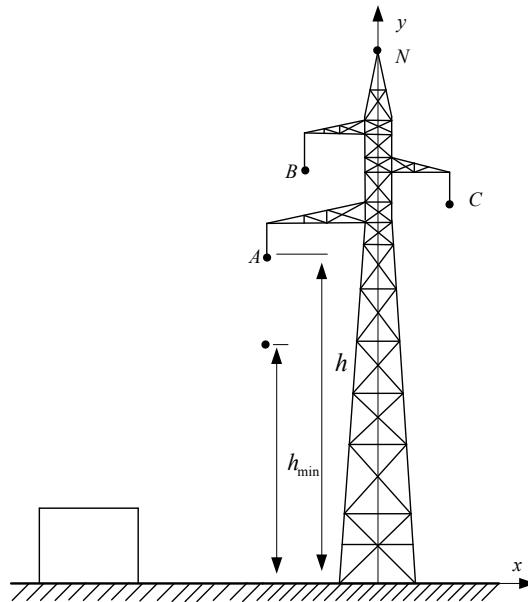


Fig. 1. Scheme of the studied overhead power line

1. Analysis of the electromagnetic field

The wires of high-voltage overhead line are considered as sources of the magnetic field, created by current with current density \vec{j} [1, 2]. To obtain the electromagnetic field vectors, an approach, which is based on the finite-element method (FEM) solution of Maxwell's equations, is used.

4. Discussion

Till now has no universally accepted theoretical explanation for the biological action of electromagnetic fields. No an established mechanism of bio-system field interaction. There is no commonly guidance what attributes of the field might be biologically important – electric or magnetic [7]. We can summarize, that magnetic field are encountered not only on the studied predominantly sinusoidal cases with main frequency at 50 or 60 Hz in normal modes, but and on extraordinary cases such as short circuits and lightning strikes. These fields present complex multi-frequency patterns variable in time and space. The study of these random events is possible just by simulations.

5. Conclusion

The electrical and magnetic field in the vicinity of overhead power line for high voltage - 220 kV are determined. Simulations of normal and emergency mode of the power line are made.

The electrical intensity at idle mode in some areas, very close to overhead power line, creates for long time a high voltage level. These surges violate electromagnetic compatibility. The safety levels for humans are at distance of 30 meters.

The magnetic induction at emergency mode in buildings on the close areas around the towers could give a disturbing reaction of humans, animals and sensitive electronic devices according to standards.

If the magnetic shield is created around the building in vicinity of high voltage power line, the values of the magnetic flux density is decreased to acceptable values. This is only one solution, which we can offer.

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