

## Statistical Description of Counterpoise Effective Length Based on Regressive Formulas

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**Abstract :** This paper presents a novel statistical description of the counterpoise effective length due to lightning surges, where the (impulse) effective length had been obtained by means of regressive formulas applied to the transient simulation results. The effective length is described in terms of a statistical distribution function, from which median, mean, variance, and other parameters of interest could be readily obtained. The influence of lightning current amplitude, lightning front duration, and soil resistivity on the effective length has been accounted for, assuming statistical nature of these parameters. A method for determining the optimal counterpoise length, in terms of the statistical impulse effective length, is also presented. It is based on estimating the number of dangerous events associated with lightning strikes. Proposed statistical description and the associated method provide valuable information which could aid the design engineer in optimising physical lengths of counterpoises in different grounding arrangements and soil resistivity situations.

**Keywords :** counterpoise, grounding conductor, effective length, lightning, Monte Carlo method, statistical distribution

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