Adaptive Finite-Element Ballooning Analysis Of Bipolar Ionizedfields

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Summary

This paper presents an adaptive finite-element iterative method for the analysis of the ionized field around bipolar high-voltage direct-current (HVDC) transmission line conductors without resort to Deutsch's assumption. A new iterative finite-element ballooning technique is used to solve Poisson's equation wherein the commonly used artificial boundary around the transmission line conductors is simulated at infinity. Unlike all attempts reported in the literature for the solution of ionized field, the constancy of the conductors' surface field at the corona onset value is directly implemented in the finite-element formulation. In order to investigate the effectiveness of the proposed method, a laboratory model was built. It has been found that the calculated V-I characteristics and the ground-plane current density agreed well with those measured experimentally. The simplicity in computer programming in addition to the low number of iterations required to achieve convergence characterize this method of analysis