3-D FDTD Simulation of the Lightning-induced Waves on Overhead Lines Considering the Vertically Stratified conducting Ground

Distant Electromagnetic Environment Produced by Lightning

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In this paper we have employed the 3-D FDTD model (Three-Dimensional Finite-Difference Time-Domain) to analyze the influence of the vertically stratified conducting ground on the lightning-induced voltages of the overhead line at a height of 10 m above the ground at distances of 60 m and 200 m from the center of the line to the lightning strike point. Note that, when the conductivity near the strike point (0.1 S/m) is larger than that near the overhead line section (0.001 S/m), the induced voltage obviously increases with the increase of the closest distance from the center of the line to the interface between the two mediums (*dl*). For instance, when the section width *dl* = 5 m, the peak value at the center of the line is about 94 kV, while the peak value is about 101 kV when *dl* = 30 m. However, when the conductivity near the strike point (0.001 S/m) is less than that near the overhead line (0.1 S/m), the induced voltage decreases with the increase of the section width. Therefore, in some cases we should take into account the influence of vertically stratified ground in calculating the lightning-induced waves on overhead lines.