

## Revised Tower Earthing Design in High-Voltage Transmission Network for High-Frequency Lightning Condition

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**Abstract :** Earthing system for high-voltage transmission tower is designed to protect the working personnel and equipments, and to maintain the quality of supply during fault. The existing earthing system for transmission towers in TNB's system is purposely designed for normal power frequency (low-frequency) fault conditions that take into account the step and touch voltages. This earthing design is found to be inapt for lightning (transient) condition to a certain extent, which involves a high-frequency domain. The current earthing practice of laying the electrodes radially in straight 60 m horizontal lines under the ground, in order to achieve the specified impedance value of less than 10  $\Omega$ , was deemed ineffective in reducing the high-frequency impedance. This paper introduces a new earthing design that produces low impedance value at the high-frequency domain, without compromising the performance of low-frequency impedance. The performances of this new earthing design, as well as the existing design, are simulated for various soil resistivity values at varying frequency. The proposed concentrated earthing design is found to possess low TFR value at both low and high-frequency. A good earthing design should have a fine balance between compact and radial electrodes under the ground.

**Keywords :** earthing design, high-frequency, lightning, tower footing impedance

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