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Transient Response of Surge Protective Devices during the Potentials Transferred between Independent Grounding Grids

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Abstract

This paper analyzes the potential transferred between two independent grounding grids located 40 m apart, one of which, called the active grid, was injected with current of rocket-triggered lightning flashes. The transferred potentials in another grid, called the passive grid, and the transient response of the surge protective device (SPD) in the passive grid are evaluated. Observations results benefiting from six nearby triggered flashes, in which a total of 35 return strokes were involved, show that the peak transferred potential in the passive grid ranges from -1.1 to -28.5 kV with a mean of -10.7 kV. These voltages exhibit transient pulses, having a primary peak with a mean duration of $3 \mu\text{s}$, followed by a sub-peak, whose amplitude is averagely 36.6% against the primary one. The average 10–90% risetime is $0.74 \mu\text{s}$ and the average half-peak width is $1.6 \mu\text{s}$. The energy consumed by SPD during transferred potentials is 2.0 J on average, much lower than that of SPD equipped in nearby overhead power lines. The amplitude of initially-injected lightning currents in the active grid is found to be an important determinant of the peak transferred potentials, the peak current flowing through the SPDs, and the energy consumed by the SPD.

Topic Areas

Lightning Safety, Protection, and Casualty Occurrence

Submission Format

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