



Surge Impedance of a Hybrid Overhead Line Tower

Luana Batista Moraes
Institute of Energy and Environment
University of São Paulo (USP)
São Paulo, Brazil
luana_batista@usp.br

Alexandre Piantini
Institute of Energy and Environment
University of São Paulo (USP)
São Paulo, Brazil
piantini@iee.usp.br

Miltom Shighara
Institute of Energy and Environment
University of São Paulo (USP)
São Paulo, Brazil
mshighara@usp.br

Abstract — Lightning causes disturbances and outages in transmission and distribution systems, usually significantly impacting the power quality. An adequate evaluation of such transients requires knowledge of the behavior of the most important system components. In the case of transmission and sub-transmission lines, the tower is one of the components whose response to the lightning currents affects the corresponding overvoltages. This paper evaluates the surge impedance of the tower of a hybrid overhead line composed of sub-transmission (138 kV) and distribution circuits. The analysis involves comparisons between the voltages calculated assuming different formulas for the tower impedance in the case of a lightning hit to the tower top. The calculated voltages are compared to the one measured on a 1:20 reduced tower model. Measured voltages along the tower indicate a good agreement with the surge impedance calculated according to the simple expression proposed by Takahashi.

Keywords — hybrid overhead line, tower model, tower surge impedance, tower response, transmission tower.