

Electrical performance of polymer-insulated rail brackets of DC transit subjected to lightning induced overvoltage

ABSTRACT

The fourth rail transit is an interesting topic to be shared and accessed by the community within that area of expertise. Several ongoing works are currently being conducted especially in the aspects of system technical performances including the rail bracket component and the sensitivity analyses on the various rail designs. Furthermore, the lightning surge study on railway electrification is significant due to the fact that only a handful of publications are available in this regard, especially on the fourth rail transit. For this reason, this paper presents a study on the electrical performance of a fourth rail Direct Current (DC) urban transit affected by an indirect lightning strike. The indirect lightning strike was modelled by means of the Rusck model and the sum of two Heidler functions. The simulations were carried out using the EMTP-RV software which included the performance comparison of polymer-insulated rail brackets, namely the Cast Epoxy (CE), the Cycloaliphatic Epoxy A (CEA), and the Glass Reinforced Plastic (GRP) together with the station arresters when subjected by 30 kA (5/80 μ s) and 90 kA (9/200 μ s) lightning currents. The results obtained demonstrated that the GRP material has been able to slightly lower its induced overvoltage as compared to other materials, especially for the case of 90 kA (9/200 μ s), and thus serves better coordination with the station arresters. This improvement has also reflected on the recorded residual voltage and energy absorption capacity of the arrester, respectively.

Keyword: DC transit; EMTP-RV; Fourth rail; Indirect lightning; Lightning induced overvoltage; Surge arrester