

Expressions for Current/Voltage Distribution in Broadband Power-Line Communication Networks Involving Branches

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Abstract

Estimation of electromagnetic (EM)-field emissions from broadband power-line communication systems (BPLC) is necessary, because at its operating frequencies, the radiated emissions from BPLC systems act as sources of interference/crosstalk to other radio-communication systems. Currently, the transmission-line (TL) system used for BPLC is complex, involving arbitrarily/irregularly distributed branched networks, arbitrary termination loads, varying line lengths, and line characteristic impedance. In order to study the electromagnetic-compatibility (EMC) issues associated with the radiated emissions of such complex BPLC networks, knowledge of current and voltage distributions along the length of the power-line channels is needed. This paper attempts to derive and present generalized expressions for either the current or voltage distribution along the line (whose TL parameters are known) between the transmitting and receiving ends for any line boundary condition and configuration based on the TL theory. The expressions presented in this paper could be beneficial for direct calculation of EM emissions from BPLC systems.

Keywords

Broadband power line; communication channels; electromagnetic compatibility (EMC); load impedance; transmission lines (TLs)