

The Effects of Load Impedance, Line Length, and Branches in Typical Low-Voltage Channels of the BPLC Systems of Developing Countries: Transmission-Line Analyses

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Abstract

This paper presents the influence of line length, number of branches (distributed and concentrated), and terminal impedances on the performance of a low-voltage broadband power-line communication channel. For analyses, the systems chosen are typical low-voltage power-line networks found in Tanzania. The parameters varied were the network's load impedances, direct line length (from transmitter to receiver), branched line lengths, and number of branches. From the frequency responses of the transfer functions (ratio of the received and transmitted signal), it is seen that the position of notches and peaks in the amplitude responses are affected by the aforementioned network parameters and topology. As a result, the time-domain responses are attenuated and distorted. Time-domain responses of power-line channels under various conditions are also investigated for a given pulse input at the transmitter. The observations presented in this paper could be useful for suitable power-line communication system design.

KEYWORDS

Branched network; broadband power line; impulse response; interconnections; load impedance; low-voltage channel; multipath; transfer function