

The Influence of Load Impedance, Line Length, and Branches on Underground Cable Power-Line Communications (PLC) Systems

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Abstract

An underground cable power transmission system is widely used in urban low-voltage power distribution systems. In order to assess the performance of such distribution systems as a low-voltage broadband power-line communication (BPLC) channel, this paper investigates the effects of load impedance, line length, and branches on such systems, with special emphasis on power-line networks found in Tanzania. From the frequency response of the transfer function (ratio of the received and transmitted signals), it is seen that the position of notches and peaks in the magnitude are largely affected (observed in time-domain responses too) by the aforementioned network configuration and parameters. Additionally, channel capacity for such PLC channels for various conditions is investigated. The observations presented in this paper could be helpful as a suitable design of the PLC systems for better data transfer and system performance.

KEYWORDS

Branched network; broadband power line; channel capacity; interconnections; load impedance; low-voltage channel; multipath; transfer function; underground cable