

# Ergodic Capacity Analysis of OFDM-based NB-PLC Systems

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## Abstract

Power line communication (PLC) has been proposed as a crucial part of smart grid applications. This is due to its capacity to use existing power-grid infrastructure to provide cost-efficient data transmissions. However, the communication performance might be degraded by channel attenuation and high unpredictable noise levels. Consequently, the performance analysis of PLC is of high importance. In this paper, we investigated and evaluated the performance of orthogonal frequency division multiplexing (OFDM)-based narrow-band (NB)-PLC systems in terms of ergodic capacity. Mathematical tools were used to derive the expression of the corresponding average ergodic capacity (AEC). Furthermore, field measurements were conducted to confirm the theoretical results and assess the NB-PLC system's performance. The theoretical and field measurement results confirm the impact of the selected channel on the performance of the considered OFDM-based NB-PLC systems. Notably, with respect to the conducted field measurements in the NB-PLC Federal Communications Commission (FCC) band, it is showed that some frequency sub-bands enjoy a higher ergodic capacity with respect to rest of the frequency spectrum.

## Index Terms

PLC, Field Measurements, Average Ergodic capacity, NB-PLC, OFDM, Performance Analysis, Smart Grid.



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