



Research Letters in Communications

About this Journal Submit a Manuscript Table of Contents



Journal Menu

- Abstracting and Indexing
- Aims and Scope
- Article Processing Charges
- Articles in Press
- Author Guidelines
- Bibliographic Information
- Contact Information
- Conference Sponsorships
- Editorial Board
- Editorial Workflow
- Reviewers Acknowledgment
- Subscription Information

Call for Proposals for Special Issues

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Research Letter

The Distribution of Path Losses for Uniformly Distributed Nodes in a Circle

Zubin Bharucha and Harald Haas

Institute for Digital Communications, School of Engineering and Electronics,
University of Edinburgh, EH9 3JL Edinburgh, UK

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Abstract

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Linked References

How to Cite this Article

Abstract

When simulating a wireless network, users/nodes are usually assumed to be distributed uniformly in space. Path losses between nodes in a simulated network are generally calculated by determining the distance between every pair of nodes and applying a suitable path loss model as a function of this distance (power of distance with an environment-specific path loss exponent) and adding a random component to represent the log-normal shadowing. A network with N nodes consists of $N(N-1)/2$ path loss values. In order to generate statistically significant results for system-level simulations, Monte Carlo simulations must be performed where the nodes are randomly distributed at the start of every run. This is a time-consuming operation which need not be carried out if the distribution of path losses between the nodes is known. The probability density function (pdf) of the path loss between the centre of a circle and a node distributed uniformly within a the circle is derived in this work.