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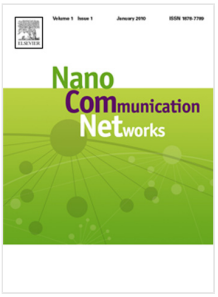

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Farnoosh Moshir, Suresh Singh

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Modulation and Rate Adaptation Algorithms for Terahertz Channels

Farnoosh Moshir, Suresh Singh

Department of Computer Science, Portland State University, Portland, OR 97207

Abstract

The ever increasing demand for higher wireless data rates has led to the development of new techniques to increase spectrum efficiency. However, the limited bandwidth of the frequency bands that are currently used for wireless communication bounds the maximum data rate possible. In the past few years, researchers have developed new devices that work as Terahertz (THz) transmitters and receivers. The development of these devices and the large available bandwidth of the THz band is a possible solution to this ever increasing demand. However, THz communication is still in its infancy and more research needs to be done to bring THz technology into every day life.

This paper considers two specific problems – modulation of terahertz pulses and rate adaptation for terahertz communication systems. We describe a pulse modulation technique where multiple symbols are transmitted in each pulse. The technique is shown to achieve terabit/sec datarates. Subsequently, we examine the problem of rate adaptation which is significant at these frequencies due to the high distance based attenuation. Algorithms are presented to fairly share the channel among multiple users located at different distances from the access point. The research is based on simulations in Matlab and the channel model used is based on our own measurements using a time-domain terahertz system. The channel model is also presented in this paper.

Keywords: THz channel model, THz pulsed signal, THz continuous signal, Adaptation rate

1. Introduction

The demand for higher data rates is ever increasing and is unlikely to stabilize anytime soon. This trend is driven by increasing number of deployed devices providing content-rich data to users and the demand from users for greater download speeds, anywhere and anytime. For example, the Japanese

Email addresses: moshir2@cs.pdx.edu (Farnoosh Moshir), singh@cs.pdx.edu (Suresh Singh)