Transmit Power Optimization in OFDM Systems

Dr. Brian Krongold
Dept. Electrical and Electronic Engineering
The University of Melbourne

Abstract

This tutorial considers two important aspects related to transmit power in OFDM systems. First, we consider the inherently large peak-to-average power ratio (PAPR) problem, which can limit performance and significantly reduce power efficiency. Various approaches, optimization problems, and algorithms to alleviate the PAPR problem will be presented, including their various tradeoffs and implementation issues. The ability to extend such approaches to multi-user and multiple antenna systems will briefly highlighted.

The second part of this tutorial looks at optimizing the transmit power spectrum based upon channel state information (CSI). This ability to allocate power and rate for each subchannel, sometimes referred to as "bit loading", can greatly enhance the throughput and performance of OFDM systems. Starting with a basic convex optimization problem, we look at optimally solving the standard bit loading problems, followed by extensions to multi-user and multiple antenna systems. Recent work in the literature, such as using quantized CSI feedback, will be highlighted.

Bio

Brian Scott Krongold received the B.S., M.S., and Ph.D. degrees in electrical engineering in 1995, 1997, and 2001, respectively, from the University of Illinois at Urbana-Champaign. Brian joined the University of Melbourne in December 2001 starting as a Research Fellow at the ARC Special Research Centre for Ultra-Broadband Information Networks (CUBIN). From 2005 to 2008, he held an Australian Research Council (ARC) Postdoctoral Fellowship, and is currently a Senior Lecturer in the Department of Electrical and Electronic Engineering. During the summer of 1994, he interned for Martin Marietta at the Oak Ridge National Laboratory, Oak Ridge, TN. For most of 1995, he consulted at Bell Laboratories in Middletown, NJ. During the summer of 1998, he worked at the Electronics and Telecommunications Research Institute, Taejon, South Korea, under a National Science Foundation summer research grant. He received 2nd prize in the student paper contest at the 2001 Asilomar Conference on Signals, Systems, and Computers. In 2006, he received the Best Paper Award at the European Wireless Conference. His current research interests are in wireless communications, signal processing, and optical OFDM systems.