Multi-Carrier Communication Systems with Examples in MATLAB®: A New Perspective

By Emad Hassan

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Detailing the advantages and limitations of multi-carrier communication, this book proposes possible solutions for these limitations. **Multi-Carrier Communication Systems with Examples in MATLAB®: A New Perspective** addresses the two primary drawbacks of orthogonal frequency division multiplexing (OFDM) communication systems: the high sensitivity to carrier frequency offsets and phase noise, and the high peak-to-average power ratio (PAPR) of the transmitted signals.

Presenting a new interleaving scheme for multicarrier communication, the book starts with a detailed overview of multi-carrier systems such as OFDM, multi-carrier code division multiple access (MC-CDMA), and single-carrier frequency division multiple access (SC-FDMA) systems. From there, it proposes a new way to deal with the frequency-selective fading channel: the single-carrier with frequency domain equalization (SC-FDE) scheme.

The second part of the book examines the performance of the continuous phase modulation (CPM)-based OFDM (CPM-OFDM) system. It proposes a CPM-based single-carrier frequency domain equalization (CPM-SC-FDE) structure for broadband wireless communication systems.

In the third part of the book, the author proposes a chaotic interleaving scheme for both CPM-OFDM and the CPM-SC-FDE systems. A comparison between the proposed chaotic interleaving and the conventional block interleaving is also performed in this part.

The final part of the book presents efficient image transmission techniques over multi-carrier systems such as OFDM, MC-CDMA, and SC-FDMA. It details a new approach for efficient image transmission over OFDM and MC-CDMA systems using chaotic interleaving that transmits images over wireless channels efficiently.

The book studies the performance of discrete cosine transform-based single-

carrier frequency division multiple access (DCT-SC-FDMA) with image transmission. It also proposes a CPM-based DCT-SC-FDMA structure for efficient image transmission.

The book includes MATLAB® simulations along with MATLAB code so you can practice carrying out your own extensive simulations.

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Editorial Review

About the Author

Dr. Emad S. Hassan earned his BSc (Honors), MSc, and PhD from the Electronics and Electrical Communications Engineering Department, Faculty of Electronic Engineering, Menoufia University, Egypt, in 2003, 2006, and 2010, respectively. In 2008, he joined the Communications Research Group at Liverpool University, United Kingdom, as a visiting researcher to complete his PhD research.

Dr. Hassan has been a full-time demonstrator (2003–2006) and assistant lecturer (2007–2010) at the Faculty of Electronic Engineering, Menoufia University. He was a visitor researcher at University of Liverpool, (2008–2009), a teaching assistant at the University of Liverpool (2008–2009), and a part-time lecturer at several private engineering universities in Egypt (2010–2011). He co-supervises many MSc and PhD students (2010–present).

Dr. Hassan is currently an assistant professor at the Electronics and Electrical Communications Engineering Department, Faculty of Electronic Engineering, Menoufia University, Egypt.

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