

Preface

Dear readers, dear friends,

The Orthogonal Frequency-Division Multiplexing (OFDM) digital transmission technique has several advantages in broadcast and mobile communications applications. Therefore, the German Research Foundation (DFG) funded a so-called priority program “Techniques, Algorithms, and Concepts for Future OFDM Systems” (TakeOFDM), which started in 2004. The main objective of this research program is to study the specific research topics in a collaborative work between experts and young scientists from different universities.

In broadcast applications like Digital Audio Broadcast (DAB), Digital Video broadcast (DVB-T), Digital Radio Mondiale (DRM), and single-cell WLAN systems, the OFDM transmission technique is already mature and operational for several years. However, in wireless and wireline communications there is still need for further research and optimization. The OFDM transmission technique has gained a lot of attention in research, and it has proven to be a suitable choice in the design of digital transmission concepts for mobile applications, such as the Long Term Evolution (LTE) standard, which is the system proposal for the fourth generation (4G) of mobile communication systems. The OFDM transmission method, specific medium access techniques, cellular networks with full coverage, and multiple antenna systems have been playing an important and ever-growing role in the 4G development.

Since 2004, more than 15 different universities in over 40 specific research projects have been contributing to the TakeOFDM program, covering a large variety of detailed aspects of OFDM and all related system design aspects. This TakeOFDM research project led to several PhD theses and is a basis for the young generation of excellent scientific researchers and staff. The results have been exchanged in several workshops, conferences, and direct cooperations. Besides topics regarding the physical layer, such as coding, modulation, and non-linearities, a special emphasis was put on system aspects and concepts, in particular focusing on cellular networks and multiple antenna techniques. The challenges of link adaptation, adaptive resource allocation, and interference mitigation in such systems were addressed extensively. Moreover, the domain of cross-layer design, i.e., the combination of physical layer aspects and issues of higher layers, was considered in detail.

This book summarizes the main results and gives an overview of the combined research efforts which have been undertaken in the past 6 years within the TakeOFDM priority program. As a coordinator of the program, I would like to express my gratitude to the German Research Foundation (DFG) for their generous funding, continuous support and fruitful collaboration throughout the lifetime of the TakeOFDM project. Moreover, my sincere thanks go to all scientists for their excellent work on a high scientific level and their valuable contributions over the last years.

The aim of this book is to give a good insight into these efforts, and provide the reader with a comprehensive overview of the scientific progress which was achieved in the framework of TakeOFDM. I am convinced that also in the future, these results will facilitate and stimulate further innovation and developments in the design of modern communication systems, based on the powerful OFDM transmission technique.

Prof. Dr. Hermann Rohling

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OFDM

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