Wireless OFDM Systems - How to make them work?

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The basic idea of multicarrier modulation was introduced and patented in the mid 60's by R.W.Chang: the available bandwidth W is divided into a number Nc of subbands, commonly called subcarriers or subchannels, each of width .f=W/Nc . Data symbols are transmitted in parallel by modulating the Nc carriers. To assure a high spectral efficiency, the subchannel waveforms must have overlapping transmit spectra. They need to be orthogonal for enabling simple separation of these overlapping subchannels at the receiver. Multicarrier modulations that fulfill these conditions are called Orthogonal Frequency Division Multiplex (OFDM) system.

Although the principle of OFDM communication has been around for several decades, it was only in the last decade that it started to be used in commercial systems. The most important wireless applications that make use of OFDM are Digital Audio Broadcasting (DAB), Digital Video Broadcasting (DVB), wireless local area networks (WLAN), and more recently wireless local loop (WLL). Although the theory of OFDM is well understood, implementation aspects of OFDM system are seldom discussed. This book fills this gap and gives a comprehensive overview of the implementation of OFDM systems. The book capitalizes on the large experience of the authors with the implementation of OFDM base WLAN system.

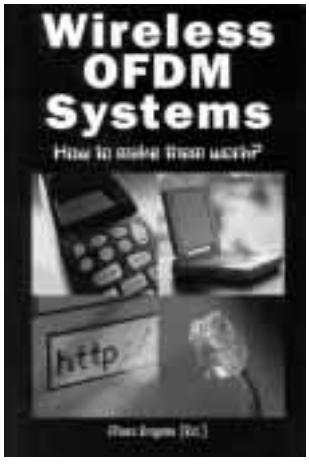
This book consists of eight chapters. The first chapter is an introductory which reviews the extraordinary success of the Internet and the digital mobile communication. This chapter also briefly introduces wireless OFDM systems: DAB, DVB and WLAN.

In Chapter 2, the indoor wireless environment is discussed. Knowledge of the propagation property is essential for several aspects of the receiver design. The first task in any wireless system design is to establish an accurate channel model.

Next, the book reviews the OFDM in chapter 3 and provides a system model tha serves as a reference in the remainder of the book. Besides an overview of well-known theory, the chapter contains also some new materials on introduction of Doppler effect in this system model.

The fourth chapter introduces the WLAN standards. Most materials in this chapter deal with physical and medium access control layers of the HIPERLAN/2. However, a comparison with the IEEE 802.11a and Japanese HiSANa standards is also included.

The next two chapters are devoted to baseband implementation challenges. In chapter 5 several channel estimation algorithms are presented. The book shows that large performance differences exist between the estimation methods. In chapter 6, various synchronization problems and solutions for OFDM modems are examined.



An OFDM transceiver does not only consist of a bandband circuit but also needs a radio that translates the signal to and from its carrier frequency. Several effects of this radio part have a considerable influence on the performance of the OFDM system. These effects are analyzed in detail in Chapter 7.

Finally, chapter 8 puts everything together and shows some practical implementation of OFDM systems involving wireless OFDM transceivers. The authors concluded with the question that how far we are away from the optimum? Two examples, automatic gain control and power-efficient transmission, are presented at the end of the book.

In summary, this book focuses well on OFDM. It covers most of the related topics within 200 pages. For those who study or work on broadband communication in a wireless multipath environment, this book is a useful and easy-to-read reference monogram. We would like to see some improvement on the quality of the graphics in future editions.

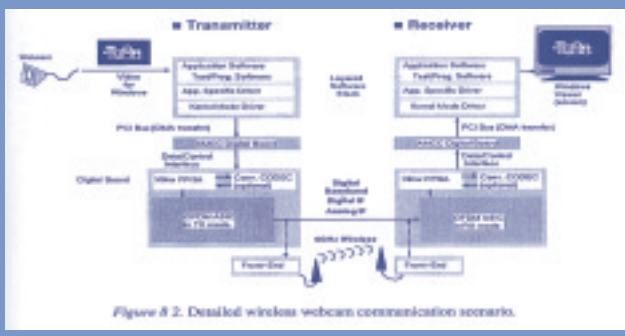


Figure 8 2. Detailed wireless webcam communication scenario.

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Obituary

Dr. Do Xuan-Dai, 1945-2003, passed away at home March 6, 2003 at the age of 58. He leaves his wife Mrs Marielle Haché, a son Daniel, his mother and numerous relatives and friends. Dr. Do was coordinator of the IEEE Ecole Polytechnique Student Branch. He taught Electrical Networks to many generations of engineers and researchers.

En Memoriam

Dr. Do Xuan-Dai, 1945-2003, est décédé à son domicile le 6 mars 2003 à l'âge de 58 ans. Outre sa conjointe Mme Marielle Haché, il laisse dans le deuil son fils unique Daniel, sa mère ainsi que de nombreux parents et amis. Dr. Do était le coordonateur de la branche étudiante IEEE de l'Ecole Polytechnique. Il a enseigné à plusieurs générations d'ingénieurs et de chercheurs en réseaux électriques.

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