

# Preface

Long-range radio-frequency (RF) tags are becoming increasingly important in a number of different sensor network applications. Our effort in this book is to discuss the potential advantages of ultra-wideband (UWB) RF systems for designing long-range RF tags that are passive; i.e. *sensors that communicate without batteries*. While the technology of UWB RF tags is still at an early stage of research and development, today UWB communications and radar systems can be considered mature technologies. The GHz's of bandwidth of pulsed RF UWB communications and radar systems have proven to be extremely useful in harsh electromagnetic (EM) environments. Because RF tags address similar technical challenges faced by wireless communication and radar systems, in this book we discuss the key technical challenges of short and long range passive RF tags and discuss how UWB signals and systems might be employed to address those challenges.

When we began the project of writing a book on this subject, our goal was to focus just on UWB RF tags as that was the area of our research and there was a gap on this subject in the technical literature. However, during the process of writing the book, it became clear that the reader would benefit tremendously by including a comparative discussion on narrow-band and low-frequency RF tags in order to evaluate the benefits of UWB RF tags. The first few chapters have been developed to not only review the history and technology of RF tags and RFIDS, but also to discuss the physics of narrowband signaling for RFID's, their advantages and limitations. The later chapters of this book are more focused on discussing the unique features of UWB design that might lead to important insights and breakthrough in future UWB RF tags, and their use in important applications. In our discussion, throughout the book, we have attempted to be up to date and concise, but with extensive references and bibliographies.

The subject of RFID has an audience with a diverse technical background. We have attempted to maintain the contents at an introductory level, while pointing out some of the key reference books and journal papers, for those readers wanting a

more rigorous discussion on a subject. We expect this book would be most useful to those wanting a concise overview of the subject. In particular, technical managers responsible to making decisions on the potential use of RFID's for special application areas, might be the ideal audience for this book.

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Ultra-Wideband Radio Frequency Identification Systems

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2012, XVI, 160 p., Hardcover

ISBN: 978-1-4419-9700-5