

Preface

When the first volume of the *Ultra-Wideband, Short Pulse Electromagnetics* book series was published in 1993, the terms ultra-wideband (UWB) and short-pulse (SP) were acronyms for challenging technologies. In 1992, the DARPA Ultra-wideband Radar Review Panel defined UWB by the need for special techniques to overcome challenging problems facing conventional systems and technologies when attempting to operate over a broad range of frequencies.

Since then notable progress in UWB and SP technologies has been achieved. As a result, wide-band systems are now being used for an increasingly wide variety of applications. UWB radar systems are used for collision avoidance, concealed object detection, mine detection, and oil pipeline inspections. In the communication area, the need for increasing bandwidth boosted the development of UWB communication systems such as the impulse radio. Many high-power electromagnetic (HPEM) environments are generated employing short-pulse technology. With the advent of HPEM sources capable of interrupting and/or damaging sensitive electronics, there has been an increasing interest in protecting critical infrastructure and systems. Recently, the literature has reported the usage of SP techniques in microwave tomography systems for biomedical applications.

Through the whole development of UWB and SP technologies, *Ultra-Wideband, Short Pulse Electromagnetic* books provided new and state-of-the-art information on the tendencies and current achievements in UWB- and SP-related technologies, analyzing methodologies, theoretical models, and time domain data processing. The objectives of the *Ultra-Wideband, Short Pulse Electromagnetics* book series are as follows:

- To focus on advanced technologies for the generation, radiation, and detection of UWB and SP signals
- To report on developments in supporting mathematical and numerical methods, which are capable of analyzing the propagation of UWB and SP signals, as well as their scattering from and coupling to targets and media of interest
- To describe current and potential future applications of the UWB and SP technology

“*Ultra-Wideband, Short Pulse Electromagnetics 9*” (UWB SP 9) presents recent developments in the areas of UWB and SP technology, components, application, numerical analysis, modeling, and electromagnetic theory. The editorial board selected the initial set of contributions from presentations at the UWB-SP 9 conference that was held in conjunction with EUROEM 2008 in Lausanne, Switzerland. The editorial board’s goal was to cover the complete range of aforementioned topics with articles of deep technical content and high scientific quality. Wherever we felt that something was missing, we invited selected authors to contribute additional articles to complete the overall picture. Therefore we hope that this book contains something of interest for every scientist and engineer working in the area of UWB and SP electromagnetics.

Following the tradition in the odd-numbered volumes of *Ultra-Wideband, Short Pulse Electromagnetics* (UWB SP) books, which are related to EUROEM conferences, the cover displays the picture of a renowned scientist. This ninth volume honors Albert Einstein, who is well known for his various achievements in theoretical physics. From the view point of the editorial board, Einstein is eminently well qualified for the cover picture from multiple aspects. First, Einstein started his professional life at the Swiss Patent Office in Bern and later in life was professor at the ETH Zurich. He introduced the theory of special relativity in 1905 in a paper entitled “The electrodynamics of moving bodies.” The editorial board liked the idea of honoring this contribution to physics, as well as showing the link to electromagnetics. Second, there is a special relation among Maxwell, Hertz, and Einstein. A cover picture showing Einstein completes the series started with the *UWB SP 5* book. The cover of the *UWP SP 5* book shows a picture of James Clerk Maxwell, the Scottish theoretical physicist and mathematician, who developed the classical electromagnetic theory. The well known set of Maxwell’s equations is the physical foundation of the research presented in the *UWB SP* books. The next odd-numbered volume, *UWB SP 7*, showed a picture of Heinrich Rudolf Herz, a German physicist, who was the first scientist to demonstrate electromagnetic waves by building an apparatus that produced radio waves. Therefore the cover of the *UWB SP 7* book continued the series by featuring the scientist who clarified Maxwell’s theory. The next, and for the moment final, improvement of Maxwell’s theory was Einstein’s development into the special theory of relativity. Einstein noted that the special theory of relativity owes its origins to Maxwell’s equations of electromagnetic fields.

Finally, I would like to express my gratitude to all persons who contributed to this book. In particular, I thank the authors for writing articles of deep technical content and high scientific quality, and the members of the editorial board, Farhad Rachidi, D.V. Giri, and Armin Kaelin, for reviewing all articles and numerous discussions, which helped improve the quality of this book.

Last but not least, I thank my family, particularly my wife Martina, for her great patience and for granting me the time to work on this book.

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