

Preface

The terahertz (THz) spectral range is possibly the least explored part of the electromagnetic spectrum. This is despite the fact that THz research made a very significant early contribution to the development of physics when in 1900 H. Rubens and his colleagues measured the emission spectrum of a blackbody down to about 6 THz. This finally led to the discovery of the blackbody radiation law by M. Planck. For several decades it remained a rather exotic field, although there were interesting applications particularly in condensed matter research. However, in the 1970s it was realized that the THz portion of the electromagnetic spectrum – at that time still called the far-infrared or submillimeter region – offers unique opportunities in astronomical research. Subsequently, many dedicated THz telescopes were built, among them very successful air- and space-borne observatories. In the past few years, THz research and development has attracted ever-increasing attention. This has been triggered by tremendous progress in the development of sources, detectors, optics, and systems. THz technology is now on the verge of commercial applications for example in security, biomedicine, broadband communication, nondestructive testing, and process control.

Correspondingly, the number of researchers working in THz science and technology is rapidly growing. They might be developing new techniques and instruments for the exploration of the THz region or using THz instruments for specific research purposes. However, there are relatively few books, and they only cover some parts of the field. From our daily work with students we feel that there is a real need for a general introduction to all aspects of THz research, including methods, instrumentation, and physical principles. This book is in the spirit of an earlier, widely distributed textbook written by one of us (M. F. Kimmitt, *Far-Infrared Techniques*, Pion Ltd, London, 1970). It is a modern, comprehensive text aimed at covering the entire research field. The focus is on established THz techniques and instrumentation that are widely used over the frequency range 0.3–10 THz (1 mm to 30 μm). Recent developments are included in the belief that they are likely to become the standard techniques of the future. Wherever possible, references are given to excellent reviews on particular aspects. Figures and tables are based on published data and the reader is encouraged to read these in order to obtain

more detailed knowledge and insight. The book is primarily aimed at graduate students and researchers who are new to the field. But we also hope that active THz researchers may find helpful information and that the book will serve both as a useful introduction and as a reference for all involved in THz research.

As with our own THz research, the book has benefited from cooperation and discussion with many colleagues over a long period of time. They are far too many to be named here but to all of them we are greatly indebted. We also express our gratitude to the institutions where we are currently working, where we have worked, and which have supported our THz research. We especially thank our wives and children for their continuous support and never-ending patience during the time of writing, and, in particular, we thank Mhairi Kimmitt for her careful proof-reading of the text.

Bochum,
Berlin,
Brightlingsea

Erik Bründermann
Heinz-Wilhelm Hübers
Maurice FitzGerald Kimmitt

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Bründermann, E.; Hübers, H.-W.; Kimmitt, M.F.

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