Advanced Millimeter-wave Technologies

Antennas, Packaging and Circuits

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WILEY

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Preface

This book is intended for a wide range of researchers, engineers, managers and the wireless industry at large who are interested to learn and influence the future direction of wireless. Its focus is on millimeter-wave (mmWave) antennas and packaging, but context and relevance is provided by including a systems perspective to give the reader an understanding of the importance of each element and the hidden depths beyond the seemingly simple topics. The goal of this book is not to showcase problems solved, but to educate everyone in this new and exciting area of research that holds the promise further to invigorate and fuel the wireless industry and pull together the brightest minds to solve some of the toughest technical challenges we have ever faced as a wireless industry. What the reader will find between these covers is the work of a small subset of people who have begun to scratch the surface enough for others to see the few brilliant gems hidden in the depths of granite-hard challenges.

At the time of writing, there were no books available on the subject of mmWave chip, antenna and packaging co-design. In order to fill this void, the authors decided to leverage some of the most recent efforts and pull them together into a coherent story that builds from a bottoms-up approach into useful and interesting systems.

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The authors would like to acknowledge the many people and organizations that made this work possible, especially seed funding from programs including NASA, under contract NAS3-03070, and DARPA, contracts N66001-02-C-8014 and N66001-05-C-8013. As in every field, there are pioneers who began in this area years ago. There is no clear delineation of by whom and when work in the mmWave field began, but there was a defining demonstration of its potential as early as 1895 with J.C. Bose, and the field has been rich with many contributors since. Likewise, Japan stands out as the first country to promote strongly the use of mmWaves, beginning decades ago. Therefore, it only seems fitting to mention from a very long list a few key people who helped to inspire this work: J.C. Bose [1], Johann-Friedrich Luy [2], Keiichi Ohata [3, 4], Peter F.M. Smulders [5], Herbert Zirath [6], Peter Russer [7], Hiroyo Ogowa [8, 9], Ted Rappaport [10], Larry Larson [11], John Cressler [12]. Also, fundamental to the success of any new technical area is university involvement. A few of the key researchers and their universities who took up this challenge early on and helped to make great strides, as seen in recent ISSCC and other symposia, journals and conferences, are: Professor Ali Hajimiri of California Institute of Technology; Professors Robert Broderson and Ali Niknejad of UC Berkeley; Professors John Cressler and Joy Laskar of Georgia Institute of Technology; Professor Charles Sodini of the Massachusetts Institute of Technology (MIT); Professors Behzad Razavi, Frank Chang [8] and Tatsuo Itoh of UCLA; Professors Larry Larson, Gabriel Rabiz and Larry Milstein of UCSD; Professor John Long of Delft University; Professors Ken O of the University of Florida; Dr Efstratios Skafidas of Melbourne/NICT Australia; Professors Linda Katehi and Jennifer T. Bernhard of the University of Illinois; Professor John Volakis of Ohio State University; Professor Koichi Ito of Chiba University, Japan; Professor Yue Ping Zhang of Nanyang Technological University, Singapore; and Professor Jri Lee of Taiwan National University.

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