



Microwave Imaging Techniques (Wiley Series in Remote Sensing and Image Processing)

By Bernard D. Steinberg, Harish M. Subbaram

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Handbook of Microwave and Optical Components

Editor-in-Chief: Kai Chang

This important, four-volume work covers recent developments in a field that continues to evolve at an extraordinarily rapid pace. The information given is almost entirely of a practical nature, with theoretical discussions and mathematical formulations given only where essential. Consequently, the Handbook is the definitive source guide for professionals working in optical and microwave engineering. It covers all important areas of microwave, millimeter-wave, submillimeter-wave, infrared, and optical frequency spectra—from essential principles, methods, design information, and references for solving all types of problems in high-frequency spectra.

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This interdisciplinary journal offers comprehensive coverage of the theory and applications of imaging technology. Papers are drawn from a wide range of areas—holography, optical processing, engineering, chemistry, radiology, geology, geography, astronomy, computer and materials science, and mathematics. The journal provides a single source for current information pertinent to engineers and specialists working in imaging technology, as well as a forum for the development of new technology.

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Editorial Review

From the Publisher

As the authors' third book in a series dealing with large arrays and microwave imaging, this work explores how to make good microwave pictures. It has two distinct parts. The first part describes what microwave imagery is, how it is obtained, and what the problems are in obtaining good microwave images. The second part describes many of the techniques available for enhancing image quality. Topics covered include: ways for achieving diversity-combining of images; deconvolution procedures for eliminating large artifacts and for the general improvement of image quality; the self-calibration methods necessary for successful operation of very large arrays; the means for reducing the data-handling requirements of large, high resolution phased array systems; the theory and practice of superresolution or non-Fourier processing of spatial data; and display techniques.

From the Inside Flap

Stated quite simply, this book is about how to make good microwave pictures. Conceived and written by two leading members of the Valley Forge Research Center at the University of Pennsylvania's Moore School of Engineering, this work describes the latest thinking and most advanced practical applications in terrestrial microwave imaging enhancement. The first part (four chapters) is devoted to an understanding of how microwave imagery is obtained and the various problems inherent in producing high-resolution microwave images. Topics covered include fundamental aspects of objective terrestrial microwave imaging, image quality, the mathematics of microwave imaging, wideband effects, long wavelength effects, scattering effects, large aperture effects, and more. The remaining eight chapters of *Microwave imaging Techniques* are devoted to the state of the art in microwave image enhancement. Included are detailed discussions of techniques for:

- achieving diversity-combining images
- deconvolution procedures for eliminating image artifacts and for general image improvement (especially the Clean technique)
- self-calibration methods essential to the operation of large arrays
- techniques for reducing data-handling requirements; super-resolution processing of spatial data—both theory and practice
- and a broad range of proven image-enhancing techniques.

The text is well supplemented with nearly one hundred and seventy illustrations and mathematical equations. Designed to assist researchers in microwave imaging and communications as well as practicing engineers and advanced-level engineering students, *Microwave imaging Techniques* assumes some prior knowledge of large phased arrays and the problems intrinsic to large microwave systems.

About the Author

Bernard D. Steinberg, PhD, was co-founder and Vice President in charge of Research and Engineering at General Atronics Corporation, as well as a founder of and former Chairman of the Board of Interspec, Inc. (a Philadelphia based company specializing in signal processing for radar and sonar, and the manufacture of ultrasonic imaging equipment for cardiologists). Dr. Steinberg is a professor of electrical engineering and Director of the Valley Forge Research Center, University of Pennsylvania, a facility primarily devoted to high-resolution microwave imaging based on adaptive self-calibration of huge, distorted antenna arrays,

which may be real, synthetic, or a combination of both. Dr. Steinberg's previous books in the field include *Principles of Aperture and Array System Design: Including Random and Adaptive Arrays* and *Microwave Imaging with Large Antenna Arrays: Radio Camera Principles and Techniques*. Dr. Steinberg holds degrees in electrical engineering from MIT and the University of Pennsylvania.

Harish M. Subbaram, PhD, received a BTech in electronics engineering from the Indian Institute of Technology and an MSE and PhD in electrical engineering from the University of Pennsylvania. Dr. Subbaram's research interests include signal and image processing, microwave and ultrasonic imaging, and spectrum analysis.

Users Review

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