



# Fundamentals of Ultrasonic Phased Arrays (Solid Mechanics and Its Applications)

*Lester W. Schmerr*

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This book describes in detail the physical and mathematical foundations of ultrasonic phased array measurements. The book uses linear systems theory to develop a comprehensive model of the signals and images that can be formed with phased arrays. Engineers working in the field of ultrasonic nondestructive evaluation (NDE) will find in this approach a wealth of information on how to design, optimize and interpret ultrasonic inspections with phased arrays. The fundamentals and models described in the book will also be of significant interest to other fields, including the medical ultrasound and seismology communities. A unique feature of this book is that it presents a unified theory of imaging with phased arrays that shows how common imaging methods such as the synthetic aperture focusing technique (SAFT), the total focusing method (TFM), and the physical optics far field inverse scattering (POFFIS) imaging method are all simplified versions of more fundamental and quantitative imaging approaches, called imaging measurement models.

To enhance learning, this book first describes the fundamentals of phased array systems using 2-D models, so that the complex 3-D cases normally found in practice can be more easily understood. In addition to giving a detailed discussion of phased array systems, Fundamentals of Ultrasonic Phased Arrays also provides MATLAB® functions and scripts, allowing the reader to conduct simulations of ultrasonic phased array transducers and phased array systems with the latest modeling technology.

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