BOOK REVIEWS

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Editorial Policy: *If there is a negative review, the author of the book will be given a chance to respond to the review in this section of the Journal and the reviewer will be allowed to respond to the author's comments. [See ''Book Reviews Editor's Note,'' J. Acoust. Soc. Am.* ***81****, 1651 (May 1987).]*

Acoustic Particle Velocity Sensors: Design, Performance, and Applications

Marilyn J. Berliner and Jan F. Lindberg, Editors

AIP Conference Proceedings 368.
AIP Press, Woodbury, New York, 1996.
x+448 pp. Price $140.00.

This is the published proceedings of a two-day workshop on the subject held in Mystic, CT in the Fall of 1995, sponsored by the Naval Undersea Warfare Center Division Newport, the Office of Naval Research, and the Acoustical Society of America. Twenty-nine technical presentations were made in the areas of sensor designs, applications, and performance, representing current research in this field in academia, industry, and government laboratories. Two were invited presentations. The list of attendees numbers 128 individuals from government laboratories, industry, and academic institutions. This reviewer wishes that he could have attended.

Borrowing from the preface written by the editors,

''Underwater acoustic sensors in the U.S. Navy have always been synonymous with hydrophones which measure pressure. However, the acoustic particle velocity may be the more desirable component of the acoustic field that one wants to measure. This may be because the measurement must be taken at a low impedance boundary or because one wants to combine particle velocity information with pressure information to determine acoustic intensity or the direction of propagation. To an acoustician or transducer designer the subject of acoustic particle velocity and the means to sense such shouldn't be unknown but, alas, when one spends decades focused on the exploitation of acoustic pressure, a refresher on particle velocity is eagerly welcomed. To a certain extent, the theory can be the easy part; the design and physical execution of a working velocity sensor package is the challenge. Innovation and attention to detail must be brought to bear to translate the theory into a practical device. Thus this workshop was much more than an academic exercise, it was an energizer which sparked the imagination of the attendees and hopefully will result in new innovation in this field.

''Presentations of sensor designs ranged from, among others, commercial off-the-shelf devices to designs using emerging technologies in fiber optics, micromachined silicon, and metallic glass. Discussions of applications included measurement of and signal processing of underwater acoustics using linear and planar arrays of particle velocity sensors. Performance issues presented included inherent and flow-induced self-noise in velocity and acceleration sensors, and the physical effects of sensor size and placement on the acoustic signal.

''The technical presentation included two invited papers. The paper by Tom Gabrielson, 'Modeling and measuring self-noise in velocity and acceleration sensors,' points out many of the difficulties in predicting and measuring sensor noise and the need to consider inherent self-noise in the early stages of the sensor design process. The paper by Barrie Franklin, 'Acoustic particle acceleration sensors,' discusses sensor acoustic performance issues and compares experimental results to theory.

''Most scientists and engineers working in the area of acoustics reference performance and noise to equivalent acoustic pressure. To orient the reader to performance and noise referenced to an acoustic particle velocity, a discussion of the relative noise performance of displacement, velocity, and acceleration sensors is contained in the Introduction.''

The breadth of the subject matter is shown by the list of titles and authors of the papers, taken from the book's Table of Contents:

Clearly the emphasis is on the current state of the art in the design and modeling of acoustic motion sensors and their applications to underwater sound. There is some attention given to effects of motion on the performance of pressure sensors. The papers on the analysis of noise limitations are applicable to motion sensors in all media. The book should be useful to designers of acoustic sensors or of systems that use acoustic sensors in underwater sound. These proceedings should also stimulate further interest and research in this important and interesting subject.

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