Formulas of Acoustics

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Formulas of Acoustics

Second Edition

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Preface to the first edition, abbreviated

Modern acoustics is more and more based on computations, and computations are based on formulas. Such work needs previous and contemporary results. It consumes much time and effort to search needed formulas during the actual work. Therefore, fundamentals and results of acoustics that can be expressed as formulas will be collected in this book.

The formula collection is subdivided into fields of acoustics (Chapters). For some fields, in which this author is not expert enough, he invited co-authors to contribute. Most colleagues contacted for possible contributions were convinced of the project and agreed spontaneously.

The material within a field of acoustics is subdivided in Sections which deal with a defined task. Some overlap of Sections should be tolerated; but the subdivision into well-defined Sections will be helpful to the reader to find a particular topic of interest.

The present formula collection should not be considered a textbook in a condensed form. Derivations of a presented result will be described only as far as they are helpful in understanding the problem; the more interested reader is referred to the "source" of the result. Useful principles and computational procedures will also be included, even if they need more describing text. Symbols and quantities will be defined in the Section, and wherever useful a sketch will help to explain the object and the task.

One of the advantages of a formula collection is seen in uniform definitions, notations and symbols for quantities. A strict uniformity in the form of a central list of symbols used never works, according to this author's observation. Therefore, only commonly used symbols (such as medium density, speed of sound, circular frequency, etc.) are collected in a central list of symbols (see Conventions); other symbols are defined in the relevant chapter.

Most Sections contain, below their title or in the text, a reference to the literature. It cannot be the task and intention of this book either to indicate time priorities of publications concerning a topic or to give a survey of the existing literature. The reference quoted is the source of more information, which the author has used.

Higher transcendental functions used in the formulas will be explained by reference to mathematical literature, if necessary. If functions are used with different definitions in the literature, the definition applied here will be presented.

The authors think that the book in its present form contains most of traditional and modern results of both fundamental and special character so that the book can be helpful to researchers and engineers in the fields of physical acoustics, noise control, and room acoustics.

The manuscript was written in a camera ready form (in order to avoid proof reading). So printing errors are the responsibility of the editing author. He would be grateful for indications of such errors.

The author gratefully acknowledges the support given to the project by the co-authors and by the publisher.

Grafenau, October 2001

Preface to the second edition

The book was out of print in 2004. The need of reprint gave a first opportunity to apply some corrections to (rather harmless) misprints and to a few more serious formula errors (the positions of the errors are marked by a footnote *)). Some of the shown diagrams were generated by the computing program *Mathematica*®; this program unfortunately has lost its ability to write axes and plot labels so that they can be understood by receiving text programs. Therefore transscriptions to plot labels are enumerated near the diagrams, where necessary. This second edition is moderately enlarged by some additional topics in new Sections.

Grafenau, May 2008

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