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Characterization of nonlinear port parameters in loudspeaker modeling

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ABSTRACT

The outputs from ports used in common vented box loudspeakers are not linear with input level. With the goal of developing accurate modelling of vented boxes, a new method for estimation of nonlinear port parameters is shown. Acoustic mass and acoustic resistance parameters change with pressure in the enclosure and velocity in the port. Along with all nonlinear speaker parameters required for modeling, a practical way to characterize the changing acoustic mass and acoustic resistance is presented and tested with measurements. Using the new method, nonlinear port parameters are extracted for multiple box and port types.

1 Introduction

This work extends the vented box model by incorporating dynamic acoustic resistance (R_a) and acoustic mass (M_a) parameters. The R_a and M_a parameters are functions of the volume velocity in the port. For the adaptive parameter estimation method to work, we approximate the R_a and M_a functions as being dependent on input voltage level. The volume velocity in the port is also a state variable and its calculation depends on the current estimate of R_a and M_a , whereas input voltage level is a known and easily tracked value. Evaluating this method based on the normalized mean squared error between measured and modeled displacement we found that excellent vented box model predictions can be made.

2 Background

Many excellent background papers exist in the literature which study vented boxes and port characteristics. Roosen, et. al. [1], Backman [2, 3, 4], Vanderkooy [5, 6], Salvatti, et. al. [7] have characterized aspects of the port, including differences in port geometry. Klippel [8] has presented a succinct state space equation for modeling vented boxes. These papers and the equations in [8] are limited to characterizing fixed level input signals rather than incorporating dynamic acoustic resistance (R_a) and acoustic mass (M_a) terms. Therefore, there is still a need for a practical vented box model that can be used to model a full vented box system with any type of input signal.

Linear And Nonlinear Loudspeaker Characterization

Xiang Xie



Linear And Nonlinear Loudspeaker Characterization:

Loudspeakers Philip Newell, Keith Holland, 2006-10-05 Need advice on which type of speaker to use and where Very often the choice and positioning of loudspeakers is down to intuition hearsay and chance This practical guide explores the link between experience and the technology giving you a better understanding of the tools you are using and why leading to greatly improved results Newell and Holland share years of experience in the design application and use of loudspeakers for recording and reproducing music Get practical advice on the applications of different loudspeakers to the different phases of the music recording and reproduction chain If you are using loudspeakers in a recording studio mastering facility broadcasting studio film post production facility home or musician s studio or you inspire to improve your music reproduction system this book will help you make the right decisions [Journal of the Audio Engineering Society Audio Engineering Society](#), 2007 Directory of members published as pt 2 of Apr 1954 issue [Audio Engineering Explained](#) Douglas Self, 2012-11-12 All the design and development inspiration and direction an audio engineer needs in one blockbuster book Douglas Self has selected the very best sound engineering design material from the Focal and Newnes portfolio and compiled it into this volume The result is a book covering the gamut of sound engineering The material has been selected for its timelessness as well as for its relevance to contemporary sound engineering issues **Academic Press Library in Signal Processing**, 2013-09-14 This fourth volume edited and authored by world leading experts gives a review of the principles methods and techniques of important and emerging research topics and technologies in Image Video Processing and Analysis Hardware Audio Acoustic and Speech Processing With this reference source you will Quickly grasp a new area of research Understand the underlying principles of a topic and its application Ascertain how a topic relates to other areas and learn of the research issues yet to be resolved Quick tutorial reviews of important and emerging topics of research in Image Video Processing and Analysis Hardware Audio Acoustic and Speech Processing Presents core principles and shows their application Reference content on core principles technologies algorithms and applications Comprehensive references to journal articles and other literature on which to build further more specific and detailed knowledge Edited by leading people in the field who through their reputation have been able to commission experts to write on a particular topic

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The Journal of the Acoustical Society of America Acoustical Society of America,2005 **Blue Book** International Telegraph and Telephone Consultative Committee. Plenary Assembly,1989 Proceedings of the ... International Modal Analysis Conference & Exhibit ,1990 **Annual Index/abstracts of SAE Technical Papers** ,2007 **An Anthology of Articles on Spatial Sound Techniques** Durand R. Begault,Francis Rumsey,2004 **Library & Information Sciences** ,1988 *Cumulative Index to Entire IEEE Group Transactions/journals, 1951-1971: Subject* Nichigai Asoshietsu,1973

Audio Engineering Handbook K. Blair Benson,1988 *Radio & Television News* ,1950 Some issues Aug 1948 1954 are called Radio electronic engineering edition and include a separately numbered and paged section Radio electronic engineering issued separately Aug 1954 May 1955 *Archives of Acoustics Quarterly* ,2019 *Journal of the Institution of Electronics and Telecommunication Engineers* Institution of Electronics and Telecommunication Engineers (India),1981

Linear And Nonlinear Loudspeaker Characterization Book Review: Unveiling the Power of Words

In some sort of driven by information and connectivity, the power of words has be evident than ever. They have the capability to inspire, provoke, and ignite change. Such is the essence of the book **Linear And Nonlinear Loudspeaker Characterization**, a literary masterpiece that delves deep in to the significance of words and their effect on our lives. Compiled by a renowned author, this captivating work takes readers on a transformative journey, unraveling the secrets and potential behind every word. In this review, we shall explore the book is key themes, examine its writing style, and analyze its overall affect readers.

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Linear And Nonlinear Loudspeaker Characterization Introduction

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