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[A Listening Comparison of Far-Field Microphone Techniques](#)

Far-field pickup of large musical ensembles can use coincident, near-coincident, or spaced microphone arrays. After a brief theoretical introduction, an orchestra recording made by using the three microphone techniques simultaneously on multiple recorders will be demonstrated. . The demonstration tape has been edited to sequentially present the three basic techniques. Audible differences from each technique can then be easily compared.

Author: Shafer, Robert T.

Affiliation: WDET-FM, Wayne State University, Detroit, MI

AES Convention:69 (May 1981) **Paper Number:**1753 [Permalink](#) [Import into BibTeX](#)

Publication Date:May 1, 1981

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[The Countereffective Influence of the Audio Marketplace on the Musician/Consumer](#)

The apparent lack of planning and piecemeal approach to sound-system design by working musicians suggests less-than-ideal information transfer between the manufactures of audio equipment, the retail-level audio sales people, and the consumer. Often the perception of adequate information for efficient system design on the part of the musician is based on unacceptable premises. The author will define these premises, the reason for their propagation, and some possible palliative measures.

Author: Daniels, Drew

Affiliation: TEAC Corporation of America, Montebello, CA

AES Convention:69 (May 1981) **Paper Number:**1754 [Permalink](#) [Import into BibTeX](#)

Publication Date:May 1, 1981

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[Central Cluster Design Technique for Large Multipurpose Auditoria](#)

A step by step central cluster design procedure is given which is applicable to large multipurpose spaces. The procedure takes into account the factors of speech intelligibility, uniformity of coverage, , required sound pressure level, and the necessity for electrically reconfiguring the cluster for different events.

Authors: Patronis, Jr., Eugene T.; Donders, Catharina

Affiliation: Georgia Institute of Technology, Atlanta, GA

AES Convention:69 (May 1981) **Paper Number:**1755 [Permalink](#) [Import into BibTeX](#)

Publication Date:May 1, 1981

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Acoustic Radiation of a Horn Loudspeaker by the Finite Element Method: Acoustic Characteristics of a Horn Loudspeaker with an Elastic Diaphragm

Acoustical characteristics of an axisymmetric horn loudspeaker with an elastic diaphragm are calculated by applying the Finite Element method to both the elastic diaphragm and the acoustic cavity of a horn mounted in a rigid infinite baffle. Acoustic radiation into the semi-infinite space is treated analytically in terms of the velocity potential that is given as the integral of the product of particle velocity and Green's function. Vibrational behavior of the diaphragm, driving point impedance, sound pressure distribution inside the horn, nearfield and fourfold acoustic radiation are presented for discussion. Experimental validity of the calculated characteristics is confirmed for the horn loudspeaker in fourfold sound pressure responses.

Authors: Kyouno, Noboru; Sakai, Shinichi; Morita, Shigeru; Yamabuchi, Tasuo; Kagawa, Yukio

Affiliations: Mitsubishi Electric Corporation, Kamakura, Japan ; Toyama University, Toyama, Japan(See document for exact affiliation information.)

AES Convention:69 (May 1981) **Paper Number:**1756 [Permalink](#) [Import into BibTeX](#)

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THE AUTOBIAS AMPLIFIER: A New Topology for Automatically Biased Audio Amplifiers Using Power MOSFETs

An obstacle blocking wide acceptance of power MOSFETs in audio amplifiers is the lack of an automatic bias technique. A unique circuit topology senses and maintains quiescent current despite the half-wave pulses inherent in class AB operation. Performance of the circuit, consisting of little more than a differential amplifier driving a totem pole output, rivals that of more complex circuits.

Author: Roehr, Bill

Affiliation: Siliconix, Inc., Santa Clara, CA

AES Convention:69 (May 1981) **Paper Number:**1757 [Permalink](#) [Import into BibTeX](#)

Publication Date:May 1, 1981

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A Polar Plot Method of Loudspeaker Array Design

By using overlays of loudspeaker polar plots (readily available in product literature) and both vertical and horizontal "polar plots" of a room, a loudspeaker array may be effectively designed. This method will not only show the effect of loudspeaker polar patterns in the room, but will also show visually the interaction between loudspeaker polar pattern(s) and inverse square law as overlays are manipulated in real time. Simple formulas for producing the room "polar plots" will be presented, as well as computer programs in Basic and HP-41C.

Author: Becker, Farrel M.

Affiliation: Audio Artistry, Kensington, MD

AES Convention:69 (May 1981) **Paper Number:**1758 [Permalink](#) [Import into BibTeX](#)

Publication Date:May 1, 1981

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LSIs for Digital Signal Processing Based on a PCM Standard Format

Two LSIs and one IC have been developed for PCM digital signal processing based on a PCM standard format. These two LSIs and one IC can provide the same processing capabilities as about 500 conventional logic ICs, thus allowing much more compact dimensions for digital signal processing.

Authors: Hirota, Yutaka; Senoo, Takanori; Eguchi, Takashi; Takeguchi, Nobuyasu; Nomura, Kazuo; Kameda, Keiichi

Affiliation: Matsushita Electric Industrial Co., Ltd., Osaka, Japan

AES Convention:69 (May 1981) **Paper Number:**1759 [Permalink](#) [Import into BibTeX](#)

Publication Date:May 1, 1981

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Digital Audio Cassette Recorder with Built-In VHS Video Tape Mechanism in a Single Unit

The SV-P100 PCM cassette recorder with a remarkably high performance has been developed with a digital signal processing technique. It offers the following features over and above a conventional PCM processor using a home-use VTR as the recording/reproduction medium: 1) Full range of functions thanks to new construction integrated with a full-logic control VHS tape mechanism, and 2) high performance and high-level functions combined with compact size and low cost thanks to introduction of LSIs (2 MOS types, 1 bipolar type) for PCM digital signal processing, and analog-to-digital and digital-to-analog converters. The basic design has been

carried out in consideration for future facilities for professional use. These include a digital editing equipment and other accessories for PCM digital systems.

Authors: Obata, Shuichi; Hirose, Teruo; Odaki, Kanji; Sano, Nobuya; Yamashita, Kazuhiko; Hirota, Yutaka

Affiliation: Matsushita Electric Industrial Co., Ltd., Osaka, Japan

AES Convention:69 (May 1981) **Paper Number:**1760 [Permalink](#) [Import into BibTeX](#)

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Manipulating the Response of Multiway Loudspeaker Crossovers

The use of tactics such as introducing time delay, modifying crossover filter parameters, adjusting crossover frequencies, and inverting the polarity of some drivers in order to improve the amplitude and phase response of crossover systems is reviewed in this paper. It is shown that improvements indicated solely by study of the steady state frequency domain results can be quite misleading. Time domain results show clearly that some tactics, such as inversion of the polarity of some drivers, will cause transient response catastrophies which should be avoided. The use of time delay obtained through physical offsetting of drivers is shown to have a strong effect on transient response as well as frequency and phase response of multiway loudspeaker sand time delay can improve the expected response from some selected crossover configurations.

Authors: Greiner, Richard A.; Allie, Mark

Affiliation: University of Wisconsin-Madison, Madison, WI

AES Convention:69 (May 1981) **Paper Number:**1761 [Permalink](#) [Import into BibTeX](#)

Publication Date:May 1, 1981

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Tone Burst Testing on Selected Electronic Crossover Networks

This paper presents measurements in the form of time domain oscilloscope traces of the tone burst responses of several popularly used electronic crossover networks. The tone burst test is an especially useful waveform for quick and decisive impression of the problems associated with crossover networks. The results should convince any remaining doubters that there are real problems still to be solved in this area.

Author: Greiner, Richard A.

Affiliation: University of Wisconsin-Madison, Madison, WI

AES Convention:69 (May 1981) **Paper Number:**1762 [Permalink](#) [Import into BibTeX](#)

Publication Date:May 1, 1981

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[The Interrelation Between Fundamental Parameters and Low Frequency Response in Dynamic Loudspeakers](#)

This paper examines the relative variations of low frequency characteristics to fundamental parameters in dynamic loudspeakers. The analysis results, as demonstrated by efficiency response, may provide appropriate technical methods for meeting prescribed specific requirements.

Author: Zhong, H. Y.

Affiliation: Shanghai Feng Lei Broadcasting, Shanghai, China

AES Convention:69 (May 1981) **Paper Number:**1773 [Permalink](#) [Import into BibTeX](#)

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[Phase Error in Tape Cartridges for Radio Broadcast Service](#)

Much discussion has evolved around the subject of phase error in stereo radio broadcast cartridge systems. A survey was made in the form of phase measurements at radio stations using the same equipment those stations used for on-air spots and music. This paper reports on the measurements taken and shows that much of the phase error is in excess of 50° and 10kHz.

Authors: Moris, Alfred H.; Mullin, John T.

Affiliation: 3M Company, St. Paul, MN

AES Convention:69 (May 1981) **Paper Number:**1774 [Permalink](#) [Import into BibTeX](#)

Publication Date:May 1, 1981

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[A New Vocal De-Esser](#)

The development and design of a high-quality vocal de-esser is described. Precise "ess" control is achieved by utilizing the characteristic properties of sibilants and a unique spectral detection technique. With appropriate gain reduction topologies, a constant sibilant balance can be maintained, independent of level or pre-equalization. The operating range exceeds 65dB without the need for user controls or adjustments. Other non-vocal applications of the methods illustrated are also discussed.

Author: Lemanski, Joseph B.

Affiliation: dbx, Incorporated, Newton, MA

AES Convention:69 (May 1981) **Paper Number:**1775 [Permalink](#) [Import into BibTeX](#)

Publication Date:May 1, 1981

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A Personal Computer Program for Optimizing Component Tolerances

A BASIC microcomputer program for examining effects of component tolerances on transfer functions is described. The user determines the transfer equation as a function of component values, and the program calculates the nominal, high, and low values of the desired network parameter versus frequency. Further, the program can tighten individual component tolerances to meet an arbitrary user-defined error window.

Author: Allen, William A.

Affiliation: dbx, Incorporated, Newton, MA

AES Convention:69 (May 1981) **Paper Number:**1776 [Permalink](#) [Import into BibTeX](#)

Publication Date:May 1, 1981

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Systematic Design of Accurate Pink Noise Filters

This paper presents a novel approach to the design of wideband pink noise filters. Two well known filter designs are analyzed and shown to exhibit errors of about 2dB. An original technique based on mathematical properties of the ideal transfer function is then developed, and used to design a circuit whose errors are an order of magnitude lower. Graphical data is also presented, illustrating the performance of the different filter designs.

Author: Powell, Lee

AES Convention:69 (May 1981) **Paper Number:**1777 [Permalink](#) [Import into BibTeX](#)

Publication Date:May 1, 1981

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The LaVerne Terrace Low Pass Filter

This paper presents the original theory and development of optimum LaVerne Terrace filters. These filters are designed to provide the same degree of stopband attenuation as Butterworth filters, while exhibiting much less overshoot in the step response. Numerical and graphical data for filters of the 4th through 9th orders are included, illustrating the advantages of the LaVerne Terrace Filter over comparable Butterworth and Bessel Filters.

Author: Powell, Lee

AES Convention:69 (May 1981) **Paper Number:**1778 [Permalink](#) [Import into BibTeX](#)

Publication Date:May 1, 1981

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Advancements in the USQ Family of Multichannel Reproduction Systems

The USQ family of multichannel sound reproduction systems has undergone several noteworthy refinements in recent years. Advances in encoding techniques and the commercial availability of the Tate Directional Enhancement System provide for fully compatible 2-channel storage, transmission and reproduction of surround programs while allowing the possibility of using 3- and 4-channel USQ systems for reproduction of height effects. A system for improved FM and television transmission of stereo and multichannel programs will be discussed. Performance criteria and design of commercially available encoders and decoders using current state of the art circuitry will also be presented.

Author: Badger, Greg

Affiliation: Audiometric Laboratories, Los Angeles, CA

AES Convention:69 (May 1981) **Paper Number:**1779 [Permalink](#) [Import into BibTeX](#)

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A Touch Sensitive Keyboard for Electronic Music

An interface system has been developed allowing for connection of a concert grand piano action and keyboard to a digital electronic music synthesizer. The interface uses machined-steel flags attached to the hammers and keys of the piano action which pass through phototransistor detectors. These detectors are scanned by a microcomputer and information about the velocity and sustained duration of each key depressed is passed on to the synthesizer.

Authors: Shapiro, Gerald M.; Cullen, Bill

Affiliation: Brown University, Providence, RI

AES Convention:69 (May 1981) **Paper Number:**1780 [Permalink](#) [Import into BibTeX](#)

Publication Date:May 1, 1981

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Mathematical Functions that Relate the Surround Sound Matrix to General Aspects of Mental Functioning

The orthogonal surround sound matrix is based on certain mathematical functions which are found in the mechanisms of sound localization in the mid-brain, with equivalent mathematical functions also being found in the thermodynamics and dynamics of external, material reality. The principles involved serve as a bridge which spans the gap between the mathematical functions that dominate mental life and those which predominate within material reality. Important implications are to be found in relating this concept to learning processes, and sound discrimination, and psycholinguistics.

Author: Baumzweiger-Bauer, William E.

Affiliation: Audio Metrics, Inc., Stamford, CT

AES Convention:69 (May 1981) **Paper Number:**1781 [Permalink](#) [Import into BibTeX](#)

Publication Date:May 1, 1981

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Tonal Effects of Close Microphone Placement

The effect of microphone placement on reproduced tonal balance is investigated for acoustic guitar, piano, electric guitar amplifier, and voice. The data presented are based on spectral measurements in various microphone locations, listening tests, and study of instrument radiation patterns. Suggestions are offered for close microphone placements and equalization to achieve various tonal effects, including the natural timbre of the instrument as heard at a typical listening position.

Author: Bartlett, Bruce

Affiliation: Shure Brothers Incorporated, Evanston, IL

AES Convention:69 (May 1981) **Paper Number:**1782 [Permalink](#) [Import into BibTeX](#)

Publication Date:May 1, 1981

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Selective Acoustic Absorber Design with Personal Calculators

Selective acoustic absorbers are frequently used to shape the acoustic environment of closed spaces prone to unwanted resonances. Two of the most widely used are slot absorbers and "B" panels both of the Hemholtz family. The formulas for calculating each type are straightforward, but when the many variables are combined and changed frequently, the formulas become cumbersome with multiple calculation. The personal calculator provides

easy calculation of the formula permutations and hard copy labeling of the absorber design through programs for the Hewlett Packard 67, 97, and 41C. Barcodes and longhand program listing are featured.

Author: Berger, II, Russell E.

Affiliation: Arnold & Morgan Music Co., Inc., Dallas, TX

AES Convention:69 (May 1981) **Paper Number:**1783 [Permalink Import into BibTeX](#)

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Improvements in Monitor Loudspeaker Systems

As the recording industry enjoys the benefits of both digital and advanced analog recording technology, attention is appropriately focused on the use of compression driver and horn designs which are some 25 to 30 years old. Evolutionary improvements in woofers, compression drivers, and dividing networks combined with new constant coverage horn designs have resulted in frequency response more consistently uniform at all coverage angles (yielding flat power response) along with lowered distortion and increased acoustic power output at the frequency extremes.

Authors: Smith, David; Keele, Jr., D. B. (Don); Eargle, John

Affiliation: James B. Lansing Sound, Inc., Northridge, CA

AES Convention:69 (May 1981) **Paper Number:**1784 [Permalink Import into BibTeX](#)

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Graphic Equalizer with Microprocessor

A graphic equalizer with a built-in microprocessor has been developed to enable automatic acoustic controls. This paper describes how a 4-bit microprocessor stores manually-set fader positions in RAM, recalls them and achieves acoustically flat response.

Authors: Takahashi, Susumu; Kameda, Hiromi; Tanaka, Yuzuru; Miyazaki, Harumitsu; Chikashige, Tadaaki; Furukawa, Masanobu

Affiliation: Sansui Electric Co., Ltd., Tokyo, Japan

AES Convention:69 (May 1981) **Paper Number:**1785 [Permalink Import into BibTeX](#)

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Loudspeaker Coverage by Architectural Mapping

A new technique uses rectangular to spherical coordinate transforms to generate an angular map, displaying auditorium seating in latitude and longitude angles as seen by the loudspeaker. Loudspeaker coverage and inverse-square losses can be instantly determined by this method. Loudspeaker radiation angular contours are presented for a number of commercial high frequency horns, as well as software for automatic computation of map point locations.

Author: Uzzle, Ted

Affiliation: Altec Lansing Corporation, Anaheim, CA

AES Convention:69 (May 1981) **Paper Number:**1786 [Permalink Import into BibTeX](#)

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Synthesis by Amplitude and "Brightness" Matching of Analyzed Musical Instrument Tones

Time-variant index and amplitude parameters for a computer model are calculated by matching the instantaneous spectral center ("brightness") of a synthetic tone and minimizing the rms error with respect to an original tone. Synthesis accuracy is gauged by measuring the difference between the spectra of the original synthetic tones and by listening tests. Nonlinear and FM synthesis models are compared by means of graphics and taped examples.

Author: Beauchamp, James W.

Affiliation: University of Illinois at Urbana-Champaign, Urbana, IL

AES Convention:69 (May 1981) **Paper Number:**1787 [Permalink Import into BibTeX](#)

Publication Date:May 1, 1981

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Optically Encoded Moving Shutter Attenuator

This attenuator approach features an optically encoded position sensing slider with digital output for controlling amplifier gain. The slider incorporates a uniquely patterned moving shutter, no moving electrical contacts or parts, for quiet operation and long life. The optical sensing of position can be easily programmed to any attenuation curve or sequence of events and outputted through microprocessing interface or directly to a DAC and VCA.

Author: Keller, G. James

Affiliation: Harris Corporation, Quincy, IL

AES Convention:69 (May 1981) **Paper Number:**1788 [Permalink Import into BibTeX](#)

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Television Multiplex Broadcast Systems for Stereo, Bilingual and Other Services

Reference is made to the successful operation of a stereo and bilingual multiplex broadcast system by Japanese television stations. Background information relating to the development of TV multiplex systems is presented. problems involved in adapting multiplex systems for use at TV stations and at receiving equipment are set forth. Technical means for receiving these problems are presented. Proposed TV multiplex systems for use in the United States are outlined, including a review of procedures to be followed by the Broadcast Transmission Standards (BTS) Committee of the Electronic Industries Association (EIA).

Author: Halstead, William S.

AES Convention:69 (May 1981) **Paper Number:**1789 [Permalink Import into BibTeX](#)

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Refinements of the Threshold Error Correcting Algorithm

Refinements of the convolutional codes which were presented at the 67th AES Convention are examined. These refinements are feedback and multiple decoding. Using these improvements, it is possible to correct noisy signals having bit error rates of the order of 10^{-2} to one uncorrected error per hour. By interleaving or by increasing tap spacing, error bursts up to several thousand bits may be corrected. The addition of a parity bit which may be used for error concealment is also discussed. Error concealment techniques evaluated by listening tests will be reported. Implementation of both refinement schemes in hardware is of the same order of simplicity as the original mode.

Authors: White, Larry; Komamura, Mitsuya; Locanthi, Bart

Affiliation: Pioneer Development Laboratory, Pasadena, CA

AES Convention:69 (May 1981) **Paper Number:**1790 [Permalink Import into BibTeX](#)

Publication Date:May 1, 1981

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Digital Audio/Video Combination Recorder Using Custom Made LSI's, IC's

A digital audio/video recorder which combines the digital audio processor (which conforms to the requirements of the EIAJ Technical File) with the VHS-format color video cassette recorder (VCR) has been developed on a

commercial basis. The analog processor in the recorder contains IC-fashioned 14-bit analog-to-digital (A/D) and digital-to-analog (D/A) converters and a sample & hold (S/H) circuit, through which a distortion of less than 0.01% and dynamic range of better than 84 dB have been achieved. The digital processor in the recorder contains five newly developed CMOS LSI's of which signal processing system complies with the NTSC and PAL/SECAM television standards. Those LSI's are functionally equivalent to approximately 500 general purpose TTL integrated circuits, and provide increased data protection quality.

Authors: Arai, Takao; Ohashi, Shin-ichi; Takeuchi, Takashi; Akitake, Isao

Affiliation: Hitachi, Ltd., Yokohama, Japan

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M-S Stereo: A Powerful Technique for Working in Stereo

The practical requirements of broadcast and cinema stereo sound dictate the need for good stereo imaging, as well as full monaural compatibility. Coincident miking fulfills this requirements, and the most versatile of these techniques is the M-5 matrixing of a forward facing directional microphone with a laterally oriented bi-directional microphone. The results offer both good stereo perspective and full (discrete) monaural compatibility. The importance and implementation of this technique to the recording, broadcast, and film media will be discussed.

Authors: Dooley, Wesley L.; Streicher, Ronald D.

Affiliation: Audio Engineering Associates, Pasadena, CA

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An Improved Preamplifier Design

A discussion of preamplifier performance criteria with respect to audible differences between preamps is given. A series of highly dynamic tests is given to a good quality preamplifier and the distortion noted. A new preamplifier topology is presented which does not have nearly as much dynamic error and also performs well in steady-state tests.

Author: Harvey, Barry

Affiliation: Advanced Micro Devices, Sunnyvale, CA

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Publication Date:May 1, 1981

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The VU Meter

'What You See is What You Don't Get' may be a good description of the relative meter indications of the complex wave as viewed on either the PPM or VU meter. There are advantages to both displays. The obvious answer is a dual-function display. This paper describes an LED arrangement which indicates with both VU ballistics and peak indications on a single display. Representative program material will be presented to demonstrate the effectiveness of the ballistics of this device on the measurement of the complex wave.

Author: Dorrough, Michael

Affiliation: Dorrough Electronics, Woodland Hills, CA

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Polarity and Phase Standards for Analog Tape Recorders

Under suitable conditions, reversing the polarity of an audio signal produces an audible but subtle effect. We propose a polarity standard for analog tape recorders and reproducers in the face of several other proposals which are subject to misinterpretation or are used solely as in-house standards. The physical principles of the reproduction process are discussed to clarify the presentation and implementation of our proposed polarity standard.

Authors: Vanderkooy, John; Lipshitz, Stanley P.

Affiliation: University of Waterloo, Waterloo, Ontario, Canada

AES Convention:69 (May 1981) **Paper Number:**1795 [Permalink Import into BibTeX](#)

Publication Date:May 1, 1981

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The Acoustical Behavior of Pressure-Responding Microphones Positioned on Rigid Boundaries: A Review and Critique

Pressure-responding microphones have occasionally been placed on rigid boundaries for recording purposes, and indeed there is merit in this idea. A new type of microphone, called the "pressure zone microphone," has recently been introduced for this purpose. This microphone obscures the diaphragm from receiving any direct sound by pointing it towards the rigid boundary, in the mistaken belief that, were it pointing forwards, it would display the on-axis high-frequency rise characteristic of such microphones when used free-field. It is shown that this is not true and that for a given capsule size, the frequency and polar responses are significantly degraded by obscuring the diaphragm. Conversely, for a given frequency and polar response tolerance, a larger diaphragm, giving lower self-noise, could be used for a non-occluded design. We present both experimental data and a theoretical model to verify our contentions.

Authors: Lipshitz, Stanley P.; Vanderkooy, John

Affiliation: University of Waterloo

AES Convention:69 (May 1981) **Paper Number:**1796 [Permalink](#) [Import into BibTeX](#)

Publication Date:May 1, 1981

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Direct Low-Frequency Driver Synthesis from System Specifications

The usual procedure for direct-radiator low-frequency loudspeaker system design leads to calculation of the driver's fundamental electromechanical parameters by an intermediate specification of the Thiele/Small parameters. A reformulation of the synthesis procedure to eliminate the intermediate Thiele/Small calculation lends to a set of equations that yield the driver's electromechanical parameters directly from the system specifications.

Author: Keele, Jr., D. B. (Don)

Affiliation: University of Waterloo, Waterloo, Ontario, Canada

AES Convention:69 (May 1981) **Paper Number:**1797 [Permalink](#) [Import into BibTeX](#)

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Large Scale Integrated Circuits for PCM Audio Processors

These recently developed LSIs are for use in EIAJ-format PCM processors to be used together with 1/2-in video cassette recorders. As well as combining all the features of conventional digital signal processing circuits, these LSIs ensure the following: 1) When used with 1/2-in VCRs, they can reproduce high quality sound with improved stability, and 2) they increase the range of applications. Their design features make possible more compact PCM processors using less parts, enabling us to design high performance and less costly PCM audio equipment.

Authors: Fujimoto, Masahiro; Kobari, Harukuni; Ohashi, Shin-ichi; Arai, Takao

Affiliations: JVC Audio Engineering Research Center, Yamato, Japan ; Hitachi Consumer Product Research Center, Yokohama, Japan(See document for exact affiliation information.)

AES Convention:69 (May 1981) **Paper Number:**1798 [Permalink](#) [Import into BibTeX](#)

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State-of-the-Art Cinema Sound Reproduction Systems: Technology Advances and System Design Considerations

Today's state of the art criteria for motion picture sound reproduction may fall far short of meeting the demands of motion picture audiences in five to ten year's time. Present day A-chain capabilities far exceed the capabilities of motion picture theater playback equipment, and the gap widens at an ever increasing rate. The authors propose a quantum improvement in film sound playback systems as a necessary ingredient to gain significant improvements in sound quality in the motion picture theater.

Authors: Engebretson, Mark; Eargle, John M.

Affiliations: Advanced Technology Design, Van Nuys, CA ; James B. Lansing Sound, Inc., Northridge, CA(See document for exact affiliation information.)

AES Convention:69 (May 1981) **Paper Number:**1799 [Permalink](#) [Import into BibTeX](#)

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A Microphone Technique Applying the Principle of Second-Order Gradient Unidirectionality

This paper presents a theoretical basis and practical implementation of a microphone technique, which combines first-order gradient and second-order gradient unidirectional characteristics, and allows for a degree of the adjustment of magnitude and polar response. The proposed technique, through transition into the second-order gradient system, extends the high directivity of pickup to low frequencies. This is desirable because most instruments radiate low frequencies unidirectionally and low frequency energy is not easily dissipated in a room. The result of this application is a more defined sound with less low frequency ambient leakage and improved separation.

Author: Woszczyk, Wieslaw R.

Affiliation: McGill University, Montreal, Canada

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A Family of Linear-Phase Crossover Networks of High Slope Derived by Time Delay

The design of linear-phase crossover networks has until now necessitated the use of crossovers at least one of whose outputs suffers from either frequency response ripple in the passband or low rolloff rate in the stopband. It may be desirable, at least for experimental purposes, to construct a high-quality loudspeaker which avoids the all-pass phase characteristic exhibited by the best of conventional Butterworth or Thiele-Linkwitz-Riley-derived high-slope crossovers, because such phase distortion can subtly degrade some program signals. This paper generalizes a recent suggestion and shows how, by introducing a suitable time delay into the signal path, a family of complementary constant-voltage crossovers can be synthesized with high slopes in both low-pass and high-pass outputs. Such crossovers are also applicable more widely, for example in bandsplitting companders, limiters and signal processors of various kinds. The performance of the new crossover design for different low-pass alignments is discussed in some detail.

Authors: Lipshitz, Stanley P.; Vanderkooy, John

Affiliation: University of Waterloo, Waterloo, Ontario, Canada

AES Convention:69 (May 1981) **Paper Number:**1801 [Permalink Import into BibTeX](#)

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100 Years with Stereo!: The Beginning

This paper describes details about the first real stereo performance that took place in Paris during the first Electrical Exhibition, August, 1881 - 100 years ago. (Editor's Note: in German.)

Author: Hertz, Bent F.

Affiliation: Danish Broadcasting, Copenhagen, Denmark

AES Convention:68 (March 1981) **Paper Number:**1724 [Permalink Import into BibTeX](#)

Publication Date:March 1, 1981

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Electronic Editing in the PCM Recording Using U-Type VTR

A professional Digital Audio Mastering System using the U-type VTR with 3/4-in tape has been developed. The system is based on a PCM signal processor, an electronic editor, and a preview unit. The electronic editor and concerned techniques are described in this paper. Electronic editing techniques must be applied to the cartridge tapes because splicing them is not practical. The editor we have developed makes highly accurate editing (180μsec) possible without risking the original tape which cannot be attained with analog editing by splicing. Other facilities of this editor are cross-fading which can eliminate noise due to abnormal level changes at the editing point and level control of the signal being recorded. Since the signal data representing editing point are stored in the memory together with vicinity information, the editing point can be searched with the same feeling as in analog editing and rehearsals can be performed by recalling data from the memory device without running the tape. These functions have been made possible with digital filtering and data reduction techniques.

Authors: Mori, Toshinori; Matsushige, Takashi; Yamada, Yasuhiro; Kosuda, Yukio

Affiliation: Victor Company of Japan, Ltd. (JVC), Kanagawa, Japan

AES Convention:68 (March 1981) **Paper Number:**1725 [Permalink](#) [Import into BibTeX](#)

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An Effective RAM Accessing Method for PCM Processing Systems

An effective method to control RAM in PCM digital audio processors using VCR has been studied. The main functions of the RAM is to interleave/de-interleave data during recording and playback respectively, and to absorb time base error of data caused by jitter of VCR. Newly developed RAM control method (called corn type) can reduce the necessary RAM size to one-half that of conventional method.

Authors: Ohashi, Shin-ichi; Arai, Takao; Fujimoto, Masahira; Kobari, Harukuni

Affiliations: Hitachi Ltd., Japan ; Victor Co. of Japan Ltd., Japan(See document for exact affiliation information.)

AES Convention:68 (March 1981) **Paper Number:**1726 [Permalink](#) [Import into BibTeX](#)

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TIM-Distortion in Monolithic Integrated Circuits: Measurements and Simulation

Linear amplifiers and preamplifiers for audio applications have a well-known intrinsic dynamic limitation known as slew-rate (SR) and produce distortion when the output signal slope (SS) tends to equal or exceed this limit. A great deal has been written on this subject over the last few years, but it is only recently that a clear and definitive analysis has been formulated. In a series of papers - Jung, Stephens, and Todd - have been able to determine

the relevant parameters for the formation of TIM distortion. It is a widespread belief that the use of large amounts of feedback is the cause of TIM distortion. Only recently has it been concluded that large amounts of feedback do not increase the possibility of TIM if the amplifier has a sufficiently high slew rate. In particular, for SS lower than SR, an increase in the feedback factor reduces the TIM, while for lower values of SR increasing the feedback increases the TIM, hence the TIM is under control for values of the ratio SS/SR less than unit. The SR of a hi-fi audio amplifier is therefore an essential design parameter, whereas the small signal parameters, the feedback factor, and the open-loop frequency response, are per se irrelevant as far as dynamic distortion is concerned. This paper describes the "IS-TIM" measurement system and the results of experimental and simulation work on monolithic preamplifiers and power amplifiers for hi-fi.

Authors: Antognetti, P.; Antoniazzi, P.; Meda, E.

Affiliations: SGS-Ates, Electronic Components SpA, Agrate B.za, Milano, Italy ; University of Genova, Italy(See document for exact affiliation information.)

AES Convention:68 (March 1981) **Paper Number:**1727 [Permalink](#) [Import into BibTeX](#)

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A Contribution to the Objective Investigation of the Frequency Response Characteristics of the Multiway Loudspeaker Cabinet Systems

The objective investigations of the frequency response characteristics of the four-way loudspeaker cabinet system JBL 4343 were carried out. The investigations were performed in an anechoic chamber, a recording studio, and a control room of Radio Beograd. More than one hundred frequency response characteristics were obtained under different measurement conditions. The comparative analysis was carried out to determine the influence of the measuring microphone position and the acoustic characteristics of the surrounding. The measurements confirmed that the frequency response characteristic could be improved by reversing the polarity of the bass driver and using the built-in contour controls. Unfortunately it seems that it is not enough for small control rooms in the low frequency range because of the influence of room resonance phenomena. The sound pressure level fluctuations exceeded 10 dB. In principle, one can find a rather flat frequency response characteristic by changing the positions, either of the measuring microphone or of the loudspeaker system, but in practice this is not applicable to small room conditions. The only possibility to solve the problem is the use of a graphic equalizer. Some subjective tests of the loudspeaker system quality were carried out equally.

Authors: Guzina, Blazo; Kurtovic, Husnija

Affiliations: Radio Beograd, Yugoslavia ; Faculty of Electrical Eng., Beograd, Yugoslavia(See document for exact affiliation information.)

AES Convention:68 (March 1981) **Paper Number:**1728 [Permalink](#) [Import into BibTeX](#)

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Amplifier Remote Sensing Technique for Driving Speakers

To drive a speaker with an amplifier requires a connection cord between the two units. The connection cord carried not only the speaker drive current but also current due to the speaker counter-electromotive force, causing a voltage drop. This fact allows no accurate transmission of output information from the amplifier to the speaker. To eliminate any transmission loss, we developed the technique of remote sensing that provides negative feedback to the amplifier from the speaker input terminal. This technique has brought about satisfactory results. This paper reports the theoretical analysis of the technique and its effects when compared with conventional systems.

Authors: Tamura, Eijiro; Sakamoto, Hideto; Matsuoka, Susumu

Affiliation: Trio Kenwood Electronics N.V., Zaventem, Belgium

AES Convention:68 (March 1981) **Paper Number:**1729 [Permalink](#) [Import into BibTeX](#)

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Optimum Reverberation Times of Monitor Rooms and Listening Rooms

Relationships among halls, studio monitor rooms, and listening rooms are described from the aspect of sound recording and reproduction. It will be shown that the reverberating time is an important factor in a room where a musical sound is reproduced. The optimum reverberation time for studio monitor rooms and listening rooms will be proposed and compared with measured results.

Authors: Hirata, Yoshimitsu; Matsudaira, T. K.; Nakajima, H.

Affiliations: Waseda University, Tokyo, Japan ; Sony Corporation, Tokyo, Japan(*See document for exact affiliation information.*)

AES Convention:68 (March 1981) **Paper Number:**1730 [Permalink](#) [Import into BibTeX](#)

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Experiments in Hearing with Magnetomotorically Induced Tone

This paper describes the experiments in which the magnetic field around the coil currently driven by an audiofrequency signal causes the vibration of a tiny magnet stuck in the eardrum. This produces a tone registered from the outside by a tiny microphone in the outer auditory passage. The tone level is proportional to the eardrum vibration amplitude. The research into the acoustic reflex caused ipsilaterally and contralaterally has displayed certain dynamic characteristics of the ear.

Author: Ribic, Zlatan

Affiliation: GHETALDUS, Varazdin, Yugoslavia

AES Convention:68 (March 1981) **Paper Number:**1731 [Permalink](#) [Import into BibTeX](#)

Publication Date:March 1, 1981

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Is Linear Phase Worthwhile?

This paper investigates the improved performance of 'linear phase' loudspeakers. It was found that phase distortions several times greater than that introduced by conventional speakers are inaudible on speech and music signals. However, making speakers minimum phase also improves other performance aspects which lead to their enhanced stereo and depth presentation. Arising from these findings are guidelines to designing loudspeakers with these characteristics.

Author: Lee, Richard

Affiliation: Rank HiFi, Bradford, England

AES Convention:68 (March 1981) **Paper Number:**1732 [Permalink](#) [Import into BibTeX](#)

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A Flexible Digital Sound Editing Program for Minicomputer Systems

A FORTRAN-based program for digital sound recording, editing, and playback is described which operates in a minicomputer environment with disc storage and dual channel converters. Interactive operations facilitate rapid sound editing (via visual and aural monitoring), estimation and display of waveform parameters, and output of signals in a variety of flexible formats, thereby meeting the needs of both scientific audio research and creative sound editing.

Authors: Griffiths, M.; Bloom, P. J.

Affiliation: Polytechnic of Central London, London, UK

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A Method of Evaluation for Reproduced Sound Fields Using Crosspower Spectrum

It is known that subjective diffuseness of the sound field depends on interaural crosscorrelation function. This paper will present other parameters of the sound field which correspond to subjective diffuseness and subjective preference. Here, cross power spectrum is recommended because its characteristics in frequency domain are also important factors and relate to subjective diffuseness and subjective preference.

Authors: Motegi, A.; Okao, K.; Ohkawa, M.

Affiliation: Toshiba Corporation, Kawasaki, Kanagawa, Japan

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On Disk-Record Echo Phenomena

Pre- and post-echoes may disturb considerably listener's artistic sensations, especially in exciting or dramatic program titles; therefore, anti-echo measures should be a must for quality disc record manufacturers, at least regarding the classical repertoire. During the three disc manufacturing steps - transcription, electroforming, and pressing - numerous parameters exercise an influence on the echo formation. Within the scope of this report, only a few items of all facts checked within the echo field may be discussed. The article will present outward forms of pre- and post-echo which are characteristic for the .AM. three stages and it will yield the attempt to explain the mode of echo origin. A few indications on how to minimize the echo formation as much as possible will be given.

Author: Stephani, Otfried

Affiliation: Polygram GmbH, Hannover, West Germany

AES Convention:68 (March 1981) **Paper Number:**1735 [Permalink](#) [Import into BibTeX](#)

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An Interactive Multi Criteria Computer Program for the Synthesis of Loudspeaker Systems

The design of loudspeaker systems involves the satisfaction of multiple conflicting design specifications (frequency response, efficiency, distortion, damping...). The 'optimal' compromise solution is obtained inquiring the designer's preferences in the neighborhood of a tentative solution by means of an interactive program. The program in turn suggests a new solution which gives a compromise among criteria according to the suggested

preferences. The loudspeaker and enclosure design is used as an example and the indicated criteria are evaluated by means of the Small-Thiele model.

Authors: Guglielmone, C.; Campia, E.; Milanese, M.

Affiliations: Selectra-Revac, Torino, Italy ; Politecnico di Torino, Torino, Italy(See document for exact affiliation information.)

AES Convention:68 (March 1981) **Paper Number:**1736 [Permalink](#) [Import into BibTeX](#)

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Audio Restoration and Transfer Technology

This paper discusses the application of today's technology to the retrieval and restoration/preservation of audio sources. It outlines the technical growth of the recording industry, as well as its parallel industries (plating, cutting, and pressing), a thorough understanding of which is necessary for competent restoration work. Restoration equipment, the use of spectrum analyzers, voice identifications, and digital techniques of restoration are discussed.

Author: Owen, Tom

Affiliation: Rodgers and Hammerstein Archives of Recorded Sound, NY

AES Convention:68 (March 1981) **Paper Number:**1737 [Permalink](#) [Import into BibTeX](#)

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A Digital I/O Interface Suitable for Broadcasting Use

This paper presents a digital interface designed for interconnecting equipment at distances up to several hundred meters. A single cable arrangement is used to carry a monophonic or stereophonic program as well as synchronization information and user's bits. For maximum flexibility, the system is operated in a bus structure which allows interconnection of several pieces of equipment. A high degree of noise rejection is achieved by transformer coupling and use of screened pairs.

Author: Weisser, A.

Affiliation: TeleDiffusion de France, Paris, France

AES Convention:68 (March 1981) **Paper Number:**1738 [Permalink](#) [Import into BibTeX](#)

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Multipurpose High Speed Random Access System on PCM Audio Disc with Touching Pick-Up and Groove Guidance

High speed and accurate random access to high density storage video or PCM audio discs with groove-guided signal pick-up seems difficult to achieve. For the Telefunken/Teldec Mini Disc (MD) System a method for reliable and accurate random access has been developed. The signal bit rate needed for random access control is small and leaves room for another feature proposed: text information in the Videotext format.

Authors: Redlich, Horst; Busse, Wolfgang

Affiliations: TELDEC, Schallplatten GmbH, Berlin, W. Germany ; TELEFUNKEN Fernseh und Rundfunk GmbH, Hannover, W. Germany(See document for exact affiliation information.)

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The Influence of Some Parameters on the Quality of Spatial Impression with Transmission by Eidophony

There are especially two parameters of eidophonic transmission with great influence on quality of reproduction. The shape of the patterns of the two rotating microphones is found to be important for the impression of a sound source far away. The number of the speakers should be smaller than 2 x 6. This experience is confirmed by charts of constant phase. Such charts can be made easily with the aid of a computer. Each configuration of loudspeakers can be set up if one tries to get a good quality with less expenditure.

Author: Scherer, Paul

Affiliation: Technical University of Aachen, Aachen, W. Germany

AES Convention:68 (March 1981) **Paper Number:**1740 [Permalink](#) [Import into BibTeX](#)

Publication Date:March 1, 1981

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Transient Nonlinear Distortions: Duration and Structure of Components

Transient nonlinear distortions (TND) effect exists in each reflecting area and duration range is 10 - 100 ms. Spectral structure of the TND effect was investigated using sine wave and trumpet sound. Evolution of the first four components in time function will be presented including the measuring method and analysis. Average THD factor and relation to TND effect will be discussed.

Author: Wagnanski, Wladyslaw

Affiliation: Academy of Music, Warsaw, Poland

AES Convention:68 (March 1981) **Paper Number:**1741 [Permalink](#) [Import into BibTeX](#)

Publication Date:March 1, 1981

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Common-Mode Induced Distortion in Differential Stages

The characteristics of differential stages has been investigated. It has been found that common-mode signals induce even-order harmonics, and that this nonlinearity is dependent upon the differential stage's constant current generator. This may affect the overall characteristics of a feedback amplifier and its compensation requirements. It is also shown that the usual feedback model no longer accurately describes the amplifier's performance.

Author: Sandström, Terje

Affiliation: University of Oslo, Oslo, Norway

AES Convention:68 (March 1981) **Paper Number:**1742 [Permalink](#) [Import into BibTeX](#)

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Digital Audio Editor

As digital audio editing method is required to have equal or better function compared to the analog editing method, several important factors should be solved: 1) Easy location of edit point similar to the shuttling of the analog tape recorders, 2) high editing accuracy, and 3) smooth and natural signal continuity at the edit point similar to the diagonal tape-splicing of analog tapes. In digital audio systems employing VTR (video tape recorder), the electronic editor satisfied the important factors described above, as reported in this paper.

Authors: Ohtsuki, Tadashi; Kazami, Shinichi; Watari, Masao; Tanaka, Masato; Doi, Toshi T.

Affiliation: Sony Digital Audio Division, Atsugi Kanagawa, Japan

AES Convention:68 (March 1981) **Paper Number:**1743 [Permalink](#) [Import into BibTeX](#)

Publication Date:March 1, 1981

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Design Factors of Digital Filters for Audio Signals

This paper summarizes the features of digital signal processing with respect to digital audio applications. The most important filter types and their practical requirements are discussed. Data for typical realizations are provided and hardware concepts are discussed.

Author: Skritek, Paul

Affiliation: Technical University, Vienna, Austria

AES Convention:68 (March 1981) **Paper Number:**1744 [Permalink](#) [Import into BibTeX](#)

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Advanced Negative Feedback Design for High Performance Amplifiers

The need for high power at very low distortion levels leads to the employment of a new feedback design technique. This paper analyzes a theoretical approach and describes its practical design rules. The multiple poles and zeros 9 dB/octave network will be studied. A calculator program will be given to solve real design problems. The double loop feedback method will also be analyzed and its advantages, shown with the aid of the Baxandall Theorem.

Author: Bonello, Oscar J.

Affiliation: solidyne Srl., Buenos Aires, Argentina

AES Convention:68 (March 1981) **Paper Number:**1745 [Permalink](#) [Import into BibTeX](#)

Publication Date:March 1, 1981

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A New Image Enhancement Technique for Stereo Reproduction

An improved system for unlimiting and clarifying the sonic image in stereo loudspeaker reproduction is described. The system preserves fidelity in the central sonic image region and is adjustable for loudspeaker/listener positions and variations in source material.

Author: Cohen, Joel M.

Affiliation: Sound Concepts, Inc., Brookline, MA

AES Convention:68 (March 1981) **Paper Number:**1746 [Permalink](#) [Import into BibTeX](#)

Publication Date:March 1, 1981

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Ribbon Sendust Heads

Sendust material can now be produced in ribbon form which possesses all of the properties necessary for ideal tape heads for recording and playback: 1) High malleability, permitting easy machining, 2) high initial permeability, over 32,000, permitting high sensitivity for playback heads, 3) low coercivity, less than 0.2 Oersteds, permitting low magnetizing noise for record and playback heads, 4) high saturation flux density, over 9,000 gauss, permitting easy recording on high energy metal tapes, 5) thickness as small as 20 micrometers permitting high frequency performance comparable to the best ferrites to over 20 kHz, and 6) high wear-resistance, less than 2 micrometers per 1000 hours. Some details of the manufacturing process will be discussed along with the measured head performance data.

Authors: Tsukagashi, Tsnehiro; Ito, Hiroshi; Ogasawara, Kiyohide; Namaki, Tetsu; Yasuda, Shinji; Masumoto, Yutaka

Affiliation: Pioneer Electronic Corporation, Tokorozawa, Japan

AES Convention:68 (March 1981) **Paper Number:**1747 [Permalink Import into BibTeX](#)

Publication Date:March 1, 1981

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Differential Technology in Recording Consoles and the Impact of Transformerless Circuitry on Grounding Technique

Possibly the least understood problem encountered during the construction of a recording studio is the powering and grounding of the equipment. While the arts of acoustics, monitoring, and equipment, design have been studied extensively it seems that the art of studio powering and grounding has been left to the "Black Art" category. As an appendix I have included a short discussion of current differential technology being used in professional recording equipment. While many readers will sigh relief that their opinions concerning transformers have been proven true, the remainder of the readers will have their eyes opened.

Author: Hay, Thomas M.

Affiliation: MCI, Inc., Fort Lauderdale, FL

AES Convention:68 (March 1981) **Paper Number:**1748 [Permalink Import into BibTeX](#)

Publication Date:March 1, 1981

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A New Approach to Digital Sampling Frequency Conversion

Conversion between different sampling frequencies will be a necessity in many applications of digital audio, due to conflicting sampling rates in a different systems which may have to be interconnected. A universal sampling frequency converter for arbitrary sampling rates will be required. State of the art methods involving either a return in the analog domain or conventional FIR digital filtering are at present uneconomical and do not offer the flexibility required by digital audio applications. After a short review of these techniques, the paper presents a radically new approach to digital sampling rate conversion. It provides pitch-true, high accuracy conversion between arbitrary sampling frequencies. The implementation of the sampling-frequency converter is discussed, along with some applications in digital audio.

Authors: Lagadec, Roger; Kunz, Henry O.

Affiliation: Studer Revox, Regensdorf, Switzerland

AES Convention:68 (March 1981) **Paper Number:**1749 [Permalink](#) [Import into BibTeX](#)

Publication Date:March 1, 1981

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A New Approach to Transient Intermodulation (TIM) Distortion Measurements

Transient Intermodulation (TIM) has been recognized as an important source of imperfections in audio products. A set of test signals for assessing TIM performance has been proposed by Otala. If performed in a straightforward way, TIM determination using Otala's method requires complex measurement equipment and procedures. In this paper, the use of sampling and digital techniques for TIM measurements is proposed.

Authors: Lagadec, Roger; Weiss, Daniel

Affiliation: Studer Revox, Regensdorf, Switzerland

AES Convention:68 (March 1981) **Paper Number:**1750 [Permalink](#) [Import into BibTeX](#)

Publication Date:March 1, 1981

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Phase Modulation and Intermodulation in Feedback Audio Amplifiers

The recently published theory on feedback-generated phase modulation is reviewed, and the magnitude of closed-loop phase nonlinearity is calculated for various amounts of open-loop amplitude nonlinearity. A measurement method for this effect is outlined, and typical measurement results are shown.

Author: Otala, Matti

Affiliation: Technical Research Centre of Finland, Oulu, Finland

AES Convention:68 (March 1981) **Paper Number:**1751 [Permalink](#) [Import into BibTeX](#)

Publication Date:March 1, 1981

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New Investigations on Linearity Problems of Capacitive Transducers

Linearity problems are a major aspect in electroacoustical engineering. Improvements of recording techniques led to the point that the formerly negligible nonlinearities within the microphones have become obvious. Measurements on condenser microphones have shown that even moderate sound pressure levels may cause significant intermodulation distortion. The measurement results are presented and the influences of the different electroacoustical parameters are discussed. Improvements are described which are obtainable with a symmetrically constructed capacitive transducer.

Authors: Hibbing, Manfred; Griese, Hans-Joachim

Affiliation: Sennheiser electronic KG, Wedemark, West Germany

AES Convention:68 (March 1981) **Paper Number:**1752 [Permalink](#) [Import into BibTeX](#)

Publication Date:March 1, 1981

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Thiele-Small Nuts and Bolts with Painless Math

A simple hands-on method is needed to obtain the parameters of drivers with no available published data, or to confirm the data for an individual sample. This paper describes in detail, a quick and efficient process, using a minimum of test equipment and dedicated apparatus, based on the use of personal calculators. In most laboratories or audio workshops the system can be running in a day, and only minimal training is required to allow entry-level technicians to perform the actual tests.

Author: Daniels, Drew

Affiliation: Teac Corporation of America, Montebello, CA

AES Convention:70 (October 1981) **Paper Number:**1802 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Transducers

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The Status of Current Standards in Audio and Acoustics

Existing standards in the audio field into several categories. The most commonly recognized is the configuration standard which provides dimensional and operating limits for a device or a process. Such standards have provided us with interchangeable analog tape recordings, for example. Another category is the method for measurement which is sometimes combined with a configuration standard and provides repeatable and reproducible tests for a device or a process. Other categories include standard definitions, procedures, and performance levels. Such standards usually arise out of a need in the industry and are put into writing by several organizations not always in concert with one another.

Author: Queen, Daniel

Affiliation: Daniel Queen Associates, Chicago, IL

AES Convention:70 (October 1981) **Paper Number:**1803 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Standardization Activity of the AES

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A High-Efficiency Audio Power Amplifier

A small-sized audio amplifier with high power and low distortion has been developed. In the new system with a Class B output circuit, the power voltage supplied to the output stage of the amplifier is changed according to the input signal so that the voltage applied to the output element is controlled to a small constant value, thus remarkably decreasing the power dissipation of the amplifier. Through the new system, the total power dissipation of the conventional Class B amplifier has been decreased to 1/2, the size of the heat-sink to 1/5 and the weight of the set of 1/4, respectively. The new amplifier is highly efficient, showing a distortion of 0.01% (at 20kHz, maximum output) and S/N of 110dB (IHF-A network).

Authors: Nakagaki, Harushige; Amada, Nobutaka; Inoue, Shigeki

Affiliation: Hitachi, Ltd., Shiratoricho, Toyokawa, Japan

AES Convention:70 (October 1981) **Paper Number:**1804 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Circuit Design and Development

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A Decoded Digital-to-Analogue Converter for Audio

A digital-to-analog (D/A) conversion scheme will be presented which utilizes a decoded or segmented approach. The design technique improves differential linearity and stability which makes it ideally suited for audio

applications. Results of a number of converts which employ this technique will be presented. These converters range from 18 to a 14 bit monolithic.

Author: Wilensky, Samuel

Affiliation: Hybrid Systems, Billerica, MA

AES Convention:70 (October 1981) **Paper Number:**1805 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Digital Recording, Editing, Reproduction, and Signal Processing

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Flat Frequency Response Speaker System Using Flush-Filled Flat Diaphragm

We have developed the flush-filled flat diaphragm speaker system using our original metal cone technology. The purpose of the system is to get flat frequency response and to realize this, we also have made a new approach for better mechanical, electrical and acoustic performance. The actually measured frequency response is that from 22 Hz to 20 kHz, within ± 1.5 dB when this 270 litre system is mounted in the ground to get an infinite baffle effect.

Authors: Takami, Norihiko; Kawamura, Shinichiro

Affiliation: Hitachi, Ltd., Shiratoricho, Toyokawa, Japan

AES Convention:70 (October 1981) **Paper Number:**1806 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Transducers

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Hybrid RIAA Equalisation Circuit

A new topology for an RIAA equalization circuit is described. It employs both active and passive equalization techniques such that it combines the advantages of each of these methods and suffers from none of their disadvantages.

Author: Gift, Stephan J.

Affiliation: University of the West Indies, St. Augustine, Trinidad, West Indies

AES Convention:70 (October 1981) **Paper Number:**1807 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Disk Reproduction and Broadcast

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Anomalies in the Frequency-Length Functions in Violin Strings

A computer-controlled machine has been constructed which accurately stops the string of a violin at known positions. The string is excited electromagnetically at each position and the frequency measured. Correlation between body resonances and frequency perturbations is clearly demonstrated. Errors, often attributed to false strings, are inherent, and of the order of 10 to 30 cents. Violins vary widely.

Author: Pickering, Norman C.

Affiliation: The Norman Pickering Company, Southampton, NY

AES Convention:70 (October 1981) **Paper Number:**1808 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Electronic Music and Musical Instruments

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Digital Equalization and Mixing Circuit Design

Digital filtering is one of the most important technology in the field of digital audio. Digital filter circuits have so far been applied to digital audio equipments for real-time digital signal processing. We think, however, no specific theory of systematic designing has been developed yet in this area. Authors have some experience in developing digital audio equalizer circuits by digital filter technology, which makes it possible to realize the desired frequency response, and also have developed, for application of these circuits, the digital audio mixer having three position equalizer on each channel. Then followed the development of 8-channel input, 2-channel output digital audio mixers as well as the designing theory and its applications, of which descriptions are given in this paper.

Authors: Sakamoto, Naraji; Yamaguchi, Susumu; Kurahashi, Akira; Kogure, Takuyo

Affiliation: Matsushita Electric Ind. Co., Ltd., Osaka, Japan

AES Convention:70 (October 1981) **Paper Number:**1809 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Digital Recording, Editing, Reproduction, and Signal Processing

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A Digital Audio Reverberator

A digital audio mixer having 8-channel inputs and 2-channel outputs has been developed as a part of the digital audio system for professional use. As for the reverberation signal, this digital audio mixer has 4-channel AUX outputs. For musical sound mixing in the field of professional audio, a number of different reverberators have been developed such as a spring, metal-plate, magnetic tape and head. These equipments, however, do not seem to meet completely the requirements of the present recording industry. We have established a new

technology for sound composition in this area and have developed an equipment which makes it possible for us to realize effective sound through digital technique. Yet the reverberators may not be neglected particularly the specific sound effect highly effective for some kinds of music. The equipment that we have developed has a large capacity solid state memory, which memorizes the special sound composed of these kinds of reverberation signals. The reverberator has some switch functions to change the initial delay time and duration of the following continuous reverberation components. The principle and the practical design of this digital reverberator are described in this paper.

Authors: Sakamoto, Naraji; Kurahashi, Akira; Eda Hiro, Yasuaki; Yamaguchi, Susumu; Kogure, Takuyo

Affiliation: Matsushita Electric Ind. Co., Ltd., Osaka, Japan

AES Convention:70 (October 1981) **Paper Number:**1810 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Digital Recording, Editing, Reproduction, and Signal Processing

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A Proposal of Normalization for Binaural Recording

Binaural recording utilizing a dummy head is considered the most ideal method of preserving the original sound field. When proper equalization of the transfer characteristics are used, the fidelity of directions and distance is maintained. We propose a normalization process, to be applied during recording, which preserves the sound quality and distance and direction fidelity when played back by conventional stereophonic loudspeakers. This equalization of the dummy head transforms the signals such that they become equal to those obtained by intensity recording.

Authors: Gotoh, Toshiyuki; Kimura, Yoichi; Sakamoto, Naraji

Affiliation: Matsushita Electric Industrial Co., Ltd., Osaka, Japan

AES Convention:70 (October 1981) **Paper Number:**1811 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Microphones, Loudspeakers, Listeners, and Rooms

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A Calculator Program for Predicting Sound System Performance

The author presents a program written for hand-held programmable calculators which employs readily available base data and computes the most relevant performance criteria for supplied equipment in a given acoustic space.

The author also presents a technique wherein the affects of occupancy may be used to establish the minimum occupancy required to render a marginally performing sound system effective in an otherwise unsatisfactory setting.

Author: Bouliane, Thomas G.

Affiliation: Audio Contractors, Inc., Buffalo, NY

AES Convention:70 (October 1981) **Paper Number:**1812 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Sound Reinforcement and Room Acoustics

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Performance Characterization of Audio Reproducurs Using a Spectrum Analyzer and a Small Computer

Several quantities derivable from the frequency response of an audio output transducer can, when taken together, serve as the first approximation to the performance description of that product. A system is described which measures the frequency respone and from that data dalculators and prints the sensitivity, bandwidth, average midband standard deviation per octave, and the octaves of maximum output and maximum standard deviation.

Author: Van Weelden, Richard K.

Affiliation: Sears Roebuck and Company, Chicago, IL

AES Convention:70 (October 1981) **Paper Number:**1813 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Transducers

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Development of a Single Chip IC for Dolby B-C-Type Noise Reduction Systems

The Dolby C-type noise reduction (NR) system was designed to provide 20 dB of noise reduction compared to the 10dB obtained from the present Dolby B-type system. Although the Dolby C-type noise reduction system is much more complex, it was possible to design a single integrated circuit chip to operate in any of 3 modes (NR OFF/B/C) for either encoding (RECORD) or decoding (PLAYBACK) functions. Mode and function selection are accomplished by applying control volumes to only two pins of the standard 28 pin package.

Authors: Aizawa, Kohki; Haeno, Akira; Takizawa, Yoshiyuki; Nagashima, Nozomu; Suzuki, Nobuhiro; Yokogawa, Fumihiko

Affiliation: Pioneer Electronic Corporation, Saitama, Japan

AES Convention:70 (October 1981) **Paper Number:**1814 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Circuit Design and Development

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Assembling Audio: Design Considerations for Automatic PWB Assembly

With the ever increasing desire among electronic manufacturers to increase production and decrease cost, designing for automation is becoming an industry standard procedure. PWB designers now consider the tenth-grid system common place. Computer-Aided-Design-and Manufacturing (CAD/CAM) is in the forefront of all design considerations. Automated PWB assembly is a standard consideration in component layout and selection. In such a rapidly changing industry, it is the designers obligation to familiarize himself with the techniques, limitations, restrictions, and advantages of automated assembly. This paper will set forth guidelines for design of PWB's which are easily manufacturable using automated techniques.

Author: Bilow, Steven C.

Affiliation: Hughes Aircraft Company, El Segundo, CA

AES Convention:70 (October 1981) **Paper Number:**1815 [Permalink Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Circuit Design and Development

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A Method for Level Variance Analysis of Magnetic Tapes

This paper describes an analysis of level variance which is peculiar to magnetic tape recording. This level variance causes a calibration error in magnetic recording systems. The result of the analysis was applied to a micro-computer mounted cassette taperecorder which made possible the automatic adjustment of the recording level, frequency response and bias current. The adjustment is done in a time length which is much shorter than that of manual adjustment using a VU meter. From this analysis the accuracy of the adjustment has come to be estimated as a function of the time length which is determined by the conditions of level variation observation and averaging.

Author: Kitamura, M.

Affiliation: Victor Company of Japan, Ltd., Yamato-shi Kanagawa-Ken, Japan

AES Convention:70 (October 1981) **Paper Number:**1816 [Permalink Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Analog Recording and Reproduction

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Acoustic Scaling in the Design of Sound Control Rooms

Acoustic scale models are useful not only in the design of concert halls but also in the design of sound control rooms. In a model it is possible to study in advance at relatively low cost the impulse response, for examples, of the room and the influence of the shape of the room, certain surfaces, loudspeaker location etc, on the loudspeaker response in order to achieve good listening conditions in the final room. General principles of modelling are dealt with and some practical matters such as how to get the right kind of model absorbers and loudspeakers are discussed. Practical results of a 1/10 model of a music control room are given.

Authors: Borenus, Juhani; Pakarinen, Urpo

Affiliation: The Finnish Broadcasting Company, Helsinki, Finland

AES Convention:70 (October 1981) **Paper Number:**1817 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Studio Technology

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Acoustical and Electrical Interaction in Multi-Driver Arrays

The low frequency performance of a multi-driver loudspeaker system is related both to the basic parameters of the drivers and their electrical configuration. Two and four driver arrays are described. When using similar drivers with typical tolerances of the basic parameters best performance is obtained when the resonant frequencies of the drivers are matched. For a given set of drivers, the parallel or parallel-series electrical configurations give the best results.

Authors: Greiner, Richard A.; Allie, Mark

Affiliation: University of Wisconsin-Madison, Madison, WI

AES Convention:70 (October 1981) **Paper Number:**1818 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Microphones, Loudspeakers, Listeners, and Rooms

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Electronic Equalization of Closed Box Loudspeakers

The ideal response of sealed box loudspeaker systems is characterized by the resonant frequency and the Q of the system. It is possible to alter the system characteristics by electronic means. The practical limitations which exist due to driver parameter variations and increased power requirements are examined. Computer analysis indicates that the overall equalized frequency and transient response can be seriously degraded by variations in driver V_{as} and Q_{ts} of as little as twenty percent. Results indicate that through judicious design decisions this

technique may be successfully employed to improve the response of systems using drivers with realistic parameter spreads.

Authors: Greiner, Richard A.; Schoessaw, Michael

Affiliation: University of Wisconsin-Madison, Madison, WI

AES Convention:70 (October 1981) **Paper Number:**1819 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Transducers

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A Programmable Signal Processing System

A signal-processing system has been developed that provides all the benefits of conventional rack-mounted modular systems (compact size, flexibility, easy service and upgrade). In addition, a microprocessor-controlled programming system allows all control settings to be stored and recalled. A memory allocation system assures efficient use of the nonvolatile program memory. A proposed interface standard for controlling analog modules is presented, as well as several general computer control techniques, such as multiplexed sample-and-holds, operational transconductance amplifiers (OTAs), multiplying digital-to-analog converters (DACs), and analog switching.

Authors: Salani, Steve; Smith, Dave

Affiliation: Sequential Circuits, Inc., San Jose, CA

AES Convention:70 (October 1981) **Paper Number:**1820 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Studio Technology

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Synchro-Sonic Recording Techniques

Synchro-sonic refers to a type of music, a musical attitude, and the technology required to make synchro-sonic music. This paper examines the precedents of synchro-sonic music, how synchro-sonic techniques are used in modern recording studios, the advantages of recording synchro-sonically, and the future of synchro-sonic recording.

Author: Anderton, Craig

AES Convention:70 (October 1981) **Paper Number:**1821 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Electronic Music and Musical Instruments

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Using Musical Notes for Parameter Changes in Electronic Music

Every sound modelling technique carries with it a set of parameters which must be manipulated to produce the desired sonic result. These parameters are usually technical in nature and have little in common with the music being performed. This paper presents a technique which brings together the creative and the technical sides of electronic music.

Author: Tavel, Donald L.

Affiliation: Musico, Indianapolis, IN

AES Convention:70 (October 1981) **Paper Number:**1822 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Electronic Music and Musical Instruments

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A Measurement Method of Hum Modulation Caused by a Loudspeaker's Electromotive Force

This paper describes a new kind of power amplifier distortion caused by a loudspeaker's electromotive force. This distortion is a type of intermodulation distortion that arises from modulation of the power frequency and its harmonics by the reverse current flowing from the loudspeaker to the amplifier. This problem is pronounced around a speaker's resonant frequency, where the reverse current can nearly equal the applied current. Unlike conventional distortion measurements, our method uses test signals fed to the output terminals at which the distortion is measured. This paper also describes the relationship between the type of loudspeaker and the amount of electromotive current.

Authors: Takahashi, Susumu; Tanaka, Susumu

Affiliation: Sansui Electric Co., Ltd., Suginami-ku, Tokyo, Japan

AES Convention:70 (October 1981) **Paper Number:**1823 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Circuit Design and Development

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The Design of Distributed Sound Systems from Uniformity of Coverage and Other Sound Field Considerations

The sound distribution on a plane normal to the axis of a single loudspeaker can be approximated by a simple equation with known constants. The sound distribution on the listening plane of distributed systems can then be found. Maximum and minimum direct SPL values, relative to the axial values of a single loudspeaker, and their differences can also be expressed as simple equations with known constants along with the density in number of loudspeakers per - 6 dB coverage circle area. A method is given for designing distributed sound systems to satisfy a given maximum or minimum SPL relative to the axial level of a single loudspeaker or a given uniformity of coverage. A previous restriction of only six available combinations of loudspeaker patterns and degrees of overlap is removed by replacing such combinations by loudspeaker density even though it is not necessary to know the density to use the method and there need be no direct reference to it or the degree or overlap. Two transparent overlays are used with appropriately scaled room drawings giving a short design time and design flexibility. Values of all constants needed for the simple calculations and the planar -6dB coverage angles and radii are tabulated for a selection of loudspeakers. Worked examples are included.

Author: Sinclair, Rex

Affiliation: Altec Lansing Corporation, Anaheim, CA

AES Convention:70 (October 1981) **Paper Number:**1824 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Sound Reinforcement and Room Acoustics

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Off-Axis Performance of Multiple Loudspeakers

Methods are shown for calculating Q at different positions in the listening plane of a distributed system and in different directions for a central array. Total power radiated onto different surfaces, positional or directional dependence of critical distance and articulation loss of consonants can be found. For central arrays, design overlays can be created. For distributed systems, design graphs are included for several example loudspeakers.

Authors: Sinclair, Rex; Uzzle, Ted

Affiliation: Altec Lansing Corporation, Anaheim, CA

AES Convention:70 (October 1981) **Paper Number:**1825 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Microphones, Loudspeakers, Listeners, and Rooms

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An Introduction to Helium Reflex Loudspeakers

This paper describes how the use of a gas with a negative Joule-Thompson coefficient will provide a means for effectively increasing the volume of a loudspeaker enclosure. The Joule-Thompson effect describes how real gases deviate from ideal behavior. A negative coefficient indicates the gas heats upon expansion and cools on compression, as well as to what degree. Using this principle, we have developed an enclosure theory that allows either a large reduction in enclosure volume without affecting performance, or a significant improvement in performance at a given volume. This new principle is designated Helium Reflex.

Author: Allen, James C.

Affiliation: Allen Engineering, Andover, MA

AES Convention:70 (October 1981) **Paper Number:**1826 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Transducers

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New Modulation Technique for High Density Recording on Digital Audio Discs

A new modulation scheme for a run length limited (RLL) Code is suggested in this paper which applies well to high density recording for digital audio discs (DAD). When this code is recorded in the optical DAD system, the opening of the eye pattern is the largest among traditional modulation schemes at bit rates of 1Mb/s to 2.8Mb/s.

Authors: Moriyama, Yoshiaki; Yamagata, Kenji; Suzuki, Tsutomu; Iwasawa, Takashi

Affiliation: Pioneer Electronic Corporation, Saitama, Japan

AES Convention:70 (October 1981) **Paper Number:**1827 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Digital Recording, Editing, Reproduction, and Signal Processing

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The Fiber Optic Guitar

A Fiber Optic Guitar (Patent Pending) provides an innovation in amplified musical instrument design in which the musical notes and characteristic instrument sounds normally sensed by electromechanical devices such as magnetic pickups and acoustic transducers are now generated by the modulation of light within optical fibers (strings) and are optically transmitted without losses to distant amplifying devices. Problems associated with conventional electric guitars, such as induced noise and hum pickup, limited frequency response, short cable feeds and electric shock vulnerability, are virtually eliminated.

Author: Bowley, George A.

Affiliation: Dynamic Systems Inc., McLean, VA

AES Convention:70 (October 1981) **Paper Number:**1828 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Electronic Music and Musical Instruments

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Designing Low-Noise, High-Linearity and High-Speed Preamplifiers for Magnetic Transducers

An ultra-low-noise preamplifier front end configuration is determined through the analysis of the noise behaviour of a bipolar transistor, current mirror and an FET in relation to the noise performance of various preamplifier configurations. A design for Hi-Fi performance, in accordance with the demand for a low-noise, high-linearity and high-speed preamplifier for use with a magnetic transducer, is then presented.

Author: Ogwang, D. Okel

Affiliation: Hunter College of CUNY, New York, NY

AES Convention:70 (October 1981) **Paper Number:**1829 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Disk Reproduction and Broadcast

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An Analysis of the Ghent Microphone System

The SQ Ghent Microphone System generates a new kernel encoding for the SQ code, compatible with fixed and adaptive SQ matrix decoders. In the USQ system, a 0-3-4 encoding is provided for multiplexed FM transmission, and the stereo channels retain the 0-2-4 encoding enabling surround reproduction from existing stereo receivers. Several parameters of the microphone encoding may be adjusted for optimum results in different environments.

Author: Willcocks, Martin E. G.

Affiliation: Willcocks Research Consultants, Los Angeles, CA

AES Convention:70 (October 1981) **Paper Number:**1830 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Microphones, Loudspeakers, Listeners, and Rooms

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Transformations of the Energy Sphere

By application of suitable matrices to a phase-amplitude surround reproduction system, the energy sphere may be rotated or boosted as desired. Practical applications of this technology are included.

Author: Willcocks, Martin E. G.

Affiliation: Willcocks Research Consultants, Los Angeles, CA

AES Convention:70 (October 1981) **Paper Number:**1831 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Signal Processing

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[A Multi-Track Digital Audio Recorder for Consumer Applications](#)

A prototype multi-track digital audio recorder is described. Two audio channels are sampled and coded by 14-bit linear quantization. The sampling rate is 44.1kHz, the tape speed is 9.5 cm/sec. and the tape width is 1/4 inch. The channel code (a dc free block code) makes use of the statistics of the audio signal. Precautions are taken to limit the crosstalk in the 16-track ferrite head stack. Error correction and concealment techniques are applied to compensate for random and burst errors.

Authors: van Gestel, Wilm J.; Driessen, Léon M.; Moeskops, John C.

Affiliation: Philips Research Laboratories, Eindhoven, the Netherlands

AES Convention:70 (October 1981) **Paper Number:**1832 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Digital Recording, Editing, Reproduction, and Signal Processing

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[A New Technique for Minimizing Distortion](#)

Most amplifiers today are based on designs which exhibit low distortion. Feedforward and feedback schemes have been suggested to further refine the circuit performance, each processing inherent advantages and drawbacks. A method is presented in this paper which provides an improvement in performance by modulating the loop gain of a feedback amplifier. Following a theoretical discussion are experimental results which test the theory.

Author: Frey, Douglas R.

Affiliation: Lehigh University, Bethlehem, PA

AES Convention:70 (October 1981) **Paper Number:**1833 [Permalink Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Signal Processing

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A New Tape Transport System with Digital Control

This paper analyzes a new design of tape transport system, developed for its use in a professional stereo recorder. Including only a few mechanical moving parts and five optical sensors, all its operation is electronically controlled without relays. A microprocessor based system commands all the transport functions, including multi-point search, by means of nine memories through a calculator type keyboard; it features constant tape tension and several characteristics. The equations of the tape's movement and the theoretical optimization of the fast search to cue algorithm will also be analyzed.

Author: Bonello, Oscar J.

Affiliation: Solidyne SRL., Buenos Aires, Argentina

AES Convention:70 (October 1981) **Paper Number:**1834 [Permalink Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Studio Technology

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Glass Fiber and Graphite Flake Reinforced Polyimide Composite Diaphragm for Loudspeakers

This paper describes a newly developed diaphragm material especially suitable for loudspeaker drivers. The new diaphragm using this material features a high Young's modulus and an appropriate mechanical loss. The diaphragm is composed of a glass fiber fabric base with a polyimide matrix polymer and a flaked graphite filler. Young's modulus for the new diaphragm is ten times higher than that of commonly used paper pulp diaphragms, with about the same mechanical loss.

Authors: Takahashi, Susumu; Katoh, Tomomi; Taguchi, Sadao; Watanabe, Toshio

Affiliation: Sansui Electric Co., Ltd., Tokyo, Japan

AES Convention:70 (October 1981) **Paper Number:**1835 [Permalink Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Transducers

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Direct AM Stereo Detection by a PLL Synthesized Synchronous Carrier Generator

It is now possible to combine a PLL frequency synthesizer and PLL synchronous detector to form a new demodulation system. In this circuit the crystal oscillator phase, which is the reference for the PLL frequency synthesizer, is controlled by the DC output voltage of the quadrature detector. Received frequencies are detected directly, without the need for super-heterodyne conversion. This detecting system incorporates very few inductors and can be produced in an integrated circuit. The system yields high fidelity AM reception, and is easily adapted for AM stereo.

Authors: Takahashi, Susumu; Iida, Hiroshi

Affiliation: Sansui Electric Co., Ltd., Tokyo, Japan

AES Convention:70 (October 1981) **Paper Number:**1836 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Disk Reproduction and Broadcast

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A New Method of Reducing Direct-Drive Motor Vibration in Turntables

As a direct-drive motor rotates, there are action/reaction forces set up between the platter and base (cabinet), and between the motor rotor and stator. These lead to tonearm vibrations which cause poor sound reproduction. This paper describes how these forces can be minimized by adding a second motor or torque generator. The main drive motor and second motor or torque generator are driven in reverse phase, which greatly reduces base (cabinet) vibration in the rotational plane. This technique provides a substantial improvement in tonal quality.

Authors: Fujimoto, Yasuhiro; Suzuki, Masao; Fujio, Kazuyuki; Sasamoto, Katsumi; Satoh, Yuji

Affiliation: Sansui Electric Co., Ltd., Suginami-ku, Tokyo, Japan

AES Convention:70 (October 1981) **Paper Number:**1837 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

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Design of Entertainment Equipment for Passenger Aircraft

Audio and video equipment for entertainment use on passenger aircraft must be specially designed to withstand the environmental rigors of flight and meet performance standards set by government agencies, air frame manufacturers, aviation associations, and airlines. Qualification procedures include environmental simulation trials, checkout of the effects of power input aberrations, EMI (electromagnetic interference) measurements, and airworthiness safety tests.

Authors: Raichel, Daniel R.; Margulies, Irving

Affiliations: Raichel Technology Group, Wyckoff, NJ ; Inflight Services, Inc., Jamaica, NY (See document for exact affiliation information.)

AES Convention:70 (October 1981) **Paper Number:**1838 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Signal Processing

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A New Run Length Limited Code

For increasing packing density of digital magnetic recording, improvement of modulation code has important role(1). (2,4,2,7) and (8,9,0,3) run length limited codes are presented. Evaluation of codes for error propagation, easiness of clock regeneration, and influence of intersymbol interference is described.

Authors: Furukawa, Teruo; Tanaka, Kunimaro; Kosunoku, Yoshitsugu

Affiliation: Mitsubishi Electric Corporation, Hyogo, Japan

AES Convention:70 (October 1981) **Paper Number:**1839 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Digital Recording, Editing, Reproduction, and Signal Processing

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A Hi-Fi Moving Magnet Cartridge Using Recent Technology

The cartridge described in this paper is a high performance moving magnet cartridge of original one-point suspension type, employing a disc-shaped high energy Sm-Co magnet in its electrical generating system. The major feature of this cartridge is the pure boron tapered pipe cantilever which contributes to a low effective moving mass (only 0.098mg). Another original development is the damper material used which effectively resists temperature changes in response characteristics. This is achieved by its specific viscous elastic characteristics. For magnetic transfer, this cartridge employs mirror polished HPF (Hot Pressed Ferriete) exhibiting excellent high range frequency response characteristics. As a result, this cartridge is capable of a frequency response extending from 5Hz to 100kHz, it also exhibits very low mechanical impedance and improved tracing ability.

Authors: Obata, Shuichi; Itoh, Masashi; Azuma, Koichi

Affiliation: Matsushita Electric Ind. Co., Ltd., Osaka, Japan

AES Convention:70 (October 1981) **Paper Number:**1840 [Permalink](#) [Import into BibTeX](#)

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A New Approach to High Speed Digital Signal Processing Based on Microprogramming

A microprogrammed high speed signal processor is presented here. Bipolar bit slice ALU along with high speed parallel multipliers enables the processing programs, such as digital filters and reverberation simulations which include many additions and multiplications, to be executed fast and efficiently. Microinstructions and microprogram development system, which are designed for this machine, will also be described.

Authors: Sekiguchi, Keisuke; Ishizaka, Koichi; Matsudaira, Takeshi K.; Nakajima, Heitaro

Affiliation: Sony Corporation, Kanagawa-ken, Japan

AES Convention:70 (October 1981) **Paper Number:**1841 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Signal Processing

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Phase Intermodulation Distortion: Instrumentation and Measurement Results

Phase intermodulation (PIM) in audio amplifiers, particularly that which may arise from the use of negative feedback, is considered. Coherent SMPTE-IM instrumentation capable of resolving two nanoseconds of equivalent time dispersion and measurement results from several different real amplifiers are presented. The results show that PIM is not a problem in contemporary amplifiers and that negative feedback reduces total PIM in most cases.

Author: Cordell, Robert R.

Affiliation: Bell Laboratories, Holmdel, NJ

AES Convention:70 (October 1981) **Paper Number:**1842 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Signal Processing

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A Woofer Using an Air Coupled Diaphragm

This air coupled woofer is designed for low frequency sound reproduction with high efficiency. The woofer was developed by applying a new analytic design which is CAD (Computer Aided Design) based. We made use of a built-in acoustic filter employing an air spring mechanism that is cleverly installed between the voice coil and the diaphragm. It is similar to, but a more advanced application of the Kelton concept loudspeaker. Calculations of the characteristic parameters agree closely with the measured results.

Authors: Mizutani, Toshiyuki; Ishii, Shinichiro; Fukuyama, Tatsuo; Shimada, Yasuomi

Affiliation: Matsushita Electric Ind. Co., Ltd., Osaka, Japan

AES Convention:70 (October 1981) **Paper Number:**1843 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Transducers

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The Audibility of Doppler Distortion in Loudspeakers

Although Doppler distortion in loudspeakers has been often viewed with alarm since Beers and Belar described it in 1943, the question of its significance in music reproduction has not yet been answered. In this study the audibility of Doppler distortion in simple direct radiators is investigated theoretically (by analogy to tape-machine flutter and by analysis of blind listening-room acoustic effects), and experimentally (by double-blind listening tests). The analysis predicts Doppler inaudibility for any practical cone velocity, and the experimental results provide confirming evidence.

Authors: Allison, Roy; Villchur, Edgar

Affiliations: Allison Acoustics Inc., Natick, MA ; Foundation for Hearing Aid Research, Woodstock, NY (See document for exact affiliation information.)

AES Convention:70 (October 1981) **Paper Number:**1844 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Microphones, Loudspeakers, Listeners, and Rooms

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The 'USI', or Universal Synthesizer Interface

The Universal Synthesizer Interface is a specification designed to enable inter-connecting synthesizers, sequencers and home computers with an industry-wide standard interface. This is a preliminary specification; comments, criticism, and alternative proposals are welcome. This interface specification has not been tested and would need to be retrofitted to any equipment presently in the field. The interface is basically specified as one-to-one between two units; ie, a synthesizer and a sequencer. Under certain circumstances, however, more units may be placed on a single line.

Authors: Smith, Dave; Wood, Chet

Affiliation: Sequential Circuits, Inc., San Jose, CA

AES Convention:70 (October 1981) **Paper Number:**1845 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Electronic Music and Musical Instruments

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Applications of Voltage-Controlled Amplifiers

The VCA, with its input, output, and control ports, is described as a generic building block in several designs including: VCO's and VCF's, tracking filters, spectrum analyzers, and distortion analyzers. Methods of remote gain control and console applications including digital control techniques are discussed with a comparison of designs using VCA's and faders.

Author: Allen, William A.

Affiliation: dbx, Inc., Newton, MA

AES Convention:70 (October 1981) **Paper Number:**1846 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Studio Technology

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Total Harmonic Distortion Measurements in Magnetic Tape Equipment

With audio equipment achieving ever higher standards of performance these days, the capability of measuring the performance parameters is becoming even more difficult. One such important parameter is total harmonic distortion (THD). Accurate measurement of total harmonic distortion requires not only very good test equipment, but also a clear understanding of what is really being measured to avoid errors in interpreting the measured results.

Author: Bates, Charles M.

Affiliation: International Tapetronics Corporation, Bloomington, IL

AES Convention:70 (October 1981) **Paper Number:**1847 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Analog Recording and Reproduction

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A High-Efficiency, One-Decade Midrange Loudspeaker

A study of professional sound reinforcement loudspeaker systems used for reproducing modern musical information suggests the need for an improved-format, optimized compression-driver/ horn-loudspeaker for midrange (200 Hz to 2000 Hz). Performance trade-offs are investigated. The final design is a driver with unusually high efficiency, high output capability and low distortion. Furthermore, it uses a novel-design diaphragm with improved mechanical behavior.

Authors: Howze, Bruce; Henricksen, Clifford

Affiliation: Community Light and Sound, Inc., Philadelphia, PA

AES Convention:70 (October 1981) **Paper Number:**1848 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Sound Reinforcement and Room Acoustics

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Phase Distortion and Phase Equalization in Audio Signal Processing: A Tutorial Review

Various definitions and measures of phase distortion are reviewed beginning with first principles. Numerous representative examples are included indicating quantitative amounts of phase distortion produced by microphones, loudspeakers, coaxial cables, anti-alias filters and magnetic recording. The effects of phase distortion on time-domain performance are discussed. A frequency-dependent tolerance on group delay distortion is developed based on seven different perceptual studies and compared with some representative measurements. New and complementary experiments are proposed to assess further the perceptual significance of phase distortion in music reproduction. Methods of phase equalization and phase equalizer design are presented. A new time-frequency display, showing both the location of a signal in time and its frequency spread, is introduced which provides a more unified view of time-domain and frequency-domain interrelationships.

Author: Preis, Douglas

Affiliation: Tufts University, Medford, MA

AES Convention:70 (October 1981) **Paper Number:**1849 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Analog Recording and Reproduction

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A 20 dB Audio Noise Reduction System for Consumer Applications

A 20 dB noise reduction system, designated C-type, for use in cassette tape recording and similar applications is described. An arrangement of two compressors and two expanders in cascade has been developed in which the signal to noise ratio improvement is compounded without significant accompanying increases of the overall

maximum compression and expansion ratio. Overshoots, modulation distortion, and noise modulation are well controlled. The demands made on transmission channel uniformity are generally unchanged from these associated with the B-type system. However, an improvement has been made in one condition of compressor/expander mistracking--namely low-level mid-frequency signals in combination with dominant signals in the region above 10kHz and incorrect channel response at such frequencies. A further development reduces the tendency of highly equalized channels to saturate, thereby increasing the useful signal levels which can be handled.

Author: Dolby, Ray

Affiliation: Dolby Laboratories, San Francisco and London

AES Convention:70 (October 1981) **Paper Number:**1850 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Analog Recording and Reproduction

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A Personal Calculator Program for Frequency-Domain Analysis of the Discrete Hilbert Transform

A calculator program which computes the weighted or unweighted discrete Hilbert transform of a sinewave signal is presented. Results may be tabulated or plotted. The transform may be computed at spot frequencies or over a range of frequencies, using a linear or logarithmic frequency scale. This program operates on a TI-59 and PC100C printer.

Author: Willcocks, Martin E. G.

Affiliation: Willcocks Research Consultants, Los Angeles, CA

AES Convention:70 (October 1981) **Paper Number:**1851 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Signal Processing

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Recording with Feedback Controlled Effective Bias

In magnetic recording, high frequencies present in the signal act as bias for lower frequencies. If supersonic bias is dynamically reduced by the same amount as the added effective bias of the audio signal, several advantages

result. The theoretical aspects of constant effective bias, the implementation in a cassette recorder, and the resulting improvements in quality are described.

Author: Jensen, Jørgen Selmer

Affiliation: Bang and Olufsen a/s, Struer, Denmark

AES Convention:70 (October 1981) **Paper Number:**1852 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Analog Recording and Reproduction

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A Compact, High Performance Cinema Loudspeaker for Dialogue, Music and Effects

A new, three channel, three way horn loaded loudspeaker with passive crossovers was designed and installed behind the screen of a large 1400 seat theater. Data from a variety of measurement techniques, including TEF (Time Delay Spectrometry with FFT impulse response) and IACC (Interaural Crosscorrelation Coefficient using dual FFT) will be presented which characterize the system relative to frequency response, power output, distortion, and stereo imaging.

Authors: Czerwinski, Eugene; Buck, Marshall D.

Affiliation: Cerwin-Vega, Inc., Arleta, CA

AES Convention:70 (October 1981) **Paper Number:**1853 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Sound Reinforcement and Room Acoustics

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Electrical Reproduction of Acoustically Recorded Cylinders and Disks

This paper will discuss the audio restoration and electrical recording of the Napleson cylinders from the 1901, 1902, and 1903 Metropolitan Opera seasons. Original Edison blanks were shaved and recorded (under controlled conditions) with pink noise, tone sweeps, digital-generated-frequency-source signal, and simultaneous recording, acoustically and electrically, of a wind ensemble. Acoustical analysis, groove analysis, wax formulation, surface-to-noise content, and horn-resonance frequencies were sampled and plotted. Slides and musical examples verify the results achieved.

Authors: Owen, Tom; Fesler, John C.

Affiliations: Rodgers and Hammerstein Archives of Recorded Sound, Performing Arts Research Center at Lincoln Center, New York, NY ; International Tapetronics Corporation, Bloomington, IL (*See document for exact affiliation information.*)

AES Convention:70 (October 1981) **Paper Number:**1854 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Studio Technology

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Satellite Broadcasting System for Digital Audio

Direct transmission of digital audio programs by satellite is studied. A prototype system was built to transmit 12 stereo (or 24 monaural) digital audio channels using the same bandwidth as a single video channel, encoded by QPSK.

Authors: Nakajima, Heitaro; Iga, Akira; Hideshima, Yasuhiro; Saito, Tomojiro; Sato, Teruo; Fujita, Etsumi

Affiliation: Sony Corporation, Tokyo, Japan

AES Convention:70 (October 1981) **Paper Number:**1855 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Disk Reproduction and Broadcast

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Channel Codings for Digital Audio Recordings

Channel coding is very important in order to obtain high density recording and high reliability at the same time. Several new channel codes are developed for the improvement of digital audio recordings. In this paper, the fundamental parameters for the evaluation of channel codes are described, and several conventional codes are explained with the application to the present digital audio systems. In comparison to those, new codes are discussed. One of the new codes is applied to the format of professional digital audio recorders. The other is applied to Compact Disc Digital Audio Systems.

Author: Doi, Toshi T.

Affiliation: Sony Corporation, Tokyo, Japan

AES Convention:70 (October 1981) **Paper Number:**1856 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Digital Recording, Editing, Reproduction, and Signal Processing

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Is Phase Linearization of Loudspeaker Crossover Networks Possible by Time Offset and Equalization?

Conventional loudspeaker crossover networks of slope greater than 6 dB/octave, when properly implemented, result in a loudspeaker system whose acoustic transfer function, although of flat magnitude, has all-pass phase characteristics. The system is thus non-minimum phase, and complicated phase equalization using delay equalizers is required in order to render it linear-phase and so transient-perfect. A number of attempts are currently being made to acoustically align such systems by deliberately either introducing or eliminating time delays between the drivers and using conventional minimum-phase equalization to flatten their overall frequency response. It is shown in this paper that no choice of inter-unit time delay can render the system minimum-phase, and hence that minimum-phase equalization cannot make such a system both flat and phase linear.

Authors: Vanderkooy, John; Lipshitz, Stanley P.

Affiliation: University of Waterloo, Waterloo, Ontario, Canada

AES Convention:70 (October 1981) **Paper Number:**1857 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Transducers

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[The Loudspeaker and Control Room as a Wholly Integrated System](#)

The recording studio control room and its loudspeaker monitor system, have been the target of a wide variety of design techniques over the past years. This presentation deals with the design and measured performance of a loudspeaker and control room in which the monitor loudspeaker is horn coupled to the room. The console and room become a manifold section of the horn. This provides a quantum increase in the efficiency of conversion of electrical input power to acoustical output power, extends the lower frequency limit and improves the response in the amplitude and time domain. Other features of the room design provide a nominal control over the ratio of direct to indirect sound while maintaining excellent diffusion, eliminating critical listening positions. All other requirements of the physical and architectural and optical parameters of a control room are accommodated without compromise.

Author: Putnam, Milton T.

Affiliation: The URC Companies, Hollywood, CA

AES Convention:70 (October 1981) **Paper Number:**1858 [Permalink](#) [Import into BibTeX](#)

Publication Date:October 1, 1981

Subject:Studio Technology

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