E-NEWSLETTER

September 2020 issue

THE SOCIETY OF ACOUSTICS SINGAPORE

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CONTENTS

I.CONFERENCE NEWS

. The 27^{7h} International Congress on Sound and Vibration(ICSV27) will be held in Prague.Czech Republic from 11 to 15 July 2021.

Woon Siong Gan will be organising three structured sessions on:

1. **Nonlinear acoustics and vibration**
2. **Acoustic metamaterials & phononic crystals: fundamentals and applications**
3. **Sound propagation in curvilinear spacetime**

Please visit www.icsv27.org for more informations.

Due to the coronavirus situation, the ICSV27 will be postponed to 11 to 15 July 2021, but will still be held at the same hotel in Prague. Please visit www.icsv27.org for further informations.

II.ANNONCEMENTS

The Society of Acoustics will be sending out invoices to members with outstanding membership subscriptions. Members are encouraged to make payment in support of the Society.

The E-Newsletters will be made available to industrial contacts in an effort to promote the activities of the Society.

The Society is also exploring the possibility of organising talks and other professional events in collaboration with acoustic societies of other countries.

Membership Certificates will soon be made available to all members who had made full payments of membership dues

The Society aims to increase membership by inviting all persons, including those from the institution of higher learning and other related societies such as the Institute of Architects, Singapore and the members of the mechanical engineering division of the Institution of Engineers, Singapore who are qualified in the various field of Acoustics to join our Society.

We are especially keen to invite students to join our society and we are establishing the Youth Chapter soon.

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III.INTERNATIONAL ACOUSTICS NEWS

Woon Siong Gan was recently elected as a Director of the International Institute of Acoustics and Vibration(IIAV) for the period 2018 to 2022.

IV.MEMBERSHIP SUBSCRIPTION

Fellow	**S$70**
Member	**S$50**
Associate	**S$30**
Student	**S$15**

Corporate **S$200**

FEE BASED ON ANNUAL RATE

FOR MORE INFORMATION PLEASE CONTACT: Dr. Woon Siong Gan at email: wsgan5@gmail.com

Membership application forms can be downloaded from the society website: www.acousticssingapore.com. Please complete and email to wsgan5@gmail.com

V.ARTICLES

The following paper is a brief version of the paper to be presented at the ICSV27, Prague,11-15 July 2021.

The Application of Statistical Mechanics in Acoustics and Vibration

Woon Siong Gan

Acoustics and vibration is built on the framework of fluid mechanics with the use of the Navier Stokes equations.However, to solve complex problems in some situations is beyond the limit of fluid mechanics and statistical mechanics has to play a part. The statistical theory of turbulence developed by Kolmogorov[1] is an example . Statistical energy analysis is another example. It is a transport theory[2,3] in acoustics and vibration. It handles the complex situation of huge number of modes of coupled systems and their energy transportation. Turbulence and sonoluminescence considered as a form of phase transition have to be treated by the use of statistical mechanics.

Statistical energy analysis(SEA) [,4,5,6,7]is a method for predicting the transmission of sound and vibration through complex structural acoustic systems. It is particularly useful when there are thousands of vibration modes involved with in the huge complex

structures and statistical approach has to be used. Here the structural vibrational behaviour of elements(subsystems) is analysed statistically. It is used in high frequency vibration problems for vibration prediction but can also be used for predicting noise levels of new designs such as that for cars. The usual modal analysis using finite element analysis for analysing the vibration response of complex system such as for the aircrafts and space shuttles has limitations as the engineer is interested in frequencies which lie very far up the modal series of a large complex structure. While the finite element approach is very suitable for predicting the first few modes of such a structure, the accurate description of modes far up the series will involve matrix equations of very large dimensions. If one wishes to predict N modes the dimension must obviously be at least N. For good accuracy it must be considerably larger than this the higher modes are never very accurate because of the piecewise construction of the finite element modal displacements. In any case, the individual modes high up the series become increasingly sensitive to details of the physical structure under investigation,to such an extent that they may be influenced by the deviations from ideal design which inevitably occur in construction. Thus the modal pattern predicted from the ideal design may not even be relevant in detail to the actual structure-shipbuilding or aircraft as manufactured. Equally , one is unlikely to know the fine details of the vibration source accurately enough to calculate the modal amplitudes excited. What the vibration engineer would therefore like is a method which enables him to understand certain broad features of the vibration distribution and transmission without knowledge of the detailed modal structure or the fine details of the excitation. The reason that such an approach is often possible is that far up the modal series the modes are dense in frequency, and a source of disturbance will often excite many of them. This may happen because the source is of a broad-band nature, or it may happen even for a narrow-band source if the resonances overlap strongly in frequency. The distribution

of vibrational energy through the structure, which is what we are often interested in, is the sum over these modal responses, and it may have a simpler behaviour than the amplitude of individual modes. Thus a detailed calculation of all the excited modes may sometimes give us a vast amount of information we do not really need. However, we should note that, particularly in the case of a narrow-band source, the statistical behaviour must be studied in addition to the average response: as we shall see later, the fluctuations about the average can be large.This gives rise to the concept of the use of statistical mechanics and hence the method of statistical energy analysis(SEA).

Both turbulence and sonoluminescence are phenomena in acoustics which are beyond the scope of fluid mechanics. Statistical mechanics has to be used. These two phenomena can be interpreted as phase transition and critical phenomena[8.9]. Phase transition is an important topic in statistical mechanics. Turbulence is a phase transition from the laminar flow to the turbulence flow. During turbulence, there is a tremendous increase in the Reynolds number and hence reduction in the viscosity of the fluid flow. This is considered as a singularity in the transport property. Again in sonoluminescence there is a tremendous increase in the heat capacity, which is also a singularity in the transport property. Also there is a phase transition from the gaseous phase(bubble) to the liquid phase(break up of bubble). The singularity behaviour of the transport property is a characteristics of phase transition. Lee and Yang also made us of the singularity behaviour during phase transition to study the spontaneous magnetization, a second order phase transition. Although the two dimension Ising model is a rigorous theory, it can only study the critical point of phase transition and cannot explain the region surrounding the critical point. The Lee Yang theorem[10,11] studied the singularity behaviour of the partition function which has singularity behaviour. The roots of the partition function lie on a circle.

The partition function is a polynomial and tends to infinity when each of its term is zero at the denominator. Each zero corresponds to one critical point in the critical region. The zeros lie on this unit circle.

A key aspect of phase transition is the involvement of huge number of molecules in interaction as for the case of turbulence and sonoluminescence. This has to be treated by statistical mechanics.

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Psycho-Acoustics Perception For Speaker Systems

by Sonny CY Lim 24 February 2013 (V2b2c)

INTRODUCTION

Sound is a precious gift to human for the joy in listening to music and voices for singing or speech. When the possibility of storing of sound

was discovered in 1857, it opened up the further interest in the sound recording arts leading to tremendous development in the media today! My interest in recorded music started at the early age in 1947 when I was given a HMV acoustic gramophone, it played only 78 rpm records using steel needles. Never the less during those days although electric phonograms were available portability was something left much to be desired?

Fig. 1 *The famous His Master Voice (HMV) clock-work driven acoustic gramophone*

The famous His Master Voice (HMV) clock-work driven acoustic gramophone When I embarked on my career in Electro-acoustics engineering in mid 1960 high fidelity sound was just being introduced together with the vinyl long playing records. Stereophonic (binaural)

sound came along a few years later including equipment to provide the two channels audio system required. From that moment electro-acoustics and recording engineers attempted to achieve the psychological approach in sound reproduction to closely simulate the live sound from orchestral and human voices. Although stereophonic (binaural) audio reproduction can provide the sound "imaging" in listening perception, psychologically the speaker systems available are still the major obstacle, in fact up till today, they cannot produce the listening perception equivalent to live music performances. Through the period electro-acoustics engineering have advanced significantly up to the digital audio technology today, but still the speaker systems are unable to achieve the psychological effect on sound produced closely similar to live performances.

PSYCHOLOGICAL PERCEPTION

The word psychological derives from psychology involving human auditory perception to sound. Although we hear sound with our ears, but the sound recognition, definition, and effect on ambience are recognised and controlled by the brain. This is the most important criteria when listening to recorded or live music and voices where the comparisons on similarity between live and recorded sound. For music involving instruments and voices the electro-acoustics properties of the speakers design and engineering must be able to recreate the psychological ambience of the sound waves reaching the listeners' ears and audited by the brain enhancing the tonal composition for music and clarity for voices.

The following image in Fig.2 illustrates the omni-directional dispersion of sound from musical instruments during live performances.

Fig. 2 *Instruments produce omni-directional tonal resonance for solo or orchestral music including accompaniment of human voices.*

To enhance the sound intensity from the orchestra musical instruments, they are normally grouped together by similar musical instruments, this is to enable the increase in the sound intensity (loudness) to provide better dynamic range and sound definition. They are illustrated in Figs. 3A and 3B of small ensemble and orchestra arrangements respectively. These are the more or less the standard arrangements for live concert performances, they also allow the audio recording engineers to capture the full sound spectrum and dynamic range with minimum intermodulation. The only limitation now depends on the

possibility of the speaker systems being able to recreate the sound reproduction on the recording playback to be closely similar to the original live sound.

Fig. 3A *Musician arrangements for a small music band or ensemble are important to obtain good sound definition and imaging.*

Fig. 3B *For Large Orchestra Recordings in concert halls require more complex microphone placement and arrangement to "capture" the*

audio perception, dynamic range and wide stereophonic ambience.

If the recorded sound is reproduced by conventional speaker systems having "flat" baffle with speakers mounted on them as illustrated in Fig.4, they will not be able generate the sound dispersion of the live recorded sound and lose the depth and ambience of the original live audio recordings

Fig. 4 *Conventional range of High Fidelity speakers with all the Loudspeaker Drivers mounted in the front on one single flat plane baffle.*

This limitation exists with most conventional speaker systems having cabinet design and speaker drivers mounted on single flat baffle. They are often referred to as “the box with a hole in the middle”. The speaker designers have to consider the reproduction of the omni-directional effect sound waves to closely simulate the sound from the live performances. But for cost reason “the box with a hole in the middle” are still the most economical standard design up to today.

The single flat baffle arrangement as shown in Fig.4, will only generate flat plane sound waves. This will result in the sound generated absent in dispersion and ambience completely different from the original live performances recordings.

With this in mind, I concluded that if speaker systems could be constructed with speakers mounted on multi-angled baffles precisely designed cabinet conforming closely to psycho-acoustics sound dispersion they will be able to recreate the psychological effect in recorded sound similar to live performances.

My initial interest on the concept was initiated in 1957 by a book written by GA Briggs from Wharfedale, United Kingdom on "**Sound Reproduction**" explaining the full details on speakers sound propagation, cabinet designs and working principles of audio frequency dividing (cross-over) networks. Although high fidelity was in the development stage psycho-acoustics was never discussed or mentioned.

This sound reproduction in electro-acoustics was immediately followed in late 1960 by Philips in Eindhoven, Nederland introducing the infinite baffle concept for bass speaker cabinet in 1970 together with their publications of two technical books entitled "**Selected Hi-Fi Speaker Systems** "and "**Building Hi Fi Speaker Systems**".

Fig 5 *Books on loudspeaker enclosures design and construction Published by Philips, Nederland.*

The books provided enclosure designs with construction details on the building of high fidelity speaker systems for the range of Philips electro-acoustics components. During the same period their whole range of audio equipment and the loudspeaker components were made available from their ELCOMA Division to electro-acoustics engineers and the audio industry

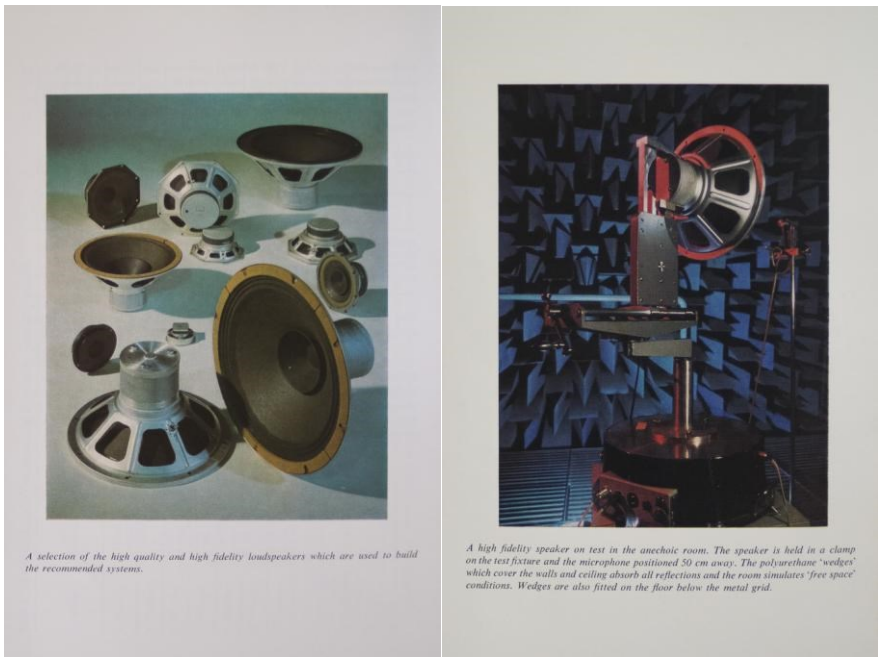


Fig 6 *The complete range of loudspeakers, with anechoic tests, specifications, including matching enclosure designs and constructional details.*

That is when I decided to embark on the design and construction of the unique cabinet design for the speaker systems applying my electro-acoustics engineering and psychoacoustics knowledge with the technical information from Wharfedale and Philips. This resulted in a pair of cabinet (enclosures) being constructed in early 1970 by a carpenter, whom was very familiar in the construction details of speaker enclosures, as they had been building them for the Company.

The whole project took over 3 years to complete as the cabinets involve special carpentry, loudspeaker selection based on the standard

electro-acoustics principle and the selection of special components for the crossover networks.

The project took further 2 years to fine-tune including substituting of loudspeakers to eliminate harmonics and resonances to achieve the tonal balance and ambience sound reproduction eliminating "colouration" and harmonics on the recorded sound reproduction. Accordingly the cross-over networks components were also substituted to make minor technical adjustments for the frequency curves response deviations of the new drivers. All these were laboriously done with only hearing perception as the real time analyser was beyond the means of hobbyist.

During the same period, transistors were introduced to replace vacuum valves for audio equipment, this caused further problems with the low power output and limited transient response of early transistorised audio equipment, resulting in the speakers not producing the results as had been expected.

Finally the break-through came in the mid 1980 when Amcron (Crown) USA introduced the high performance home audio Preamplifier PSL-2 and the Power Amplifier A150 producing 2 X 150 Watts output with linear frequency response from 20 to 20,000 Hz which could provide the dynamic power output and linear frequency response to "drive" the speaker systems for the infinite baffle bass speaker design concept. The high performance amplifier is able to produce the sound reproduction with good transient and dynamic range covering the full frequency response with minimal distortion and

"colouration". The Crown PSL-2 Preamplifier audio circuitry incorporates the variable "contour" (loudness) psychological equalisation to achieve the tonal spectrum with only 70 decibels to achieve the full psycho-acoustic effects on the sound reproduction.

PSYCHO-ACOUSTICS

To understand what is psycho-acoustic we need to touch briefly on the human auditory system in sound perception. The human auditory system is not linear on intensity and frequency response. At reduced sound level the ears' sensitivity to low frequency is significantly reduced creating reduction or loss of low (bass) frequency on the amplified sound of recorded music and voice. That is the reason why people like to play at loud volume to achieve the psychological effect.

This can best be illustrated with the following graphical diagrams displaying the detailed multiple frequency level curves for human auditory perception in Fig.7. For easy reference the human auditory perception is in single line graphic curve is illustrated in Fig.8. The compensation required by the psychological contour (loudness) control on the frequency response curve to achieve the "flat" frequency perception for the human auditory system is illustrated by the single line graphic curve in Fig.9.

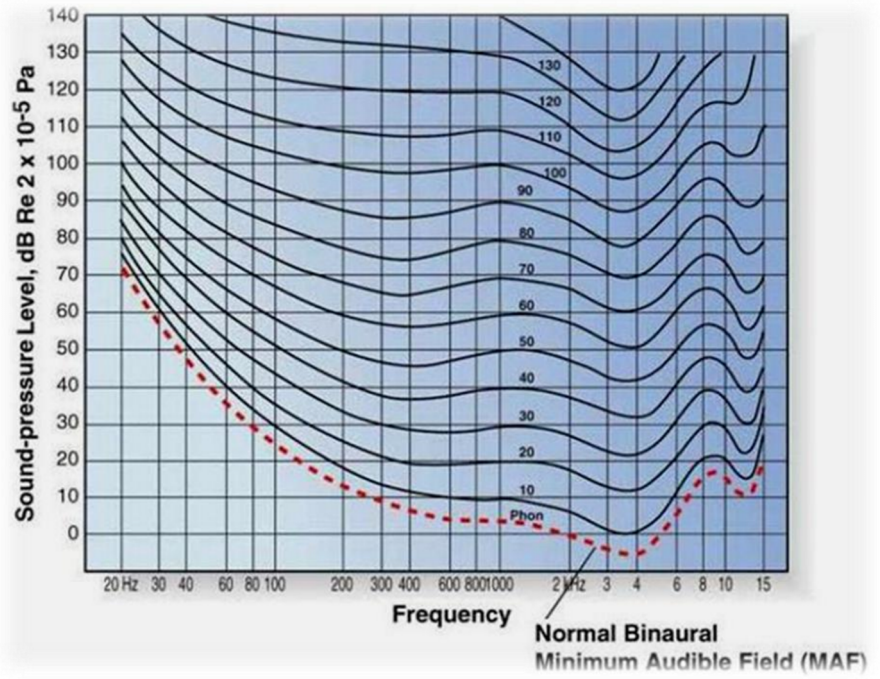


Fig 7 Detailed graphical curves of human auditory sensitivity to sound frequency and intensity

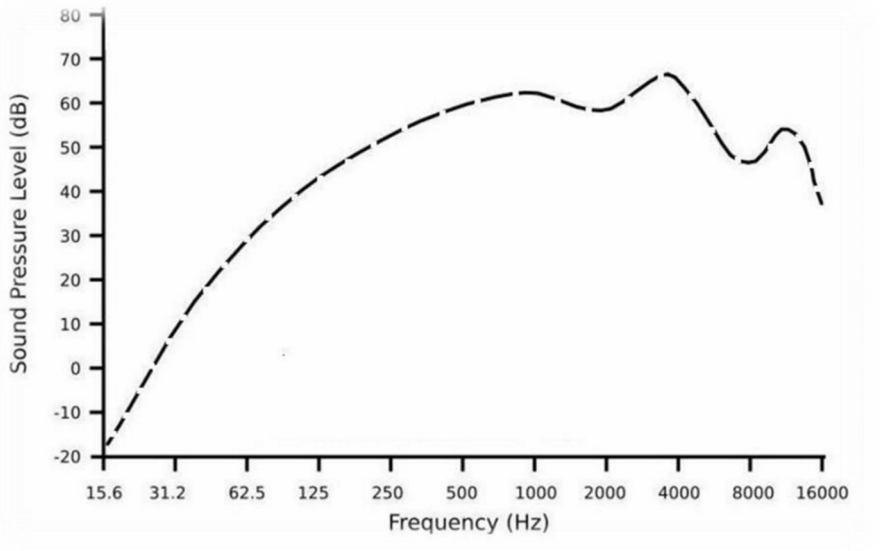


***Fig 8** The human auditory graphical perception for sound frequency and level.*

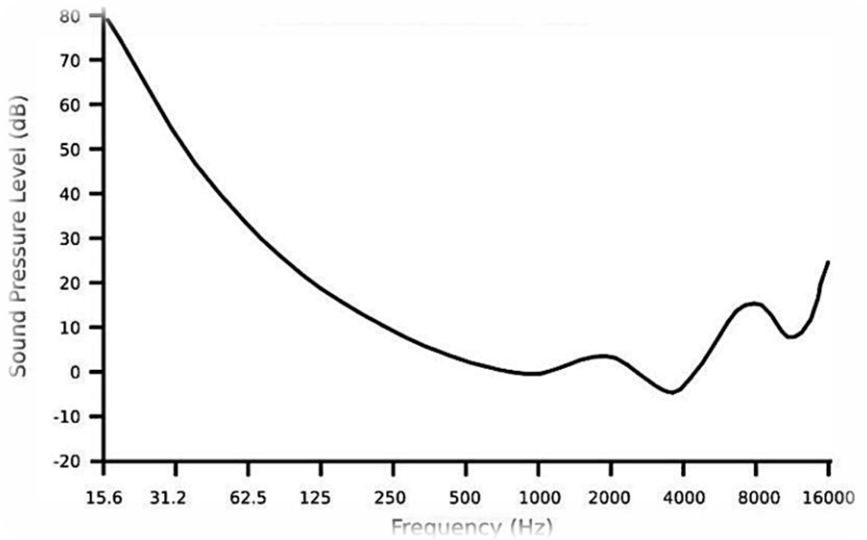


Fig 9 *The graphical curve compensation on frequency and level required.*

By superimposing Fig.8 graphical curve for the human auditory perception and Fig.9 the graphical contour for music and voice reproduction the final resultant is equalised and represented as a “flat” line response with psychological sound perception in Fig.10. This is termed as psycho-acoustic in the electro-acoustics engineering to allow better balanced sound enjoyment between high and low frequencies (bass and treble) for both music and voice.

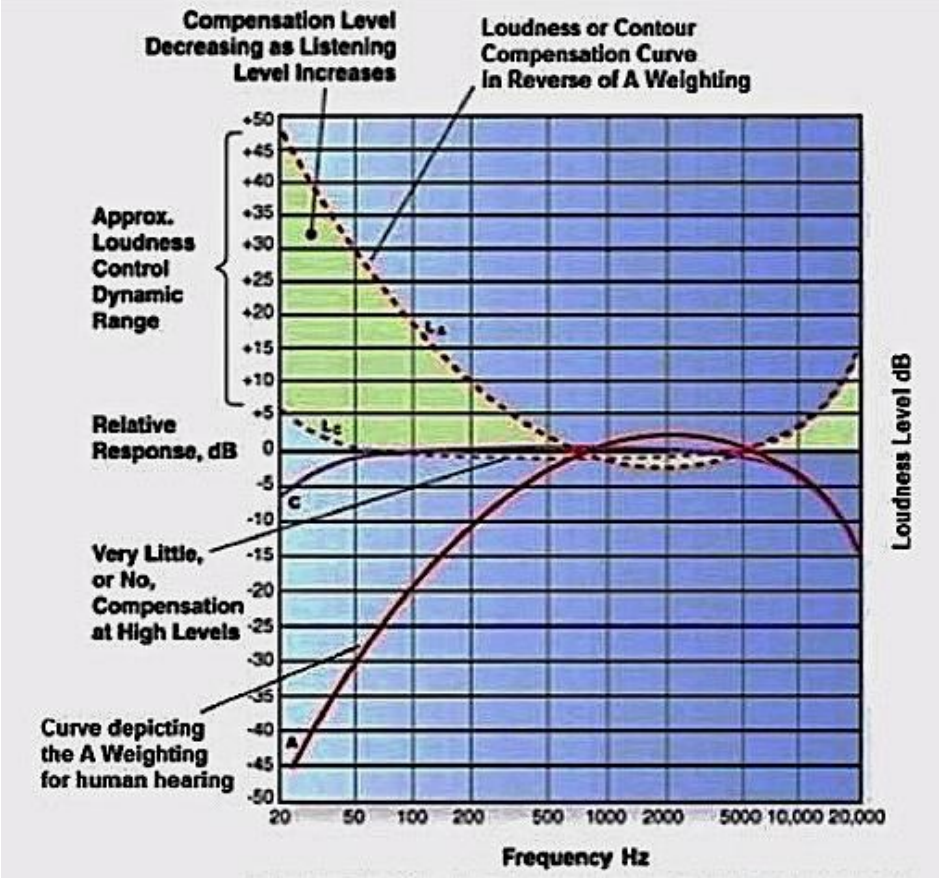


Fig. 10 *The combined graphical curves representation for human auditory system and the compensation for sound contour to achieve the psycho-acoustic perception on the sound reproduction.*

Now after having explained the psychological approach of human auditory systems, resulting in the terminology as psycho-acoustics we can proceed on the technical explanation of the speaker systems in reference.

The illustration of Fig.11 shows the sound propagation of the speaker system's unique physical arrangement of the speaker drivers to achieve the psycho-acoustic effect on the sound waves produced by the speaker drivers.

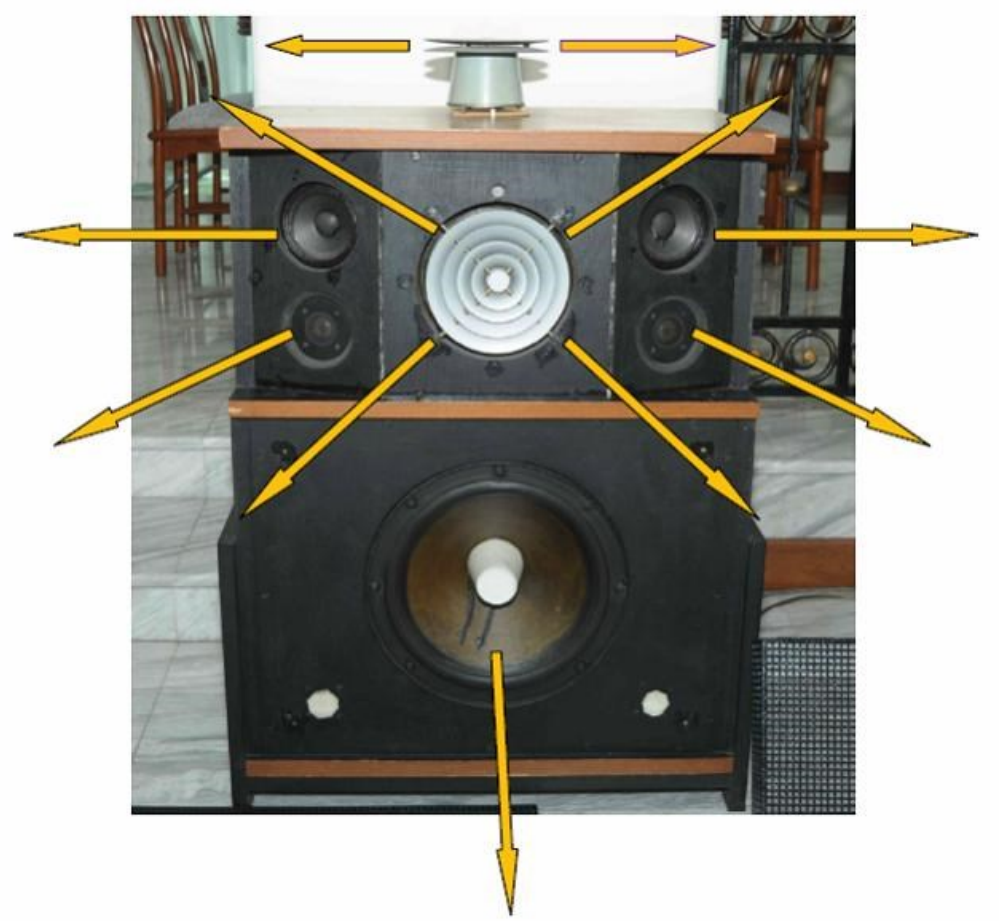


Fig11 *Omni-directional sound dispersion of the speaker design simulating the live performances of the musical instruments and voice dispersion.*

The cabinet for each speaker system is a 2.6 cubic feet enclosure with two acoustically isolated chambers for the Bass and Mid/High

speakers. The cabinet is constructed of high density chip-board and speaker baffles of plywood. The whole enclosure is fully airtight to achieve the infinite baffle design. The cabinet is reinforced with internal wooden plinth and dowels for added rigidity to reduce cabinet resonance which can cause sound “colouration” and harmonics.

For each of the speaker system comprises one bass high compliance 12 inch low resonance speaker mounted in an “infinite baffle” cabinet section having bass response down to 18 hertz. For the low-mid speaker is a single 8 inch exponential cone speaker fitted with “acoustic lens” to provide diffused sound field effect of low mid-range frequencies. For the mid-high two 5 inch high compliance speakers are mounted on two 35 degrees angled baffles to provide wider dispersion. On the same baffles also

are mounted the soft-dome 1 inch tweeter to provide the high frequency. Finally for full

360 degrees high frequency coverage a “flying saucer” tweeter using compression driver is mounted on the top of the speaker cabinet.

The passive crossover network are also specially designed and engineered to provide minimal distortion and frequency inter-modulation. Each unit is a four way full section design with crossover attenuation of 18 decibels per octave to avoid frequency intermodulation between the speakers for bass, low-mid, high-mid, tweeter and an omnidirectional tweeter. Although full section crossover has higher signal attenuation the power output from the power amplifier stereo channel is more than sufficient.

The crossover network have also been calibrated for level output for each section to ensure that the output level are within the specified level to maintain the psychoacoustics frequency level curve. This will minimise further adjustments required on the preamplifier contour or tone controls.

Fig.12 *Each of the speaker system is in a 2.6 cubic feet cabinet with two acoustically isolated chambers for the Bass, Mid/High Speakers and Omni-Directional Tweeter on the top.*

Fig.13 *The arrangements of the two Speaker Systems in the Living Room. (Note the Back Walls for rear sound-waves rein-enforcement.)*

Today, after almost 50 years I have further refined to make it possible for the speaker systems to produce the most life-like recorded music and vocal sound reproduction at home. The reason I use the word home is that the acoustic environment is not acoustically identical to a concert hall. But can provide the psychological perception closely similar in ambience for orchestral music and voices under home environment.

The availability of higher bit-rate and high-definition recordings introduce new possibilities to achieve the dynamic range, transient response and sound definition equivalent to live music and vocal sound. Similarly recording engineers and the music industries are

becoming more aware of the psychological nature on the human listening perception of sound to engineer into their recorded programmes, which is now the feature or expectation by music enthusiasts and high fidelity buffs.

Recorded sound for orchestral music and human voices have improved significantly both in dynamic range and psycho-acoustic characteristics permitting the recorded sound from compact discs and digital media to match the dynamic sound reproduction quality of live music. You only need good audio equipment and speaker systems to reproduce and appreciate the audio recordings quality of compact discs and digital media.

CONCLUSION

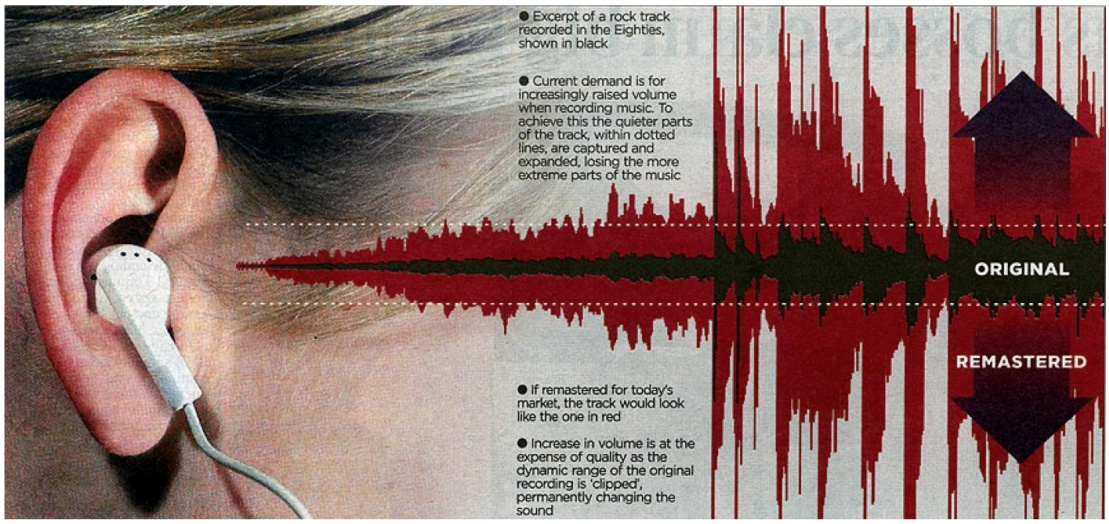


Fig.14 *The significant improvement in the dynamic range of recorded music from Compact Discs and Digital Media Programmes*

It was earlier mentioned that electro-acousticians and sound recording engineers, as far back from the 1960s, had the obsession and passion to achieve realism in recorded sound reproduction, here are some publications dating back over 50 years ago providing the clear evidence of the intention.

The following folder, notes and labels from the booklet accompanying Capitol Records long-playing records released in 1975 are clear evidence precisely describing what sound recording engineers were trying to achieve, from those initial period. "Staged for Stereo" are special recordings released by the Capitol label with emphasis on recording quality, stereo imaging and full frequency range reproduction.

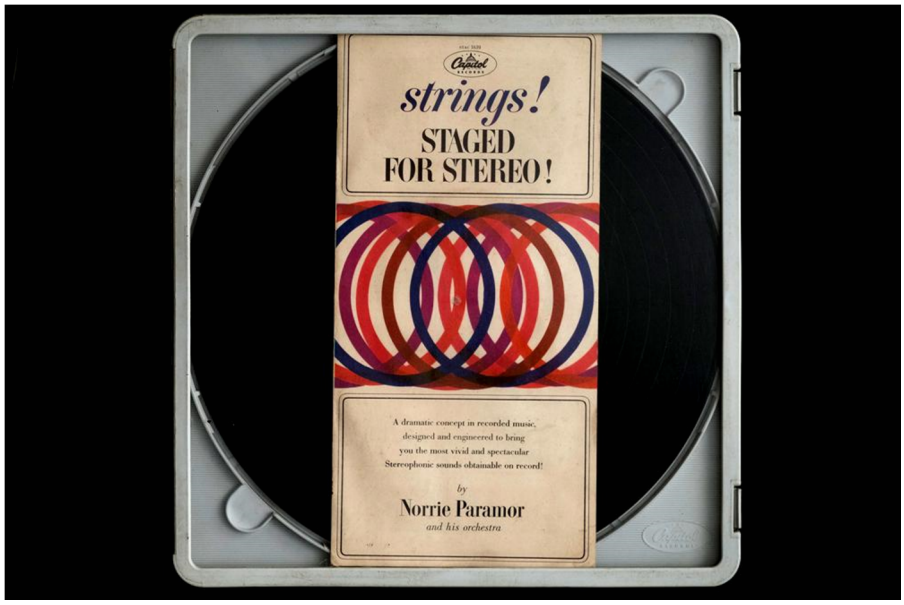


Fig.15 *Capitol Records "Staged for Stereo' in special plastic casing and recording notes.*

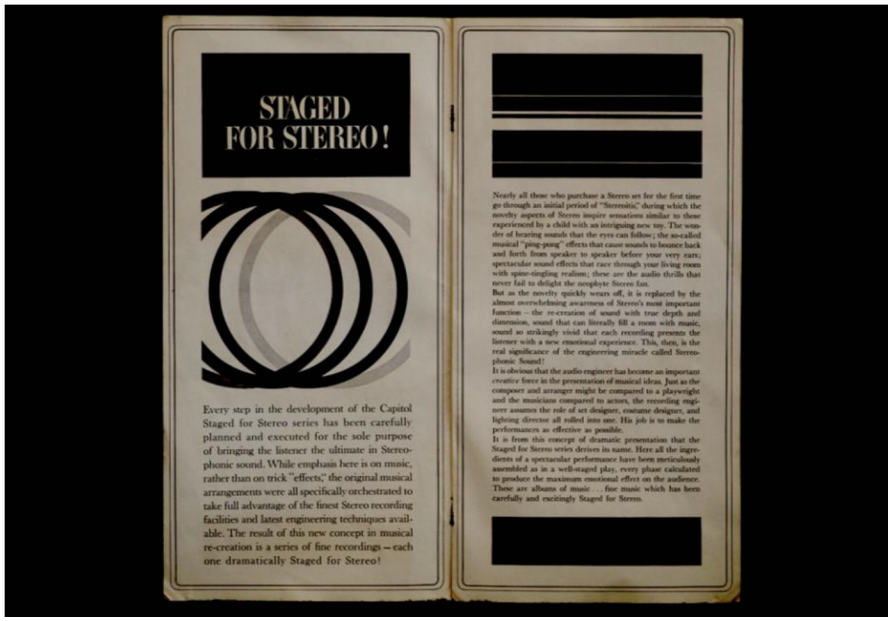


Fig.16 *The enclosed Folder, describes in detail the obsession of the producers and recording engineers on the psychological quality and the dynamic range of the stereophonic recording from way back in 1970.*

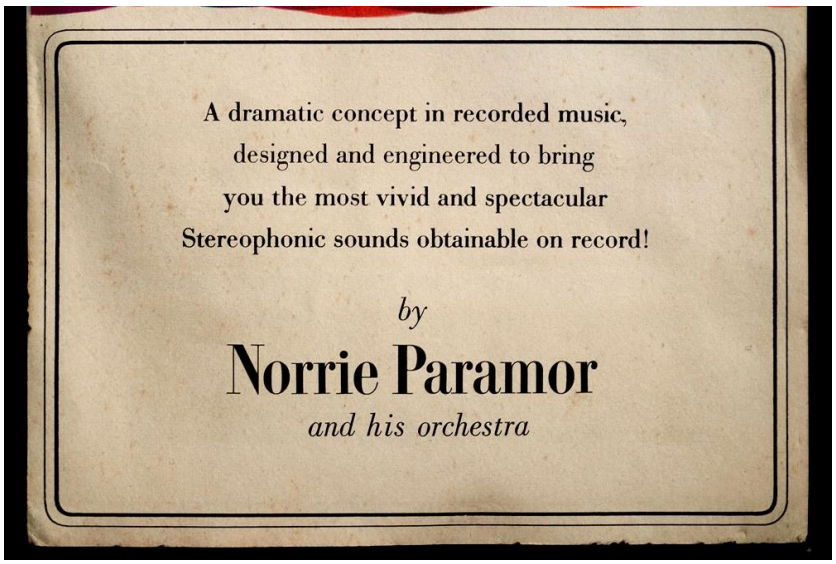
(Actual enlarged copy of the printed transcript

Nearly all those who purchase a Stereo set for the first time go through an initial period of "Stereoitis," during which the novelty aspects of Stereo inspire sensations similar to those experienced by a child with an intriguing new toy. The wonder of hearing sounds that the eyes can follow; the so-called musical "ping-pong" effects that cause sounds to bounce back and forth from speaker to speaker before your very ears; spectacular sound effects that race through your living room with spine-tingling realism; these are the audio thrills that never fail to delight the neophyte Stereo fan.

But as the novelty quickly wears off, it is replaced by the almost overwhelming awareness of Stereo's most important function – the re-creation of sound with true depth and dimension, sound that can literally fill a room with music, sound so strikingly vivid that each recording presents the listener with a new emotional experience. This, then, is the real significance of the engineering miracle called Stereophonic Sound!

It is obvious that the audio engineer has become an important *creative* force in the presentation of musical ideas. Just as the composer and arranger might be compared to a playwright and the musicians compared to actors, the recording engineer assumes the role of set designer, costume designer, and lighting director all rolled into one. His job is to make the performances as effective as possible.

It is from this concept of dramatic presentation that the Staged for Stereo series derives its name. Here all the ingredients of a spectacular performance have been meticulously assembled as in a well-staged play, every phase calculated to produce the maximum emotional effect on the audience. These are albums of music . . . fine music which has been carefully and excitingly Staged for Stereo.



Norrie Paramor is synonymous with Capitol Records for his many musical composition, arrangements and orchestra conducted playing his famous Interpretation of "Always in My Heart" at:

https://www.youtube.com/watch?v=1xStYu1ZL4I

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Philips Electrical, Nederland, MD Hull Eng A.M.I.E.R.E and KR de Vries;

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Bose Corporation, Dr Amar Bose, USA and Wikipedia.

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I also wish to thank all my friends and associates involved in Electro-Acoustics Engineering and Audio Recording for their valuable technical support and assistance

Footnote

Please note that what have been written on Electro-Acoustics and Psycho-

Acoustics are very specialised topics on sound reproduction and listening perception related to the human auditory system. Owing to space limitation of the essay the topics cannot be fully explained in detail.

Further information can be found on the internet websites or books pertaining to the topics or you can get in touch with me at:
<*limcysonny@gmail.com*>

VI. PRODUCTS AND SERVICES FROM OUR MEMBERS

ACOUSTICS AND VIBRATION CONSULTING MALAYSIA (AVCM) SDN. BHD.

Acoustics and Vibration Consulting Malaysia (AVCM) Sdn. Bhd. is an acoustical company based in Kuala Lumpur, Malaysia, also a member of *Geonoise Asia Co. Ltd*. AVCM specializes in the noise and vibration field, striving to improve the environmental quality, specifically on noise, by providing relevant services and solutions to customers. Our services and products include:

- Acoustical Consultation - Geonoise
- Calibration Products - SPEKTRA
- Noise Modelling Software - SoundPLAN

- Vibration Monitoring System & Pile Integrity Testing - Profound
- Acoustical Insulation Calculation - SONarchitect ISO
- Noise & Vibration Sensors/Instruments - PLACID Instruments
- Acoustics & Audio Measurement Instruments - Bedrock
- Analysis of Sound in Duct Networks - SIDLAB
- Noise & Vibration Testing & Data Acquisition - m+p
- Smart Noise & Vibration Excitation Technology – Qsources

For more details on the software/hardware we have, do take a look at our company's website. We are also reachable through LinkedIn and Facebook.

Calibration with AVCM

CV -10, a one stop solution for on-site calibration.

That is right! The CV-10 is a mobile vibration calibrator by SPEKTRA, suitable for calibration of accelerometers, proximity, and vibration velocity sensors and many more. The frequency range of CV-10 covers the range of 5 Hz to 10 kHz, with maximum acceleration of 200 m/s^2. Its internal rechargeable battery allows an operation of up to 10 hours and is stored in a rugged case for daily on-site operation. Another bonus feature of CV-10 is the Easy Data Exchange function via USB, with an optional choice of having Ethernet/Wi-Fi connections.

For more details, visit our CV-10 product page: https://avcm.my/cv-10/

Acoustic Camera

The **Norsonic Hextile** is a module-based approach to acoustic camera that gives the user both portability and great resolution for a wide range of measurement situations. The array dish is based on a hexagon shape, given it both its name, and the ability to combine several tiles into larger systems.

With Hextile, user has a *small, portable and lightweight* acoustic camera to be used for a wide range of measurement situations. There is a USB connection for both power and data transfer, hence no extra battery cable is required. This array is made from aluminium, which is robust and lightweight, containing 128 MEMS microphones, but still less than 3kg while having a maximum diameter of 46 cm. The Hextile has a low frequency limit of 410 Hz.

To learn more about Norsonic Hextile, visit the Norsonic's page: https://web2.norsonic.com/product_single/acoustic-camera/

VI. ACOUSTICAL NEWS

The National Environmental Agency of Singapore has launched a SGD 2 million new foundation to further encourage construction companies to use machineries with lower noise levels to provide a more quiet and pleasant living environment.

This new fund entitled Quieter Construction Innovation Fund will be for a period of two years and will replace the current Quieter Construction Fund which will expire on 31 March 209. This new fund will assist construction companies to purchase , rent machineries or to use new methods to reduce the noise generated during construction and to enable the nearby residents to enjoy a more peaceful living environment.

The local construction companies can begin to apply for this fund from 1 April 2019 onwards. Each application is capped at

three hundred thousand Singapore dollars. It will be different from the current framework. Those applying for reducing piling noise and demolition noise equipment and can have maximum eight thousand Singapore dollars assistance for application under two hundred Singapore dollars. For application exceeding half a million Singapore dollars will have a maximum three hundred thousand dollars subsidies. The condition is that these noise reducing equipment must be able to produce a 10 decibels noise reduction.

To rent piling and demolition noise reduction equipment and materials can be entitled to a nine thousand to fifty thousand Singapore dollars assistance.

Up to end of February 2019, the current Quieter Construction Fund has approved 126 applications and provided a total of 5.1 millions dollars to 112 construction sites. It is anticipated that by the expiry of this fund, the total fund allocated will reach a level of 7.5 million dollars.

VI.REPORT ON CONFERENCES

The Regional Conference on Acoustics and Vibration (RECAV) organised by the Society of Acoustics(Singapore) and the Association of Acoustics and Vibration Indonesia(AAVI) was successfully held in Bali,Indonesia from 27 to 28 Nov 2017. There were 110 presentations from 14 countries with 60% of them from Indonesia. There were also some 18 exhibition booths. This reflected strong local participation and the international nature of the conference.

VII. BID FOR FUTURE INTERNATIONAL CONFERENCES

The Society of Acoustics(Singapore) will be hosting the ICSV28 in Singapore from 24 to 28 July 2022 at the Marina Bay Sands Hotel.

Government Bodies

www.mom.gov.sg

www.nea.gov.sg

www.lta.gov.sg

Technical and Research Sites

Corporate Sites

www.metaultrasound.com

www.noisecontrols.com

(The Society welcomes interested parties to contribute relevant websites to the above e useful links. For more information, please contact us. Thank you.)

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