# Introduction

Spendor loudspeakers have rightly gained a reputation for providing the high standard of sound reproduction demanded by professionals and other discerning listeners. The many inquiries we receive have lead us to publish this manual to explain some ambiguities and myths surrounding the use of loudspeakers for high quality sound reproduction.

# Contents



# Opposite

Walnut BCI Teak BCII Rosewood BCIII

# Loudspeaker Power Ratings

The absolute power rating of a single loudspeaker unit or a system where a number of units are combined can only be defined as a function of frequency.

Two types of permanent damage occur in moving coil units. Distortion or fracture of the cone voice coil assemblies occur mainly in the low frequency range of any specific unit where the cone movement is large enough to deform the material beyond its elastic limit, or damage is caused by physical contact with the magnet/frame assembly. Overheating of the voice coil, the more frequent form of damage, can occur at any frequency but is usually associated with the middle and upper frequency regions. These two power limitations may not have the same value.

As most units have a very poor electrical to acoustic power transfer characteristic, usually between 1 and 5 per cent, a large part of the input power is dissipated as heat within the voice coil. It is therefore evident that the maximum input power will be related to the heat energy which the voice coil/magnet assembly is capable of dissipating before the temperature rises to a point where the coil former or adhesives suffer physical changes which cause failure. The temperature rise of the coil will be associated with both the power (watts) applied and the period of time for which the power is applied.

Where the overload conditions are bounded only by the limits of cone excurtion the maximum continuous input power and the maximum peak power, may have the same value.

It is now evident that even for a single unit two values would be required to express the maximum power capabilities in absolute terms, and for multi-unit systems the number of values would, in most cases, be the number of units plus one, to cover the bass limitations.

It follows, therefore, that for a three unit system such as the Spendor BCI, a single value for maximum input power, continuous or any other time period cannot be specified, as each unit will have its own rating which is frequency dependant.

Fortunately, for general use, i.e. reproduction of music, etc., the power input to a loudspeaker is constantly changing, this coulped with a programme spectrum which normally fall in level at both low and high frequencies allows a maximum power rating figure to be given to a system

which bears little relationship to the only measurable figure, i.e. average watts times time.

Analysis of a range of programme material will show large variations, with time in the relationships between the peak power values and the R.M.S. average power values. Percussive instruments, for instance, may have an instantaneous peak to average power value of 20 to 1, whereas an orchestra, fully engaged in a finale, may reach a ratio of 2 to 1.

It will be seen now that the only relevant figure which can be placed on the maximum power input to any system which is to be used for normal programme material is one which takes into account all the factors mentioned. This figure can be termed "peak programme power". This is directly related to the maximum power which should be delivered by the driving amplifier. In the case of the Spendor BCI, 40 watts is quoted, and is meant to cover "normal" programme material which has a spectrum where the peak levels at low and high frequencies are well below the mid-band levels, thus providing the necessary protection at low and high frequencies.

A complication does arise for bass guitar, organ pedal notes and electronic music reproduction. In the first two cases it will be possible because of the nature of the instruments to apply the full 40 watts at very low frequencies, which would result in mechanical damage. In the other instance the full power could be maintained for any period of time, and at any frequency. This could result in either mechanical damage or severe overheating.

Amplifier specifications do not always specify the peak output power, thus an amplifier rated at 40 watts continuous may, with an increase in distortion, be able to deliver 80 watts for a short period of time.

The final choice of a suitable amplifier will depend upon the user, and care should be taken to ensure that whatever the amplifier rating, the input to the loudspeaker does not exceed the recommended peak value.

The term R.M.S. power and R.M.S. watts is often used to imply a continuous rating for power amplifiers. In the context of this article R.M.S. power or R.M.S. watts may be equated to average power.

# Stereophonic Reproduction

The requirements range from general background music to high definition stereophonic reproduction of drama. The latter requirement is the most difficult to reproduce as each part of the programme chain has to be operating under ideal conditions. The notes on " Programme Quality" explain some of the problems associated with the subjective assessment of such a system.

It is unfortunate that to obtain the best stereophonic definition, symmetry of acoustics is vital and the listening position is fixed within small limits. A typical set-up is shown in fig. 1. Any deviation from this general layout will degrade the stereo image to some extent. A single fixed position is usually far too restrictive for domestic listening and a compromise has to be found. Changing the angle of the speakers (fig. 2) is the most convenient method of increasing the listening area. Nowhere within this larger area will the stereophonic image be as sharp as before, but a larger audience may receive an only slightly degraded stereophonic impression.

It is important that, as far as possible, the speakers and the listening area are arranged symmetrically within the room, as much of the information is received as reflected sound from the surface of the walls. Asymmetry of surface finish will affect to some extent both the stereo balance and the sound quality. It is not possible with any known system to produce a sharp and accurate stereophonic image everywhere in a given room, although an "all round" or spread sound can be produced by a number of methods. This type of reproduction quality is described in many commercial leaflets and does not come within the Spendor design criteria.

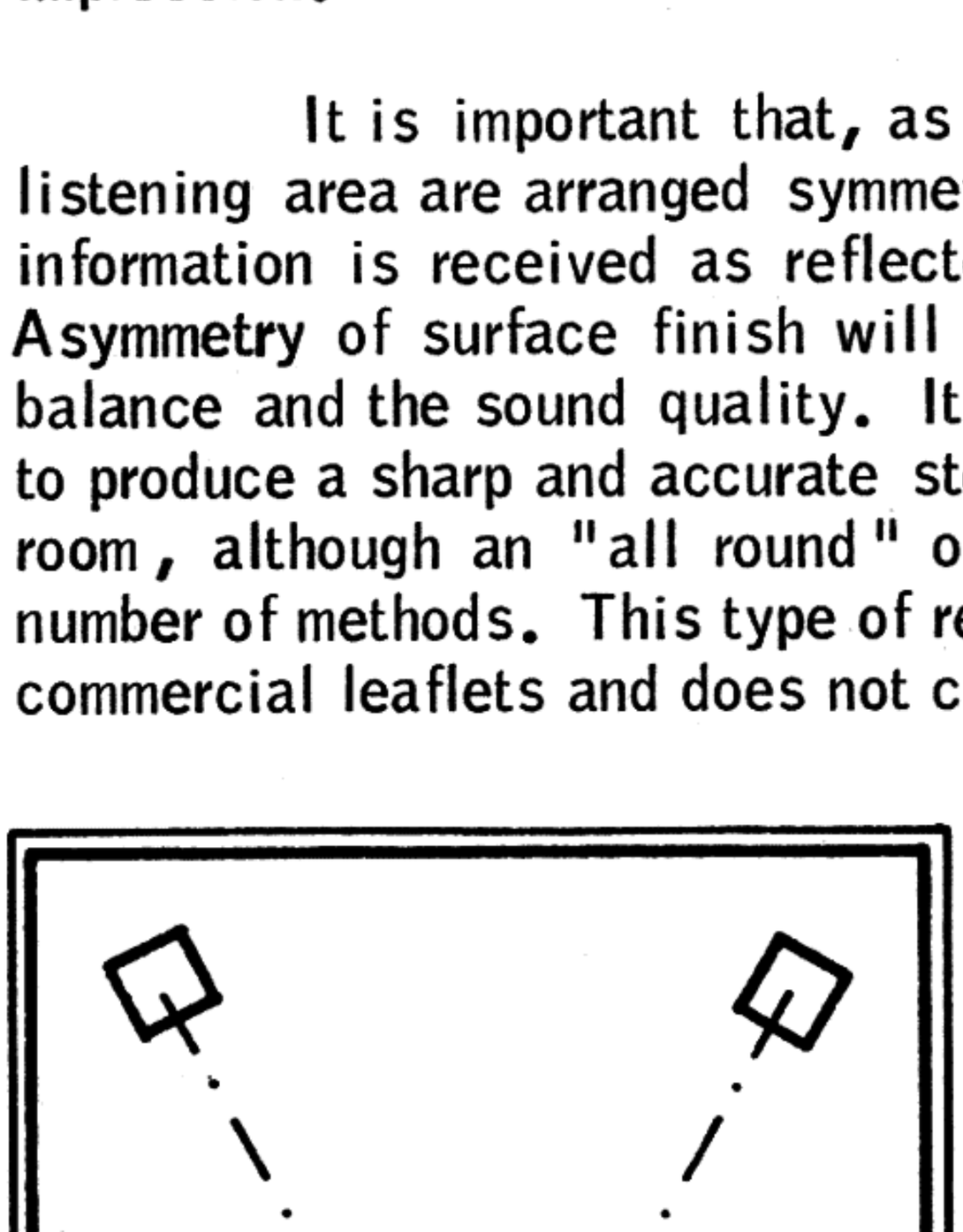


Fig. 1

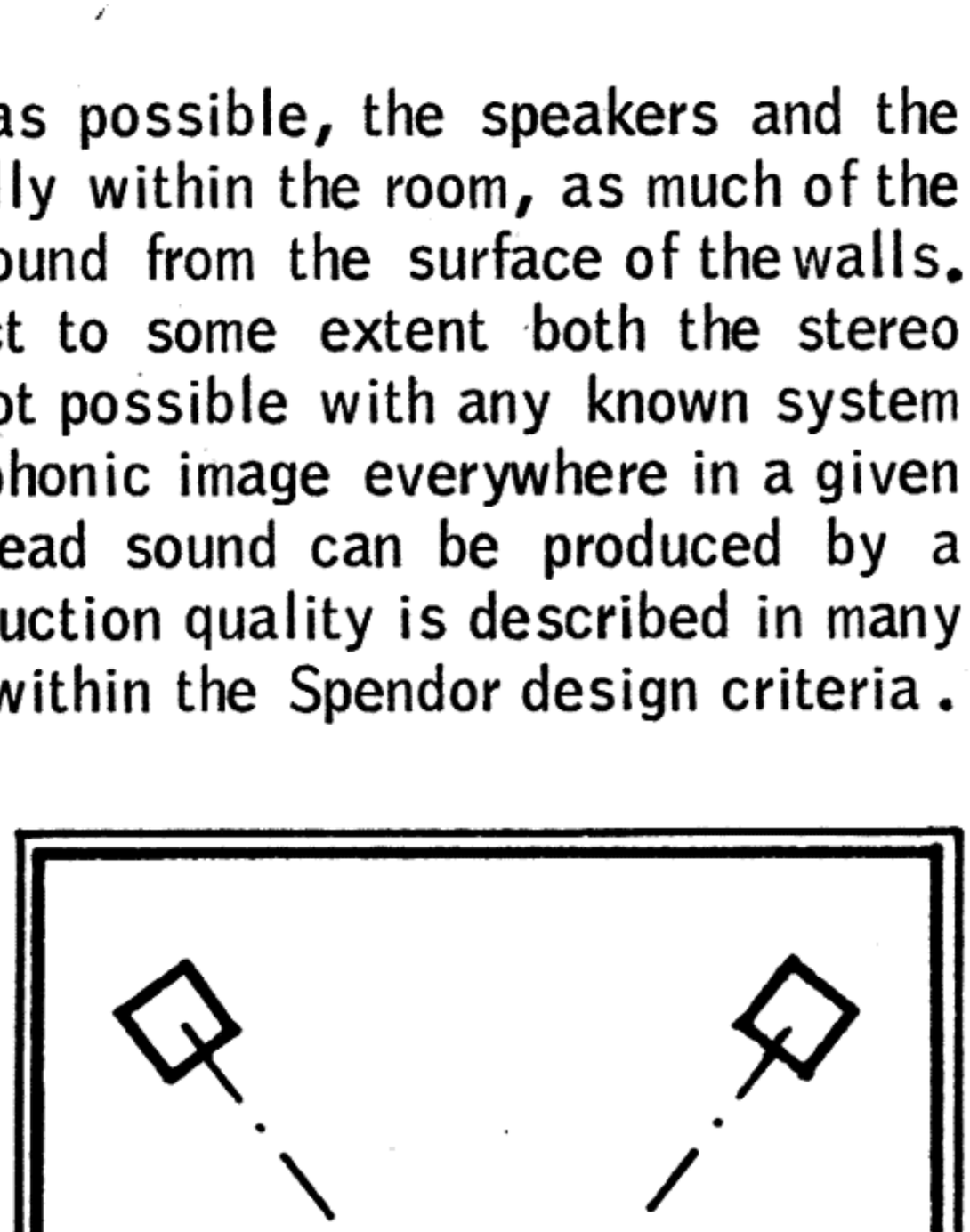


Fig. 2

# Programme Quality

The three sources of programme material - disc, tape and radio - present between them quality variations which are often confusing to the listener.

Recording techniques in themselves vary greatly, and during the processing of both disc and tape, undesirable effects easily can be introduced. When high quality monitoring systems are used for replay many faults inherent in the recording become painfully obvious, whereas a more "mellow" reproduction system will often mask them.

Contemporary requirements often lead to recordings, of which the reproduction qualities, although good, have no basis on which to judge the twin-channel stereo effect, or indeed, the sound quality. This is particularly applicable to multi-microphone and or multi-track recording techniques where the final result is usually a combination of both the producer's and engineer's artistic temperaments and may bear no relation to anything which may be heard at a live performance. It is impossible, of course, to judge the reproduction accuracy of an audio system on this type of material as there may be no refererce from which to start. It is better to use live broadcast material where it is probable that only one pair of microphones will be used, this will in most cases reproduce the characteristics of the hall and will therefore provide a good basis for the initial setting-up of the system. A system set up in this way will provide a standard by which to judge the vast range of recorded material available.

To further complicate the assessment of the reproduction quality of disc, large variations may occur in the tonal and frequency response characteristics of various makes of cartridges, indeed easily decernable variations often occur between cartridges which have the same make and type number. The installation of high quality amplifiers and loudspeakers will allow the listener to judge the programme quality accurately. We would however like to point out that this can lead to dissatisfaction and frustration with the poor quality of many disc, cassettes and tapes which are commercially available.

# Loudspeaker Positioning

Spendor loudspeakers are designed to be free-standing, i.e. there should be an air space between any part of the cabinet and large surface areas such as walls and floor. It is difficult to specify an absolute minimum distance as much will depend upon the type of wall and floor covering, soft furnishings being the best for minimising unwanted multiple reflections. However, in general terms a minimum of six inches from walls and nine inches from floor would be recommended. Within reasonable limits increases in these dimensions will improve the overall results. The high frequency unit, HF1300, which is positioned six inches down from the top of the cabinet, should be directed at the head of the listener. When the loudspeakers are mounted above head height it will be advantageous to tilt them to achieve this condition.

Where the loudspeakers are to be placed near to the corners of a room they should be positioned non-equidistant from the two wall surfaces. This reduces the effect of amplitude additions and subtractions which occur owing to the phase relationships between the sounds reflected from the two wall surfaces and the directly radiated sound.

Most loudspeakers should never be placed tightly into a corner, for although this does increase the bass response in one frequency band, it is followed by a cancellation in the next (fig. 3). The unnatural effects may be heard by listening to live speech where the head is close to the room corner, and comparing this with normal speech quality. The quality of music reproduction will be affected in the same way.

The dispersion characteristics of Spendor loudspeakers, in common with many other makes, are only correct for operation in an upright position, and the loudspeakers should therefore not be placed horizontally.

The speakers may be mounted on shelves, but the conditions outlined in the first paragraph should be taken into account. A space between the back of the shelf and wall will, in most cases, be of some advantage.

The foregoing is intended as a general guide. Users of our equipment are advised to experiment to find the ideal operating conditions irrespective of practical and aesthetic considerations. This approach will provide the necessary basis from which to judge any decrease in quality which may occur when all aspects of an installation are taken into account.

# Spendor Loudspeaker Specifications

## BCI & BCII

| | |
|---|---|
| Size | 25" x 11¾" x 12" |
| Weight | 31lbs. |
| L.F. Unit | Spendor 8" (BCI 1" voice coil plastic cone)<br>(BCII 1½" voice coil plastic cone) |
| H.F. Units | Celestion Type HF1300 and STC Type 4001G |
| Crossover Points | 3KHz - 13KHz |
| Nominal Impedance | 8ohms |
| Frequency Range | 45Hz - 25KHz |
| Frequency Response | ± 3dB, 60 Hz - 14KHz |
| Power Rating | BCI 40watts peak programme<br>BCII 50watts peak programme |
| Sensitivity | BCI 0dB BCII +1dB<br>relative to 1 dyne/cm²/volt applied |
| Max. Sound Pressure Level | BCI 101dBA BCII 103dBA |
| Input Connection | Terminals |

## BCIII

| | |
|---|---|
| Size | 31½" x 15½" x 15½" |
| Weight | 75lbs. |
| L.F. Unit | Spendor 12" (plastic cone) |
| M.F. Unit | Spendor 8" (1½" voice coil, plastic cone) |
| H.F. Units | Celestion Type HF 1300 and Type HF 2000 |
| Crossover Points | 700Hz - 3KHz - 13KHz |
| Nominal Impedance | 8 ohms |
| Frequency Range | 30Hz - 20KHz |
| Frequency Response | ± 2½ dB, 50 Hz - 14KHz |
| Power Rating | 70 watts peak programme |
| Sensitivity | + 2½ dB relative to 1 dyne/cm²/volt applied |
| Max. Sound Pressure Level | 105 dBA |
| Input Connection | "XLR" 4-pin |

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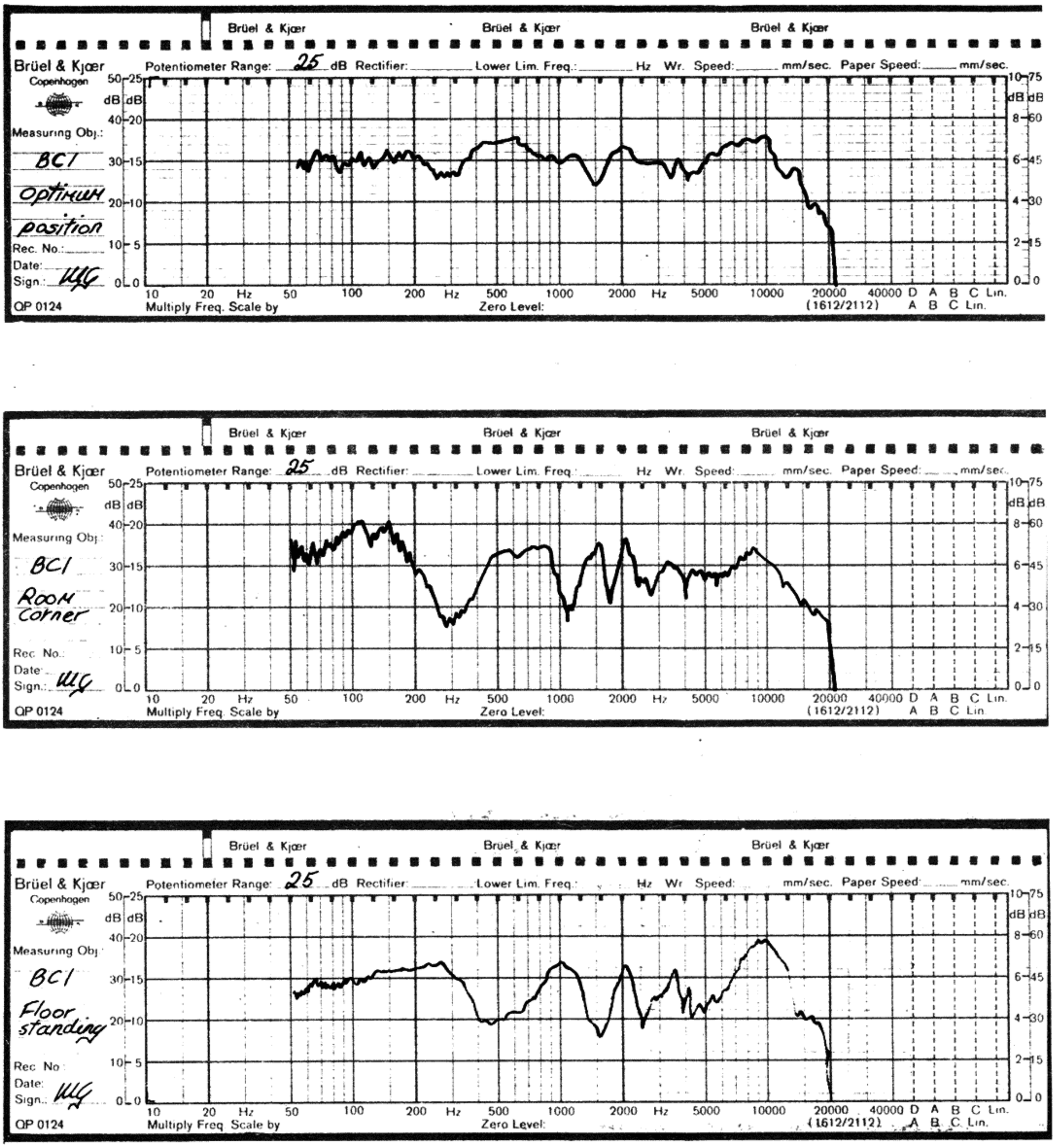


**Fig.3 BCI Response Curves under live conditions using warble tone.**
**Top - Optimum position. Middle - Corner position.**
**Bottom - Position as top, loudspeaker placed on floor.**