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Head and Torso Simulator Test Report

Manufacturer: Bruel & Kjeaar

Type: Head and Torso Simulator

Model: 4100

For: Internal

Report No.: IR/59

Prepared By: P.R.Edwards, B.Sc

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1. Object

- 1.1. The object of this Report is to present measurements of the directional characteristics of the B&K 4100 Head and Torso Simulator.

2. Scope

- 2.1. The following characteristics were measured

- Polar response of single ear and both ears combined.

from which the following are calculated

- a) Directivity Index (dB), tabulated and graphical
- b) Directivity factor, Q
- c) Polar response charts

3. Method

- 3.1. The device was mounted in Free Space as shown in Appendix A.
- 3.2. All measurements were made in an anechoic chamber.
- 3.3. Two sets of Horizontal polar data measurements taken at 10° increments, were collected. One set measuring the left ear only, the other set measuring both simultaneously.
- 3.4. Due to the symmetrical nature of the Head, the same set of vertical plane measurements would be valid for both scenarios.

4. Results

- 4.1. Polar plots of the device are shown graphically in Appendix B.
- 4.2. Tabulated values of Directivity index and Directivity factor are shown in the Summary data sheet given in Appendix B.
- 4.3. The Directivity Index has been calculated using Gerzon' equal angle, weighted area method, and is plotted on figure 1 in Appendix C.

5. Notes

5.1. Polar Plots

For convenience each polar plot has been normalized to 0dB. For this reason caution is advised when comparison of levels between octave bands is made.

6. Engineers Notes

6.1. Reference point located at centre of head between ears.

6.2. Reference axis following head line of sight including reference point.

7. Observations

7.1. The horizontal polar data representing the sum of both ears shows the head to be most directional on axis, except at 8kHz.

7.2. At 8kHz the head shows to be most directional at the sides (ie: 90° and 270°).

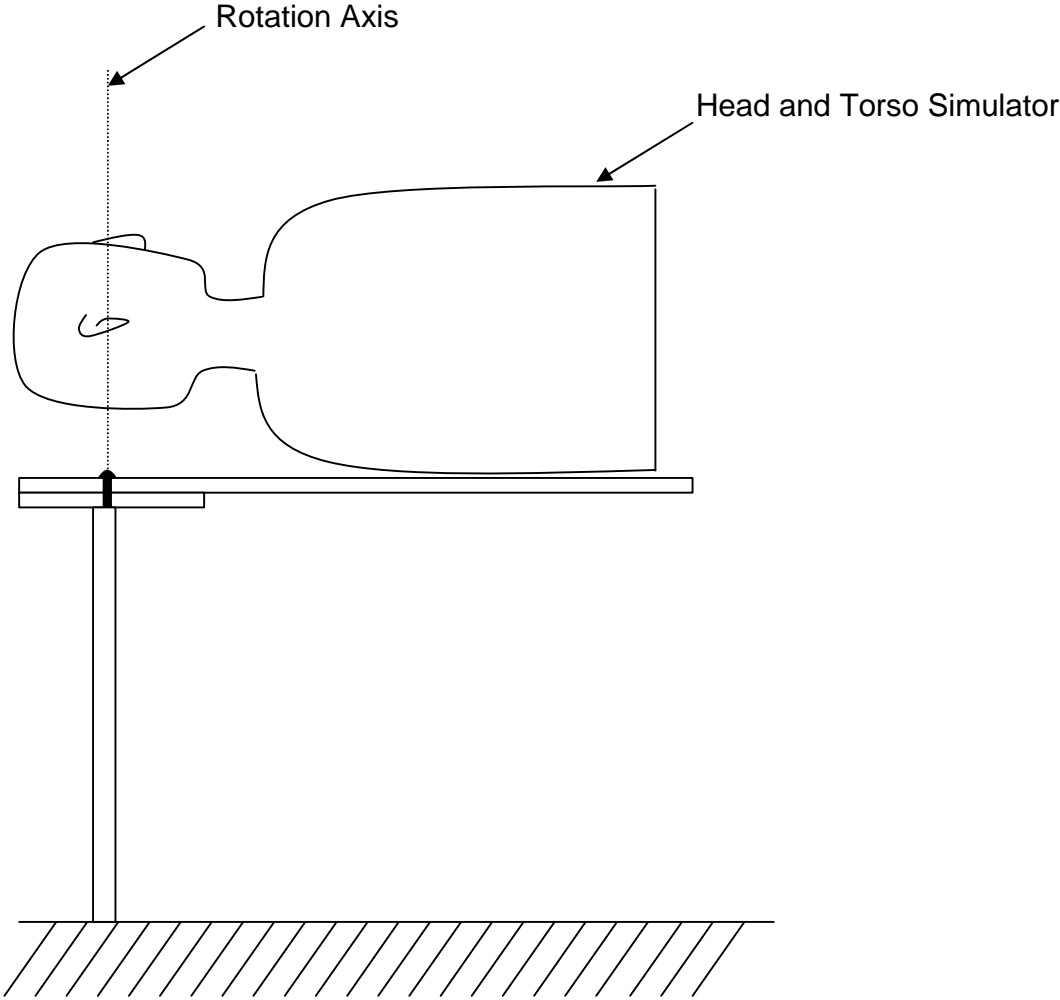
7.3. Both the vertical and horizontal data indicates a higher directivity at the front than the back.

7.4. Figure 1 in Appendix C also shows the Octave Band weightings used in standard STI calculations. The directivity index shows a similar shape, except the two peaks are shifted up in frequency.

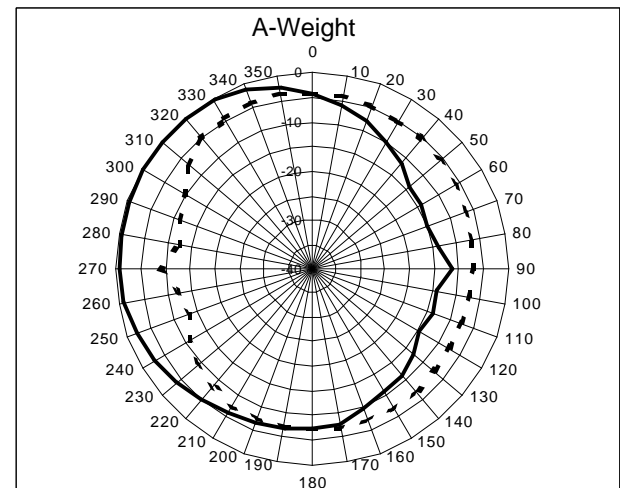
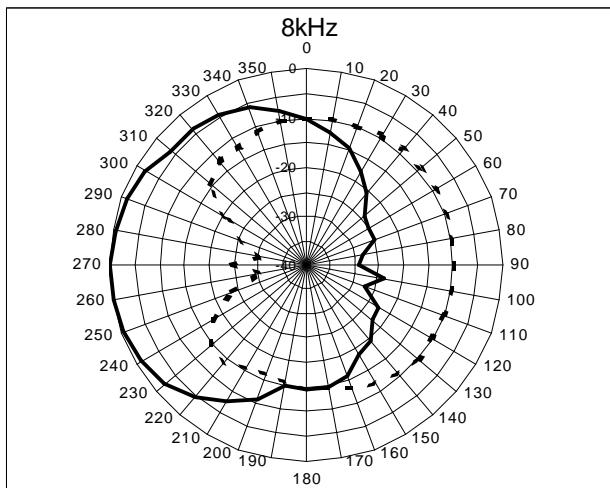
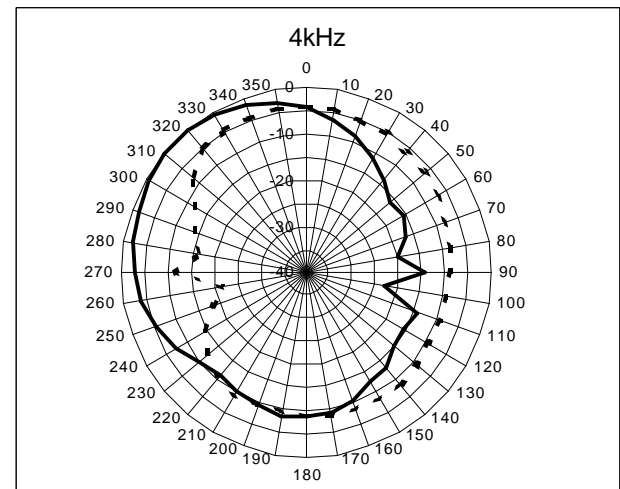
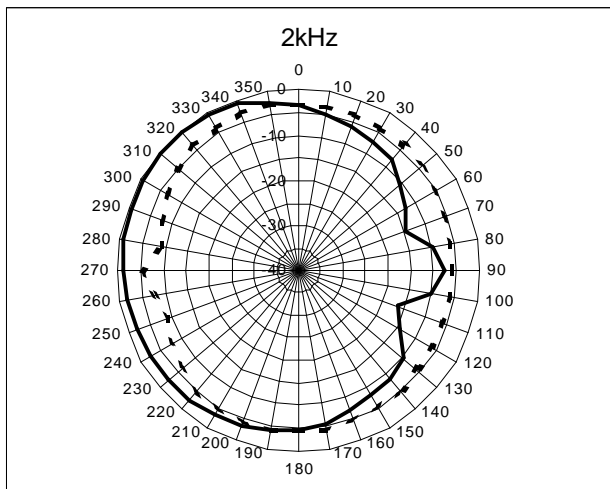
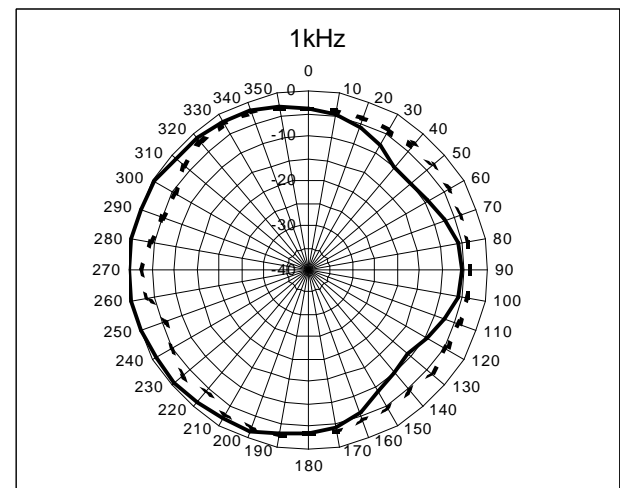
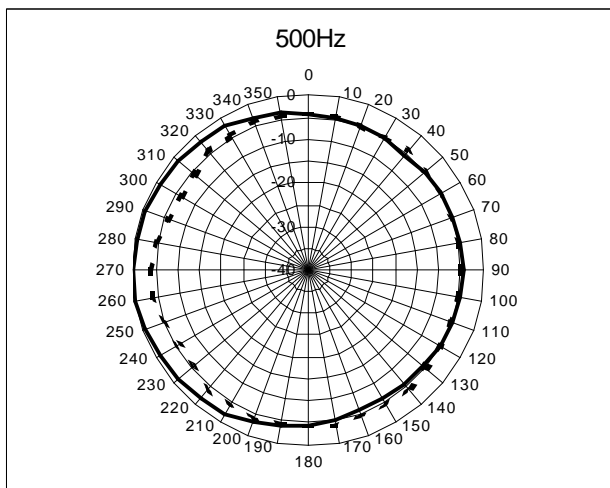
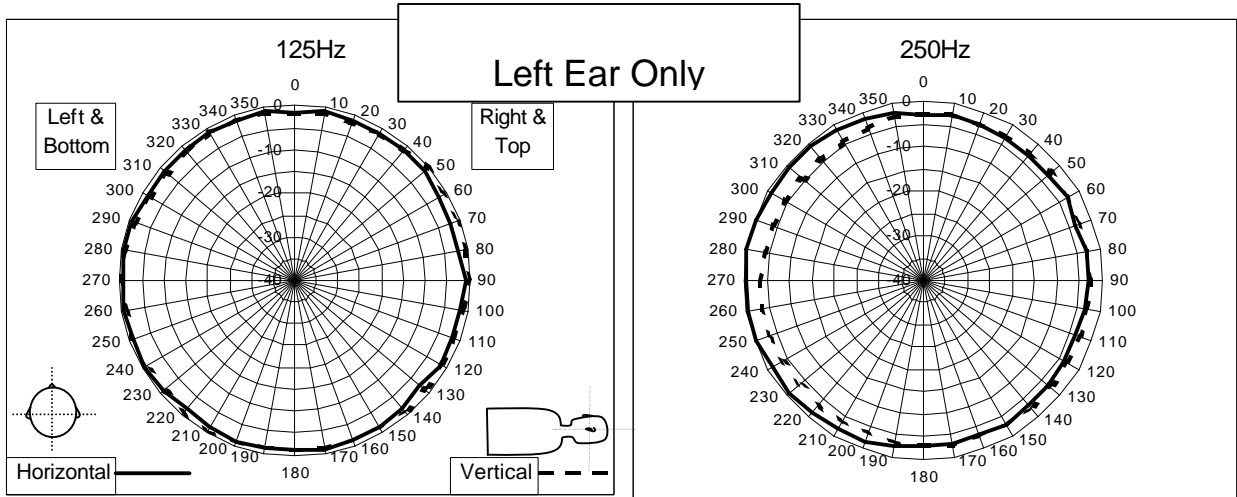
7.5. The A-weighted horizontal plane polar plots representing the left ear only demonstrate highest directivity index at 280° to 330°.

APPENDIX A

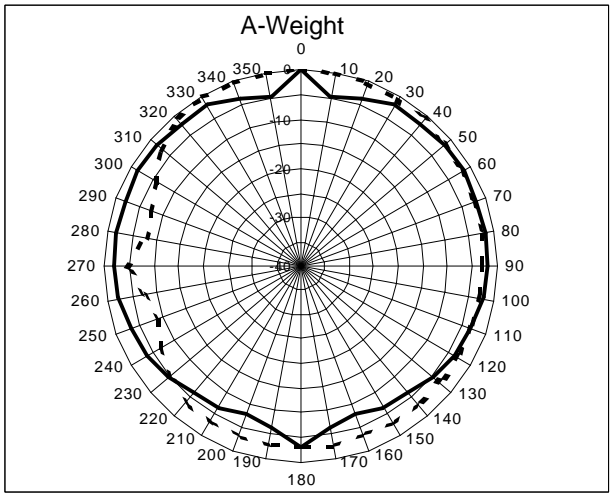
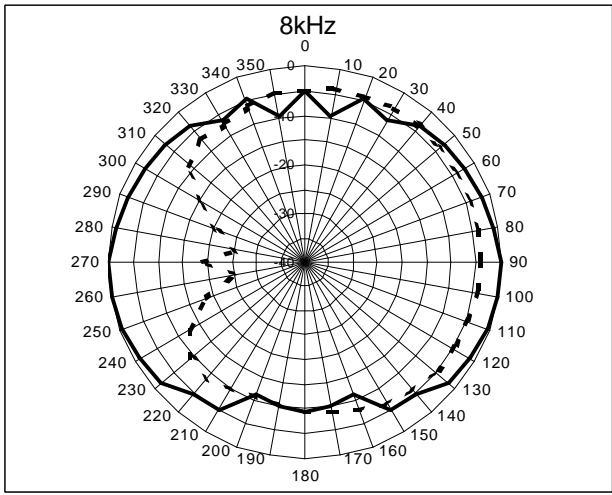
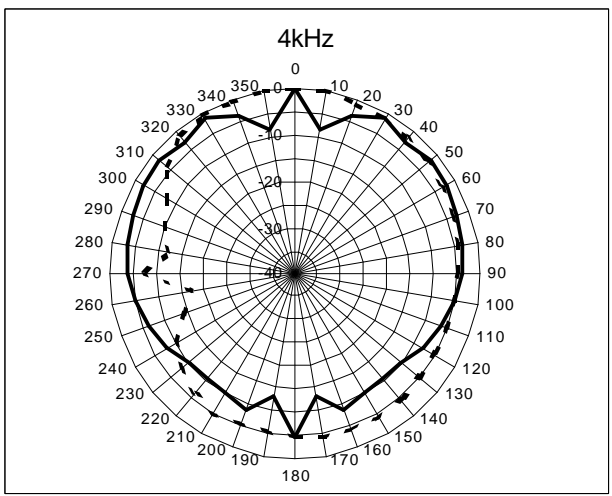
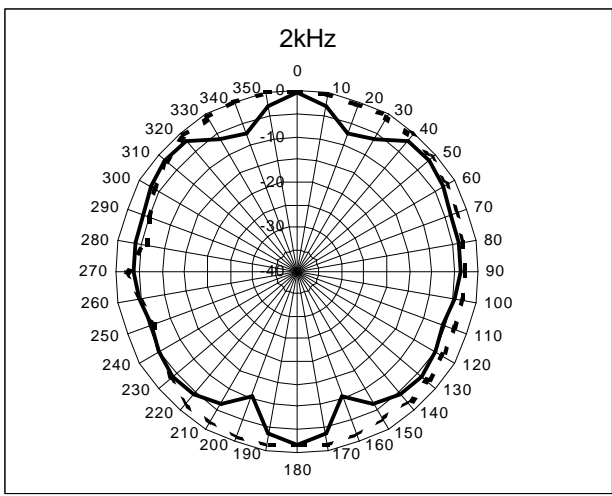
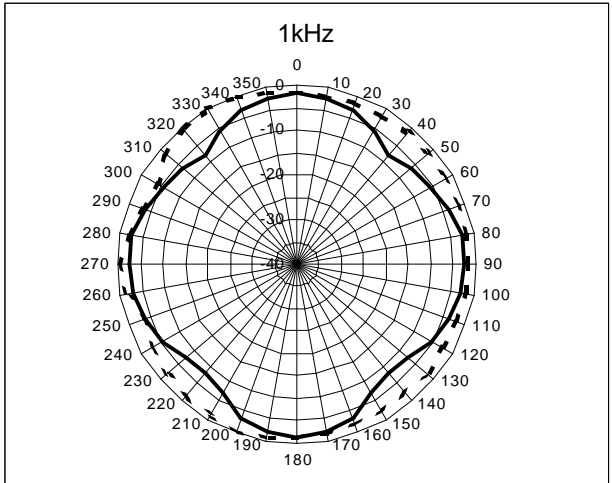
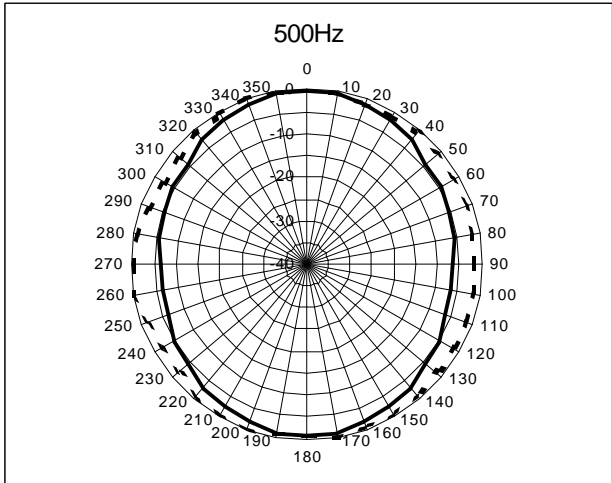
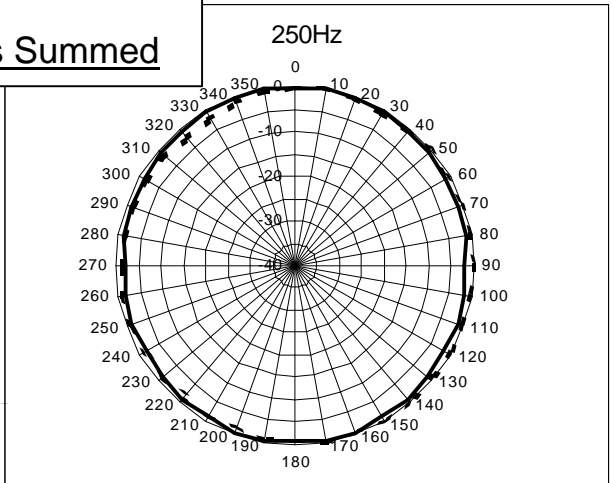
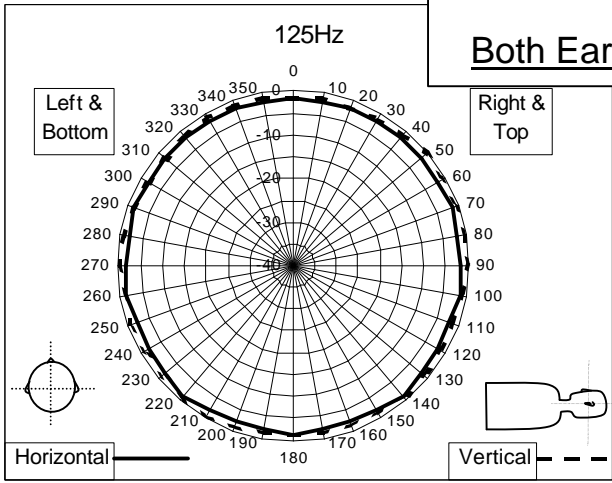
Mounting Method for Vertical Plane Measurements



APPENDIX B



Both Ears Summed



Left Ears Only	Frequency (Hz)						
	125	250	500	1k	2k	4k	8k
Parameter							
Axial Q	0.9	0.9	0.9	0.9	1.3	1.9	0.5
Directivity Index (dB on-axis)	-0.5	-0.5	-0.5	-0.5	1.1	2.8	-3.0

Both Ears Summed	Frequency (Hz)						
	125	250	500	1k	2k	4k	8k
Parameter							
Axial Q	0.9	1.2	1.6	1.3	1.9	2.8	0.8
Directivity Index (dB on-axis)	-0.5	0.8	2.0	1.1	2.8	4.5	-1.0

APPENDIX C

Comparison of Head Q and STI Weightings

