

# Technical Documentation

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Microphone Type 4950  
for Hand-held Analyzer  
Types 2250, 2250-L and 2270

Supplement to Instruction Manual BE 1712



# **Microphone Type 4950 for Hand-held Analyzer Types 2250, 2250-L and 2270**

Type 2250, from Hardware Version 1.1  
Type 2250-L, from Hardware Version 2.0  
Type 2270, from Hardware Version 3.0

***Supplement to Instruction Manual BE 1712***

# Safety Considerations

This apparatus has been designed and tested in accordance with IEC 61010 – 1 and EN 61010 – 1 *Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use*. This manual contains information and warnings which must be followed to ensure safe operation and to retain the apparatus in safe condition. Special note should be made of the following:

## Safety Symbols

 The apparatus will be marked with this symbol when it is important that you refer to the associated warning statements given in the manual.

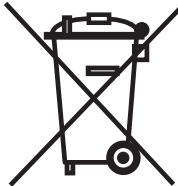
 Protective Earth Terminal     Hazardous Voltage

## Explosion Hazard

The equipment is not designed to be used in potentially explosive environments. It should not be operated in the presence of flammable liquids or gases.

## Warnings

- Switch off all power to equipment before connecting or disconnecting their digital interface. Failure to do so could damage the equipment.
- Whenever it is likely that the correct function or operating safety of the apparatus has been impaired, it must be made inoperative and be secured against unintended operation.
- Any adjustment, maintenance and repair of the open apparatus under voltage must be avoided as far as possible and, if unavoidable, must be carried out only by trained service personnel.



- Do not dispose of electronic equipment or batteries as unsorted municipal waste
- It is your responsibility to contribute to a clean and healthy environment by using the appropriate local return and collection systems
- Hazardous substances in electronic equipment or batteries may have detrimental effects on the environment and human health
- The symbol shown to the left indicates that separate collection systems must be used for any discarded equipment or batteries marked with that symbol
- Waste electrical and electronic equipment or batteries may be returned to your local Brüel & Kjær representative or to Brüel & Kjær Headquarters for disposal

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# Chapter 1

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## Introduction

### 1.1 About This Supplement

This document is a supplement, to Instruction Manual for Hand-held Analyzer Types 2250, 2250-L and 2270 BE 1712. It provides the information relevant when Hand-held Analyzer Type 2250, 2250 L or 2270 is configured with Prepolarized Free-field ½" Condenser Microphone Type 4950.

The combination of Prepolarized Free-field ½" Condenser Microphone Type 4950 and the hand-held analyzer is intended for low-cost general purpose use.

**The numbering of chapters, sections, figures and tables in this supplement corresponds to Instruction Manual BE 1712. This supplement only contains content that is different from the instruction manual and is specific to this microphone configuration. The other chapters, sections, figures and tables should be read in Instruction Manual BE 1712.**

Also see section 1.1 of the instruction manual.

### 1.2 System Overview

#### 1.2.4 Hardware Setup

This section provides an overview of the additional hardware components used when the analyzers are configured with Microphone Type 4950. The other hardware components can be found in Instruction Manual BE 1712, section 1.2.4.

**NOTE:** Microphone Type 4950 is not specified together with Outdoor Microphone Kit UA-1404

**Table 1.1**  
*Additional hardware components needed for conformance testing of the analyzers configured with Type 4950*

Quantity*	Brüel & Kjær Type/Part Number	Description
1 or 2	Type 4950	Prepolarized Free-field ½" Condenser Microphone
1 or 2	WA-0302-A	Electrical Substitute for Microphone Type 4950, 12 pF

\*. Quantity depends on which analyzer is to be tested.



# Chapter 2

## Information Required by the Standards

### 2.1 Introduction

This chapter contains detailed information required by the standards to be described in the Instruction Manual.

### 2.7 Measuring at Low Static Pressure

The frequency response of the microphone depends on the static pressure. Using a sound level calibrator to adjust the sensitivity of a sound level meter at the calibration check frequency provides no information on the influence of static pressure on frequency response. Conformance to the specified standards ensures that the system measures within the standard's tolerances, in the range from 85 kPa to 108 kPa. Data for the frequency response as a function of static pressure for the microphone can be found in the Microphone Handbook BA 5105. Type 4950 is not covered by the Microphone Handbook, but in this respect, it performs like Microphone Type 4188.

At the calibration check frequency, both the microphones and the recommended Brüel & Kjær Sound Calibrator Type 4231 are rather insensitive to variations in the static pressure – for Sound Calibrator Type 4231, below 0.001 dB/kPa.



# Chapter 3

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## Conformance Testing

### 3.1 Introduction

This chapter contains the information needed to conduct conformance testing according to the specified standards.

### 3.5 Electrical Substitute for Microphones

To obtain a BNC type electrical input, replace the microphone with a **WA-0302-A, 12 pF**, fitted with a 10–32 UNF to BNC adaptor, UA-0245.

This Electrical Substitute for Microphones has a nominal attenuation of **0.70 dB**.

The electrical input obtained in this way has a maximum input level of  $\pm 15.44 \text{ V}_{\text{Peak}}$  and no damage will occur for signals up to  $\pm 20 \text{ V}_{\text{Peak}}$ .

All electrical inputs can be short-circuited when needed for test.

To calibrate the analyzer for the electrical conformances test with a calibration that corresponds to the calibration you would get if the analyzer were fitted with a microphone with the nominal Open Circuit Sensitivity do the following:

- 1) On the **Setup** display (*Full* tab):
  - Set *Input, Transd. Used* to the microphone that you intend to substitute
  - Set *Input, Input to Top Socket*
- 2) Calibrate the analyzer by typing in the nominal sensitivity as the *Sensitivity* on the **Calibration** display. For Microphone **Type 4950**, the nominal sensitivity is the microphone's Open Circuit Sensitivity (**50.00 mV/Pa**), attenuated by the Microphone Preamplifier ZC-0032's nominal attenuation (**0.30 dB**), which equates to **48.38 mV/Pa**. Do not press the **Start Calibration** button.
- 3) Connect an electrical sinusoidal signal with a frequency of 1 kHz to the Electrical Substitute for Microphones and adjust the amplitude of this signal until LZF (or LCF) displays 94.00 dB in the **Calibration** display. This electrical amplitude is the 94.00 dB reference for the electrical tests. The amplitude will typically be **52.6 mV**. This is due to the attenuation of the Electrical Substitute for Microphones (nominally **0.70 dB**).



# Chapter 4

## Specifications

### 4.1 Specifications

Specifications are given for the configurations detailed in Chapter 1.

Unless specifically noted, specifications are given as typical data under Reference Environmental Conditions, and with the system calibrated to the nominal microphone open circuit sensitivity.

**NOTE:** The specifications given here for the Z-weighting, as defined in IEC 61672-1, are also valid for the Lin response, as defined in IEC 60651.

### 4.5 Microphone

Microphone Type 4950 and Microphone Preamplifier ZC-0032:

**Type:** Prepolarized Free-field ½ " Condenser Microphone

**Nominal Open Circuit Sensitivity:** 50 mV/Pa, (corresponding to -26 dB re 1 V/Pa) ± 2 dB

**Capacitance:** 12.5 pF (at 250 Hz)

**Nominal Preamplifier Attenuation:** 0.3 dB

**Extension Cables between Microphone Preamplifier ZC-0032 and the Analyzer:** Up to 100 m without degradation of the specifications. **Note:** EMC is only tested with a 10 m cable (AO-0697-D-100)

**Microphone Reference Point:** The centre of the front surface of the microphone protection grid.

**Reference Direction of Sound Incidence:** See the small drawings in the lower right corner of the directional response graphs in section 4.7.

### 4.6 Frequency Responses

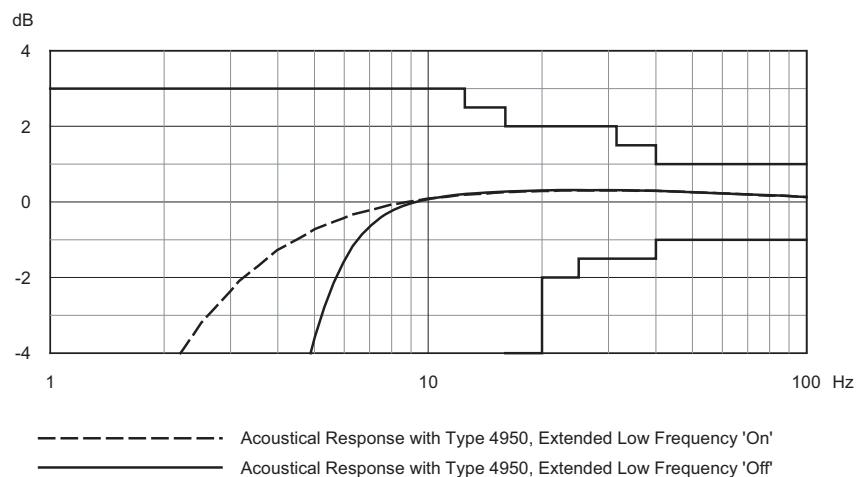
#### 4.6.2 Typical Low-frequency Responses

The typical Low-frequency Responses for Z-frequency weighting are given in Fig.4.2. **For the rear 'Input' socket Electrical Responses refer to section 4.6.2 in the Instruction Manual.** The Acoustical Responses include Microphone Type 4950 and Microphone Preamplifier ZC-0032.

The Low-frequency Responses depends on the state of the *Extended Low Frequency* parameter on the **Setup** display, under *Input*.

The Low-frequency Responses are not influenced by the microphone accessories described in section 1.2.4.

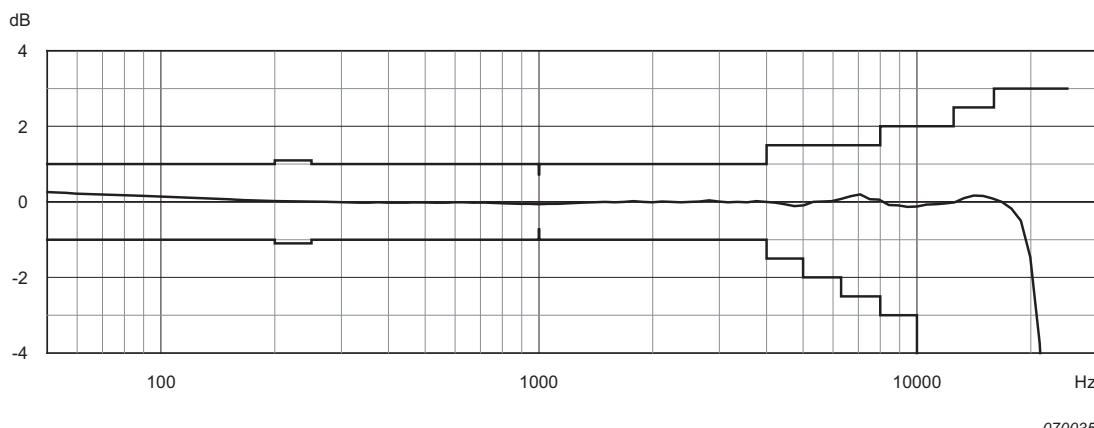
The Low-frequency Responses for introduction of the electrical signal through the recommended means to substitute the microphone with an electrical input facility (see section 3.5) differs from the electrical responses in Fig.4.2 **in the Instruction Manual** because it also includes Microphone Preamplifier ZC-0032.

**Fig.4.2** Typical low-frequency responses

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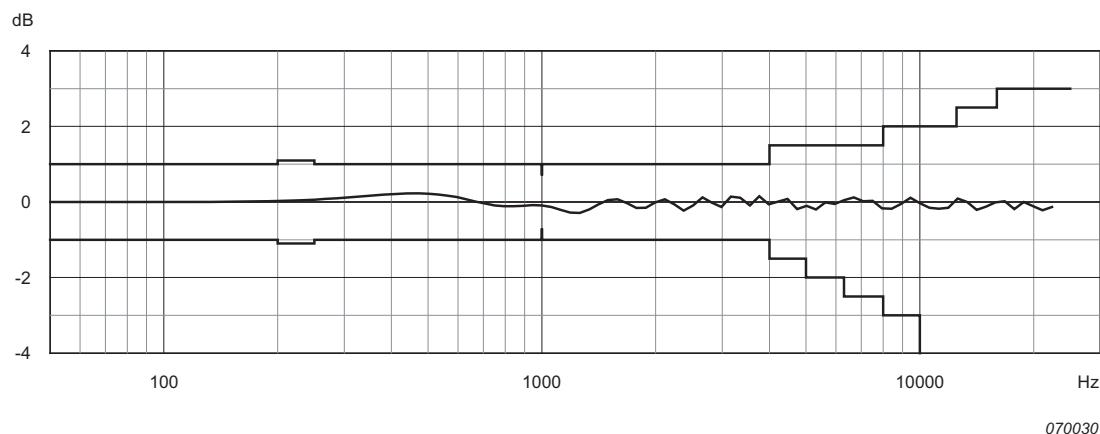
#### 4.6.5 Free-field Frequency Responses

The free-field frequency responses for plane progressive sinusoidal sound waves incident from the reference direction with Z-frequency weighting are provided in Fig.4.3 to Fig.4.7 and Table A.2 to Table A.5. The tables also provide the ‘Expanded Uncertainties of Measurement’ required by IEC 61672–1, see the start of section 4.6 in the Instruction Manual.

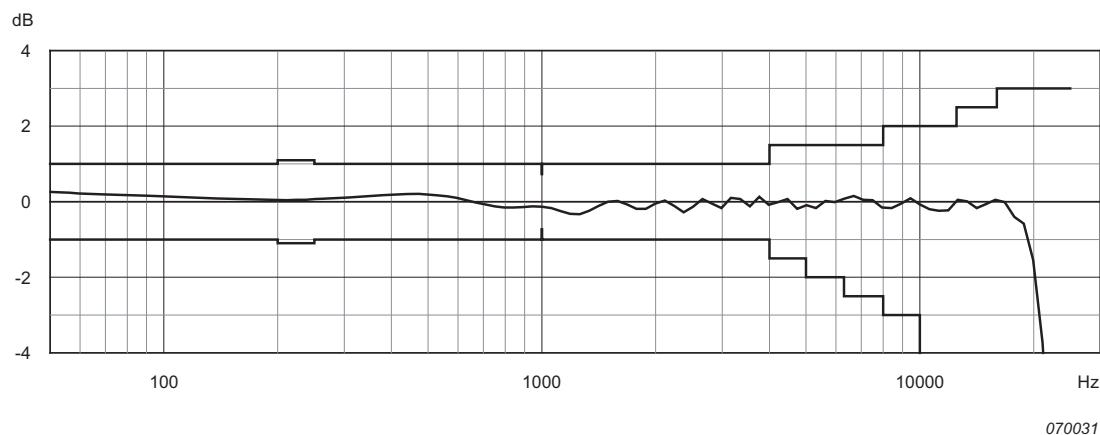
**Fig.4.3** Free-field  $0^\circ$  frequency response for Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer's electrical response, with the microphone preamplifier connected to a microphone extension cable. Corresponds to the “Acoustical Response” column in Table A.2

070035

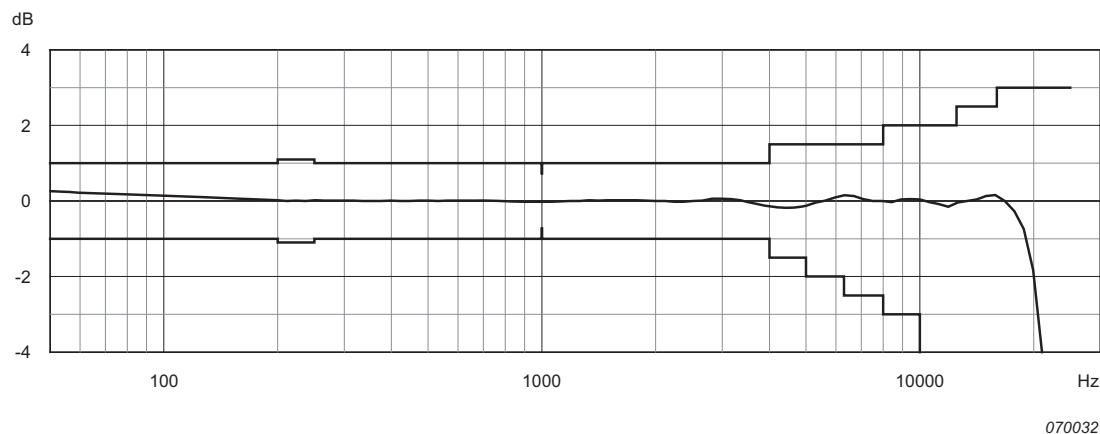
**Fig. 4.4** Influence of the analyzer body on free-field  $0^\circ$  response, corresponds to the “Body Influence” column in Table A.3



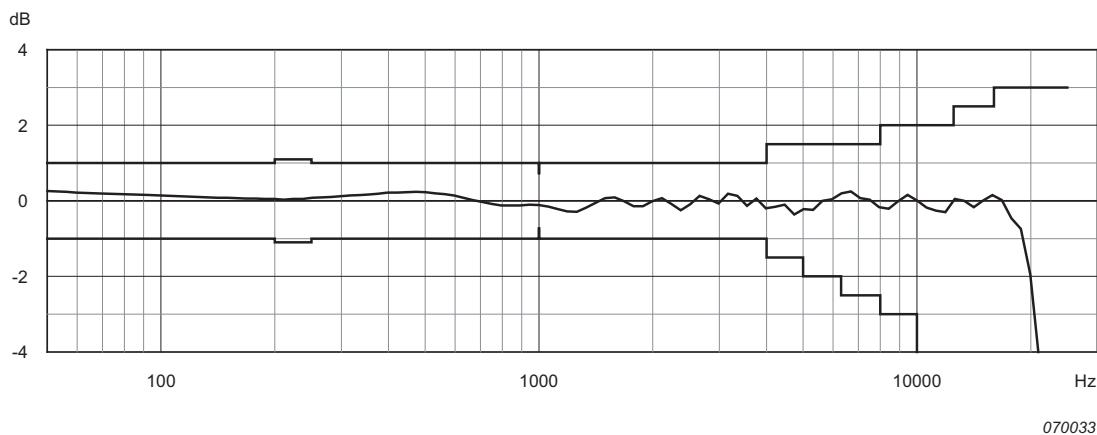
**Fig. 4.5** Free-field  $0^\circ$  frequency response for Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with the microphone preamplifier mounted directly on the analyzer. Corresponds to the “Acoustical Response” column in Table A.3



**Fig. 4.6** Free-field  $0^\circ$  frequency response for Windscreen UA-1650, Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer’s electrical response, with the microphone preamplifier connected to a microphone extension cable. Corresponds to the “Acoustical Response” column in Table A.4



**Fig.4.7** Free-field 0° frequency response for Windscreen UA-1650, Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with the microphone preamplifier mounted directly on the analyzer. Corresponds to the “Acoustical Response” column in Table A.5



070033

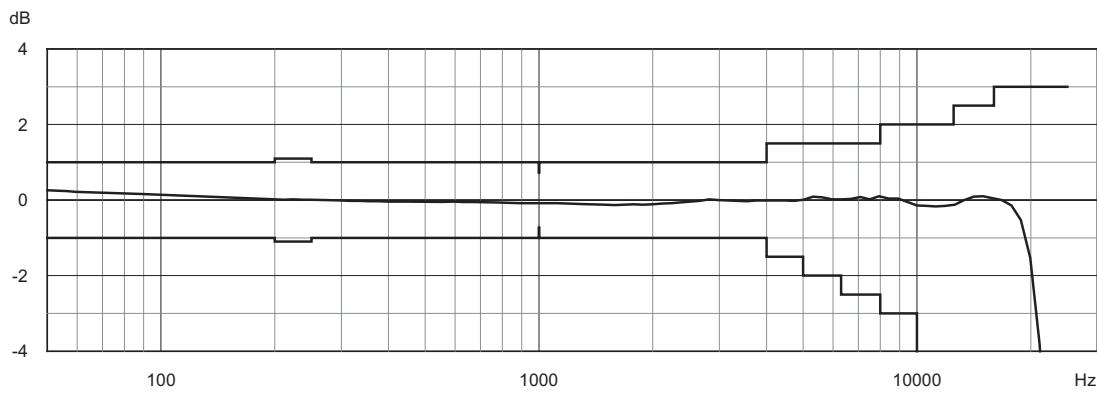
**Fig.4.8** Microphone Type 4950 is not specified together with Outdoor Microphone Kit UA-1404

#### 4.6.6 Diffuse-field Frequency Responses

The diffuse-field frequency responses (also called random-incidence frequency responses) with Z-frequency-weighting are provided in Fig.4.9 and Fig.4.10, and Table A.7 and Table A.8.

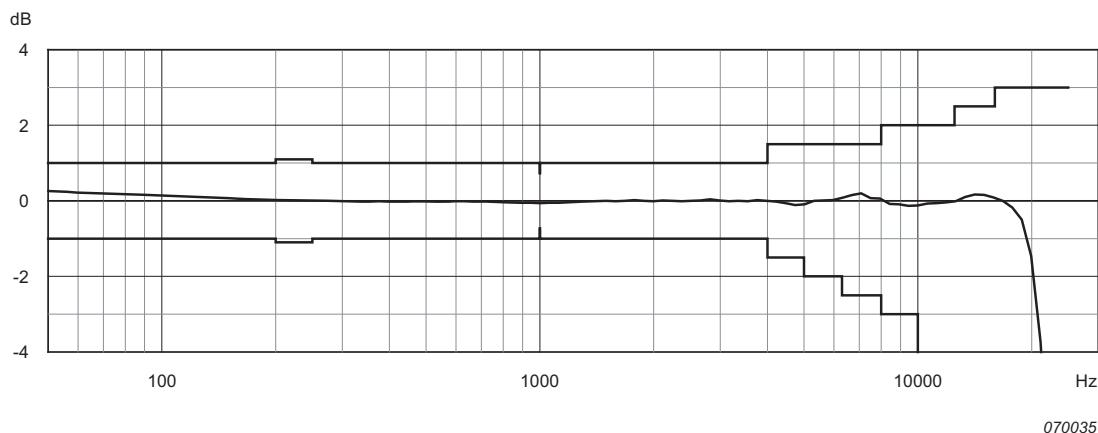
The diffuse-field body influence of the analyzer is so small that the diffuse-field frequency responses are the same with and without the Microphone Preamplifier connected to the microphone extension cable.

**Fig.4.9** Diffuse-field frequency response for Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with or without the microphone preamplifier connected to a microphone extension cable. Corresponds to the “Acoustical Response” column in Table A.7



070034

**Fig. 4.10** Diffuse-field frequency response for Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with or without the microphone preamplifier connected to a microphone extension cable. Corresponds to the “Acoustical Response” column in Table A.7



**Fig. 4.11** Microphone Type 4950 is not specified together with Outdoor Microphone Kit UA-1404

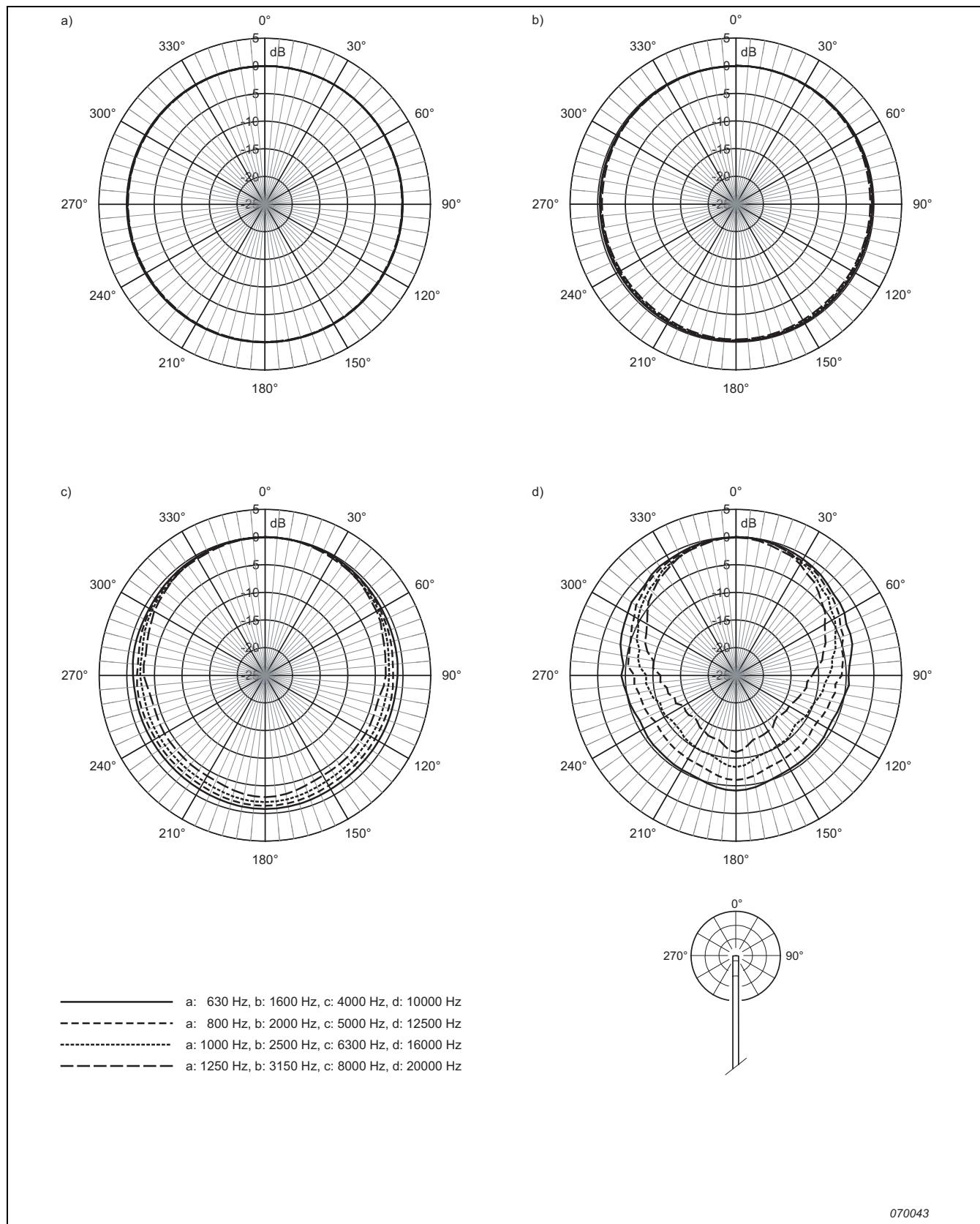
## 4.7 Directional Responses

This section gives directional responses for plane progressive sinusoidal sound waves normalised to the response in the reference direction. Both influence of body and accessories, and the resulting directional responses are given as tables in Appendix A. Only the resulting directional responses are given here as graphs.

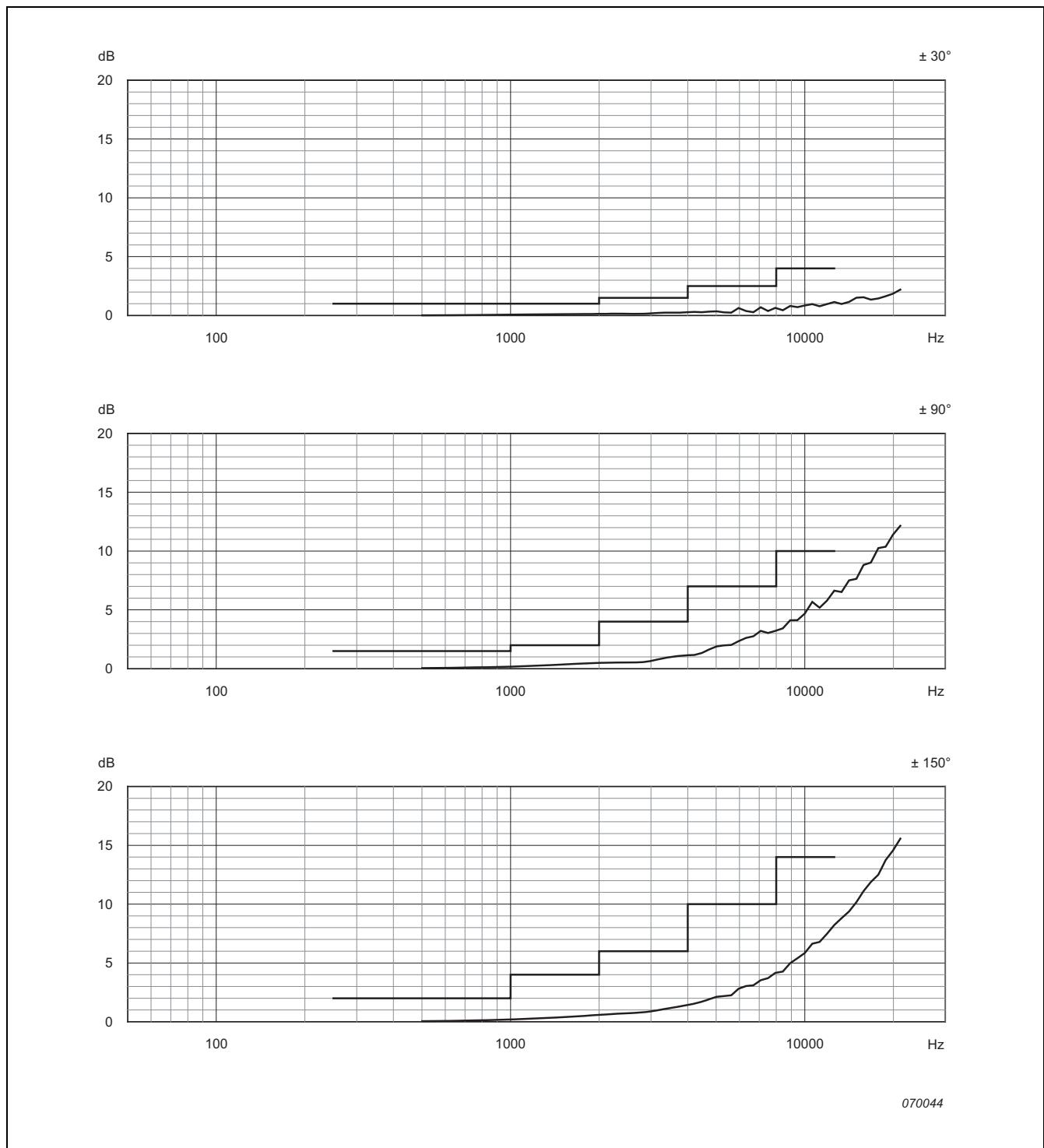
The sensitivity variation graphs show the absolute maximum difference between the sensitivities at any two sound incidence angles within the specified interval of angles. For example, at each frequency the value for  $\pm 30^\circ$  is the difference between the highest and the lowest sensitivity found in a circular cone with an opening angle of  $60^\circ$ , the top at the Microphone Reference Point and with the reference direction of incidence as the axis. Because the angle interval defines a three-dimensional geometric shape there is only one set of graphs with sensitivity variations, also where the directional response is shown for two planes. The graphs show the maximum variation for the two measurement planes combined. The sensitivity variations are also given as tables in Appendix A.

Limit curves are drawn on the sensitivity variation graphs in the following sections. These curves represent the IEC 61672-1 limits, reduced by the ‘Maximum Expanded Uncertainties of Measurement’ from Appendix A of IEC 61672-1. The ‘Maximum Expanded Uncertainties of Measurement’ used here are the maximum uncertainties that a test organisation may have on its measurements when it performs conformance tests according to IEC 61672.

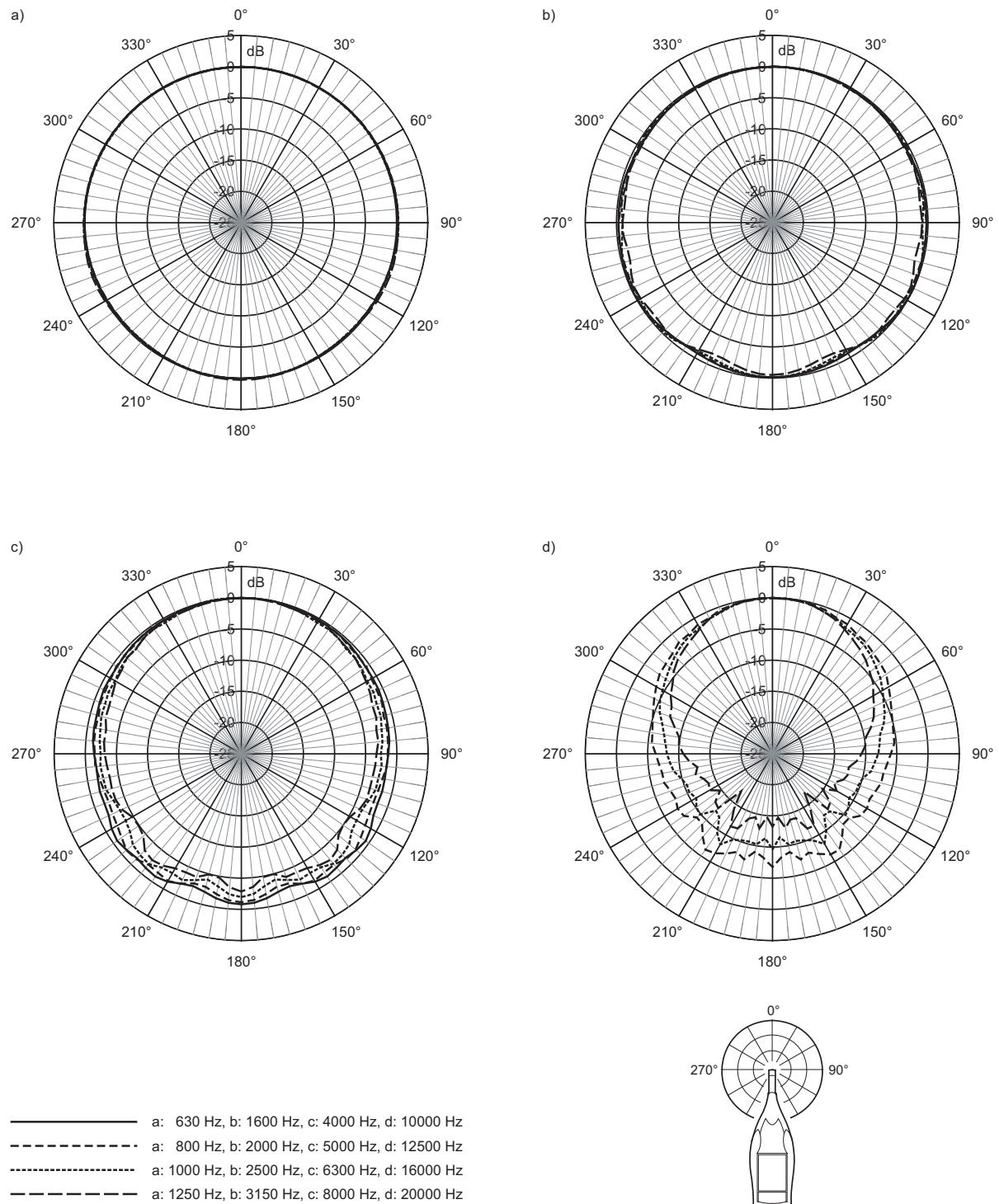
**Fig.4.12** Directional response for Microphone Type 4950 and Microphone Preamplifier ZC-0032 with the microphone preamplifier connected to a microphone extension cable. Corresponds to Table A.11 to Table A.13



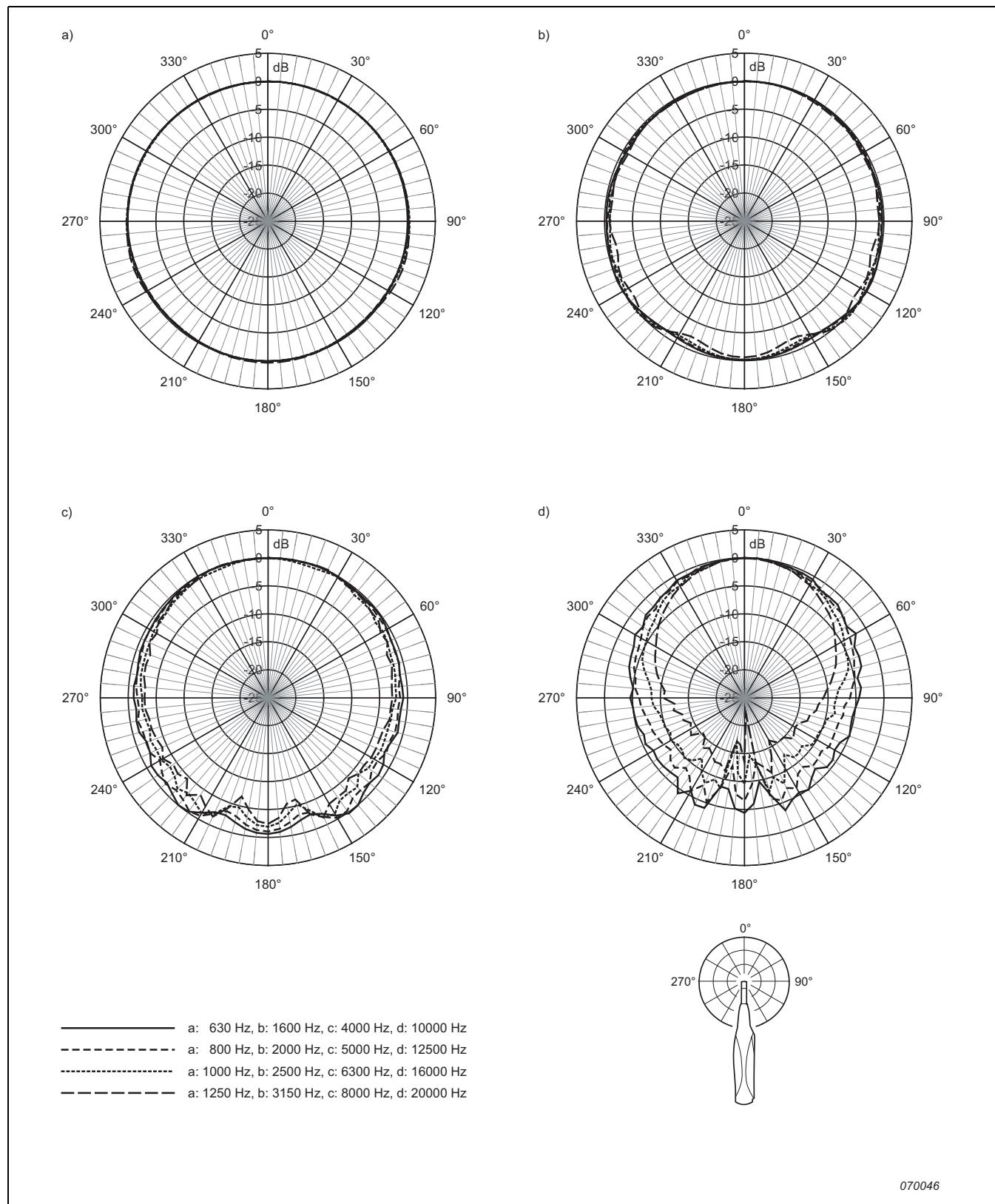
**Fig. 4.13** Sensitivity variations for Microphone Type 4950 and Microphone Preamplifier ZC-0032 with the microphone preamplifier connected to a microphone extension cable, at sound incidence angles within  $\pm\theta^\circ$  from the reference direction. Corresponds to Table A.14



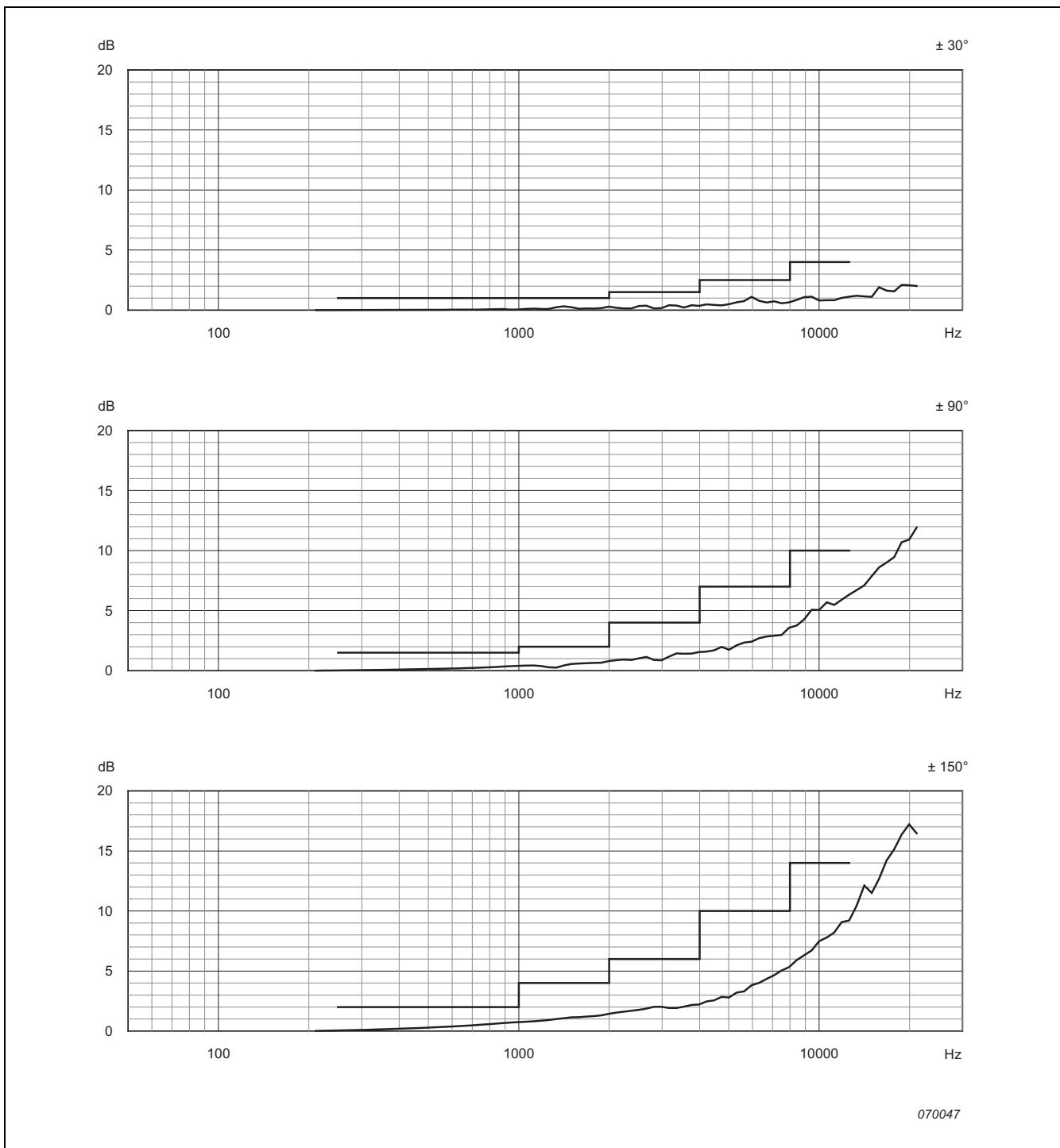
**Fig. 4.14** Directional response for Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with the Microphone Preamplifier mounted directly on the analyzer, measured in a plane parallel to the display and along the microphone axis. Corresponds to Table A.21 to Table A.23



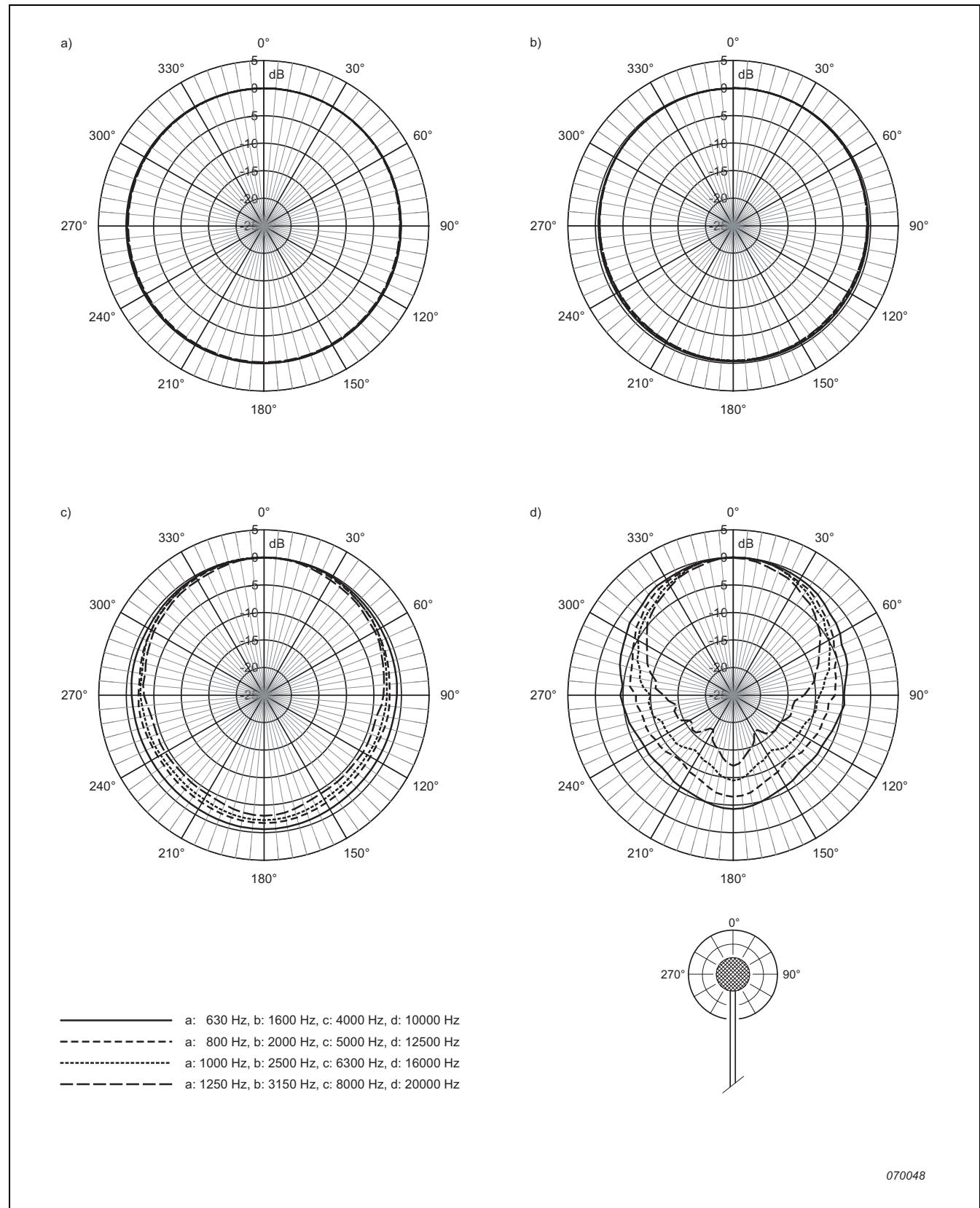
**Fig. 4.15** Directional response for Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with the microphone preamplifier mounted directly on the analyzer, measured in a plane perpendicular to the display and along the microphone axis. Corresponds to Table A.24 to Table A.26



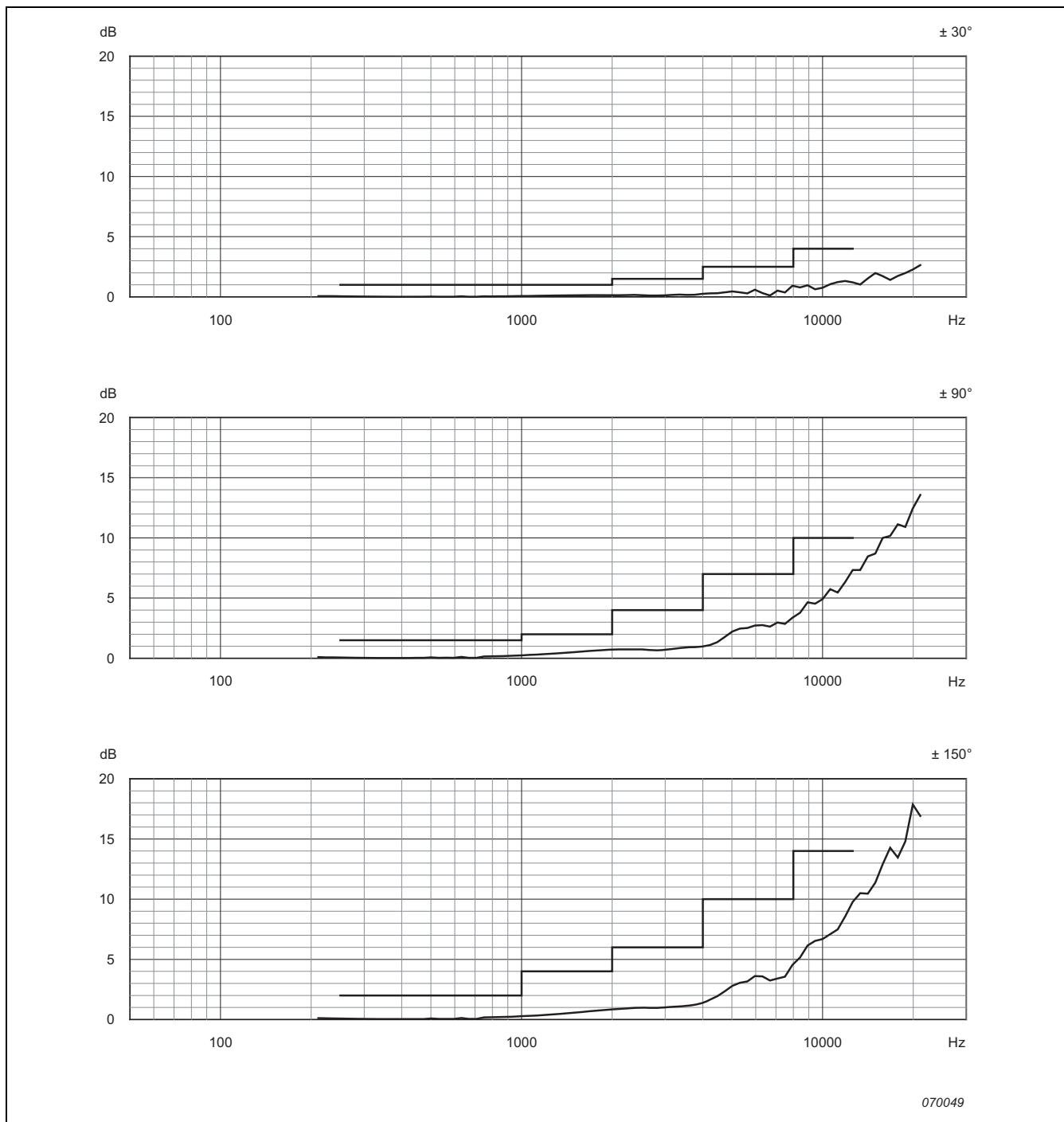
**Fig.4.16** Sensitivity variations of Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with the microphone preamplifier mounted directly on the analyzer, at sound incidence angles within  $\pm\theta^\circ$  from the reference direction. Corresponds to Table A.27



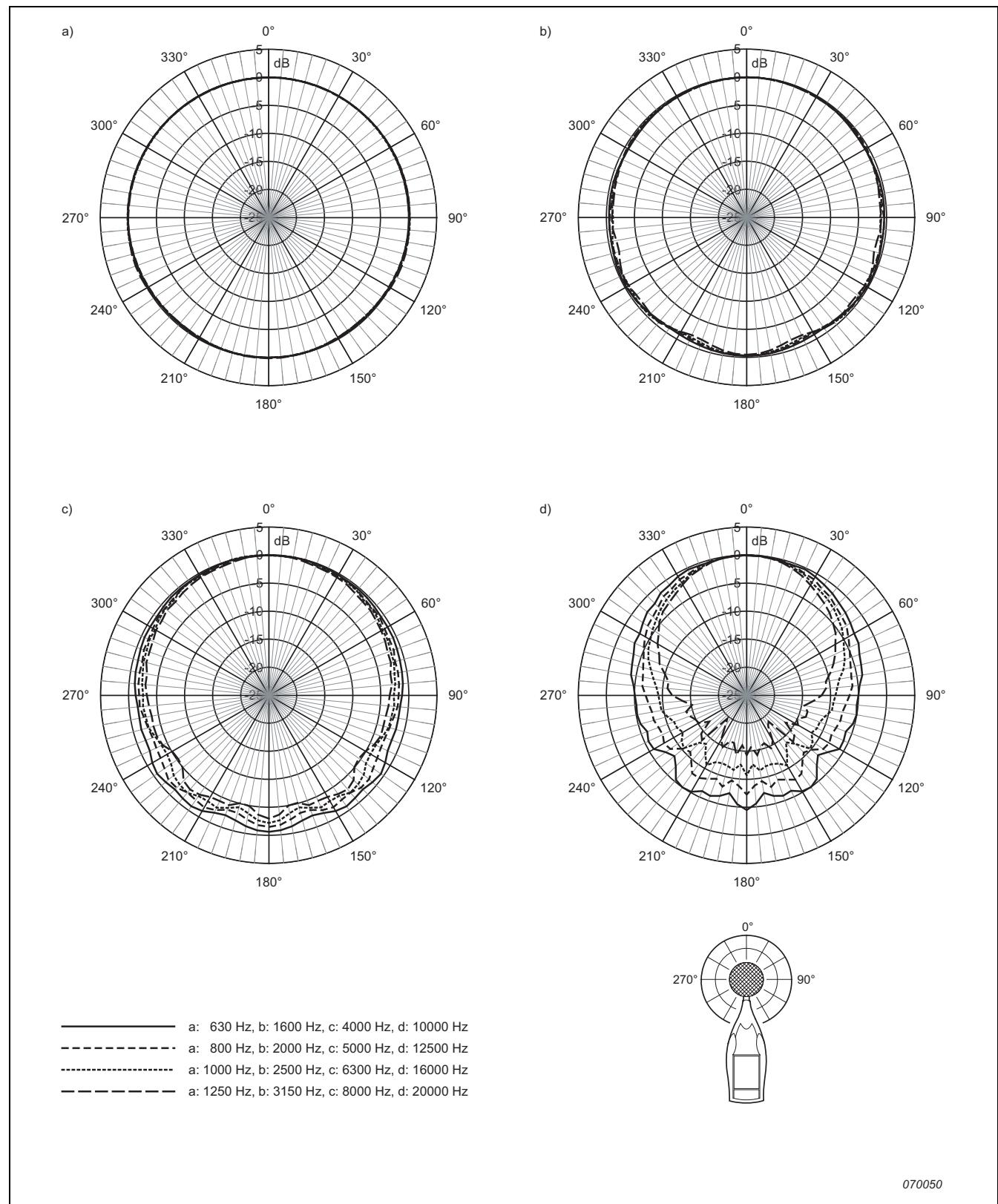
**Fig. 4.17** Directional response for Windscreen UA-1650, Microphone Type 4950 and Microphone Preamplifier ZC-0032 with the microphone preamplifier connected to a microphone extension cable. Corresponds to Table A.31 to Table A.33



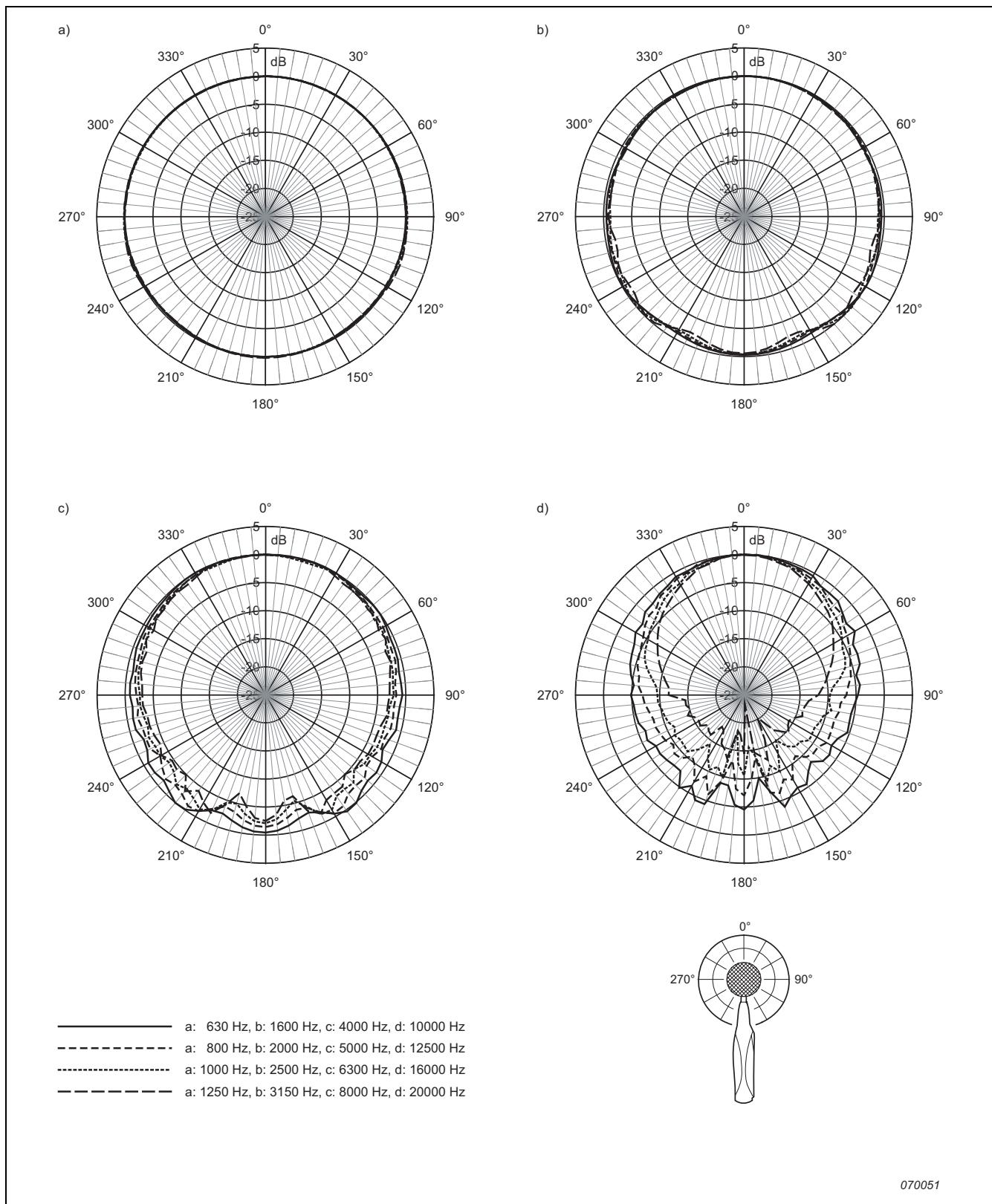
**Fig.4.18** Sensitivity variations for Windscreen UA-1650, Microphone Type 4950 and Microphone Preamplifier ZC-0032 with the microphone preamplifier connected to a microphone extension cable, at sound incidence angles within  $\pm\theta^\circ$  from the reference direction. Corresponds to Table A.34



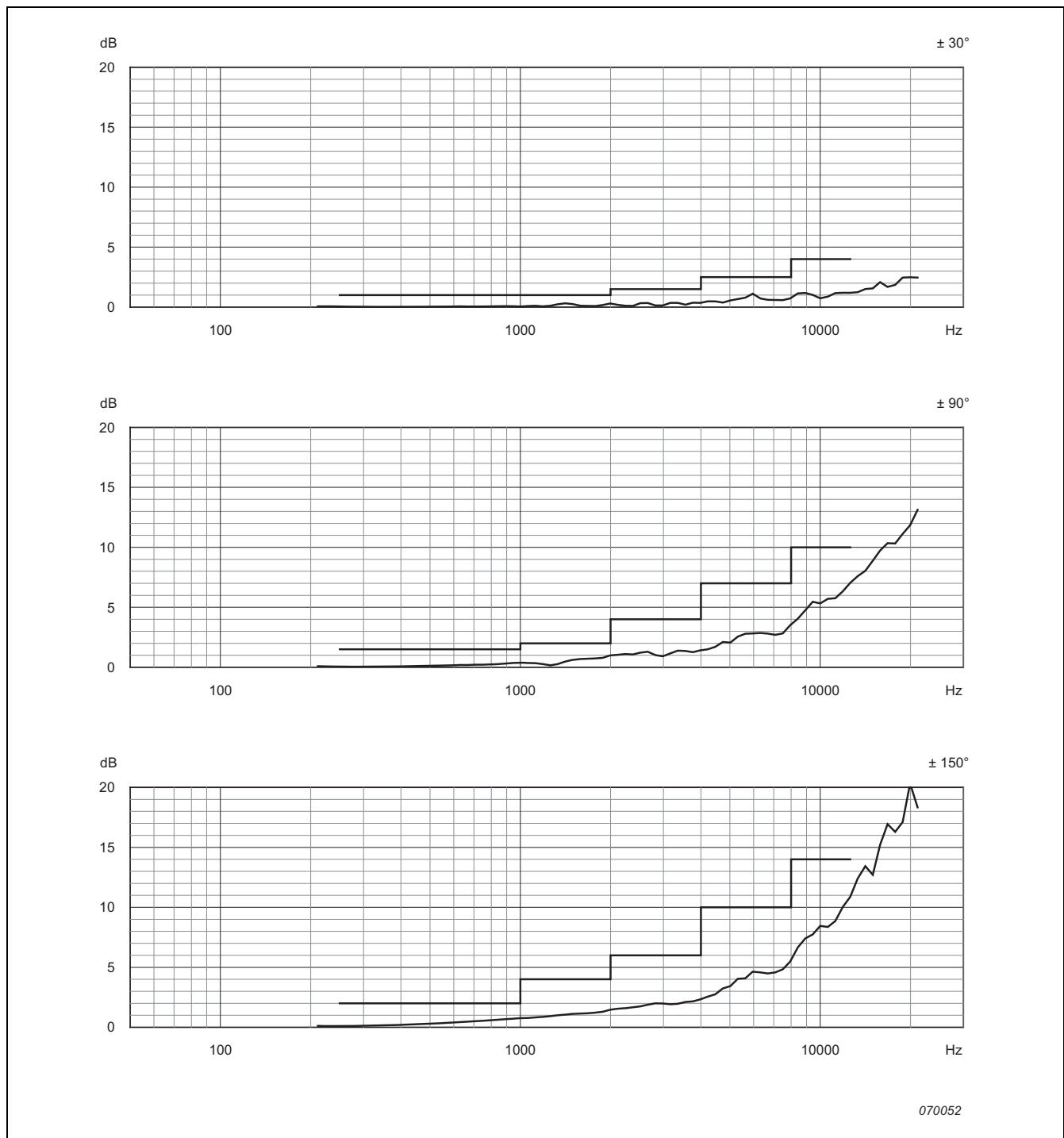
**Fig. 4.19** Directional response for Windscreen UA-1650, Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with the microphone preamplifier mounted directly on the analyzer, measured in a plane parallel to the display and along the microphone axis. Corresponds to Table A.35 to Table A.37



**Fig.4.20** Directional response for Windscreen UA-1650, Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with the microphone preamplifier mounted directly on the analyzer, measured in a plane perpendicular to the display and along the microphone axis. Corresponds to Table A.38 to Table A.40



**Fig. 4.21** Sensitivity variations of Windscreen UA-1650, Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with the microphone preamplifier mounted directly on the analyzer, at sound incidence angles within  $\pm\theta^\circ$  from the reference direction. Corresponds to Table A.41



**Fig.4.22** Microphone Type 4950 is not specified together with Outdoor Microphone Kit UA-1404

**Fig.4.23** Microphone Type 4950 is not specified together with Outdoor Microphone Kit UA-1404

## 4.8 Self-generated Noise

Self-generated noise is given for nominal microphone Open Circuit Sensitivity. *Sound Field Correction* set to *Free-field* and no microphone accessories selected.

### 4.8.1 Maximum Broadband Self-generated Noise

**Table 4.1**  
Maximum broadband self-generated noise

Maximum Noise	Frequency Weighting				
	A-weighting (dB)	B-weighting (dB)	C-weighting (dB)	Z-weighting* (dB)	Z-weighting* Extended Low Frequency (dB)
<b>Single-range</b>					
Microphone	15.0	13.9	14.0	15.4	15.4
Electrical	13.7	13.3	15.0	20.4	31.5
Total	17.4	16.6	17.5	21.6	31.6
<b>High Range</b>					
Microphone	15.0	13.9	14.0	15.4	15.4
Electrical	31.9	30.5	30.6	35.4	36.8
Total	32.0	30.6	30.7	35.4	36.8
<b>Low Range</b>					
Microphone	15.0	13.9	14.0	15.4	15.4
Electrical	13.7	13.3	15.0	20.4	31.5
Total	17.4	16.6	17.5	21.6	31.6

\*. minimum 120 seconds L<sub>Zeq</sub>

#### 4.8.2 Typical Broadband Self-generated Noise

**Table 4.2**  
*Typical broadband self-generated noise*

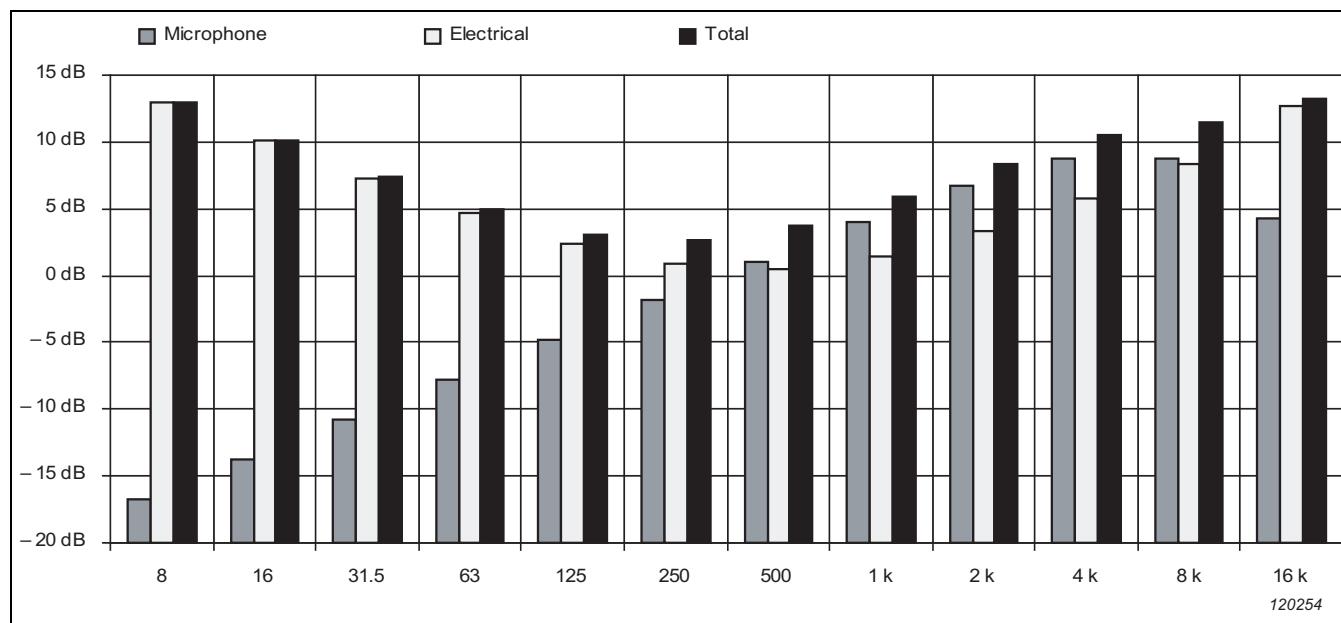
Typical Noise	Frequency Weighting				
	A-weighting (dB)	B-weighting (dB)	C-weighting (dB)	Z-weighting* (dB)	Z-weighting* Extended Low Frequency (dB)
<b>Single-range</b>					
Microphone	14.0	12.9	13.0	14.4	14.4
Electrical	12.7	11.9	13.6	19.3	26.9
Total	16.4	15.4	16.3	20.5	27.1
<b>High Range</b>					
Microphone	14.0	12.9	13.0	14.4	14.4
Electrical	28.5	27.1	27.1	32.0	33.0
Total	28.7	27.3	27.3	32.1	33.1
<b>Low Range</b>					
Microphone	14.0	12.9	13.0	14.4	14.4
Electrical	12.7	11.9	13.6	19.3	26.9
Total	16.4	15.4	16.3	20.5	27.1

\*. minimum 120 seconds L<sub>Zeq</sub>

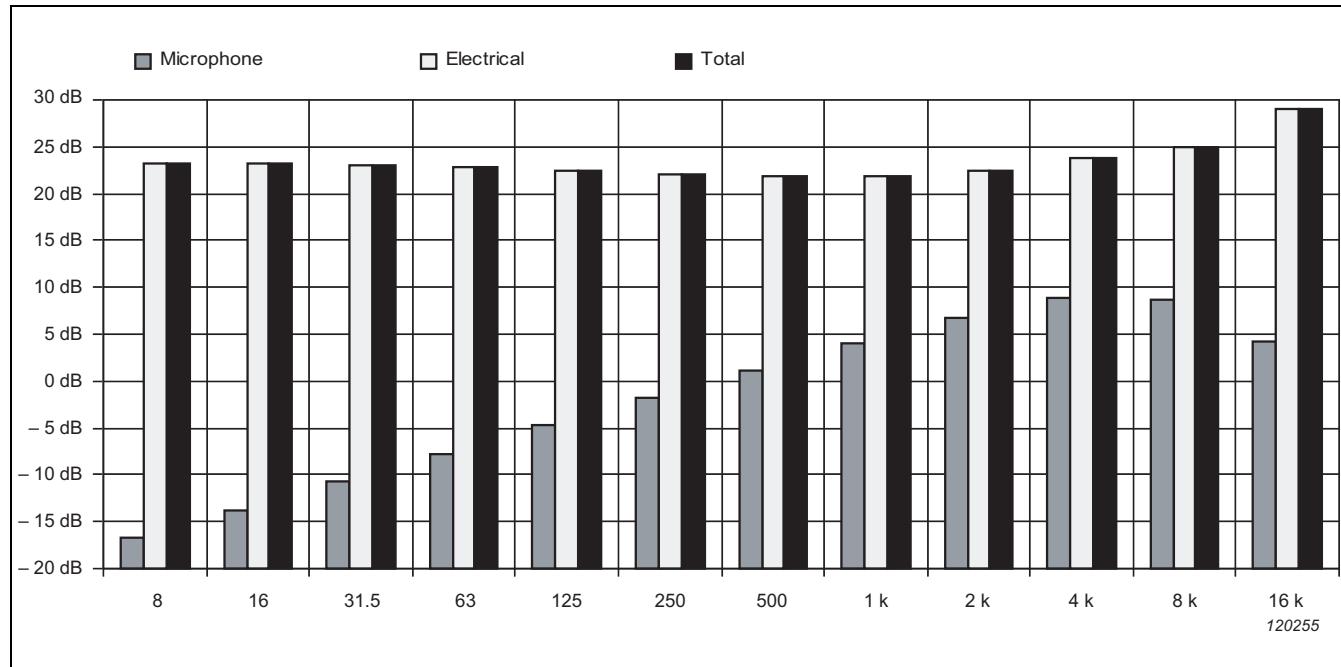
#### 4.8.3 Typical Self-generated Noise Spectra

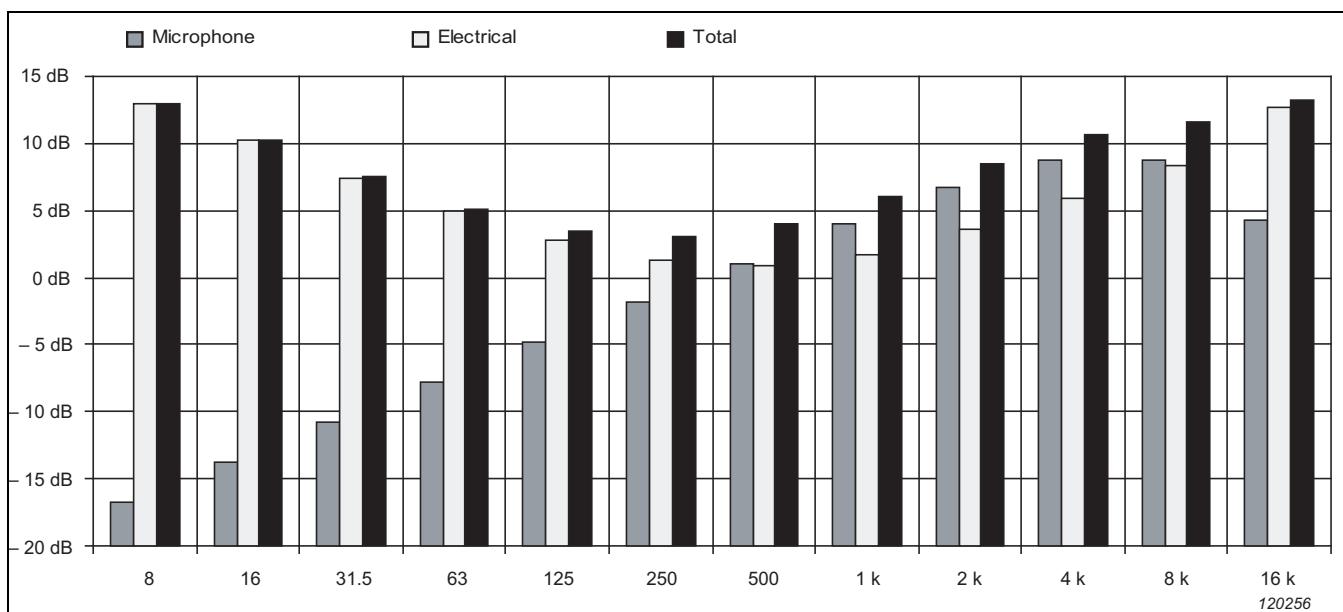
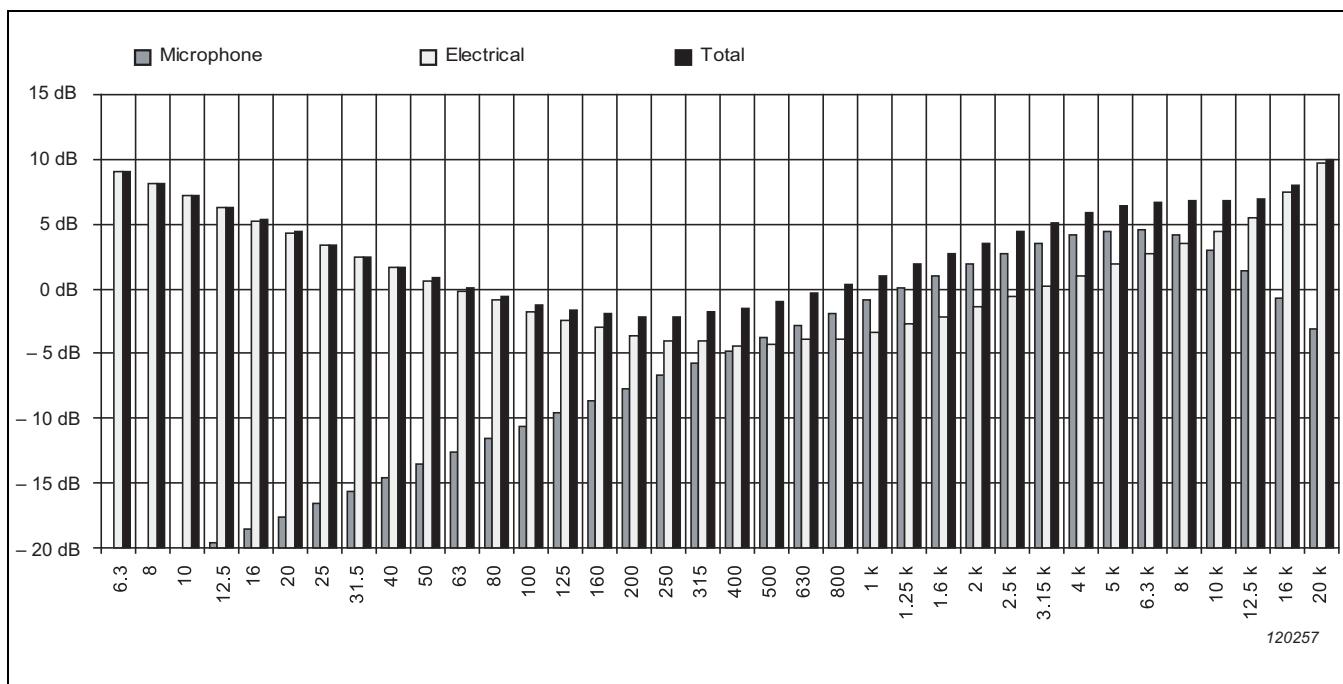
Typical spectra for self-generated noise are shown in Fig.4.24 to Fig.4.29.

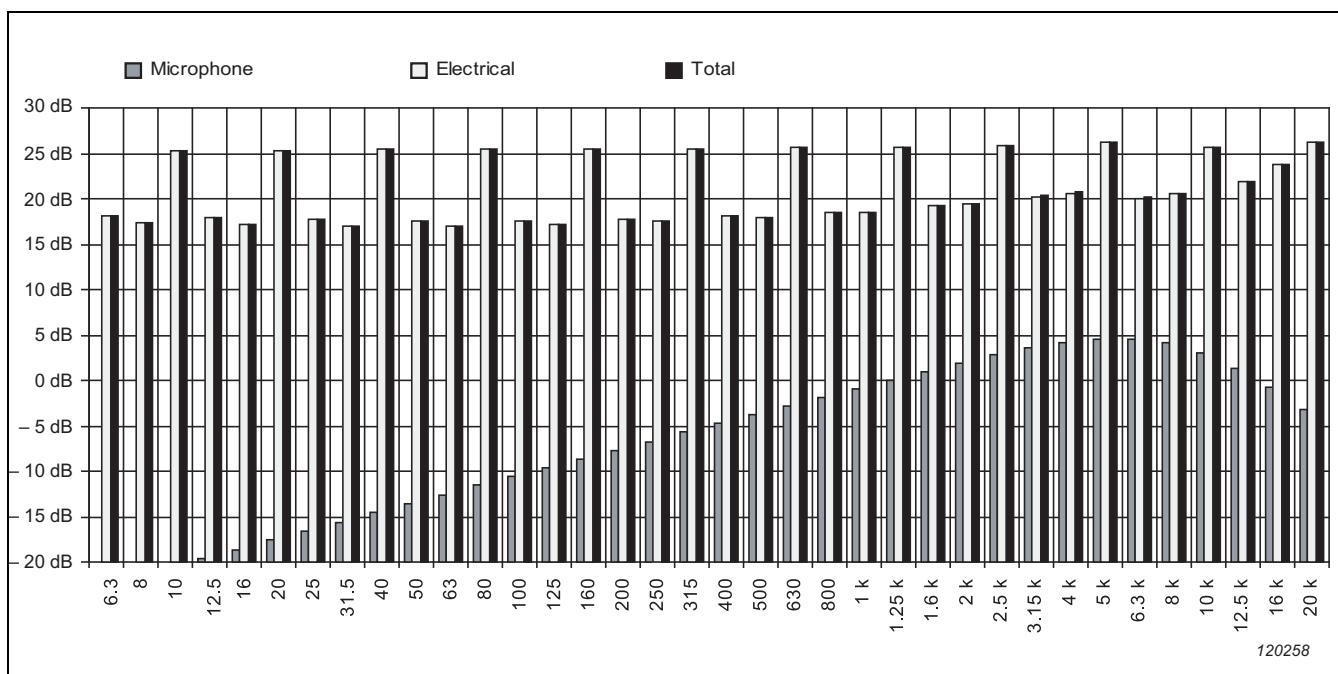
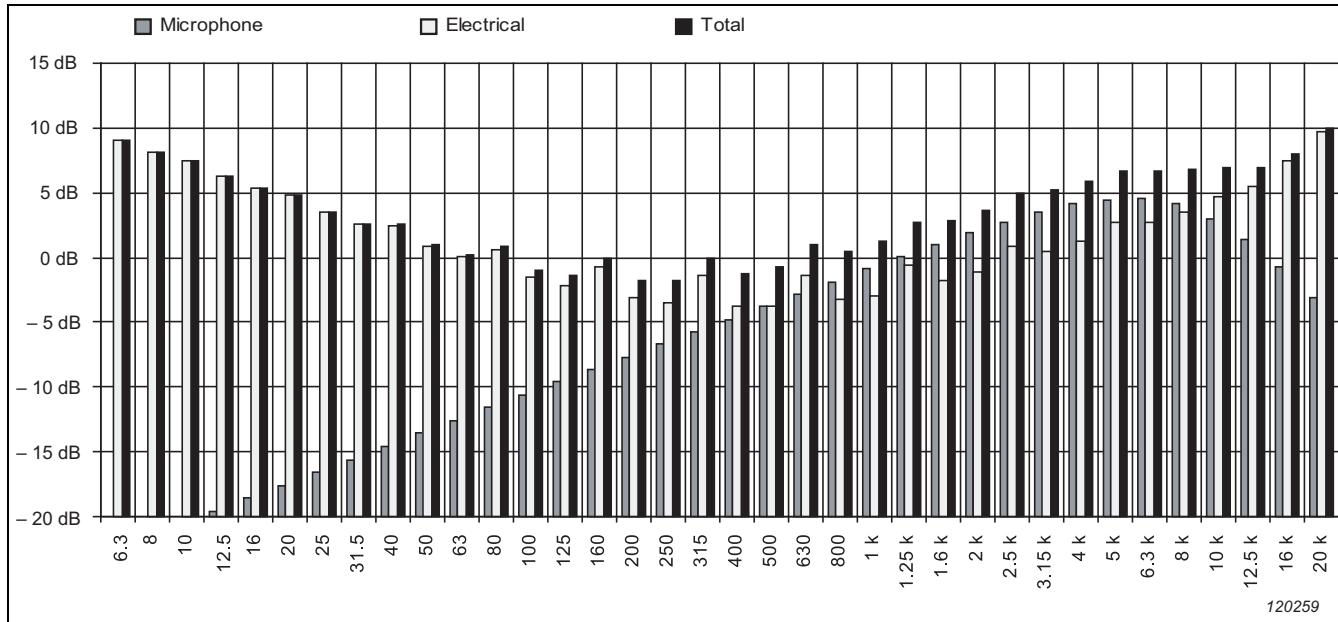
**Fig.4.24** Typical self-generated noise, 1/1 octave band, Single-range



**Fig.4.25** Typical self-generated noise, 1/1-octave band, High Range



**Fig. 4.26** Typical self-generated noise, 1/1 octave band, Low Range**Fig. 4.27** Typical self-generated noise, 1/3 octave band, Single-range

**Fig. 4.28** Typical self-generated noise, 1/3-octave band, High Range**Fig. 4.29** Typical self-generated noise, 1/3 octave band, Low Range

## 4.9 Measuring Ranges

The Upper Limit in the following sections is based on the guaranteed worst-case limit for the analyzer and the nominal Open Circuit Sensitivity of the microphone. The Overload Limit can, due to tolerances in the analyzer, be up to 1.5 dB higher than the worst-case limit, but tolerances specified in the International Standards are maintained as long as no Overload is indicated.

The Lower Limit in the following sections is based on the guaranteed worst-case limit for the analyzer and the nominal Open Circuit Sensitivity of the microphone, under Reference Environmental Conditions, *Sound Field Correction* set to *Free-field* and no microphone accessories selected.

#### 4.9.1 Maximum Sound Level

The maximum Sound Level that the Sound Level Meter can accommodate without causing damage to the Sound Level Meter: 158 dB Peak.

#### 4.9.2 Total Range

Total Range is defined as the difference between the Upper Limit on the least sensitive level range, and the lowest sound pressure level measurable on the most sensitive level range, which can be measured at 1 kHz within the most conservative tolerance limits, specified in the International Standards IEC 61672-1, IEC 60651 and IEC 60804:

**Table 4.3**  
*Total range*

Frequency Weighting				
A-weighting (dB)	B-weighting (dB)	C-weighting (dB)	Z-weighting (dB)	Z-weighting Extended Low Frequency (dB)
139.8 – 24.9	139.8 – 24.5	139.8 – 26.2	139.8 – 31.6	139.8 – 42.7

**Note:** For Sound Exposure Levels, the stated ranges are valid if  $10 \cdot \lg(\Delta t)$  is added to the limits.  $\Delta t$  being the averaging time interval, indicated as *Elapsed Time*, expressed in seconds.

#### 4.9.3 Primary Indicator Range

Primary Indicator Range according to the International Standard IEC 60651:

**Table 4.4**  
*Primary Indicator Range*

Range	Upper Limit (dB)	Lower Limit				
		A-weighting (dB)	B-weighting (dB)	C-weighting (dB)	Z-weighting (dB)	Z-weighting Extended Low Frequency (dB)
Single	122.3	23.6	23.2	24.9	30.3	41.4
High	122.3	41.8	40.4	40.5	45.3	46.7
Low	92.3	23.6	23.2	24.9	30.3	41.4

#### 4.9.4 Indicator Range

Indicator Range according to the International Standard IEC 60804:

**Table 4.5**  
*Indicator Range*

Range	Upper Limit (dB)	Lower Limit				
		A-weighting (dB)	B-weighting (dB)	C-weighting (dB)	Z-weighting (dB)	Z-weighting Extended Low Frequency (dB)
Single	139.3	23.6	23.2	24.9	30.3	41.4
High	139.3	41.8	40.4	40.5	45.3	46.7
Low	109.3	23.6	23.2	24.9	30.3	41.4

**Note:** For Sound Exposure Levels, the stated ranges are valid if  $10 \cdot \lg(\Delta t)$  is added to the limits.  $\Delta t$  being the averaging time interval, indicated as *Elapsed Time*, expressed in seconds.

#### 4.9.5 Linearity Range

Linearity Range according to the International Standard IEC 60804 is the difference between the Upper and Lower Limit in the following table:

**Table 4.6**  
Linearity Range

Range	Upper Limit (dB)	Lower Limit				
		A-weighting (dB)	B-weighting (dB)	C-weighting (dB)	Z-weighting (dB)	Z-weighting Extended Low Frequency (dB)
Single	140.8	21.5	21.1	22.8	28.2	39.3
High	140.8	39.7	38.3	38.4	43.2	44.6
Low	110.8	21.5	21.1	22.8	28.2	39.3

**Note:** For Sound Exposure Levels, the stated ranges are valid if  $10 \cdot \lg(\Delta t)$  is added to the limits.  $\Delta t$  being the averaging time interval, indicated as *Elapsed Time*, expressed in seconds.

#### 4.9.6 Pulse Range

Pulse Range according to the International Standard IEC 60804 is the difference between the Upper and Lower Limit in the following table:

**Table 4.7**  
Pulse Range

Range	Upper Limit (dB)	Lower Limit				
		A-weighting (dB)	B-weighting (dB)	C-weighting (dB)	Z-weighting (dB)	Z-weighting Extended Low Frequency (dB)
Single	143.8	21.5	21.1	22.8	28.2	39.3
High	143.8	39.7	38.3	38.4	43.2	44.6
Low	113.8	21.5	21.1	22.8	28.2	39.3

**Note:** For Sound Exposure Levels, the stated ranges are valid if  $10 \cdot \lg(\Delta t)$  is added to the limits.  $\Delta t$  being the averaging time interval, indicated as *Elapsed Time*, expressed in seconds.

#### 4.9.7 Linear Operating Range

The starting point for all the Linear Operating Range tests is 94.0 dB.

Linear Operating Range according to the International Standard IEC 61672-1:

**Table 4.8**  
Linear Operating Range

Frequency-Weighting	Upper Limit					Lower Limit
	31.5 Hz (dB)	1 kHz (dB)	4 kHz (dB)	8 kHz (dB)	12.5 kHz (dB)	
<b>Single-range</b>						
A-weighting	100.6	139.8	140.8	138.6	135.4	24.9
B-weighting	122.9	139.8	139.1	136.8	133.6	24.5
C-weighting	137.0	139.8	139.0	136.7	133.5	26.2
Z-weighting	140.0	139.8	139.8	139.7	139.7	31.6

**Table 4.8**  
*Linear Operating Range (Continued)*

Frequency-Weighting	Upper Limit					Lower Limit
	31.5 Hz (dB)	1 kHz (dB)	4 kHz (dB)	8 kHz (dB)	12.5 kHz (dB)	
Z-weighting Extended Low Frequency	140.0	139.8	139.8	139.7	139.7	42.7
<b>High Range</b>						
A-weighting	100.6	139.8	140.8	138.6	135.4	43.1
B-weighting	122.9	139.8	139.1	136.8	133.6	41.7
C-weighting	137.0	139.8	139.0	136.7	133.5	41.8
Z-weighting	140.0	139.8	139.8	139.7	139.7	46.6
Z-weighting Extended Low Frequency	140.0	139.8	139.8	139.7	139.7	48.0
<b>Low Range</b>						
A-weighting	70.6	109.8	110.8	108.6	105.4	24.9
B-weighting	92.9	109.8	109.1	106.8	103.6	24.5
C-weighting	107.0	109.8	109.0	106.7	103.5	26.2
Z-weighting	110.0	109.8	109.8	109.7	109.7	31.6
Z-weighting Extended Low Frequency	110.0	109.8	109.8	109.7	109.7	42.7

**Note:** For Sound Exposure Levels, the stated ranges are valid if  $10 \cdot \lg(\Delta t)$  is added to the limits.  $\Delta t$  being the averaging time interval, indicated as *Elapsed Time*, expressed in seconds.

#### 4.9.8 Peak C Range

Peak C Range according to the International Standard IEC 61672-1 is:

**Table 4.9**  
*Peak C Range*

Range	Upper Limit					Lower Limit
	31.5 Hz (dB)	1 kHz (dB)	4 kHz (dB)	8 kHz (dB)	12.5 kHz (dB)	
<b>Single</b>	140.0	142.8	142.0	139.7	136.5	43.0
<b>High</b>	140.0	142.8	142.0	139.7	136.5	58.6
<b>Low</b>	110.0	112.8	112.0	109.7	106.5	43.0

## 4.11 Spectrum Analysis

### 4.11.3 Linear Operating Range

Linear Operating Range according to the International Standard IEC 61260, for electrical input, for all filters in the filter banks:

**Table 4.10**  
Linear Operating Range

Range	Upper Limit (dB)	Lower Limit 1/1-octave (dB)	Lower Limit 1/3-octave (dB)
Single	140.0	25.7	22.4
High	140.0	44.2	41.4
Low	110.0	25.7	22.4

Below the Lower Limit, the Level Linearity Error is less than or equal to the error found in Fig.2.1 with  $L_{inh}$  set to the Lower Limit – 11.5 dB.

### 4.11.4 Measurement Range

Measurement Range according to the International Standard IEC 61260 is the difference between the Upper Limit of the Linear Operating Range on the least sensitive level range and the Lower Limit of the Linear Operating Range on the most sensitive level range.

**Table 4.11**  
Measurement Range

1/1-octave (dB)	1/3-octave (dB)
140.0 – 25.7	140.0 – 22.4

## 4.12 Influence from the Operating Environment

### 4.12.4 Vibration

**Vibration Sensitivity (20 – 1000 Hz) for 1 ms<sup>-2</sup>:** A-weighted max. 74 dB, Z-weighted max. 84 dB.

# Appendix A

## Tables

### A.2 Free-field Frequency Responses

Frequency responses with Z-frequency-weighting. Measured with plane progressive sinusoidal sound waves incident from the reference direction and the instrument's *Sound Field Correction* parameter set to *Free-field*, see section 4.6.5.

**Table A.2** Free-field 0° frequency response for Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer's electrical response with the Microphone Preamplifier connected to a microphone extension cable

Nominal Frequency Hz	Exact Frequency (6 digits) Hz	Microphone Actuator Response dB	Microphone Free-field Correction dB	Microphone Free-field Response dB	Electrical Response dB	Acoustical Response dB	Expanded Uncertainty dB
<b>63</b>	63.0957	0.22	-0.01	0.21	0.00	0.21	0.05
<b>80</b>	79.4328	0.18	0.00	0.18	0.00	0.18	0.05
<b>100</b>	100	0.14	0.00	0.14	0.00	0.14	0.05
<b>125</b>	125.893	0.10	0.00	0.10	0.00	0.10	0.05
<b>160</b>	158.489	0.06	0.00	0.06	0.00	0.06	0.05
<b>200</b>	199.526	0.02	0.00	0.02	0.00	0.02	0.05
<b>250</b>	251.189	0.00	0.01	0.01	0.00	0.01	0.05
<b>315</b>	316.228	-0.03	0.02	-0.01	0.00	-0.01	0.06
<b>400</b>	398.107	-0.05	0.03	-0.02	0.00	-0.02	0.06
<b>500</b>	501.187	-0.07	0.04	-0.03	0.00	-0.03	0.07
<b>630</b>	630.957	-0.09	0.06	-0.03	0.00	-0.03	0.07
<b>800</b>	794.328	-0.12	0.08	-0.04	0.00	-0.04	0.07
<b>1000</b>	1000	-0.15	0.11	-0.04	0.00	-0.04	0.07
1060	1059.25	-0.16	0.12	-0.04	0.00	-0.04	0.07
1120	1122.02	-0.17	0.13	-0.04	0.00	-0.04	0.07
1180	1188.5	-0.18	0.14	-0.04	0.00	-0.04	0.08
<b>1250</b>	1258.93	-0.20	0.16	-0.04	0.00	-0.04	0.08
1320	1333.52	-0.21	0.18	-0.03	-0.01	-0.04	0.08
1400	1412.54	-0.23	0.19	-0.04	-0.01	-0.05	0.08
1500	1496.24	-0.25	0.21	-0.04	-0.01	-0.05	0.08
<b>1600</b>	1584.89	-0.27	0.23	-0.04	-0.01	-0.05	0.08
1700	1678.8	-0.29	0.26	-0.03	-0.01	-0.04	0.08
1800	1778.28	-0.31	0.29	-0.02	-0.01	-0.03	0.09
1900	1883.65	-0.34	0.31	-0.03	-0.01	-0.04	0.09
<b>2000</b>	1995.26	-0.37	0.34	-0.03	-0.01	-0.04	0.09
2120	2113.49	-0.40	0.38	-0.02	-0.02	-0.04	0.09
2240	2238.72	-0.44	0.41	-0.03	-0.02	-0.05	0.09
2360	2371.37	-0.48	0.45	-0.03	-0.02	-0.05	0.10
<b>2500</b>	2511.89	-0.53	0.51	-0.02	-0.02	-0.04	0.10
2650	2660.73	-0.58	0.56	-0.02	-0.03	-0.05	0.10
2800	2818.38	-0.63	0.63	0.00	-0.03	-0.03	0.11
3000	2985.38	-0.70	0.69	-0.01	-0.03	-0.04	0.11
<b>3150</b>	3162.28	-0.77	0.77	0.00	-0.04	-0.04	0.12
3350	3349.65	-0.84	0.85	0.01	-0.05	-0.04	0.12
3550	3548.13	-0.93	0.95	0.02	-0.05	-0.03	0.13

Nominal Frequency Hz	Exact Frequency (6 digits) Hz	Microphone Actuator Response dB	Microphone Free-field Correction dB	Microphone Free-field Response dB	Electrical Response dB	Acoustical Response dB	Expanded Uncertainty dB
3750	3758.37	-1.02	1.06	0.04	-0.06	-0.02	0.13
<b>4000</b>	3981.07	-1.12	1.17	0.05	-0.07	-0.02	0.14
4250	4216.97	-1.24	1.30	0.06	-0.08	-0.02	0.14
4500	4466.84	-1.36	1.44	0.08	-0.09	-0.01	0.14
4750	4731.51	-1.50	1.60	0.10	-0.10	0.00	0.14
<b>5000</b>	5011.87	-1.65	1.78	0.13	-0.12	0.01	0.15
5300	5308.84	-1.82	1.98	0.16	-0.13	0.03	0.15
5600	5623.41	-2.01	2.19	0.18	-0.15	0.03	0.15
6000	5956.62	-2.22	2.43	0.21	-0.17	0.04	0.16
<b>6300</b>	6309.57	-2.45	2.68	0.23	-0.20	0.03	0.16
6700	6683.44	-2.70	2.95	0.25	-0.22	0.03	0.17
7100	7079.46	-2.98	3.26	0.28	-0.25	0.03	0.17
7500	7498.94	-3.30	3.60	0.30	-0.29	0.01	0.17
<b>8000</b>	7943.28	-3.66	4.00	0.34	-0.32	0.02	0.18
8500	8413.95	-4.08	4.44	0.36	-0.35	0.01	0.19
9000	8912.51	-4.56	4.95	0.39	-0.39	0.00	0.20
9500	9440.61	-5.13	5.53	0.40	-0.42	-0.02	0.22
<b>10000</b>	10000	-5.75	6.15	0.40	-0.44	-0.04	0.23
10600	10592.5	-6.40	6.79	0.39	-0.44	-0.05	0.24
11200	11220.2	-7.03	7.40	0.37	-0.43	-0.06	0.26
11800	11885	-7.64	7.94	0.30	-0.38	-0.08	0.28
<b>12500</b>	12589.3	-8.21	8.46	0.25	-0.29	-0.04	0.29
13200	13335.2	-8.77	8.93	0.16	-0.15	0.01	0.31
14000	14125.4	-9.38	9.38	0.00	0.04	0.04	0.33
15000	14962.4	-10.03	9.80	-0.23	0.29	0.06	0.35
<b>16000</b>	15848.9	-10.73	10.19	-0.54	0.60	0.06	0.38
17000	16788	-11.53	10.55	-0.98	0.95	-0.03	0.40
18000	17782.8	-12.47	10.94	-1.53	1.32	-0.21	0.43
19000	18836.5	-13.61	11.35	-2.26	1.68	-0.58	0.45
<b>20000</b>	19952.6	-15.09	11.65	-3.44	2.01	-1.43	0.48
21200	21134.9	-17.60	11.80	-5.80	2.28	-3.52	0.49
22400	22387.2	-21.88	10.78	-11.10	2.45	-8.65	0.49

**Table A.3** Free-field 0° frequency response for Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with the Microphone Preamplifier mounted directly on the analyzer

Nominal Frequency Hz	Exact Frequency (6 digits) Hz	Acoustical Response (From Table A.2) dB	Expanded Uncertainty dB	Body Influence dB	Expanded Uncertainty dB	Acoustical Response dB	Expanded Uncertainty dB
<b>63</b>	63.0957	0.21	0.05	0.00	0.10	0.21	0.11
<b>80</b>	79.4328	0.18	0.05	0.00	0.10	0.18	0.11
<b>100</b>	100	0.14	0.05	0.00	0.10	0.14	0.11
<b>125</b>	125.893	0.10	0.05	0.00	0.10	0.10	0.11
<b>160</b>	158.489	0.06	0.05	0.01	0.10	0.07	0.11
<b>200</b>	199.526	0.02	0.05	0.03	0.10	0.05	0.11
<b>250</b>	251.189	0.01	0.05	0.06	0.10	0.07	0.11
<b>315</b>	316.228	-0.01	0.06	0.13	0.10	0.12	0.12
<b>400</b>	398.107	-0.02	0.06	0.21	0.10	0.19	0.12
<b>500</b>	501.187	-0.03	0.07	0.22	0.10	0.19	0.12
<b>630</b>	630.957	-0.03	0.07	0.07	0.10	0.04	0.12
<b>800</b>	794.328	-0.04	0.07	-0.11	0.10	-0.15	0.12
<b>1000</b>	1000	-0.04	0.07	-0.09	0.10	-0.13	0.12
1060	1059.25	-0.04	0.07	-0.13	0.10	-0.17	0.12
1120	1122.02	-0.04	0.07	-0.21	0.10	-0.25	0.12
1180	1188.5	-0.04	0.08	-0.28	0.10	-0.32	0.13
<b>1250</b>	1258.93	-0.04	0.08	-0.29	0.10	-0.33	0.13
1320	1333.52	-0.04	0.08	-0.20	0.10	-0.24	0.13
1400	1412.54	-0.05	0.08	-0.06	0.10	-0.11	0.13

Nominal Frequency	Exact Frequency (6 digits)	Acoustical Response (From Table A.2)	Expanded Uncertainty	Body Influence	Expanded Uncertainty	Acoustical Response	Expanded Uncertainty
Hz	Hz	dB	dB	dB	dB	dB	dB
1500	1496.24	-0.05	0.08	0.05	0.10	0.00	0.13
<b>1600</b>	1584.89	-0.05	0.08	0.07	0.10	0.02	0.13
1700	1678.8	-0.04	0.08	-0.03	0.10	-0.07	0.13
1800	1778.28	-0.03	0.09	-0.16	0.10	-0.19	0.13
1900	1883.65	-0.04	0.09	-0.15	0.10	-0.19	0.13
<b>2000</b>	1995.26	-0.04	0.09	-0.01	0.10	-0.05	0.13
2120	2113.49	-0.04	0.09	0.07	0.10	0.03	0.13
2240	2238.72	-0.05	0.09	-0.06	0.15	-0.11	0.13
2360	2371.37	-0.05	0.10	-0.23	0.15	-0.28	0.18
<b>2500</b>	2511.89	-0.04	0.10	-0.09	0.15	-0.13	0.18
2650	2660.73	-0.05	0.10	0.12	0.15	0.07	0.18
2800	2818.38	-0.03	0.11	-0.02	0.15	-0.05	0.19
3000	2985.38	-0.04	0.11	-0.13	0.15	-0.17	0.19
<b>3150</b>	3162.28	-0.04	0.12	0.14	0.15	0.10	0.19
3350	3349.65	-0.04	0.12	0.11	0.15	0.07	0.19
3550	3548.13	-0.03	0.13	-0.09	0.15	-0.12	0.19
3750	3758.37	-0.02	0.13	0.15	0.15	0.13	0.20
<b>4000</b>	3981.07	-0.02	0.14	-0.06	0.15	-0.08	0.20
4250	4216.97	-0.02	0.14	0.01	0.15	-0.01	0.21
4500	4466.84	-0.01	0.14	0.08	0.15	0.07	0.21
4750	4731.51	0.00	0.14	-0.19	0.15	-0.19	0.21
<b>5000</b>	5011.87	0.01	0.15	-0.10	0.15	-0.09	0.21
5300	5308.84	0.03	0.15	-0.20	0.15	-0.17	0.21
5600	5623.41	0.03	0.15	-0.01	0.15	0.02	0.21
6000	5956.62	0.04	0.16	-0.05	0.15	-0.01	0.21
<b>6300</b>	6309.57	0.03	0.16	0.05	0.15	0.08	0.22
6700	6683.44	0.03	0.17	0.12	0.15	0.15	0.22
7100	7079.46	0.03	0.17	0.02	0.15	0.05	0.23
7500	7498.94	0.01	0.17	0.03	0.20	0.04	0.23
<b>8000</b>	7943.28	0.02	0.18	-0.17	0.20	-0.15	0.26
8500	8413.95	0.01	0.19	-0.18	0.20	-0.17	0.27
9000	8912.51	0.00	0.20	-0.05	0.20	-0.05	0.28
9500	9440.61	-0.02	0.22	0.11	0.20	0.09	0.28
<b>10000</b>	10000	-0.04	0.23	-0.03	0.20	-0.07	0.30
10600	10592.5	-0.05	0.24	-0.15	0.20	-0.20	0.30
11200	11220.2	-0.06	0.26	-0.18	0.20	-0.24	0.33
11800	11885	-0.08	0.28	-0.15	0.20	-0.23	0.34
<b>12500</b>	12589.3	-0.04	0.29	0.09	0.20	0.05	0.35
13200	13335.2	0.01	0.31	0.00	0.20	0.01	0.37
14000	14125.4	0.04	0.33	-0.21	0.20	-0.17	0.39
15000	14962.4	0.06	0.35	-0.12	0.20	-0.06	0.39
<b>16000</b>	15848.9	0.06	0.38	-0.01	0.20	0.05	0.40
17000	16788	-0.03	0.40	0.02	0.20	-0.01	0.43
18000	17782.8	-0.21	0.43	-0.19	0.20	-0.40	0.45
19000	18836.5	-0.58	0.45	0.00	0.20	-0.58	0.47
<b>20000</b>	19952.6	-1.43	0.48	-0.11	0.20	-1.54	0.49
21200	21134.9	-3.52	0.49	-0.22	0.20	-3.74	0.52
22400	22387.2	-8.65	0.49	-0.13	0.20	-8.78	0.53

**Table A.4** Free-field 0° frequency response for Windscreen UA-1650, Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer's electrical response, with the Microphone Preamplifier connected to a microphone extension cable

Nominal Frequency	Exact Frequency (6 digits)	Microphone Free-field Response (From Table A.2)	Expanded Uncertainty	Influence of Windscreen	Expanded Uncertainty	Electrical Response	Acoustical Response	Expanded Uncertainty
Hz	Hz	dB	dB	dB	dB	dB	dB	dB
63	63.0957	0.21	0.05	0.00	0.15	0.00	0.21	0.16
80	79.4328	0.18	0.05	0.00	0.15	0.00	0.18	0.16
100	100	0.14	0.05	0.00	0.15	0.00	0.14	0.16
125	125.893	0.10	0.05	0.00	0.15	0.00	0.10	0.16
160	158.489	0.06	0.05	0.00	0.15	0.00	0.06	0.16
200	199.526	0.02	0.05	0.00	0.15	0.00	0.02	0.16
250	251.189	0.01	0.05	0.02	0.15	-0.01	0.02	0.16
315	316.228	-0.01	0.06	0.03	0.15	-0.01	0.01	0.16
400	398.107	-0.02	0.06	0.05	0.15	-0.02	0.01	0.16
500	501.187	-0.03	0.07	0.08	0.15	-0.04	0.01	0.17
630	630.957	-0.03	0.07	0.11	0.15	-0.07	0.01	0.17
800	794.328	-0.04	0.07	0.14	0.15	-0.11	-0.01	0.17
1000	1000	-0.04	0.07	0.19	0.15	-0.17	-0.02	0.17
1060	1059.25	-0.04	0.07	0.22	0.15	-0.20	-0.02	0.17
1120	1122.02	-0.04	0.07	0.25	0.15	-0.22	-0.01	0.17
1180	1188.5	-0.04	0.08	0.29	0.15	-0.25	0.00	0.17
1250	1258.93	-0.04	0.08	0.32	0.15	-0.28	0.00	0.17
1320	1333.52	-0.03	0.08	0.37	0.15	-0.32	0.02	0.17
1400	1412.54	-0.04	0.08	0.41	0.15	-0.36	0.01	0.17
1500	1496.24	-0.04	0.08	0.46	0.15	-0.40	0.02	0.17
1600	1584.89	-0.04	0.08	0.51	0.15	-0.45	0.02	0.17
1700	1678.8	-0.03	0.08	0.55	0.15	-0.50	0.02	0.17
1800	1778.28	-0.02	0.09	0.59	0.15	-0.55	0.02	0.17
1900	1883.65	-0.03	0.09	0.64	0.15	-0.60	0.01	0.17
2000	1995.26	-0.03	0.09	0.67	0.20	-0.64	0.00	0.22
2120	2113.49	-0.02	0.09	0.70	0.20	-0.68	0.00	0.22
2240	2238.72	-0.03	0.09	0.71	0.20	-0.70	-0.02	0.22
2360	2371.37	-0.03	0.10	0.72	0.20	-0.71	-0.02	0.22
2500	2511.89	-0.02	0.10	0.72	0.20	-0.70	0.00	0.22
2650	2660.73	-0.02	0.10	0.70	0.20	-0.67	0.01	0.22
2800	2818.38	0.00	0.11	0.68	0.20	-0.62	0.06	0.11
3000	2985.38	-0.01	0.11	0.63	0.20	-0.56	0.06	0.23
3150	3162.28	0.00	0.12	0.55	0.20	-0.50	0.05	0.23
3350	3349.65	0.01	0.12	0.44	0.20	-0.43	0.02	0.23
3550	3548.13	0.02	0.13	0.30	0.20	-0.36	-0.04	0.24
3750	3758.37	0.04	0.13	0.16	0.20	-0.29	-0.09	0.24
4000	3981.07	0.05	0.14	0.04	0.20	-0.23	-0.14	0.24
4250	4216.97	0.06	0.14	-0.05	0.20	-0.18	-0.17	0.24
4500	4466.84	0.08	0.14	-0.13	0.20	-0.13	-0.18	0.24
4750	4731.51	0.10	0.14	-0.18	0.20	-0.09	-0.17	0.24
5000	5011.87	0.13	0.15	-0.19	0.20	-0.06	-0.12	0.25
5300	5308.84	0.16	0.15	-0.17	0.25	-0.03	-0.04	0.29
5600	5623.41	0.18	0.15	-0.16	0.25	-0.01	0.01	0.29
6000	5956.62	0.21	0.16	-0.13	0.25	0.01	0.09	0.30
6300	6309.57	0.23	0.16	-0.11	0.25	0.03	0.15	0.30
6700	6683.44	0.25	0.17	-0.16	0.25	0.04	0.13	0.30
7100	7079.46	0.28	0.17	-0.28	0.25	0.05	0.05	0.30
7500	7498.94	0.30	0.17	-0.36	0.25	0.06	0.00	0.30
8000	7943.28	0.34	0.18	-0.41	0.25	0.07	0.00	0.31
8500	8413.95	0.36	0.19	-0.47	0.25	0.08	-0.03	0.31
9000	8912.51	0.39	0.20	-0.45	0.25	0.10	0.04	0.32
9500	9440.61	0.40	0.22	-0.47	0.25	0.12	0.05	0.33
10000	10000	0.40	0.23	-0.52	0.25	0.16	0.04	0.34
10600	10592.5	0.39	0.24	-0.63	0.25	0.21	-0.03	0.35
11200	11220.2	0.37	0.26	-0.74	0.25	0.29	-0.08	0.36

Nominal Frequency	Exact Frequency (6 digits)	Microphone Free-field Response	Expanded Uncertainty	Influence of Windscreen	Expanded Uncertainty	Electrical Response	Acoustical Response	Expanded Uncertainty
Hz	Hz	Z(From Table A.2)	dB	dB	dB	dB	dB	dB
11800	11885	0.30	0.28	-0.86	0.25	0.41	-0.15	0.38
<b>12500</b>	12589.3	0.25	0.29	-0.88	0.25	0.59	-0.04	0.38
13200	13335.2	0.16	0.31	-1.00	0.25	0.84	0.00	0.40
14000	14125.4	0.00	0.33	-1.13	0.25	1.17	0.04	0.41
15000	14962.4	-0.23	0.35	-1.21	0.30	1.57	0.13	0.46
<b>16000</b>	15848.9	-0.54	0.38	-1.33	0.30	2.03	0.16	0.48
17000	16788	-0.98	0.40	-1.50	0.30	2.48	0.00	0.50
18000	17782.8	-1.53	0.43	-1.61	0.30	2.87	-0.27	0.52
19000	18836.5	-2.26	0.45	-1.64	0.30	3.16	-0.74	0.54
<b>20000</b>	19952.6	-3.44	0.48	-1.73	0.30	3.34	-1.83	0.57
21200	21134.9	-5.80	0.49	-1.81	0.30	3.43	-4.18	0.57
22400	22387.2	-11.10	0.49	-1.79	0.30	3.45	-9.44	0.57

**Table A.5** Free-field 0° frequency response for Windscreen UA-1650, Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with the Microphone Preamplifier mounted directly on the analyzer

Nominal Frequency	Exact Frequency (6 digits)	Acoustical Response (From Table A.4)	Expanded Uncertainty	Body Influence	Expanded Uncertainty	Acoustical Response	Expanded Uncertainty
Hz	Hz	dB	dB	dB	dB	dB	dB
<b>63</b>	63.0957	0.21	0.16	0.00	0.10	0.21	0.19
<b>80</b>	79.4328	0.18	0.16	0.00	0.10	0.18	0.19
<b>100</b>	100	0.14	0.16	0.00	0.10	0.14	0.19
<b>125</b>	125.893	0.10	0.16	0.00	0.10	0.10	0.19
<b>160</b>	158.489	0.06	0.16	0.01	0.10	0.07	0.19
<b>200</b>	199.526	0.02	0.16	0.03	0.10	0.05	0.19
<b>250</b>	251.189	0.02	0.16	0.06	0.10	0.08	0.19
<b>315</b>	316.228	0.01	0.16	0.13	0.10	0.14	0.19
<b>400</b>	398.107	0.01	0.16	0.21	0.10	0.22	0.19
<b>500</b>	501.187	0.01	0.17	0.22	0.10	0.23	0.19
<b>630</b>	630.957	0.01	0.17	0.07	0.10	0.08	0.19
<b>800</b>	794.328	-0.01	0.17	-0.11	0.10	-0.12	0.19
<b>1000</b>	1000	-0.02	0.17	-0.09	0.10	-0.11	0.19
1060	1059.25	-0.02	0.17	-0.13	0.10	-0.15	0.19
1120	1122.02	-0.01	0.17	-0.21	0.10	-0.22	0.19
1180	1188.5	0.00	0.17	-0.28	0.10	-0.28	0.20
<b>1250</b>	1258.93	0.00	0.17	-0.29	0.10	-0.29	0.20
1320	1333.52	0.02	0.17	-0.20	0.10	-0.18	0.20
1400	1412.54	0.01	0.17	-0.06	0.10	-0.05	0.20
1500	1496.24	0.02	0.17	0.05	0.10	0.07	0.20
<b>1600</b>	1584.89	0.02	0.17	0.07	0.10	0.09	0.20
1700	1678.8	0.02	0.17	-0.03	0.10	-0.01	0.20
1800	1778.28	0.02	0.17	-0.16	0.10	-0.14	0.20
1900	1883.65	0.01	0.17	-0.15	0.10	-0.14	0.20
<b>2000</b>	1995.26	0.00	0.22	-0.01	0.10	-0.01	0.24
2120	2113.49	0.00	0.22	0.07	0.10	0.07	0.24
2240	2238.72	-0.02	0.22	-0.06	0.15	-0.08	0.27
2360	2371.37	-0.02	0.22	-0.23	0.15	-0.25	0.27
<b>2500</b>	2511.89	0.00	0.22	-0.09	0.15	-0.09	0.27
2650	2660.73	0.01	0.22	0.12	0.15	0.13	0.27
2800	2818.38	0.06	0.11	-0.02	0.15	0.04	0.19
3000	2985.38	0.06	0.23	-0.13	0.15	-0.07	0.27
<b>3150</b>	3162.28	0.05	0.23	0.14	0.15	0.19	0.28
3350	3349.65	0.02	0.23	0.11	0.15	0.13	0.28
3550	3548.13	-0.04	0.24	-0.09	0.15	-0.13	0.28
3750	3758.37	-0.09	0.24	0.15	0.15	0.06	0.28
<b>4000</b>	3981.07	-0.14	0.24	-0.06	0.15	-0.20	0.29
4250	4216.97	-0.17	0.24	0.01	0.15	-0.16	0.29
4500	4466.84	-0.18	0.24	0.08	0.15	-0.10	0.29

Nominal Frequency Hz	Exact Frequency (6 digits) Hz	Acoustical Response (From Table A.4) dB	Expanded Uncertainty dB	Body Influence dB	Expanded Uncertainty dB	Acoustical Response dB	Expanded Uncertainty dB
4750	4731.51	-0.17	0.24	-0.19	0.15	-0.36	0.29
<b>5000</b>	5011.87	-0.12	0.25	-0.10	0.15	-0.22	0.29
5300	5308.84	-0.04	0.29	-0.20	0.15	-0.24	0.33
5600	5623.41	0.01	0.29	-0.01	0.15	0.00	0.33
6000	5956.62	0.09	0.30	-0.05	0.15	0.04	0.33
<b>6300</b>	6309.57	0.15	0.30	0.05	0.15	0.20	0.33
6700	6683.44	0.13	0.30	0.12	0.15	0.25	0.34
7100	7079.46	0.05	0.30	0.02	0.15	0.07	0.34
7500	7498.94	0.00	0.30	0.03	0.20	0.03	0.36
<b>8000</b>	7943.28	0.00	0.31	-0.17	0.20	-0.17	0.37
8500	8413.95	-0.03	0.31	-0.18	0.20	-0.21	0.37
9000	8912.51	0.04	0.32	-0.05	0.20	-0.01	0.38
9500	9440.61	0.05	0.33	0.11	0.20	0.16	0.39
<b>10000</b>	10000	0.04	0.34	-0.03	0.20	0.01	0.39
10600	10592.5	-0.03	0.35	-0.15	0.20	-0.18	0.40
11200	11220.2	-0.08	0.36	-0.18	0.20	-0.26	0.41
11800	11885	-0.15	0.38	-0.15	0.20	-0.30	0.43
<b>12500</b>	12589.3	-0.04	0.38	0.09	0.20	0.05	0.43
13200	13335.2	0.00	0.40	0.00	0.20	0.00	0.45
14000	14125.4	0.04	0.41	-0.21	0.20	-0.17	0.46
15000	14962.4	0.13	0.46	-0.12	0.20	0.01	0.50
<b>16000</b>	15848.9	0.16	0.48	-0.01	0.20	0.15	0.52
17000	16788	0.00	0.50	0.02	0.20	0.02	0.54
18000	17782.8	-0.27	0.52	-0.19	0.20	-0.46	0.56
19000	18836.5	-0.74	0.54	0.00	0.20	-0.74	0.58
<b>20000</b>	19952.6	-1.83	0.57	-0.11	0.20	-1.94	0.60
21200	21134.9	-4.18	0.57	-0.22	0.20	-4.40	0.61
22400	22387.2	-9.44	0.57	-0.13	0.20	-9.57	0.61

**Table A.6** Microphone Type 4950 is not specified together with Outdoor Microphone Kit UA-1404

### A.3 Diffuse-field Frequency Responses

Diffuse-field frequency responses with Z-frequency-weighting. Measured with sounds at random incidence and the instrument's *Sound Field Correction* parameter set to *Diffuse-field*, see section 4.6.6.

**Table A.7** Diffuse-field frequency response for Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with or without the Microphone Preamplifier connected to a microphone extension cable

Nominal Frequency Hz	Exact Frequency (6 digits) Hz	Microphone Actuator Response dB	Microphone Diffuse-field Correction dB	Microphone Diffuse-field Response dB	Electrical Response dB	Acoustical Response dB	Expanded Uncertainty dB
<b>63</b>	63.0957	0.22	-0.01	0.21	0.00	0.21	0.05
<b>80</b>	79.4328	0.18	0.00	0.18	0.00	0.18	0.05
<b>100</b>	100	0.14	0.00	0.14	0.00	0.14	0.05
<b>125</b>	125.893	0.10	0.00	0.10	0.00	0.10	0.05
<b>160</b>	158.489	0.06	0.00	0.06	0.00	0.06	0.05
<b>200</b>	199.526	0.02	0.00	0.02	0.00	0.02	0.05
<b>250</b>	251.189	0.00	0.00	0.00	0.01	0.01	0.05
<b>315</b>	316.228	-0.03	0.00	-0.03	0.01	-0.02	0.06
<b>400</b>	398.107	-0.05	0.00	-0.05	0.01	-0.04	0.06
<b>500</b>	501.187	-0.07	0.00	-0.07	0.02	-0.05	0.10
<b>630</b>	630.957	-0.09	0.01	-0.08	0.03	-0.05	0.10
<b>800</b>	794.328	-0.12	0.01	-0.11	0.04	-0.07	0.10
<b>1000</b>	1000	-0.15	0.00	-0.15	0.07	-0.08	0.10
1060	1059.25	-0.16	0.00	-0.16	0.08	-0.08	0.10
1120	1122.02	-0.17	0.00	-0.17	0.09	-0.08	0.10

Nominal Frequency	Exact Frequency (6 digits)	Microphone Actuator Response	Microphone Diffuse-field Correction	Microphone Diffuse-field Response	Electrical Response	Acoustical Response	Expanded Uncertainty
Hz	Hz	dB	dB	dB	dB	dB	dB
1180	1188.5	-0.18	-0.01	-0.19	0.10	-0.09	0.10
<b>1250</b>	1258.93	-0.20	-0.01	-0.21	0.11	-0.10	0.10
1320	1333.52	-0.21	-0.01	-0.22	0.12	-0.10	0.10
1400	1412.54	-0.23	-0.02	-0.25	0.13	-0.12	0.10
1500	1496.24	-0.25	-0.02	-0.27	0.15	-0.12	0.10
<b>1600</b>	1584.89	-0.27	-0.03	-0.30	0.17	-0.13	0.10
1700	1678.8	-0.29	-0.02	-0.31	0.19	-0.12	0.10
1800	1778.28	-0.31	-0.01	-0.32	0.21	-0.11	0.10
1900	1883.65	-0.34	-0.01	-0.35	0.23	-0.12	0.10
<b>2000</b>	1995.26	-0.37	0.00	-0.37	0.26	-0.11	0.10
2120	2113.49	-0.40	0.02	-0.38	0.29	-0.09	0.10
2240	2238.72	-0.44	0.04	-0.40	0.32	-0.08	0.11
2360	2371.37	-0.48	0.06	-0.42	0.36	-0.06	0.11
<b>2500</b>	2511.89	-0.53	0.09	-0.44	0.40	-0.04	0.12
2650	2660.73	-0.58	0.12	-0.46	0.44	-0.02	0.12
2800	2818.38	-0.63	0.16	-0.47	0.49	0.02	0.13
3000	2985.38	-0.70	0.16	-0.54	0.54	0.00	0.13
<b>3150</b>	3162.28	-0.77	0.16	-0.61	0.60	-0.01	0.13
3350	3349.65	-0.84	0.16	-0.68	0.66	-0.02	0.14
3550	3548.13	-0.93	0.17	-0.76	0.73	-0.03	0.14
3750	3758.37	-1.02	0.21	-0.81	0.80	-0.01	0.15
<b>4000</b>	3981.07	-1.12	0.23	-0.89	0.88	-0.01	0.15
4250	4216.97	-1.24	0.26	-0.98	0.97	-0.01	0.15
4500	4466.84	-1.36	0.29	-1.07	1.06	-0.01	0.16
4750	4731.51	-1.50	0.32	-1.18	1.16	-0.02	0.16
<b>5000</b>	5011.87	-1.65	0.40	-1.25	1.26	0.01	0.16
5300	5308.84	-1.82	0.54	-1.28	1.37	0.09	0.17
5600	5623.41	-2.01	0.59	-1.42	1.49	0.07	0.17
6000	5956.62	-2.22	0.63	-1.59	1.61	0.02	0.17
<b>6300</b>	6309.57	-2.45	0.73	-1.72	1.74	0.02	0.18
6700	6683.44	-2.70	0.86	-1.84	1.87	0.03	0.18
7100	7079.46	-2.98	1.05	-1.93	2.01	0.08	0.18
7500	7498.94	-3.30	1.16	-2.14	2.16	0.02	0.19
<b>8000</b>	7943.28	-3.66	1.45	-2.21	2.31	0.10	0.19
8500	8413.95	-4.08	1.65	-2.43	2.47	0.04	0.22
9000	8912.51	-4.56	1.96	-2.60	2.64	0.04	0.25
9500	9440.61	-5.13	2.25	-2.88	2.83	-0.05	0.28
<b>10000</b>	10000	-5.75	2.58	-3.17	3.03	-0.14	0.31
10600	10592.5	-6.40	2.99	-3.41	3.26	-0.15	0.34
11200	11220.2	-7.03	3.33	-3.70	3.53	-0.17	0.37
11800	11885	-7.64	3.64	-4.00	3.85	-0.15	0.40
<b>12500</b>	12589.3	-8.21	3.87	-4.34	4.22	-0.12	0.43
13200	13335.2	-8.77	4.11	-4.66	4.66	0.00	0.46
14000	14125.4	-9.38	4.30	-5.08	5.17	0.09	0.49
15000	14962.4	-10.03	4.37	-5.66	5.76	0.10	0.52
<b>16000</b>	15848.9	-10.73	4.37	-6.36	6.41	0.05	0.55
17000	16788	-11.53	4.43	-7.10	7.10	0.00	0.57
18000	17782.8	-12.47	4.52	-7.95	7.81	-0.14	0.59
19000	18836.5	-13.61	4.59	-9.02	8.49	-0.53	0.61
<b>20000</b>	19952.6	-15.09	4.45	-10.64	9.11	-1.53	0.63
21200	21134.9	-17.60	4.16	-13.44	9.61	-3.83	0.65
22400	22387.2	-21.88	2.69	-19.19	9.95	-9.24	0.67

**Table A.8** Diffuse-field frequency response for Windscreen UA-1650, Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with or without the Microphone Preamplifier connected to a microphone extension cable

Nominal Frequency	Exact Frequency (6 digits)	Microphone Diffuse-field Response (From Table A.7)	Expanded Uncertainty	Influence of Windscreen	Expanded Uncertainty	Electrical Response	Acoustical Response	Expanded Uncertainty
Hz	Hz	dB	dB	dB	dB	dB	dB	dB
63	63.0957	0.21	0.05	0.00	0.05	0.00	0.21	0.07
80	79.4328	0.18	0.05	0.00	0.05	0.00	0.18	0.07
100	100	0.14	0.05	0.00	0.05	0.00	0.14	0.07
125	125.893	0.10	0.05	0.00	0.05	0.00	0.10	0.07
160	158.489	0.06	0.05	0.00	0.05	0.00	0.06	0.07
200	199.526	0.02	0.05	0.00	0.05	0.00	0.02	0.07
250	251.189	0.00	0.05	0.01	0.05	0.00	0.01	0.07
315	316.228	-0.03	0.06	0.02	0.05	0.00	-0.01	0.08
400	398.107	-0.05	0.06	0.04	0.05	-0.01	-0.02	0.08
500	501.187	-0.07	0.10	0.06	0.05	-0.01	-0.02	0.11
630	630.957	-0.08	0.10	0.09	0.05	-0.02	-0.01	0.11
800	794.328	-0.11	0.10	0.11	0.05	-0.04	-0.04	0.11
1000	1000	-0.15	0.10	0.15	0.05	-0.06	-0.06	0.11
1060	1059.25	-0.16	0.10	0.18	0.08	-0.07	-0.05	0.13
1120	1122.02	-0.17	0.10	0.20	0.08	-0.08	-0.05	0.13
1180	1188.5	-0.19	0.10	0.24	0.08	-0.09	-0.04	0.13
1250	1258.93	-0.21	0.10	0.28	0.08	-0.10	-0.03	0.13
1320	1333.52	-0.22	0.10	0.32	0.10	-0.11	-0.01	0.14
1400	1412.54	-0.25	0.10	0.36	0.10	-0.12	-0.01	0.14
1500	1496.24	-0.27	0.10	0.40	0.10	-0.13	0.00	0.14
1600	1584.89	-0.30	0.10	0.44	0.12	-0.15	-0.01	0.16
1700	1678.8	-0.31	0.10	0.48	0.15	-0.17	0.00	0.18
1800	1778.28	-0.32	0.10	0.52	0.15	-0.18	0.02	0.18
1900	1883.65	-0.35	0.10	0.55	0.15	-0.20	0.00	0.18
2000	1995.26	-0.37	0.10	0.58	0.15	-0.22	-0.01	0.18
2120	2113.49	-0.38	0.10	0.62	0.15	-0.23	0.01	0.18
2240	2238.72	-0.40	0.11	0.64	0.15	-0.24	0.00	0.19
2360	2371.37	-0.42	0.11	0.66	0.15	-0.25	-0.01	0.19
2500	2511.89	-0.44	0.12	0.68	0.15	-0.24	0.00	0.19
2650	2660.73	-0.46	0.12	0.68	0.15	-0.21	0.01	0.19
2800	2818.38	-0.47	0.13	0.66	0.15	-0.15	0.04	0.20
3000	2985.38	-0.54	0.13	0.61	0.15	-0.06	0.01	0.20
3150	3162.28	-0.61	0.13	0.54	0.15	0.06	-0.01	0.20
3350	3349.65	-0.68	0.14	0.45	0.15	0.23	0.00	0.20
3550	3548.13	-0.76	0.14	0.32	0.15	0.43	-0.01	0.21
3750	3758.37	-0.81	0.15	0.18	0.15	0.65	0.02	0.21
4000	3981.07	-0.89	0.15	0.02	0.15	0.87	0.00	0.21
4250	4216.97	-0.98	0.15	-0.13	0.15	1.09	-0.02	0.21
4500	4466.84	-1.07	0.16	-0.27	0.15	1.28	-0.06	0.22
4750	4731.51	-1.18	0.16	-0.39	0.25	1.46	-0.11	0.30
5000	5011.87	-1.25	0.16	-0.46	0.35	1.62	-0.09	0.39
5300	5308.84	-1.28	0.17	-0.49	0.45	1.77	0.00	0.48
5600	5623.41	-1.42	0.17	-0.48	0.50	1.91	0.01	0.53
6000	5956.62	-1.59	0.17	-0.43	0.50	2.04	0.02	0.53
6300	6309.57	-1.72	0.18	-0.38	0.50	2.18	0.08	0.53
6700	6683.44	-1.84	0.18	-0.34	0.50	2.33	0.15	0.53
7100	7079.46	-1.93	0.18	-0.36	0.50	2.49	0.20	0.53
7500	7498.94	-2.14	0.19	-0.45	0.50	2.66	0.07	0.53
8000	7943.28	-2.21	0.19	-0.58	0.50	2.85	0.06	0.53
8500	8413.95	-2.43	0.22	-0.71	0.50	3.06	-0.08	0.55
9000	8912.51	-2.60	0.25	-0.79	0.50	3.30	-0.09	0.56
9500	9440.61	-2.88	0.28	-0.82	0.50	3.57	-0.13	0.57
10000	10000	-3.17	0.31	-0.82	0.50	3.87	-0.12	0.59
10600	10592.5	-3.41	0.34	-0.87	0.80	4.21	-0.07	0.87
11200	11220.2	-3.70	0.37	-0.96	0.80	4.60	-0.06	0.88

Nominal Frequency	Exact Frequency (6 digits)	Microphone Diffuse-field Response (From Table A.7)	Expanded Uncertainty	Influence of Windscreen	Expanded Uncertainty	Electrical Response	Acoustical Response	Expanded Uncertainty
Hz	Hz	dB	dB	dB	dB	dB	dB	dB
11800	11885	-4.00	0.40	-1.07	0.80	5.03	-0.04	0.89
<b>12500</b>	12589.3	-4.34	0.43	-1.19	0.80	5.52	-0.01	0.91
13200	13335.2	-4.66	0.46	-1.31	0.80	6.07	0.10	0.92
14000	14125.4	-5.08	0.49	-1.43	0.80	6.68	0.17	0.94
15000	14962.4	-5.66	0.52	-1.53	0.80	7.35	0.16	0.95
<b>16000</b>	15848.9	-6.36	0.55	-1.63	0.80	8.08	0.09	0.97
17000	16788	-7.10	0.57	-1.77	0.80	8.87	0.00	0.98
18000	17782.8	-7.95	0.59	-1.92	0.80	9.69	-0.18	0.99
19000	18836.5	-9.02	0.61	-1.98	0.80	10.50	-0.50	1.01
<b>20000</b>	19952.6	-10.64	0.63	-2.07	0.80	11.25	-1.46	1.02
21200	21134.9	-13.44	0.65	-2.18	0.80	11.88	-3.74	1.03
22400	22387.2	-19.19	0.67	-2.19	0.80	12.30	-9.08	1.04

**Table A.9** Microphone Type 4950 is not specified together with Outdoor Microphone Kit UA-1404

## A.4 Free-field Frequency Responses for Diffuse-field Calibrated Instruments

Free-field frequency response in the reference direction for diffuse-field calibrated instruments according to IEC 60651 and IEC 60804. Measured with plane progressive sinusoidal sound waves incident from the reference direction and the instrument's *Sound Field Correction* parameter set to *Diffuse-field*.

**Table A.10** Free-field 0° frequency response with the Sound Field Correction parameter set to Diffuse-field for the configurations for which there are specified normal Free-field responses

Nominal Frequency	Exact Frequency (6 digits)	Configuration as in Table A.2	Configuration as in Table A.3	Configuration as in Table A.4	as in Table A.5
Hz	Hz	dB	dB	dB	dB
63	63.0957	0.21	0.21	0.21	0.21
80	79.4328	0.18	0.18	0.18	0.18
100	100	0.14	0.14	0.14	0.14
125	125.893	0.10	0.10	0.10	0.10
160	158.489	0.06	0.07	0.06	0.07
200	199.526	0.02	0.05	0.02	0.05
250	251.189	0.02	0.08	0.03	0.09
315	316.228	0.00	0.13	0.02	0.15
400	398.107	-0.01	0.20	0.02	0.23
500	501.187	-0.01	0.21	0.04	0.26
630	630.957	0.00	0.07	0.06	0.13
800	794.328	0.00	-0.11	0.06	-0.05
<b>1000</b>	1000	0.03	-0.06	0.09	0.00
1060	1059.25	0.04	-0.09	0.11	-0.02
1120	1122.02	0.05	-0.16	0.13	-0.08
1180	1188.5	0.06	-0.22	0.16	-0.12
<b>1250</b>	1258.93	0.07	-0.22	0.18	-0.11
1320	1333.52	0.09	-0.11	0.23	0.03
1400	1412.54	0.09	0.03	0.25	0.19
1500	1496.24	0.11	0.16	0.29	0.34
<b>1600</b>	1584.89	0.13	0.20	0.32	0.39
1700	1678.8	0.16	0.13	0.35	0.32
1800	1778.28	0.19	0.03	0.39	0.23
1900	1883.65	0.20	0.05	0.41	0.26
<b>2000</b>	1995.26	0.23	0.22	0.42	0.41
2120	2113.49	0.27	0.34	0.45	0.52
22400	22387.2	0.29	0.23	0.44	0.38

Nominal Frequency Hz	Exact Frequency (6 digits) Hz	Configuration as in Table A.2 dB	Configuration as in Table A.3 dB	Configuration as in Table A.4 dB	Configuration as in Table A.5 dB
2360	2371.37	0.33	0.10	0.44	0.21
<b>2500</b>	2511.89	0.38	0.29	0.46	0.37
2650	2660.73	0.42	0.54	0.47	0.59
2800	2818.38	0.49	0.47	0.53	0.51
3000	2985.38	0.53	0.40	0.56	0.43
<b>3150</b>	3162.28	0.60	0.74	0.61	0.75
3350	3349.65	0.67	0.78	0.68	0.79
3550	3548.13	0.75	0.66	0.75	0.66
3750	3758.37	0.84	0.99	0.85	1.00
<b>4000</b>	3981.07	0.93	0.87	0.96	0.90
4250	4216.97	1.03	1.04	1.10	1.11
4500	4466.84	1.14	1.22	1.23	1.31
4750	4731.51	1.26	1.07	1.38	1.19
<b>5000</b>	5011.87	1.39	1.29	1.56	1.46
5300	5308.84	1.53	1.33	1.76	1.56
5600	5623.41	1.67	1.66	1.93	1.92
6000	5956.62	1.82	1.77	2.12	2.07
<b>6300</b>	6309.57	1.97	2.02	2.30	2.35
6700	6683.44	2.12	2.24	2.42	2.54
7100	7079.46	2.29	2.31	2.49	2.51
7500	7498.94	2.46	2.49	2.60	2.63
<b>8000</b>	7943.28	2.65	2.48	2.78	2.61
8500	8413.95	2.83	2.65	2.95	2.77
9000	8912.51	3.03	2.98	3.24	3.19
9500	9440.61	3.23	3.34	3.50	3.61
<b>10000</b>	10000	3.43	3.40	3.75	3.72
10600	10592.5	3.65	3.50	3.97	3.82
11200	11220.2	3.90	3.72	4.23	4.05
11800	11885	4.15	4.00	4.47	4.32
<b>12500</b>	12589.3	4.47	4.56	4.89	4.98
13200	13335.2	4.82	4.82	5.23	5.23
14000	14125.4	5.17	4.96	5.55	5.34
15000	14962.4	5.53	5.41	5.91	5.79
<b>16000</b>	15848.9	5.87	5.86	6.21	6.20
17000	16788	6.12	6.14	6.39	6.41
18000	17782.8	6.28	6.09	6.55	6.36
19000	18836.5	6.23	6.23	6.60	6.60
<b>20000</b>	19952.6	5.67	5.56	6.08	5.97
21200	21134.9	3.81	3.59	4.27	4.05
22400	22387.2	-1.15	-1.28	-0.59	-0.72

## A.5 Directional Responses

Directional responses for plane progressive sinusoidal sound waves normalised to the response in the reference direction, including sensitivity variations.

**Table A.11** Directional response for Microphone Type 4950 and Microphone Preamplifier ZC-0032 with the Microphone Preamplifier connected to a microphone extension cable, 500 Hz – 3550 Hz, in dB

Angle	Frequency											
	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz	2240 Hz	2500 Hz	2800 Hz	3150 Hz	3550 Hz
0°	0.00	0.00	0.01	0.02	0.03	0.03	0.04	0.04	0.03	0.03	0.03	0.03
5°	0.00	0.01	0.01	0.01	0.03	0.03	0.04	0.04	0.04	0.03	0.03	0.03
10°	0.00	0.00	0.01	0.00	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.01
15°	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.01	0.00	-0.01	-0.02
20°	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.00	0.00	-0.01	-0.04	-0.06
25°	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.02	-0.03	-0.07	-0.10
30°	0.00	0.00	-0.01	-0.01	0.00	-0.02	-0.02	-0.03	-0.04	-0.06	-0.12	-0.15
35°	0.00	-0.01	-0.01	-0.01	-0.02	-0.03	-0.04	-0.06	-0.06	-0.08	-0.16	-0.21
40°	0.00	-0.01	-0.01	-0.02	-0.04	-0.05	-0.07	-0.09	-0.10	-0.12	-0.21	-0.28
45°	-0.01	-0.01	-0.02	-0.03	-0.05	-0.07	-0.09	-0.11	-0.13	-0.15	-0.26	-0.36
50°	-0.01	-0.02	-0.03	-0.04	-0.06	-0.10	-0.12	-0.14	-0.17	-0.19	-0.29	-0.43
55°	-0.01	-0.02	-0.03	-0.05	-0.08	-0.13	-0.15	-0.17	-0.21	-0.23	-0.34	-0.49
60°	-0.02	-0.02	-0.04	-0.06	-0.10	-0.15	-0.18	-0.20	-0.24	-0.29	-0.38	-0.54
65°	-0.02	-0.03	-0.05	-0.07	-0.11	-0.18	-0.21	-0.23	-0.28	-0.34	-0.43	-0.58
70°	-0.02	-0.03	-0.06	-0.08	-0.13	-0.21	-0.24	-0.26	-0.31	-0.39	-0.50	-0.61
75°	-0.03	-0.04	-0.07	-0.09	-0.14	-0.23	-0.28	-0.29	-0.34	-0.43	-0.58	-0.68
80°	-0.03	-0.04	-0.07	-0.11	-0.15	-0.25	-0.32	-0.33	-0.36	-0.46	-0.65	-0.76
85°	-0.03	-0.05	-0.08	-0.12	-0.17	-0.27	-0.36	-0.38	-0.40	-0.48	-0.69	-0.86
90°	-0.03	-0.05	-0.08	-0.12	-0.18	-0.29	-0.40	-0.42	-0.44	-0.50	-0.72	-0.94
95°	-0.04	-0.05	-0.09	-0.13	-0.19	-0.31	-0.43	-0.46	-0.48	-0.53	-0.73	-0.99
100°	-0.04	-0.06	-0.09	-0.14	-0.20	-0.32	-0.45	-0.50	-0.53	-0.57	-0.75	-1.01
105°	-0.04	-0.06	-0.10	-0.14	-0.21	-0.33	-0.47	-0.53	-0.57	-0.61	-0.78	-1.03
110°	-0.04	-0.06	-0.10	-0.15	-0.22	-0.35	-0.49	-0.55	-0.61	-0.65	-0.82	-1.05
115°	-0.04	-0.06	-0.09	-0.15	-0.22	-0.35	-0.50	-0.57	-0.63	-0.69	-0.86	-1.08
120°	-0.04	-0.06	-0.09	-0.14	-0.22	-0.35	-0.51	-0.58	-0.65	-0.72	-0.89	-1.11
125°	-0.04	-0.05	-0.09	-0.14	-0.21	-0.35	-0.50	-0.58	-0.66	-0.73	-0.91	-1.14
130°	-0.04	-0.05	-0.09	-0.14	-0.21	-0.34	-0.49	-0.58	-0.66	-0.73	-0.92	-1.16
135°	-0.03	-0.05	-0.08	-0.14	-0.20	-0.33	-0.48	-0.56	-0.64	-0.72	-0.92	-1.16
140°	-0.03	-0.05	-0.08	-0.13	-0.19	-0.31	-0.45	-0.53	-0.61	-0.70	-0.89	-1.14
145°	-0.03	-0.05	-0.08	-0.12	-0.18	-0.30	-0.43	-0.50	-0.57	-0.65	-0.85	-1.09
150°	-0.03	-0.04	-0.07	-0.11	-0.17	-0.28	-0.40	-0.46	-0.53	-0.60	-0.79	-1.03
155°	-0.03	-0.04	-0.07	-0.11	-0.16	-0.26	-0.37	-0.43	-0.49	-0.55	-0.72	-0.95
160°	-0.03	-0.04	-0.06	-0.10	-0.15	-0.24	-0.34	-0.40	-0.45	-0.50	-0.66	-0.88
165°	-0.02	-0.04	-0.06	-0.10	-0.14	-0.23	-0.32	-0.37	-0.41	-0.45	-0.61	-0.81
170°	-0.02	-0.04	-0.06	-0.09	-0.13	-0.22	-0.31	-0.35	-0.38	-0.42	-0.57	-0.76
175°	-0.02	-0.04	-0.06	-0.09	-0.13	-0.22	-0.30	-0.34	-0.37	-0.40	-0.54	-0.73
180°	-0.02	-0.04	-0.06	-0.10	-0.13	-0.22	-0.29	-0.33	-0.37	-0.39	-0.54	-0.72
185°	-0.02	-0.04	-0.06	-0.10	-0.14	-0.22	-0.30	-0.34	-0.37	-0.40	-0.55	-0.73
190°	-0.03	-0.04	-0.07	-0.10	-0.15	-0.23	-0.31	-0.35	-0.39	-0.42	-0.57	-0.76
195°	-0.03	-0.04	-0.07	-0.11	-0.15	-0.25	-0.33	-0.37	-0.42	-0.46	-0.62	-0.82
200°	-0.03	-0.04	-0.07	-0.11	-0.16	-0.26	-0.35	-0.41	-0.46	-0.50	-0.67	-0.88
205°	-0.03	-0.05	-0.08	-0.12	-0.17	-0.28	-0.38	-0.44	-0.50	-0.55	-0.74	-0.96
210°	-0.03	-0.05	-0.09	-0.12	-0.19	-0.30	-0.41	-0.48	-0.55	-0.61	-0.81	-1.04
215°	-0.04	-0.05	-0.09	-0.14	-0.20	-0.32	-0.45	-0.52	-0.60	-0.67	-0.87	-1.11
220°	-0.04	-0.06	-0.10	-0.15	-0.22	-0.34	-0.48	-0.56	-0.64	-0.71	-0.92	-1.15
225°	-0.04	-0.06	-0.10	-0.15	-0.23	-0.36	-0.50	-0.59	-0.67	-0.74	-0.94	-1.17
230°	-0.04	-0.06	-0.10	-0.16	-0.24	-0.38	-0.53	-0.61	-0.69	-0.76	-0.95	-1.17
235°	-0.04	-0.07	-0.11	-0.17	-0.25	-0.39	-0.54	-0.62	-0.69	-0.76	-0.94	-1.15
240°	-0.05	-0.07	-0.11	-0.18	-0.26	-0.40	-0.55	-0.62	-0.69	-0.75	-0.92	-1.13
245°	-0.05	-0.07	-0.11	-0.18	-0.26	-0.40	-0.54	-0.61	-0.67	-0.72	-0.88	-1.10
250°	-0.05	-0.07	-0.12	-0.18	-0.26	-0.40	-0.53	-0.60	-0.65	-0.69	-0.85	-1.08
255°	-0.05	-0.07	-0.12	-0.18	-0.25	-0.39	-0.52	-0.58	-0.62	-0.66	-0.82	-1.05
260°	-0.05	-0.07	-0.12	-0.18	-0.25	-0.39	-0.51	-0.56	-0.59	-0.61	-0.78	-1.04
265°	-0.04	-0.07	-0.11	-0.17	-0.24	-0.37	-0.49	-0.53	-0.54	-0.57	-0.75	-1.02
270°	-0.04	-0.06	-0.11	-0.16	-0.23	-0.36	-0.46	-0.48	-0.49	-0.53	-0.74	-0.99
275°	-0.04	-0.06	-0.10	-0.15	-0.22	-0.34	-0.43	-0.44	-0.45	-0.50	-0.73	-0.94
280°	-0.04	-0.06	-0.10	-0.14	-0.21	-0.33	-0.39	-0.40	-0.41	-0.48	-0.70	-0.84
285°	-0.03	-0.05	-0.09	-0.14	-0.20	-0.31	-0.35	-0.35	-0.38	-0.47	-0.65	-0.73
290°	-0.04	-0.05	-0.09	-0.12	-0.19	-0.28	-0.31	-0.31	-0.36	-0.44	-0.58	-0.64
295°	-0.03	-0.05	-0.08	-0.11	-0.17	-0.26	-0.27	-0.28	-0.34	-0.41	-0.50	-0.59
300°	-0.03	-0.04	-0.07	-0.10	-0.16	-0.23	-0.24	-0.25	-0.31	-0.36	-0.43	-0.55
305°	-0.02	-0.04	-0.06	-0.09	-0.14	-0.20	-0.20	-0.23	-0.29	-0.31	-0.37	-0.53
310°	-0.02	-0.03	-0.06	-0.08	-0.13	-0.17	-0.18	-0.21	-0.25	-0.25	-0.33	-0.48
315°	-0.02	-0.03	-0.05	-0.08	-0.12	-0.15	-0.15	-0.18	-0.21	-0.20	-0.30	-0.42
320°	-0.02	-0.03	-0.04	-0.07	-0.10	-0.13	-0.14	-0.16	-0.18	-0.16	-0.27	-0.35
325°	-0.01	-0.02	-0.04	-0.06	-0.09	-0.10	-0.12	-0.14	-0.14	-0.13	-0.23	-0.28
330°	-0.01	-0.02	-0.03	-0.05	-0.07	-0.09	-0.10	-0.11	-0.11	-0.11	-0.19	-0.21
335°	-0.01	-0.02	-0.03	-0.06	-0.07	-0.08	-0.09	-0.09	-0.09	-0.09	-0.15	-0.15
340°	-0.01	-0.01	-0.02	-0.04	-0.05	-0.06	-0.07	-0.07	-0.07	-0.07	-0.11	-0.10
345°	-0.01	-0.01	-0.01	-0.04	-0.04	-0.05	-0.06	-0.06	-0.05	-0.05	-0.08	-0.07
350°	0.00	-0.01	-0.01	-0.03	-0.03	-0.04	-0.04	-0.05	-0.04	-0.04	-0.06	-0.05
355°	0.00	0.00	-0.01	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.03	-0.04	-0.03

**Table A.12** Directional response for Microphone Type 4950 and Microphone Preamplifier ZC-0032 with the microphone preamplifier connected to a microphone extension cable, 4000 Hz – 10600 Hz, in dB

Frequency												
Angle	4000 Hz	4500 Hz	5000 Hz	5600 Hz	6300 Hz	7100 Hz	8000 Hz	8500 Hz	9000 Hz	9500 Hz	10000 Hz	10600 Hz
0°	0.03	0.04	0.02	0.00	-0.03	0.03	0.04	0.01	0.02	0.05	0.04	0.03
5°	0.02	0.03	0.01	-0.01	-0.04	0.00	0.02	0.00	-0.01	0.02	0.01	0.01
10°	0.00	0.01	-0.02	-0.03	-0.06	-0.04	-0.03	-0.04	-0.08	-0.04	-0.06	-0.07
15°	-0.03	-0.02	-0.07	-0.08	-0.07	-0.11	-0.12	-0.10	-0.19	-0.13	-0.16	-0.19
20°	-0.09	-0.06	-0.14	-0.14	-0.12	-0.23	-0.25	-0.16	-0.37	-0.25	-0.31	-0.40
25°	-0.14	-0.10	-0.23	-0.18	-0.21	-0.39	-0.41	-0.23	-0.58	-0.39	-0.51	-0.65
30°	-0.21	-0.16	-0.32	-0.22	-0.34	-0.57	-0.57	-0.36	-0.77	-0.59	-0.73	-0.91
35°	-0.28	-0.24	-0.43	-0.28	-0.55	-0.73	-0.69	-0.59	-0.88	-0.89	-0.96	-1.17
40°	-0.37	-0.35	-0.52	-0.38	-0.80	-0.83	-0.78	-0.89	-1.01	-1.21	-1.21	-1.49
45°	-0.45	-0.48	-0.61	-0.54	-1.00	-0.92	-0.96	-1.09	-1.33	-1.37	-1.62	-1.80
50°	-0.54	-0.62	-0.71	-0.73	-1.09	-1.12	-1.29	-1.15	-1.77	-1.47	-2.03	-2.12
55°	-0.64	-0.75	-0.84	-0.90	-1.17	-1.49	-1.59	-1.38	-1.98	-1.93	-2.08	-2.75
60°	-0.74	-0.87	-1.01	-1.02	-1.36	-1.79	-1.73	-1.79	-2.08	-2.37	-2.34	-3.07
65°	-0.82	-1.00	-1.18	-1.15	-1.62	-1.86	-2.00	-1.97	-2.55	-2.38	-2.99	-3.12
70°	-0.87	-1.14	-1.32	-1.32	-1.85	-1.92	-2.49	-2.13	-2.92	-2.79	-2.99	-3.92
75°	-0.89	-1.25	-1.48	-1.48	-2.08	-2.10	-2.76	-2.55	-3.07	-3.38	-3.22	-4.04
80°	-0.89	-1.30	-1.66	-1.58	-2.35	-2.30	-2.93	-2.83	-3.35	-3.68	-3.88	-4.10
85°	-0.95	-1.28	-1.82	-1.71	-2.54	-2.60	-3.13	-3.14	-3.51	-3.91	-4.41	-4.59
90°	-1.04	-1.27	-1.85	-1.91	-2.57	-3.05	-3.17	-3.42	-3.92	-3.89	-4.65	-5.26
95°	-1.15	-1.33	-1.80	-2.06	-2.65	-3.29	-3.47	-3.43	-4.25	-4.37	-4.50	-5.54
100°	-1.23	-1.44	-1.80	-2.05	-2.81	-3.27	-3.97	-3.77	-4.27	-4.71	-5.03	-5.38
105°	-1.27	-1.54	-1.89	-2.02	-2.87	-3.31	-4.11	-4.20	-4.65	-4.79	-5.34	-5.92
110°	-1.28	-1.59	-2.00	-2.08	-2.84	-3.35	-4.07	-4.26	-4.96	-5.15	-5.50	-6.23
115°	-1.29	-1.61	-2.05	-2.18	-2.86	-3.33	-4.03	-4.14	-4.91	-5.35	-5.80	-6.43
120°	-1.32	-1.61	-2.06	-2.24	-2.93	-3.35	-4.02	-4.08	-4.78	-5.21	-5.78	-6.51
125°	-1.35	-1.63	-2.06	-2.25	-2.98	-3.41	-4.06	-4.16	-4.77	-5.07	-5.59	-6.41
130°	-1.38	-1.65	-2.07	-2.24	-3.00	-3.45	-4.07	-4.20	-4.85	-5.12	-5.54	-6.29
135°	-1.38	-1.66	-2.09	-2.24	-2.99	-3.48	-4.05	-4.16	-4.84	-5.16	-5.57	-6.31
140°	-1.37	-1.67	-2.10	-2.24	-2.99	-3.50	-4.07	-4.12	-4.78	-5.14	-5.56	-6.27
145°	-1.33	-1.63	-2.08	-2.22	-2.96	-3.49	-4.10	-4.13	-4.75	-5.10	-5.51	-6.22
150°	-1.26	-1.56	-2.01	-2.16	-2.90	-3.43	-4.11	-4.16	-4.76	-5.08	-5.49	-6.21
155°	-1.17	-1.45	-1.89	-2.04	-2.76	-3.29	-4.01	-4.09	-4.70	-5.03	-5.42	-6.19
160°	-1.07	-1.34	-1.75	-1.89	-2.59	-3.08	-3.79	-3.89	-4.52	-4.84	-5.22	-6.02
165°	-0.99	-1.23	-1.62	-1.73	-2.41	-2.85	-3.50	-3.59	-4.21	-4.53	-4.88	-5.66
170°	-0.93	-1.15	-1.52	-1.60	-2.25	-2.65	-3.24	-3.31	-3.91	-4.20	-4.52	-5.28
175°	-0.88	-1.10	-1.45	-1.52	-2.15	-2.52	-3.08	-3.13	-3.70	-3.99	-4.29	-5.01
180°	-0.87	-1.08	-1.43	-1.49	-2.12	-2.47	-3.01	-3.05	-3.62	-3.90	-4.19	-4.90
185°	-0.89	-1.09	-1.45	-1.52	-2.14	-2.50	-3.06	-3.11	-3.68	-3.97	-4.26	-4.98
190°	-0.93	-1.15	-1.51	-1.59	-2.23	-2.63	-3.21	-3.27	-3.87	-4.18	-4.49	-5.24
195°	-0.99	-1.23	-1.61	-1.71	-2.39	-2.82	-3.45	-3.54	-4.15	-4.49	-4.83	-5.62
200°	-1.08	-1.33	-1.74	-1.86	-2.57	-3.05	-3.72	-3.82	-4.46	-4.81	-5.17	-5.97
205°	-1.17	-1.45	-1.87	-2.02	-2.75	-3.26	-3.94	-4.04	-4.66	-5.01	-5.34	-6.14
210°	-1.26	-1.55	-1.98	-2.15	-2.88	-3.40	-4.04	-4.11	-4.70	-5.02	-5.35	-6.13
215°	-1.33	-1.62	-2.06	-2.22	-2.94	-3.45	-4.03	-4.09	-4.68	-5.00	-5.36	-6.18
220°	-1.37	-1.65	-2.08	-2.24	-2.95	-3.45	-4.02	-4.11	-4.70	-5.08	-5.48	-6.30
225°	-1.38	-1.66	-2.08	-2.24	-2.96	-3.46	-4.05	-4.15	-4.76	-5.15	-5.53	-6.28
230°	-1.38	-1.65	-2.09	-2.25	-2.96	-3.43	-4.03	-4.14	-4.75	-5.13	-5.47	-6.26
235°	-1.36	-1.65	-2.09	-2.23	-2.92	-3.38	-3.99	-4.11	-4.73	-5.11	-5.52	-6.44
240°	-1.35	-1.65	-2.07	-2.19	-2.86	-3.33	-3.98	-4.12	-4.76	-5.19	-5.71	-6.61
245°	-1.34	-1.63	-2.03	-2.12	-2.80	-3.29	-4.01	-4.18	-4.85	-5.32	-5.76	-6.44
250°	-1.32	-1.60	-1.95	-2.05	-2.77	-3.29	-4.09	-4.25	-4.87	-5.22	-5.46	-6.15
255°	-1.30	-1.54	-1.86	-2.01	-2.77	-3.32	-4.08	-4.13	-4.64	-4.87	-5.14	-5.94
260°	-1.27	-1.44	-1.77	-2.03	-2.75	-3.27	-3.94	-3.83	-4.24	-4.57	-5.01	-5.63
265°	-1.21	-1.33	-1.75	-2.09	-2.60	-3.23	-3.57	-3.37	-4.03	-4.56	-4.64	-5.26
270°	-1.10	-1.23	-1.82	-2.02	-2.40	-3.19	-3.04	-3.26	-4.10	-4.08	-4.24	-5.65
275°	-0.97	-1.22	-1.88	-1.75	-2.37	-2.79	-2.94	-3.40	-3.62	-3.67	-4.58	-4.83
280°	-0.88	-1.27	-1.79	-1.48	-2.38	-2.25	-3.08	-3.01	-3.18	-3.79	-3.99	-4.01
285°	-0.84	-1.30	-1.55	-1.37	-2.14	-2.02	-2.86	-2.60	-3.05	-3.39	-3.37	-3.89
290°	-0.85	-1.23	-1.31	-1.31	-1.80	-1.96	-2.57	-2.30	-2.67	-3.02	-3.00	-3.74
295°	-0.84	-1.08	-1.16	-1.17	-1.56	-1.83	-2.26	-2.10	-2.43	-2.70	-2.71	-3.42
300°	-0.80	-0.90	-1.04	-0.98	-1.39	-1.69	-1.84	-1.65	-2.18	-2.40	-2.38	-3.08
305°	-0.70	-0.77	-0.91	-0.82	-1.21	-1.51	-1.59	-1.40	-1.94	-2.13	-1.93	-3.04
310°	-0.59	-0.66	-0.76	-0.69	-1.07	-1.20	-1.36	-1.10	-1.83	-1.60	-1.93	-2.36
315°	-0.48	-0.55	-0.62	-0.55	-0.94	-0.94	-1.02	-0.99	-1.50	-1.33	-1.74	-1.84
320°	-0.39	-0.45	-0.52	-0.42	-0.79	-0.82	-0.74	-0.94	-1.07	-1.30	-1.22	-1.68
325°	-0.32	-0.34	-0.42	-0.32	-0.56	-0.78	-0.64	-0.71	-0.86	-1.05	-0.92	-1.33
330°	-0.25	-0.25	-0.33	-0.24	-0.33	-0.67	-0.61	-0.43	-0.80	-0.67	-0.81	-0.94
335°	-0.19	-0.18	-0.24	-0.20	-0.16	-0.50	-0.51	-0.23	-0.68	-0.38	-0.65	-0.67
340°	-0.14	-0.12	-0.16	-0.15	-0.05	-0.32	-0.35	-0.13	-0.47	-0.24	-0.43	-0.46
345°	-0.09	-0.08	-0.10	-0.10	0.00	-0.18	-0.21	-0.09	-0.27	-0.16	-0.24	-0.28
350°	-0.06	-0.05	-0.05	-0.06	0.03	-0.09	-0.11	-0.06	-0.13	-0.10	-0.13	-0.14
355°	-0.04	-0.04	-0.03	-0.02	0.04	-0.04	-0.06	-0.02	-0.04	-0.06	-0.06	-0.06

**Table A.13** Directional response for Microphone Type 4950 and Microphone Preamplifier ZC-0032 with the microphone preamplifier connected to a microphone extension cable, 11200 Hz – 20000 Hz, in dB

Angle	Frequency										
	11200 Hz	11800 Hz	12500 Hz	13200 Hz	14000 Hz	15000 Hz	16000 Hz	17000 Hz	18000 Hz	19000 Hz	20000 Hz
0°	0.02	0.02	0.03	0.03	0.06	0.07	0.05	-0.01	-0.04	-0.06	-0.05
5°	0.00	0.00	0.00	-0.01	0.02	0.03	0.01	-0.06	-0.10	-0.12	-0.12
10°	-0.10	-0.03	-0.09	-0.12	-0.08	-0.06	-0.08	-0.21	-0.24	-0.30	-0.35
15°	-0.23	-0.09	-0.26	-0.32	-0.23	-0.18	-0.27	-0.41	-0.43	-0.57	-0.71
20°	-0.35	-0.20	-0.55	-0.52	-0.34	-0.35	-0.55	-0.64	-0.59	-0.81	-1.04
25°	-0.46	-0.44	-0.90	-0.64	-0.48	-0.68	-0.96	-0.93	-0.86	-1.06	-1.23
30°	-0.64	-0.82	-1.11	-0.76	-0.85	-1.25	-1.41	-1.34	-1.41	-1.58	-1.80
35°	-0.97	-1.16	-1.22	-1.18	-1.39	-1.63	-1.66	-1.86	-1.94	-2.11	-2.59
40°	-1.38	-1.39	-1.61	-1.77	-1.61	-1.85	-2.28	-2.59	-2.48	-2.59	-2.99
45°	-1.74	-1.78	-2.14	-2.00	-1.99	-2.66	-3.01	-2.97	-3.08	-3.28	-3.83
50°	-2.11	-2.26	-2.49	-2.50	-2.70	-2.99	-3.17	-3.68	-4.01	-4.22	-4.70
55°	-2.35	-2.77	-2.96	-3.11	-2.99	-3.51	-4.12	-4.31	-4.30	-4.78	-5.31
60°	-2.79	-3.23	-3.41	-3.68	-3.58	-4.14	-4.40	-4.91	-5.38	-5.86	-6.45
65°	-3.41	-3.46	-4.16	-3.96	-4.30	-4.72	-5.10	-5.51	-5.77	-6.59	-7.27
70°	-3.34	-4.28	-4.31	-4.75	-4.73	-5.32	-5.94	-6.08	-6.63	-7.14	-7.75
75°	-4.15	-4.14	-5.23	-4.89	-5.47	-5.98	-6.37	-7.08	-7.31	-7.79	-8.66
80°	-4.54	-4.72	-5.33	-5.60	-5.87	-6.51	-7.35	-7.31	-8.46	-8.63	-9.18
85°	-4.74	-5.17	-5.69	-6.12	-6.24	-7.28	-7.57	-8.52	-8.54	-9.70	-10.42
90°	-4.97	-5.77	-5.89	-6.50	-6.83	-7.57	-8.18	-9.01	-9.27	-10.30	-11.24
95°	-5.64	-5.76	-6.96	-6.43	-7.34	-7.94	-8.88	-9.08	-10.37	-10.39	-12.06
100°	-5.88	-6.37	-6.81	-7.65	-7.43	-8.41	-9.06	-9.95	-10.39	-11.41	-12.07
105°	-5.85	-6.53	-7.32	-7.46	-8.32	-8.92	-9.53	-10.07	-10.92	-11.89	-12.62
110°	-6.35	-6.69	-7.45	-7.84	-8.27	-9.34	-10.06	-10.77	-11.24	-12.02	-13.09
115°	-6.64	-7.12	-7.72	-8.11	-8.57	-9.35	-10.31	-10.92	-11.89	-12.79	-13.54
120°	-6.75	-7.38	-8.09	-8.40	-8.95	-9.68	-10.35	-11.13	-11.79	-12.91	-13.90
125°	-6.68	-7.31	-8.14	-8.63	-9.21	-10.08	-10.79	-11.38	-12.01	-12.95	-13.86
130°	-6.51	-7.07	-7.87	-8.43	-9.12	-10.10	-11.06	-11.66	-12.46	-13.42	-14.11
135°	-6.54	-7.08	-7.74	-8.18	-8.78	-9.63	-10.73	-11.59	-12.35	-13.68	-14.51
140°	-6.49	-7.11	-7.77	-8.17	-8.75	-9.51	-10.25	-11.11	-11.85	-12.97	-14.17
145°	-6.40	-7.01	-7.71	-8.12	-8.66	-9.52	-10.30	-10.85	-11.62	-12.73	-13.48
150°	-6.35	-6.92	-7.59	-8.06	-8.53	-9.30	-10.25	-10.82	-11.35	-12.53	-13.38
155°	-6.36	-6.90	-7.53	-8.04	-8.56	-9.23	-10.08	-10.81	-11.33	-12.25	-13.19
160°	-6.23	-6.81	-7.41	-7.90	-8.49	-9.26	-10.06	-10.77	-11.40	-12.29	-13.08
165°	-5.87	-6.47	-7.04	-7.50	-8.08	-8.93	-9.81	-10.46	-11.13	-12.17	-12.98
170°	-5.45	-6.03	-6.58	-6.97	-7.47	-8.28	-9.21	-9.81	-10.35	-11.39	-12.29
175°	-5.15	-5.73	-6.24	-6.59	-7.01	-7.78	-8.67	-9.25	-9.69	-10.61	-11.51
180°	-5.03	-5.59	-6.10	-6.44	-6.84	-7.57	-8.45	-9.01	-9.41	-10.26	-11.16
185°	-5.13	-5.69	-6.20	-6.57	-6.98	-7.74	-8.63	-9.20	-9.63	-10.51	-11.42
190°	-5.41	-6.01	-6.55	-6.96	-7.44	-8.25	-9.17	-9.75	-10.29	-11.24	-12.22
195°	-5.82	-6.44	-7.02	-7.52	-8.08	-8.89	-9.78	-10.40	-11.06	-12.03	-12.99
200°	-6.17	-6.79	-7.42	-7.95	-8.49	-9.19	-10.00	-10.70	-11.30	-12.09	-12.97
205°	-6.29	-6.92	-7.56	-8.08	-8.47	-9.09	-9.95	-10.71	-11.22	-12.02	-13.02
210°	-6.27	-6.95	-7.61	-8.07	-8.48	-9.20	-10.15	-10.90	-11.48	-12.39	-13.48
215°	-6.37	-7.08	-7.72	-8.19	-8.69	-9.44	-10.27	-10.95	-11.57	-12.46	-13.56
220°	-6.48	-7.14	-7.74	-8.25	-8.72	-9.39	-10.39	-11.20	-11.90	-13.02	-14.11
225°	-6.46	-7.14	-7.83	-8.33	-8.77	-9.72	-10.86	-11.55	-12.43	-13.40	-14.40
230°	-6.56	-7.31	-7.97	-8.47	-9.15	-10.09	-10.87	-11.87	-12.33	-13.08	-13.86
235°	-6.76	-7.41	-8.09	-8.78	-9.31	-9.86	-10.81	-11.31	-11.83	-13.01	-13.84
240°	-6.75	-7.45	-8.20	-8.50	-8.77	-9.65	-10.32	-11.11	-12.00	-12.74	-14.08
245°	-6.59	-7.29	-7.71	-8.07	-8.72	-9.27	-10.22	-11.33	-11.73	-12.88	-13.01
250°	-6.35	-6.85	-7.44	-8.02	-8.29	-9.28	-10.39	-10.65	-11.38	-11.59	-13.17
255°	-6.01	-6.60	-7.34	-7.72	-8.33	-9.00	-9.48	-10.19	-10.55	-12.07	-12.33
260°	-5.73	-6.60	-7.10	-7.44	-7.80	-8.20	-9.16	-9.88	-10.52	-11.10	-12.27
265°	-5.94	-6.11	-6.53	-7.12	-6.92	-8.29	-8.64	-9.58	-9.67	-11.08	-11.26
270°	-5.16	-5.39	-6.61	-6.00	-7.44	-7.12	-8.77	-8.31	-10.21	-9.36	-11.34
275°	-4.38	-5.75	-5.39	-6.46	-6.24	-7.28	-7.53	-8.78	-8.15	-10.09	-9.92
280°	-4.63	-4.91	-5.29	-5.89	-5.80	-6.84	-6.97	-8.01	-7.96	-8.23	-9.85
285°	-4.32	-4.32	-5.12	-5.20	-5.50	-5.90	-6.93	-6.59	-7.39	-8.09	-8.41
290°	-3.77	-3.97	-4.79	-4.55	-5.04	-5.44	-5.86	-6.12	-6.86	-7.04	-7.47
295°	-3.33	-3.67	-4.19	-4.05	-4.66	-4.44	-5.47	-5.64	-5.58	-6.56	-7.08
300°	-3.02	-3.10	-3.74	-3.64	-3.74	-4.24	-4.54	-5.08	-4.95	-5.59	-6.41
305°	-2.22	-3.06	-2.91	-3.28	-3.19	-3.64	-3.88	-4.48	-4.52	-4.98	-5.44
310°	-2.07	-2.39	-2.61	-2.68	-2.56	-3.28	-3.40	-3.87	-3.87	-3.83	-4.32
315°	-1.78	-2.02	-1.99	-2.32	-2.14	-2.75	-2.86	-2.95	-3.19	-3.27	-3.65
320°	-1.28	-1.69	-1.62	-1.85	-1.64	-2.21	-2.58	-2.60	-2.47	-2.60	-2.91
325°	-1.02	-1.25	-1.28	-1.47	-1.39	-1.64	-1.79	-1.84	-1.94	-2.07	-2.38
330°	-0.77	-0.94	-1.03	-0.95	-1.09	-1.44	-1.51	-1.21	-1.27	-1.52	-1.80
335°	-0.51	-0.61	-0.90	-0.66	-0.61	-0.91	-1.24	-1.00	-0.87	-1.08	-1.16
340°	-0.35	-0.30	-0.67	-0.58	-0.38	-0.41	-0.69	-0.66	-0.49	-0.68	-0.85
345°	-0.24	-0.13	-0.37	-0.45	-0.31	-0.21	-0.32	-0.36	-0.27	-0.44	-0.66
350°	-0.14	-0.05	-0.16	-0.25	-0.23	-0.14	-0.15	-0.17	-0.13	-0.21	-0.32
355°	-0.06	-0.02	-0.05	-0.10	-0.12	-0.10	-0.07	-0.04	-0.01	-0.03	-0.06

**Table A.14** Sensitivity variations for Microphone Type 4950 and Microphone Preamplifier ZC-0032 with the microphone preamplifier connected to a microphone extension cable, at sound incidence angles within  $\pm\theta^\circ$  from the reference direction

Nominal Frequency	Exact Frequency	Max Variation $\pm 30^\circ$ dB	Max Variation $\pm 90^\circ$ dB	Max Variation $\pm 150^\circ$ dB
<b>500 Hz</b>	501.187 Hz	0.02	0.05	0.05
<b>630 Hz</b>	630.957 Hz	0.02	0.07	0.08
<b>800 Hz</b>	794.328 Hz	0.04	0.12	0.13
<b>1000 Hz</b>	1000 Hz	0.07	0.18	0.20
<b>1250 Hz</b>	1258.93 Hz	0.10	0.26	0.29
<b>1600 Hz</b>	1584.89 Hz	0.12	0.39	0.43
<b>2000 Hz</b>	1995.26 Hz	0.14	0.50	0.59
2240 Hz	2238.72 Hz	0.15	0.52	0.66
<b>2500 Hz</b>	2511.89 Hz	0.15	0.53	0.73
2800 Hz	2818.38 Hz	0.14	0.56	0.80
<b>3150 Hz</b>	3162.28 Hz	0.22	0.77	0.98
3550 Hz	3548.13 Hz	0.24	1.02	1.20
4000 Hz	3981.07 Hz	0.28	1.13	1.42
4500 Hz	4466.84 Hz	0.28	1.34	1.70
<b>5000 Hz</b>	5011.87 Hz	0.35	1.90	2.12
5600 Hz	5623.41 Hz	0.25	2.02	2.25
6300 Hz	6309.57 Hz	0.38	2.61	3.04
7100 Hz	7079.46 Hz	0.70	3.22	3.53
<b>8000 Hz</b>	7943.28 Hz	0.65	3.21	4.15
8500 Hz	8413.95 Hz	0.44	3.44	4.27
9000 Hz	8912.51 Hz	0.82	4.12	4.98
9500 Hz	9440.61 Hz	0.71	4.13	5.40
<b>10000 Hz</b>	10000 Hz	0.86	4.69	5.84
10600 Hz	10592.5 Hz	0.97	5.68	6.64
11200 Hz	11220.2 Hz	0.79	5.18	6.79
11800 Hz	11885.0 Hz	0.96	5.79	7.47
<b>12500 Hz</b>	12589.3 Hz	1.14	6.64	8.22
13200 Hz	13335.2 Hz	0.98	6.52	8.81
14000 Hz	14125.4 Hz	1.16	7.50	9.38
15000 Hz	14962.4 Hz	1.51	7.64	10.17
<b>17000 Hz</b>	16788.0 Hz	1.35	9.02	11.88
18000 Hz	17782.8 Hz	1.45	10.26	12.50
19000 Hz	18836.5 Hz	1.64	10.37	13.74
<b>20000 Hz</b>	19952.6 Hz	1.85	11.39	14.56

**Table A.15** Influence of the analyzer's body on the directional response, measured in a plane parallel to the display and along the microphone's axis, 500 Hz – 3550 Hz, in dB

Angle	Frequency											
	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz	2240 Hz	2500 Hz	2800 Hz	3150 Hz	3550 Hz
0°	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
5°	0.00	-0.01	0.00	0.00	-0.02	-0.01	-0.03	-0.02	-0.03	-0.01	-0.03	-0.01
10°	0.00	-0.01	-0.01	0.01	-0.02	-0.01	-0.04	0.00	-0.04	0.00	-0.05	0.01
15°	-0.01	-0.01	-0.01	0.01	-0.04	0.00	-0.06	0.02	-0.07	0.02	-0.07	0.03
20°	-0.01	-0.01	-0.01	0.02	-0.04	0.00	-0.09	0.05	-0.11	0.02	-0.11	0.07
25°	-0.01	-0.01	-0.02	0.02	-0.04	-0.01	-0.14	0.08	-0.14	0.03	-0.15	0.10
30°	0.00	0.00	0.01	0.03	-0.03	-0.04	-0.18	0.08	-0.13	0.00	-0.15	0.12
35°	0.01	0.01	0.02	0.03	0.01	-0.11	-0.20	0.05	-0.10	-0.06	-0.14	0.10
40°	0.02	0.03	0.05	0.01	0.06	-0.20	-0.17	-0.02	-0.02	-0.15	-0.11	0.05
45°	0.03	0.05	0.08	0.00	0.11	-0.30	-0.10	-0.11	0.03	-0.22	-0.10	0.04
50°	0.05	0.07	0.12	0.01	0.16	-0.39	-0.01	-0.16	0.03	-0.22	-0.14	0.05
55°	0.06	0.09	0.14	0.03	0.19	-0.41	0.03	-0.13	-0.07	-0.14	-0.23	0.06
60°	0.08	0.12	0.18	0.05	0.21	-0.38	-0.03	-0.01	-0.21	-0.07	-0.30	0.01
65°	0.10	0.14	0.22	0.08	0.23	-0.29	-0.18	0.08	-0.24	-0.14	-0.27	-0.07
70°	0.12	0.17	0.26	0.12	0.23	-0.17	-0.36	0.02	-0.09	-0.33	-0.19	-0.13
75°	0.13	0.19	0.29	0.18	0.23	-0.06	-0.44	-0.17	0.02	-0.38	-0.25	-0.12
80°	0.13	0.19	0.29	0.24	0.23	0.00	-0.36	-0.39	-0.06	-0.23	-0.45	-0.09
85°	0.14	0.20	0.29	0.32	0.26	0.01	-0.14	-0.43	-0.33	-0.13	-0.45	-0.22
90°	0.13	0.18	0.28	0.37	0.33	-0.01	0.09	-0.21	-0.53	-0.32	-0.27	-0.35
95°	0.11	0.15	0.24	0.40	0.41	-0.03	0.22	0.12	-0.37	-0.63	-0.31	-0.25
100°	0.08	0.11	0.17	0.40	0.51	0.01	0.20	0.33	0.03	-0.57	-0.61	-0.18
105°	0.04	0.06	0.10	0.35	0.57	0.12	0.11	0.34	0.34	-0.11	-0.64	-0.38
110°	0.00	0.00	0.03	0.27	0.58	0.24	0.09	0.22	0.37	0.28	-0.15	-0.35
115°	-0.04	-0.05	-0.05	0.15	0.53	0.31	0.21	0.18	0.21	0.30	0.32	0.17
120°	-0.07	-0.10	-0.11	0.03	0.41	0.29	0.38	0.30	0.15	0.08	0.31	0.60
125°	-0.09	-0.13	-0.16	-0.08	0.24	0.17	0.45	0.48	0.30	0.00	0.02	0.47
130°	-0.11	-0.15	-0.19	-0.15	0.09	-0.04	0.36	0.54	0.49	0.21	-0.04	0.13
135°	-0.11	-0.15	-0.19	-0.20	-0.03	-0.28	0.10	0.35	0.48	0.38	0.22	0.17
140°	-0.10	-0.14	-0.17	-0.21	-0.10	-0.47	-0.24	-0.01	0.18	0.23	0.30	0.42
145°	-0.08	-0.12	-0.14	-0.19	-0.11	-0.55	-0.52	-0.39	-0.29	-0.24	-0.04	0.31
150°	-0.06	-0.09	-0.10	-0.14	-0.06	-0.53	-0.63	-0.63	-0.66	-0.75	-0.67	-0.27
155°	-0.04	-0.05	-0.05	-0.08	0.03	-0.43	-0.56	-0.61	-0.76	-0.99	-1.15	-0.91
160°	-0.02	-0.03	-0.02	-0.02	0.12	-0.30	-0.38	-0.43	-0.60	-0.87	-1.15	-1.08
165°	0.00	0.00	0.02	0.04	0.21	-0.16	-0.18	-0.19	-0.32	-0.54	-0.81	-0.77
170°	0.01	0.02	0.04	0.08	0.27	-0.06	0.00	0.03	-0.05	-0.21	-0.41	-0.30
175°	0.02	0.03	0.06	0.10	0.32	0.01	0.11	0.17	0.13	0.01	-0.13	0.04
180°	0.03	0.04	0.07	0.13	0.33	0.03	0.14	0.22	0.20	0.09	-0.02	0.17
185°	0.02	0.03	0.06	0.11	0.32	0.01	0.12	0.18	0.15	0.02	-0.10	0.05
190°	0.02	0.02	0.05	0.09	0.29	-0.05	0.02	0.05	-0.01	-0.20	-0.37	-0.29
195°	0.00	0.00	0.02	0.05	0.22	-0.15	-0.14	-0.15	-0.27	-0.52	-0.77	-0.76
200°	-0.01	-0.02	-0.01	0.01	0.14	-0.28	-0.34	-0.39	-0.55	-0.85	-1.12	-1.11
205°	-0.04	-0.05	-0.05	-0.06	0.05	-0.41	-0.52	-0.57	-0.73	-0.99	-1.14	-0.95
210°	-0.06	-0.08	-0.09	-0.11	-0.03	-0.50	-0.59	-0.59	-0.65	-0.77	-0.69	-0.31
215°	-0.08	-0.11	-0.13	-0.15	-0.09	-0.51	-0.49	-0.37	-0.29	-0.26	-0.06	0.31
220°	-0.09	-0.13	-0.16	-0.17	-0.09	-0.41	-0.22	0.01	0.17	0.22	0.32	0.48
225°	-0.10	-0.15	-0.18	-0.16	-0.02	-0.22	0.11	0.37	0.49	0.41	0.27	0.27
230°	-0.10	-0.14	-0.18	-0.12	0.11	0.02	0.38	0.56	0.53	0.28	0.03	0.20
235°	-0.09	-0.12	-0.15	-0.03	0.27	0.25	0.49	0.53	0.36	0.08	0.06	0.53
240°	-0.06	-0.08	-0.10	0.08	0.44	0.37	0.43	0.36	0.21	0.13	0.33	0.69
245°	-0.03	-0.04	-0.03	0.20	0.56	0.39	0.27	0.23	0.26	0.35	0.38	0.28
250°	0.01	0.02	0.04	0.30	0.63	0.32	0.15	0.27	0.41	0.37	-0.04	-0.31
255°	0.05	0.07	0.12	0.39	0.63	0.21	0.16	0.38	0.42	0.00	-0.55	-0.35
260°	0.08	0.12	0.19	0.44	0.57	0.11	0.24	0.38	0.14	-0.48	-0.57	-0.08
265°	0.11	0.16	0.25	0.44	0.49	0.06	0.26	0.21	-0.26	-0.57	-0.26	-0.14
270°	0.13	0.19	0.29	0.41	0.41	0.06	0.16	-0.10	-0.45	-0.28	-0.21	-0.26
275°	0.14	0.21	0.31	0.36	0.35	0.08	-0.06	-0.34	-0.27	-0.07	-0.39	-0.11
280°	0.14	0.21	0.31	0.30	0.31	0.07	-0.27	-0.32	0.01	-0.18	-0.36	0.03
285°	0.13	0.19	0.29	0.23	0.31	0.01	-0.36	-0.11	0.09	-0.33	-0.15	0.00
290°	0.12	0.18	0.27	0.17	0.30	-0.09	-0.29	0.09	-0.04	-0.25	-0.07	-0.07
295°	0.11	0.15	0.23	0.14	0.29	-0.20	-0.13	0.14	-0.18	-0.05	-0.16	-0.06
300°	0.09	0.13	0.20	0.10	0.27	-0.28	0.02	0.05	-0.15	0.04	-0.23	0.03
305°	0.07	0.10	0.16	0.09	0.23	-0.32	0.08	-0.06	0.00	-0.04	-0.20	0.12
310°	0.06	0.08	0.14	0.07	0.20	-0.30	0.04	-0.11	0.12	-0.15	-0.11	0.14
315°	0.04	0.06	0.11	0.07	0.16	-0.22	-0.04	-0.06	0.13	-0.18	-0.04	0.12
320°	0.03	0.04	0.07	0.06	0.11	-0.13	-0.11	0.04	0.07	-0.13	-0.13	0.14
325°	0.02	0.03	0.05	0.07	0.06	-0.05	-0.14	0.11	-0.01	-0.04	-0.07	0.17
330°	0.01	0.01	0.02	0.06	0.02	0.01	-0.13	0.14	-0.07	0.03	-0.09	0.19
335°	0.00	0.00	0.01	0.07	0.00	0.04	-0.10	0.13	-0.09	0.06	-0.09	0.16
340°	0.00	0.00	0.01	0.05	0.00	0.05	-0.05	0.11	-0.07	0.07	-0.06	0.11
345°	0.00	0.00	0.00	0.04	0.00	0.04	-0.02	0.08	-0.04	0.05	-0.03	0.07
350°	0.00	0.00	0.00	0.03	0.01	0.03	0.00	0.05	-0.01	0.03	-0.01	0.04
355°	0.00	0.00	0.00	0.02	0.01	0.02	0.01	0.02	0.01	0.02	0.01	0.02

**Table A.16** Influence of the analyzer's body on the directional response, measured in a plane parallel to the display and along the microphone's axis, 4000 Hz – 10600 Hz, in dB

Angle	Frequency											
	4000 Hz	4500 Hz	5000 Hz	5600 Hz	6300 Hz	7100 Hz	8000 Hz	8500 Hz	9000 Hz	9500 Hz	10000 Hz	10600 Hz
0°	-0.02	-0.02	-0.01	-0.01	0.00	-0.02	-0.02	-0.01	-0.01	-0.02	-0.02	-0.02
5°	-0.01	-0.02	-0.02	-0.02	0.03	-0.01	-0.01	-0.03	-0.04	-0.06	-0.05	-0.02
10°	0.00	-0.03	-0.06	-0.08	0.07	-0.02	-0.03	-0.10	-0.13	-0.16	-0.13	0.00
15°	0.02	-0.07	-0.12	-0.19	0.06	0.03	-0.09	-0.21	-0.21	-0.30	-0.18	0.07
20°	0.03	-0.14	-0.17	-0.34	-0.05	0.18	-0.09	-0.28	-0.10	-0.29	-0.05	0.25
25°	0.01	-0.19	-0.14	-0.43	-0.30	0.34	0.04	-0.24	0.12	-0.21	0.24	0.46
30°	-0.02	-0.20	0.05	-0.34	-0.36	0.29	0.18	-0.29	-0.02	-0.45	0.10	0.30
35°	0.00	-0.11	0.22	-0.29	-0.06	0.14	0.19	-0.22	-0.18	-0.35	-0.09	0.09
40°	0.07	-0.05	0.20	-0.47	0.01	0.27	-0.03	-0.09	-0.24	-0.13	-0.13	0.47
45°	0.10	-0.11	0.02	-0.60	-0.21	0.01	-0.09	0.06	-0.02	-0.38	-0.16	0.10
50°	0.02	-0.14	0.09	-0.29	-0.04	-0.14	0.15	-0.30	0.09	-0.57	0.03	-0.07
55°	-0.05	0.05	0.29	-0.15	-0.19	0.11	0.04	-0.10	0.25	-0.24	-0.25	0.53
60°	0.04	0.10	0.10	-0.36	-0.33	-0.07	-0.14	-0.20	-0.17	0.04	-0.29	0.23
65°	0.11	-0.08	0.17	-0.10	0.00	0.12	-0.18	-0.23	0.13	-0.62	0.28	-0.07
70°	0.02	-0.03	0.32	-0.23	-0.04	-0.37	-0.12	-0.58	0.17	-0.24	-0.30	0.75
75°	-0.11	0.12	0.08	-0.25	0.24	-0.02	0.16	-0.50	-0.30	-0.06	-0.33	0.31
80°	-0.18	0.01	0.36	-0.23	0.17	-0.19	-0.09	-0.25	-0.32	-0.45	0.05	-0.22
85°	-0.24	-0.11	0.42	-0.49	0.25	0.22	0.17	-0.34	-0.09	-0.55	-0.17	0.12
90°	-0.38	-0.22	0.33	0.01	-0.06	0.17	-0.15	0.01	-0.15	-0.41	-0.20	0.23
95°	-0.50	-0.43	0.22	-0.24	0.23	0.37	0.02	-0.33	0.08	-0.14	-0.57	0.44
100°	-0.42	-0.64	-0.21	-0.07	0.12	0.30	0.34	-0.23	-0.14	-0.26	0.19	-0.29
105°	-0.35	-0.58	-0.39	-0.72	0.15	0.24	0.43	0.16	0.17	-0.55	0.25	-0.02
110°	-0.47	-0.47	-0.42	-0.96	-0.39	0.21	0.49	0.33	0.57	0.09	-0.25	0.43
115°	-0.33	-0.46	-0.31	-0.98	-0.81	-0.65	-0.03	-0.02	0.27	0.65	0.34	1.05
120°	0.29	-0.14	0.00	-0.82	-0.74	-0.86	-0.83	-0.95	-0.19	-0.52	0.56	1.04
125°	0.70	0.46	0.42	-0.13	-0.42	-0.83	-1.02	-1.57	-1.34	-1.60	-1.00	-0.44
130°	0.41	0.65	0.98	0.24	0.57	0.15	-0.60	-0.89	-1.05	-1.31	-1.92	-1.40
135°	-0.01	0.15	0.93	0.70	0.89	1.04	0.79	0.13	0.11	-0.75	-0.68	-0.43
140°	0.16	-0.07	0.28	0.28	0.98	1.10	1.27	1.10	1.26	1.15	0.92	1.05
145°	0.35	0.24	0.27	-0.40	0.18	0.74	0.89	0.68	1.09	0.86	1.12	1.68
150°	-0.07	0.09	0.48	-0.14	-0.06	-0.08	0.26	-0.02	0.28	0.42	0.69	1.05
155°	-0.86	-0.74	-0.13	-0.29	0.02	0.16	-0.04	-0.28	-0.27	-0.75	-0.46	0.16
160°	-1.33	-1.47	-1.12	-1.30	-0.88	-0.48	-0.20	-0.50	-0.20	-0.40	-0.50	0.05
165°	-1.11	-1.35	-1.32	-1.91	-1.71	-1.74	-1.55	-1.82	-1.46	-1.59	-1.41	-0.61
170°	-0.58	-0.72	-0.67	-1.35	-1.22	-1.48	-1.70	-2.09	-2.09	-2.53	-2.68	-2.64
175°	-0.16	-0.19	-0.02	-0.58	-0.29	-0.39	-0.49	-0.72	-0.71	-1.11	-1.20	-1.14
180°	0.00	0.01	0.24	-0.27	0.09	0.09	0.09	-0.06	0.05	-0.25	-0.23	-0.01
185°	-0.15	-0.17	0.01	-0.55	-0.26	-0.36	-0.43	-0.67	-0.62	-1.01	-1.09	-1.05
190°	-0.57	-0.70	-0.63	-1.32	-1.18	-1.45	-1.61	-2.03	-2.02	-2.44	-2.60	-2.52
195°	-1.10	-1.35	-1.29	-1.92	-1.74	-1.73	-1.54	-1.86	-1.51	-1.54	-1.42	-0.63
200°	-1.34	-1.49	-1.15	-1.36	-0.88	-0.47	-0.27	-0.45	-0.15	-0.36	-0.49	0.07
205°	-0.88	-0.75	-0.14	-0.27	0.09	0.16	-0.06	-0.31	-0.33	-0.66	-0.48	0.14
210°	-0.07	0.12	0.53	-0.07	-0.01	-0.06	0.24	0.01	0.33	0.43	0.63	1.10
215°	0.38	0.31	0.35	-0.39	0.20	0.78	0.93	0.71	1.03	0.88	1.00	1.71
220°	0.24	-0.02	0.27	0.34	1.03	1.14	1.26	1.18	1.29	1.19	1.06	1.16
225°	0.05	0.14	0.96	0.79	0.93	1.12	0.96	0.33	0.22	-0.48	-0.50	-0.22
230°	0.37	0.70	1.13	0.31	0.67	0.32	-0.46	-0.81	-1.01	-1.14	-1.70	-1.34
235°	0.68	0.63	0.52	0.01	-0.29	-0.75	-0.91	-1.36	-1.38	-1.49	-1.03	-0.41
240°	0.38	-0.03	0.08	-0.75	-0.73	-0.76	-0.82	-0.85	-0.19	-0.29	0.52	1.24
245°	-0.21	-0.39	-0.20	-0.92	-0.73	-0.66	0.12	0.13	0.32	0.75	0.59	1.09
250°	-0.33	-0.36	-0.40	-0.85	-0.40	0.28	0.57	0.47	0.52	0.31	-0.23	0.45
255°	-0.20	-0.55	-0.34	-0.61	0.20	0.39	0.58	0.13	0.23	-0.32	0.06	0.16
260°	-0.35	-0.56	-0.15	0.01	0.24	0.46	0.38	0.00	-0.10	-0.15	0.14	0.11
265°	-0.43	-0.38	0.26	-0.09	0.29	0.37	0.20	-0.25	-0.05	0.17	-0.35	0.41
270°	-0.28	-0.18	0.32	0.25	-0.02	0.50	-0.04	-0.15	0.19	-0.15	-0.56	0.83
275°	-0.14	-0.14	0.58	-0.32	0.18	0.45	0.05	-0.03	0.16	-0.74	0.08	0.44
280°	-0.13	0.01	0.53	-0.21	0.33	-0.10	0.12	0.06	-0.40	-0.32	0.20	-0.19
285°	-0.15	0.26	0.24	-0.29	0.39	0.04	0.40	-0.34	-0.35	0.03	-0.12	0.32
290°	0.02	0.12	0.37	-0.13	0.07	-0.27	0.12	-0.46	-0.03	0.15	-0.21	0.69
295°	0.20	0.04	0.20	-0.01	0.04	0.24	0.05	-0.22	0.18	-0.22	0.06	0.27
300°	0.13	0.17	0.22	-0.28	-0.20	-0.15	0.11	-0.22	-0.09	0.06	-0.34	0.14
305°	0.04	0.08	0.37	-0.18	-0.06	0.26	0.02	-0.15	0.25	-0.02	-0.38	0.87
310°	0.10	-0.06	0.20	-0.23	0.04	-0.12	0.31	-0.20	0.27	-0.29	0.09	0.38
315°	0.14	0.00	0.09	-0.52	-0.23	0.12	-0.07	-0.07	0.11	-0.51	-0.17	0.08
320°	0.08	0.04	0.20	-0.40	0.12	0.26	0.01	0.07	-0.09	0.07	-0.01	0.70
325°	0.02	-0.02	0.24	-0.18	0.03	0.22	0.10	-0.11	-0.25	-0.25	-0.20	0.26
330°	0.02	-0.11	0.09	-0.26	-0.35	0.38	0.23	-0.19	0.06	-0.31	0.24	0.34
335°	0.05	-0.13	-0.07	-0.40	-0.31	0.41	0.14	-0.22	0.22	-0.25	0.34	0.46
340°	0.07	-0.09	-0.12	-0.33	-0.08	0.27	-0.02	-0.30	0.00	-0.32	0.03	0.33
345°	0.06	-0.03	-0.08	-0.16	0.04	0.11	-0.03	-0.22	-0.13	-0.25	-0.12	0.18
350°	0.05	0.00	-0.03	-0.04	0.04	0.03	0.01	-0.08	-0.08	-0.11	-0.08	0.07
355°	0.02	0.01	0.00	0.01	0.01	0.02	0.02	-0.01	-0.02	-0.02	-0.02	0.02

**Table A.17** Influence of the analyzer's body on the directional response, measured in a plane parallel to the display and along the microphone's axis, 11200 Hz – 20000 Hz, in dB

Angle	Frequency										
	11200 Hz	11800 Hz	12500 Hz	13200 Hz	14000 Hz	15000 Hz	16000 Hz	17000 Hz	18000 Hz	19000 Hz	20000 Hz
0°	-0.01	-0.01	-0.01	-0.01	-0.03	-0.03	-0.02	0.00	0.01	0.02	0.02
5°	-0.02	-0.02	-0.02	-0.01	-0.02	-0.05	-0.01	-0.01	0.01	0.02	0.06
10°	-0.02	-0.04	-0.04	0.01	0.00	-0.11	0.03	-0.02	0.08	0.09	0.21
15°	-0.04	-0.09	0.07	0.06	0.02	-0.04	-0.04	0.01	0.12	0.08	0.34
20°	-0.08	-0.19	0.14	0.15	-0.03	-0.14	-0.26	-0.05	-0.06	-0.13	0.28
25°	-0.08	-0.13	0.00	-0.04	-0.07	-0.18	-0.02	-0.12	0.00	-0.22	0.00
30°	-0.03	0.03	0.12	-0.34	-0.10	0.18	-0.24	-0.13	0.13	-0.34	-0.12
35°	-0.06	-0.05	-0.29	-0.25	0.10	0.26	-0.22	-0.42	0.06	-0.13	0.02
40°	0.37	0.10	-0.07	-0.12	-0.35	-0.01	0.09	-0.05	-0.11	-0.21	-0.17
45°	-0.07	-0.03	-0.03	-0.50	-0.28	0.12	0.32	-0.05	-0.32	-0.27	0.01
50°	0.12	0.24	0.05	-0.35	-0.17	-0.24	-0.16	0.12	-0.03	-0.19	0.07
55°	0.05	0.46	0.24	0.01	-0.33	-0.28	0.24	0.13	-0.27	-0.33	0.03
60°	-0.28	0.13	-0.10	0.08	-0.31	-0.14	-0.21	-0.10	0.31	0.11	0.11
65°	-0.08	-0.36	0.02	-0.39	-0.13	0.04	-0.23	-0.27	-0.11	-0.10	0.22
70°	-0.35	0.16	-0.38	-0.20	-0.33	0.19	0.10	-0.34	-0.11	-0.39	0.03
75°	0.33	-0.21	0.14	-0.61	-0.33	0.03	-0.19	0.10	-0.09	-0.48	-0.02
80°	0.20	0.26	0.00	-0.27	-0.40	-0.20	-0.15	-0.48	0.52	-0.43	-0.63
85°	-0.33	0.23	0.30	-0.06	-0.37	0.17	-0.20	-0.17	-0.17	0.18	0.36
90°	-0.46	0.20	-0.13	0.07	-0.24	0.01	0.15	0.16	-0.01	-0.18	0.52
95°	-0.19	-0.21	0.42	-0.90	-0.32	0.01	0.31	-0.46	0.15	-0.81	0.61
100°	0.26	-0.09	-0.12	-0.14	-0.88	-0.21	0.12	0.06	0.09	0.08	-0.53
105°	-0.13	0.00	0.35	-0.66	-0.12	-0.12	-0.47	-0.65	0.28	-0.08	0.21
110°	-0.04	-0.27	0.01	-0.33	-0.14	0.14	-0.26	-0.34	-0.27	-0.43	0.20
115°	0.12	0.34	-0.10	-0.61	-0.34	-0.12	0.00	0.16	0.09	-0.41	-0.58
120°	0.76	1.25	0.57	0.24	0.05	-0.13	-0.48	-0.50	-0.62	0.33	0.76
125°	0.27	0.81	0.44	1.11	1.18	1.41	0.69	-0.02	-0.23	-1.14	-1.37
130°	-1.64	-1.89	-1.09	-0.23	-0.07	1.09	1.33	1.41	1.96	0.87	1.19
135°	-1.30	-1.75	-1.28	-2.25	-3.31	-1.78	-1.23	-0.69	0.55	1.10	2.06
140°	0.41	0.49	0.15	-1.05	-1.52	-0.70	-1.90	-3.07	-3.22	-3.15	-2.99
145°	1.51	1.86	1.43	1.33	1.27	1.25	0.35	-0.38	0.12	-0.11	-1.04
150°	0.86	0.73	1.23	1.42	1.51	1.73	1.94	1.84	1.97	1.75	1.69
155°	-0.09	0.30	0.24	0.01	0.06	0.42	0.39	0.61	1.13	1.15	1.41
160°	-0.35	-0.53	-0.72	-0.84	-0.58	-0.55	-0.19	-0.31	0.21	-0.50	-0.96
165°	-0.51	-0.36	-0.42	-0.51	-0.62	-0.31	-0.75	-1.18	-1.23	-1.50	-1.08
170°	-2.91	-2.43	-2.44	-2.33	-2.20	-1.44	-1.05	-0.90	-0.40	-0.47	-0.63
175°	-1.90	-1.83	-2.15	-2.52	-2.72	-3.02	-2.91	-3.59	-3.35	-3.53	-3.22
180°	-0.60	-0.53	-0.76	-1.04	-1.11	-1.31	-1.24	-1.92	-1.99	-2.37	-2.16
185°	-1.75	-1.71	-2.06	-2.41	-2.60	-2.87	-2.78	-3.49	-3.37	-3.66	-3.43
190°	-2.85	-2.48	-2.56	-2.38	-2.26	-1.45	-1.10	-0.87	-0.44	-0.47	-0.64
195°	-0.46	-0.35	-0.46	-0.48	-0.42	-0.19	-0.65	-1.13	-1.53	-1.95	-1.49
200°	-0.39	-0.61	-0.84	-0.96	-0.70	-0.58	-0.26	-0.07	0.24	-0.34	-1.00
205°	0.00	0.37	0.21	0.24	0.14	0.37	0.16	0.38	0.75	0.98	1.22
210°	0.71	0.72	1.01	1.30	1.57	1.72	1.93	1.96	1.95	1.81	1.92
215°	1.66	1.95	1.50	1.31	1.53	1.44	0.73	-0.04	-0.07	-0.27	-0.66
220°	0.63	0.56	0.15	-0.79	-1.37	-0.62	-1.33	-2.66	-3.10	-3.31	-3.08
225°	-1.07	-1.48	-1.21	-1.88	-3.09	-1.73	-1.29	-0.87	0.52	0.50	1.71
230°	-1.52	-1.60	-1.18	-0.20	0.02	1.17	1.04	1.71	1.93	0.60	0.85
235°	0.30	0.78	0.44	1.21	1.39	1.42	0.70	0.15	-0.17	-0.74	-0.92
240°	0.84	1.27	0.77	0.31	0.03	0.13	-0.55	-0.31	-0.16	0.04	0.75
245°	0.33	0.55	-0.19	-0.61	-0.22	-0.09	-0.08	0.77	0.24	0.03	-0.72
250°	0.23	-0.19	-0.14	-0.10	-0.05	0.23	-0.01	-0.35	0.03	-0.71	-0.09
255°	0.13	0.03	0.31	-0.32	-0.06	0.16	-0.35	-0.28	-0.04	0.34	0.10
260°	0.27	0.18	0.06	-0.29	-0.43	-0.40	0.22	0.12	0.27	-0.21	-0.50
265°	0.16	0.06	-0.19	-0.10	-0.47	0.53	0.14	0.16	-0.48	0.23	-0.34
270°	-0.14	-0.28	0.34	-0.46	0.52	-0.39	0.69	-0.58	0.83	-0.86	0.63
275°	-0.57	0.73	-0.21	0.16	-0.43	0.13	-0.24	0.44	-0.41	0.65	0.01
280°	0.42	0.34	-0.14	0.03	-0.32	0.40	-0.37	0.16	0.13	-0.55	0.04
285°	0.58	-0.08	0.02	-0.20	-0.03	0.04	0.22	-0.27	0.02	0.02	-0.38
290°	0.17	-0.15	0.13	-0.27	0.13	0.10	0.10	-0.19	0.18	-0.34	-0.06
295°	-0.14	-0.20	0.13	-0.07	0.28	-0.30	0.39	-0.23	-0.02	0.23	-0.06
300°	-0.12	-0.10	0.26	0.20	-0.21	0.05	-0.09	0.32	-0.15	-0.04	0.26
305°	-0.12	0.56	0.07	0.31	-0.24	0.01	-0.21	0.59	0.10	-0.13	0.00
310°	0.18	0.27	-0.01	-0.01	-0.35	0.24	-0.11	0.51	0.11	-0.28	-0.02
315°	0.05	0.32	-0.30	-0.16	-0.09	0.28	0.00	0.06	0.05	0.07	0.12
320°	0.19	0.34	-0.02	-0.16	-0.15	0.26	0.30	0.07	0.11	0.06	-0.10
325°	0.08	0.00	-0.30	0.04	0.05	0.25	-0.06	-0.29	0.26	0.03	-0.07
330°	0.06	0.15	-0.03	-0.16	0.12	0.40	-0.15	-0.24	0.06	-0.25	0.02
335°	-0.01	0.02	-0.06	-0.06	0.06	0.02	0.17	-0.03	0.04	-0.12	0.06
340°	-0.09	-0.12	0.23	0.18	0.00	-0.11	-0.12	0.06	-0.03	-0.16	0.11
345°	-0.01	-0.06	0.10	0.17	0.02	-0.08	-0.08	0.00	0.03	0.02	0.36
350°	0.02	-0.05	-0.02	0.11	0.11	-0.09	0.06	-0.05	0.03	0.09	0.26
355°	0.01	-0.02	-0.01	0.06	0.06	-0.01	0.05	-0.01	0.00	0.02	0.06

**Table A.18** Influence of the analyzer's body on the directional response, measured in a plane perpendicular to the display and along the microphone's axis, 500 Hz – 3550 Hz, in dB

Angle	Frequency											
	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz	2240 Hz	2500 Hz	2800 Hz	3150 Hz	3550 Hz
0°	0.00	0.00	-0.01	0.00	-0.01	-0.01	-0.02	-0.02	-0.01	-0.02	-0.01	-0.02
5°	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.02	-0.01	-0.02	-0.02	-0.01	-0.04
10°	0.00	-0.01	-0.01	0.01	-0.02	0.00	-0.02	0.01	-0.03	-0.02	0.00	-0.05
15°	-0.01	-0.01	-0.02	0.02	-0.04	0.02	-0.04	0.04	-0.07	0.01	-0.02	-0.05
20°	-0.01	-0.02	-0.03	0.02	-0.04	0.03	-0.08	0.08	-0.11	0.03	-0.07	-0.01
25°	-0.02	-0.02	-0.04	0.03	-0.05	0.03	-0.12	0.13	-0.15	0.07	-0.16	0.08
30°	-0.01	-0.02	-0.02	0.04	-0.04	0.01	-0.16	0.15	-0.18	0.08	-0.25	0.21
35°	-0.01	-0.01	-0.01	0.03	-0.01	-0.05	-0.19	0.14	-0.15	0.05	-0.32	0.33
40°	0.00	0.00	0.01	0.02	0.04	-0.13	-0.18	0.10	-0.07	-0.03	-0.31	0.34
45°	0.02	0.03	0.05	0.02	0.09	-0.22	-0.13	0.01	0.02	-0.13	-0.24	0.19
50°	0.04	0.06	0.09	0.02	0.13	-0.31	-0.04	-0.05	0.07	-0.15	-0.21	-0.01
55°	0.06	0.08	0.13	0.02	0.17	-0.36	0.02	-0.04	-0.01	-0.04	-0.29	-0.08
60°	0.08	0.11	0.17	0.04	0.19	-0.36	0.00	0.05	-0.14	0.09	-0.41	0.00
65°	0.10	0.15	0.22	0.07	0.20	-0.31	-0.11	0.13	-0.19	0.08	-0.33	-0.04
70°	0.12	0.17	0.26	0.14	0.18	-0.21	-0.27	0.12	-0.09	-0.10	-0.10	-0.24
75°	0.14	0.20	0.30	0.23	0.16	-0.11	-0.39	-0.03	0.03	-0.21	-0.05	-0.20
80°	0.14	0.20	0.30	0.33	0.18	-0.05	-0.39	-0.23	-0.03	-0.07	-0.28	0.11
85°	0.14	0.20	0.29	0.42	0.25	-0.05	-0.27	-0.31	-0.30	0.03	-0.35	0.09
90°	0.13	0.18	0.27	0.48	0.37	-0.08	-0.12	-0.19	-0.52	-0.18	-0.16	-0.14
95°	0.10	0.15	0.23	0.51	0.52	-0.07	-0.04	0.01	-0.42	-0.58	-0.25	0.03
100°	0.07	0.11	0.16	0.50	0.67	0.03	-0.04	0.11	-0.12	-0.58	-0.74	0.11
105°	0.04	0.06	0.09	0.43	0.77	0.21	-0.03	0.08	0.03	-0.17	-0.89	-0.49
110°	-0.01	-0.01	0.01	0.32	0.78	0.41	0.12	0.07	-0.04	0.07	-0.37	-0.76
115°	-0.05	-0.07	-0.07	0.20	0.69	0.55	0.39	0.26	-0.06	-0.09	0.00	-0.11
120°	-0.09	-0.13	-0.16	0.05	0.51	0.56	0.65	0.63	0.21	-0.16	-0.18	0.25
125°	-0.12	-0.17	-0.22	-0.07	0.29	0.39	0.74	0.93	0.67	0.26	-0.29	0.00
130°	-0.14	-0.19	-0.25	-0.17	0.08	0.11	0.57	0.97	0.96	0.87	0.26	0.10
135°	-0.14	-0.19	-0.25	-0.22	-0.08	-0.24	0.19	0.66	0.84	1.08	0.88	0.89
140°	-0.13	-0.18	-0.23	-0.24	-0.15	-0.51	-0.27	0.12	0.33	0.71	0.89	1.37
145°	-0.10	-0.15	-0.18	-0.22	-0.14	-0.66	-0.65	-0.43	-0.36	-0.09	0.20	0.95
150°	-0.08	-0.11	-0.14	-0.17	-0.07	-0.66	-0.80	-0.75	-0.89	-0.89	-0.85	-0.17
155°	-0.05	-0.07	-0.08	-0.10	0.04	-0.54	-0.74	-0.76	-1.02	-1.24	-1.59	-1.29
160°	-0.03	-0.04	-0.04	-0.03	0.15	-0.38	-0.54	-0.54	-0.82	-1.06	-1.60	-1.57
165°	-0.01	-0.01	0.01	0.04	0.25	-0.22	-0.31	-0.25	-0.48	-0.64	-1.13	-1.10
170°	0.01	0.01	0.03	0.08	0.33	-0.09	-0.11	0.00	-0.16	-0.23	-0.62	-0.48
175°	0.02	0.03	0.06	0.11	0.38	-0.01	0.01	0.17	0.05	0.04	-0.28	-0.04
180°	0.03	0.04	0.07	0.14	0.40	0.03	0.07	0.24	0.14	0.15	-0.12	0.15
185°	0.02	0.03	0.06	0.13	0.39	0.01	0.05	0.22	0.11	0.11	-0.18	0.08
190°	0.02	0.02	0.05	0.11	0.36	-0.06	-0.04	0.10	-0.04	-0.09	-0.44	-0.23
195°	0.00	0.00	0.02	0.08	0.29	-0.17	-0.20	-0.10	-0.30	-0.44	-0.88	-0.78
200°	-0.02	-0.03	-0.02	0.02	0.20	-0.32	-0.40	-0.36	-0.63	-0.88	-1.38	-1.34
205°	-0.04	-0.06	-0.06	-0.04	0.09	-0.48	-0.59	-0.60	-0.90	-1.19	-1.57	-1.40
210°	-0.07	-0.09	-0.11	-0.10	-0.02	-0.60	-0.69	-0.69	-0.92	-1.05	-1.09	-0.58
215°	-0.09	-0.13	-0.17	-0.15	-0.10	-0.64	-0.62	-0.51	-0.56	-0.40	-0.13	0.55
220°	-0.11	-0.16	-0.20	-0.18	-0.13	-0.54	-0.35	-0.08	0.06	0.41	0.67	1.19
225°	-0.12	-0.18	-0.22	-0.18	-0.09	-0.30	0.05	0.43	0.62	0.92	0.86	0.98
230°	-0.13	-0.18	-0.23	-0.12	0.02	0.01	0.41	0.79	0.86	0.89	0.40	0.26
235°	-0.11	-0.16	-0.21	-0.04	0.20	0.31	0.61	0.88	0.72	0.43	-0.16	0.02
240°	-0.09	-0.12	-0.15	0.08	0.40	0.50	0.60	0.69	0.35	0.00	-0.16	0.34
245°	-0.05	-0.07	-0.08	0.19	0.57	0.54	0.42	0.40	0.08	0.02	0.10	0.18
250°	-0.01	0.00	0.01	0.31	0.68	0.45	0.22	0.24	0.08	0.19	-0.14	-0.56
255°	0.04	0.06	0.10	0.41	0.70	0.28	0.12	0.23	0.13	0.00	-0.77	-0.63
260°	0.08	0.11	0.18	0.46	0.63	0.14	0.12	0.22	-0.01	-0.47	-0.85	0.02
265°	0.11	0.16	0.24	0.47	0.52	0.05	0.12	0.08	-0.33	-0.63	-0.34	0.16
270°	0.13	0.19	0.28	0.44	0.41	0.06	-0.01	-0.16	-0.51	-0.27	-0.10	-0.11
275°	0.14	0.20	0.31	0.38	0.31	0.08	-0.21	-0.32	-0.34	0.04	-0.31	0.02
280°	0.14	0.21	0.31	0.30	0.27	0.08	-0.39	-0.26	-0.05	-0.01	-0.36	0.15
285°	0.13	0.19	0.30	0.22	0.27	0.00	-0.41	-0.05	0.06	0.19	-0.12	-0.15
290°	0.12	0.17	0.27	0.14	0.29	-0.12	-0.29	0.13	-0.05	-0.14	-0.09	-0.33
295°	0.10	0.15	0.23	0.08	0.30	-0.25	-0.12	0.16	-0.17	0.05	-0.36	-0.07
300°	0.08	0.11	0.18	0.05	0.29	-0.34	0.01	0.07	-0.14	0.10	-0.51	0.14
305°	0.06	0.08	0.13	0.05	0.26	-0.35	0.04	-0.04	0.01	-0.07	-0.35	0.10
310°	0.04	0.05	0.09	0.04	0.21	-0.31	-0.01	-0.07	0.11	-0.25	-0.12	0.02
315°	0.02	0.03	0.06	0.06	0.16	-0.22	-0.10	0.00	0.09	-0.26	-0.04	0.04
320°	0.01	0.01	0.02	0.06	0.10	-0.12	-0.18	0.11	-0.03	-0.13	-0.09	0.08
325°	0.00	0.00	0.00	0.07	0.05	-0.03	-0.20	0.18	-0.16	0.04	-0.16	0.09
330°	-0.01	-0.02	-0.02	0.07	0.00	0.03	-0.18	0.20	-0.21	0.13	-0.19	0.05
335°	-0.01	-0.01	-0.02	0.09	-0.03	0.06	-0.13	0.18	-0.20	0.15	-0.16	0.01
340°	-0.01	-0.01	-0.01	0.06	-0.02	0.07	-0.07	0.13	-0.15	0.13	-0.11	0.00
345°	0.00	-0.01	-0.01	0.06	-0.02	0.05	-0.03	0.08	-0.09	0.09	-0.07	0.00
350°	0.00	0.00	0.00	0.03	-0.01	0.03	0.00	0.04	-0.03	0.05	-0.03	0.01
355°	0.00	0.00	0.00	0.01	0.01	0.02	0.01	0.02	0.00	0.03	-0.01	0.01

**Table A.19** Influence of the analyzer's body on the directional response, measured in a plane perpendicular to the display and along the microphone's axis, 4000 Hz – 10600 Hz, in dB

Angle	Frequency											
	4000 Hz	4500 Hz	5000 Hz	5600 Hz	6300 Hz	7100 Hz	8000 Hz	8500 Hz	9000 Hz	9500 Hz	10000 Hz	10600 Hz
0°	-0.02	-0.02	-0.01	-0.01	0.00	-0.02	-0.03	-0.01	-0.01	-0.02	-0.03	-0.02
5°	0.01	-0.02	0.01	-0.04	-0.04	0.02	-0.01	-0.01	0.09	0.02	0.01	0.07
10°	0.06	0.02	0.06	-0.04	-0.15	0.06	0.01	0.07	0.26	0.02	0.03	0.17
15°	0.13	0.05	0.14	0.01	-0.29	0.05	0.17	0.22	0.39	-0.17	0.00	0.15
20°	0.22	0.07	0.25	0.16	-0.30	-0.02	0.47	0.24	0.21	-0.59	-0.04	0.02
25°	0.26	0.05	0.31	0.25	-0.05	-0.13	0.67	-0.13	-0.26	-0.68	0.08	0.00
30°	0.24	0.01	0.31	0.17	0.30	-0.01	0.44	-0.32	-0.07	-0.03	0.16	0.22
35°	0.14	0.00	0.27	-0.14	0.21	0.29	0.17	0.30	0.13	-0.08	-0.46	0.26
40°	0.08	0.11	0.27	-0.18	-0.21	0.05	0.35	0.35	-0.47	-0.59	-0.23	0.50
45°	0.18	0.23	0.28	0.13	0.06	-0.43	0.36	0.04	0.31	-0.24	0.20	0.06
50°	0.40	0.19	0.25	0.24	0.17	0.18	0.28	0.17	0.16	-0.74	-0.11	0.28
55°	0.50	0.07	0.31	0.11	-0.39	-0.32	0.70	0.00	0.16	0.08	-0.61	0.15
60°	0.30	0.18	0.45	0.08	0.06	0.09	-0.04	0.35	0.11	-0.38	0.35	0.52
65°	0.08	0.39	0.44	0.18	0.15	-0.14	0.56	-0.31	0.26	-0.27	-0.34	0.36
70°	0.12	0.26	0.45	0.22	0.05	-0.33	0.05	0.19	-0.10	-0.29	-0.24	0.16
75°	0.08	0.00	0.67	0.22	0.28	-0.13	0.66	-0.44	0.41	-0.46	-0.12	0.35
80°	-0.18	0.11	0.55	0.29	0.45	-0.36	0.40	-0.02	-0.36	0.18	-0.63	0.36
85°	-0.01	-0.06	0.26	0.28	0.39	0.00	0.31	0.35	-0.49	-0.37	0.34	-0.45
90°	0.24	-0.28	0.46	0.06	0.49	0.25	0.38	-0.16	0.55	-1.14	0.14	0.42
95°	-0.03	0.10	0.10	0.10	-0.06	0.47	0.44	0.10	0.08	-0.18	-0.58	0.31
100°	0.02	-0.07	0.25	-0.01	0.10	-0.01	1.02	0.25	-0.02	0.09	-0.39	0.31
105°	0.25	-0.15	0.39	-0.08	-0.02	-0.34	0.52	0.76	0.49	-0.10	0.01	0.50
110°	-0.40	0.17	0.06	0.13	-0.02	-0.10	0.31	-0.39	0.30	0.00	0.49	0.36
115°	-0.74	-0.65	0.36	-0.23	0.09	-0.30	0.34	0.27	-0.29	-0.59	-0.35	0.85
120°	0.11	-0.78	-0.36	0.04	-0.22	-0.17	0.33	-0.49	0.07	0.07	-0.58	-0.16
125°	0.40	0.24	-0.33	-0.78	-0.11	-0.63	-0.01	0.19	0.04	-0.91	-0.11	0.41
130°	0.04	0.16	0.72	-0.16	-0.94	-0.51	0.15	-0.64	-0.76	-0.58	-0.21	0.13
135°	0.44	-0.08	0.43	0.54	0.55	-0.78	-0.61	-0.56	-0.17	-0.97	-1.52	-0.75
140°	1.38	0.94	0.57	0.05	0.24	0.69	0.68	-0.14	-0.67	-0.83	-0.73	-0.58
145°	1.51	1.67	1.73	0.98	0.30	-0.18	0.75	0.62	0.74	0.50	0.55	0.47
150°	0.54	1.04	1.78	1.79	1.80	1.12	0.97	0.13	-0.11	-0.52	-0.01	1.29
155°	-0.99	-0.66	0.36	0.73	1.41	1.71	2.51	2.18	1.87	1.08	0.55	0.56
160°	-1.81	-2.07	-1.48	-1.48	-1.07	-0.38	0.95	1.11	1.49	1.49	1.61	2.26
165°	-1.42	-1.89	-1.85	-2.44	-2.89	-3.25	-2.72	-2.94	-2.58	-2.48	-2.24	-0.94
170°	-0.64	-0.94	-0.92	-1.48	-1.79	-2.57	-2.57	-3.42	-3.79	-4.51	-5.29	-5.83
175°	-0.07	-0.21	-0.07	-0.42	-0.43	-0.84	-0.41	-0.93	-1.05	-1.54	-1.71	-1.87
180°	0.18	0.09	0.30	0.04	0.15	-0.11	0.52	0.11	0.11	-0.21	-0.25	-0.06
185°	0.09	-0.03	0.16	-0.13	-0.06	-0.37	0.17	-0.32	-0.40	-0.77	-0.94	-0.79
190°	-0.33	-0.56	-0.48	-0.90	-1.06	-1.63	-1.56	-2.37	-2.65	-3.36	-3.98	-4.07
195°	-1.02	-1.44	-1.44	-1.99	-2.39	-3.16	-3.32	-3.81	-3.73	-3.99	-3.78	-2.66
200°	-1.61	-2.00	-1.73	-1.89	-1.81	-1.66	-0.35	0.00	0.44	0.59	1.09	1.92
205°	-1.31	-1.19	-0.33	0.00	0.61	1.10	2.33	2.15	2.03	1.59	1.38	1.38
210°	-0.03	0.45	1.33	1.44	1.71	1.53	1.45	0.45	-0.06	-0.58	-0.51	0.44
215°	1.15	1.41	1.73	1.19	0.73	-0.08	0.15	0.44	1.01	1.06	1.19	1.50
220°	1.36	1.04	0.78	0.16	0.17	0.51	1.72	1.18	0.39	-0.56	-0.95	-0.42
225°	0.63	0.06	0.38	0.57	0.91	0.48	-0.48	-1.17	-0.65	-0.74	-0.71	-0.66
230°	0.03	0.21	1.00	0.50	-0.20	-1.19	0.13	-0.13	-0.71	-0.82	-0.55	0.40
235°	0.43	0.60	0.29	-0.65	-0.64	-0.25	-0.30	-0.30	0.23	-0.33	-0.42	0.13
240°	0.51	-0.32	-0.58	-0.25	-0.03	-0.53	0.72	0.06	-0.26	-0.31	-0.48	-0.17
245°	-0.38	-0.85	0.32	-0.07	-0.18	-0.01	-0.10	-0.05	-0.36	-0.45	0.31	0.74
250°	-0.59	0.07	0.19	-0.12	0.16	-0.50	0.37	-0.09	0.50	-0.11	-0.41	0.52
255°	0.17	0.00	0.06	0.12	-0.32	-0.24	0.66	0.34	-0.02	-0.02	-0.10	0.60
260°	0.18	-0.26	0.41	-0.22	-0.02	0.10	0.53	0.26	0.16	-0.10	-0.08	-0.21
265°	-0.12	0.11	-0.10	0.02	0.20	-0.02	0.66	0.02	0.03	-0.37	-0.36	-0.03
270°	0.15	-0.28	0.22	0.37	-0.07	0.39	0.14	-0.15	0.16	-0.45	-0.34	0.07
275°	0.06	-0.41	0.57	0.09	0.23	0.16	0.03	0.41	-0.14	-0.57	-0.46	0.44
280°	-0.31	0.12	0.61	-0.08	0.50	-0.41	0.63	0.09	-0.54	-0.20	-0.29	-0.14
285°	-0.12	0.26	0.42	0.21	0.29	-0.46	0.51	-0.50	0.20	-0.60	-0.28	-0.05
290°	0.18	0.21	0.32	0.15	0.03	-0.15	0.01	0.25	-0.63	-0.17	-0.40	0.12
295°	0.20	0.15	0.52	0.12	-0.05	-0.41	0.69	-0.65	0.12	-0.17	-0.44	0.69
300°	0.20	0.09	0.43	0.03	0.09	-0.24	-0.13	0.16	0.01	-0.13	-0.04	0.11
305°	0.25	0.19	0.23	-0.02	-0.22	-0.26	0.49	-0.17	0.19	-0.24	-0.89	0.08
310°	0.22	0.26	0.23	0.05	-0.20	0.08	0.28	0.06	0.03	-0.44	-0.04	0.47
315°	0.21	0.14	0.28	0.09	-0.01	-0.67	0.32	-0.09	0.47	-0.68	-0.28	-0.13
320°	0.28	-0.04	0.23	-0.15	-0.08	-0.05	0.21	0.21	-0.32	-0.30	-0.39	0.45
325°	0.36	-0.05	0.16	-0.31	0.06	0.31	0.05	0.35	-0.13	-0.37	-0.50	0.26
330°	0.36	0.06	0.22	-0.07	-0.02	-0.05	0.35	-0.21	0.13	-0.30	0.06	0.26
335°	0.29	0.17	0.30	0.21	-0.29	-0.12	0.61	-0.31	-0.21	-0.62	-0.13	-0.06
340°	0.17	0.20	0.30	0.29	-0.36	0.01	0.49	0.09	-0.13	-0.41	-0.15	0.07
345°	0.07	0.15	0.20	0.23	-0.24	0.05	0.20	0.27	0.02	-0.12	-0.05	0.23
350°	0.02	0.08	0.11	0.14	-0.10	0.03	0.04	0.20	0.04	-0.01	0.00	0.13
355°	0.01	0.04	0.04	0.07	-0.01	0.01	0.02	0.08	0.01	0.01	0.00	0.03

**Table A.20** Influence of the analyzer's body on the directional response, measured in a plane perpendicular to the display and along the microphone's axis, 11200 Hz – 20000 Hz, in dB

Angle	Frequency										
	11200 Hz	11800 Hz	12500 Hz	13200 Hz	14000 Hz	15000 Hz	16000 Hz	17000 Hz	18000 Hz	19000 Hz	20000 Hz
0°	-0.01	-0.01	-0.02	-0.01	-0.03	-0.03	-0.03	-0.01	0.00	0.02	0.02
5°	0.03	0.03	0.06	0.02	-0.03	-0.04	-0.03	0.00	0.02	0.05	0.06
10°	0.09	0.10	0.10	0.07	0.02	-0.06	-0.05	0.04	0.15	0.07	0.12
15°	0.07	0.20	0.15	0.15	0.06	0.03	-0.23	0.23	0.19	-0.08	0.18
20°	-0.13	0.11	0.22	0.17	-0.01	0.08	-0.22	0.26	-0.06	-0.06	0.39
25°	-0.10	-0.16	0.12	0.11	-0.05	-0.16	0.05	-0.01	0.15	-0.29	-0.09
30°	0.23	0.19	0.10	-0.24	-0.07	0.49	-0.20	0.19	0.15	-0.12	0.09
35°	-0.01	0.14	0.11	-0.11	0.21	0.25	-0.03	0.01	0.39	-0.21	0.18
40°	0.21	0.47	-0.18	-0.24	-0.10	0.30	0.12	0.07	0.29	-0.14	-0.08
45°	0.27	0.14	0.10	0.01	-0.19	0.69	0.13	0.10	0.03	-0.10	0.17
50°	0.30	0.51	0.61	0.03	-0.20	0.13	-0.06	0.51	0.26	0.03	0.40
55°	-0.32	0.44	0.10	-0.14	-0.66	0.11	0.40	0.57	0.00	-0.30	0.03
60°	0.24	0.33	0.15	-0.15	-0.17	0.26	-0.02	0.52	0.46	0.06	0.25
65°	0.40	0.37	0.43	0.03	0.14	0.70	-0.04	0.28	0.11	0.33	0.36
70°	-0.21	0.60	0.18	0.21	0.17	0.72	0.65	-0.19	0.38	-0.22	0.16
75°	-0.13	0.10	0.52	-0.21	0.05	0.64	0.57	0.54	-0.06	-0.24	0.15
80°	0.20	-0.20	0.37	0.11	-0.02	0.10	0.44	0.28	0.80	-0.45	-0.16
85°	0.28	0.01	-0.01	0.41	0.10	0.39	-0.56	0.06	0.15	0.39	0.17
90°	-0.43	0.22	-0.25	0.44	0.10	0.38	-0.40	0.29	0.16	0.08	0.36
95°	0.10	0.04	-0.15	-0.28	0.15	-0.06	-0.03	0.09	0.52	-1.02	0.35
100°	-0.39	0.42	-0.27	0.14	-0.79	0.12	0.49	0.68	0.12	-0.06	0.10
105°	-0.32	0.45	-0.28	-0.29	0.27	0.21	-0.34	-0.37	0.25	0.05	-0.30
110°	0.30	0.64	-0.21	-0.12	-0.51	0.27	0.16	0.15	-0.08	-0.23	0.03
115°	0.79	0.60	0.08	0.42	-0.21	0.60	-0.01	0.12	-0.11	-0.16	-0.76
120°	0.19	0.37	0.56	0.55	-0.03	1.25	0.12	0.49	-0.93	-0.06	-0.63
125°	-0.16	-0.38	-0.12	-0.05	-0.21	1.65	0.45	0.42	0.46	0.16	-0.33
130°	-0.24	0.04	-0.05	-0.29	-0.66	0.82	-0.53	-0.18	1.00	-0.15	0.49
135°	-0.09	0.32	-0.02	-0.68	-0.45	0.80	-0.46	-0.37	0.63	-0.40	-0.54
140°	-0.82	-1.17	-1.12	-1.36	-0.29	0.36	-0.86	-0.60	0.68	-0.12	-0.92
145°	-0.44	-0.41	-0.65	-0.86	-0.57	-1.38	-2.36	-1.19	-0.20	-0.77	-1.87
150°	1.36	1.43	1.26	0.63	-0.21	-0.43	-0.35	0.46	-0.58	-1.21	-2.85
155°	0.20	0.54	0.28	0.77	1.38	2.18	1.98	1.31	0.55	0.04	-0.39
160°	2.09	2.16	1.86	1.37	0.77	0.64	0.13	0.83	1.41	1.79	2.29
165°	-0.36	0.30	0.69	1.04	1.66	2.15	2.11	1.71	1.55	1.29	0.68
170°	-5.97	-6.06	-6.56	-6.49	-5.74	-4.48	-3.71	-2.72	-2.58	-1.86	-1.03
175°	-2.61	-2.55	-3.25	-3.90	-4.72	-4.84	-5.93	-6.67	-7.19	-8.80	-10.65
180°	-0.54	-0.24	-0.54	-0.90	-1.12	-0.89	-1.16	-1.55	-1.53	-1.99	-2.34
185°	-1.29	-1.07	-1.49	-2.01	-2.42	-2.27	-2.87	-3.34	-3.54	-4.36	-5.16
190°	-4.64	-4.95	-6.10	-7.01	-7.62	-7.24	-7.79	-6.55	-6.69	-6.16	-4.96
195°	-2.27	-1.76	-1.30	-0.59	0.13	0.90	1.46	1.50	1.66	1.73	1.45
200°	1.84	2.22	2.22	2.02	1.67	1.46	0.50	0.28	0.14	-0.24	0.53
205°	0.66	0.48	-0.25	-0.36	0.22	1.16	1.74	2.05	1.88	1.35	0.61
210°	0.82	1.48	1.80	1.81	1.23	0.80	0.48	1.14	1.23	0.81	0.12
215°	0.82	0.58	-0.12	-0.20	0.22	-0.01	-1.51	-1.97	-1.06	-0.45	-0.48
220°	-0.52	-0.36	-0.94	-1.66	-1.00	0.59	0.01	-1.09	-0.28	0.84	0.83
225°	-0.77	0.01	0.47	0.05	-1.16	0.95	1.04	-0.53	-0.86	-0.03	-0.61
230°	0.07	-0.03	0.27	0.59	-1.02	-0.20	0.41	0.19	0.36	0.09	-1.44
235°	0.20	-0.21	-0.80	0.76	0.48	0.25	0.37	-0.60	0.68	0.22	0.48
240°	0.37	1.07	-0.08	0.19	-0.13	0.52	0.62	0.09	0.59	-0.68	0.18
245°	-0.09	0.82	-0.24	0.31	0.38	0.25	-0.18	0.55	0.52	-0.40	-1.39
250°	0.20	0.67	-0.08	-0.11	-0.51	0.84	0.51	-0.45	-0.07	-1.14	-0.20
255°	-0.13	-0.04	-0.11	0.27	-0.12	-0.09	-0.34	-0.24	-0.21	0.56	-1.20
260°	0.00	0.36	0.12	-0.46	-0.18	-0.16	-0.32	0.25	-0.22	-0.24	0.14
265°	0.54	-0.50	0.06	-0.15	-0.89	0.65	-0.02	0.51	-0.17	-0.21	-1.27
270°	0.06	-0.42	0.44	-0.69	0.43	-0.71	0.39	-0.68	0.86	-1.30	0.82
275°	-0.68	0.49	0.03	0.19	-0.35	-0.11	-0.74	0.30	-0.67	-0.12	-0.76
280°	0.00	0.53	0.06	0.49	-0.50	0.04	-0.63	0.52	-0.12	-0.57	0.06
285°	0.32	0.26	0.57	-0.05	-0.29	-0.50	0.42	-0.10	0.24	-0.22	-0.41
290°	0.39	0.34	0.52	-0.33	-0.32	-0.15	0.32	-0.08	0.07	-0.60	-0.59
295°	0.09	0.31	0.11	-0.39	-0.17	-0.29	0.41	-0.34	-0.21	-0.22	-0.30
300°	-0.13	-0.34	0.10	-0.32	-0.40	0.03	-0.19	0.10	-0.39	-0.18	-0.30
305°	-0.64	0.37	0.05	0.32	-0.48	-0.04	-0.27	0.45	-0.35	-0.35	-0.39
310°	0.12	0.49	0.22	0.13	-0.50	0.17	-0.43	0.44	-0.08	-0.73	-0.60
315°	0.04	0.06	-0.56	-0.30	-0.38	0.11	-0.25	0.03	-0.01	-0.43	-0.47
320°	-0.03	0.65	0.04	-0.22	-0.29	0.23	0.23	-0.23	-0.12	-0.36	-0.54
325°	-0.17	-0.17	-0.33	-0.04	-0.18	0.04	-0.15	-0.17	0.04	-0.25	-0.31
330°	0.29	0.38	0.05	-0.22	-0.01	0.42	-0.37	-0.41	-0.23	-0.53	-0.23
335°	-0.26	-0.29	-0.10	-0.24	-0.16	0.00	0.15	-0.05	0.10	-0.35	-0.40
340°	-0.17	-0.04	0.30	0.24	-0.20	-0.15	-0.30	0.01	-0.16	-0.34	0.03
345°	0.22	0.21	0.13	0.22	-0.05	-0.09	-0.39	0.10	-0.18	-0.35	-0.03
350°	0.19	0.08	-0.09	0.04	0.11	-0.05	-0.02	-0.08	0.10	-0.12	0.09
355°	0.06	0.00	-0.08	0.00	0.08	0.01	0.05	-0.04	0.08	-0.01	0.04

**Table A.21** Directional response for Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with the microphone preamplifier mounted directly on the analyzer, measured in a plane parallel to the display and along the microphone's axis, 500 Hz – 3550 Hz, in dB

Angle	Frequency											
	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz	2240 Hz	2500 Hz	2800 Hz	3150 Hz	3550 Hz
0°	0.00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01
5°	0.00	0.00	0.01	0.01	0.02	0.01	0.02	0.02	0.02	0.02	0.00	0.01
10°	0.00	0.00	0.00	0.02	0.00	0.01	-0.01	0.03	-0.02	0.02	-0.03	0.01
15°	0.00	0.00	0.00	0.02	-0.02	0.02	-0.05	0.04	-0.06	0.02	-0.08	0.01
20°	0.00	0.00	-0.01	0.03	-0.03	0.01	-0.09	0.06	-0.11	0.01	-0.15	0.01
25°	-0.01	-0.01	-0.01	0.02	-0.04	-0.02	-0.15	0.06	-0.16	0.00	-0.22	0.00
30°	0.00	0.00	0.00	0.02	-0.03	-0.06	-0.20	0.05	-0.17	-0.06	-0.27	-0.03
35°	0.00	0.00	0.01	0.02	-0.01	-0.14	-0.24	-0.01	-0.16	-0.14	-0.30	-0.11
40°	0.01	0.02	0.03	-0.01	0.02	-0.25	-0.24	-0.10	-0.12	-0.26	-0.32	-0.23
45°	0.03	0.04	0.06	-0.03	0.06	-0.38	-0.19	-0.22	-0.10	-0.37	-0.35	-0.31
50°	0.04	0.06	0.09	-0.02	0.10	-0.48	-0.12	-0.31	-0.15	-0.41	-0.43	-0.37
55°	0.05	0.07	0.11	-0.02	0.11	-0.53	-0.12	-0.30	-0.28	-0.37	-0.57	-0.43
60°	0.06	0.09	0.14	-0.01	0.12	-0.53	-0.21	-0.21	-0.46	-0.35	-0.68	-0.53
65°	0.08	0.11	0.17	0.01	0.12	-0.47	-0.39	-0.15	-0.52	-0.48	-0.70	-0.64
70°	0.09	0.14	0.20	0.04	0.10	-0.38	-0.60	-0.24	-0.40	-0.72	-0.69	-0.75
75°	0.11	0.15	0.22	0.08	0.09	-0.29	-0.73	-0.46	-0.31	-0.81	-0.83	-0.80
80°	0.11	0.15	0.22	0.13	0.08	-0.26	-0.68	-0.73	-0.43	-0.68	-1.10	-0.85
85°	0.11	0.15	0.22	0.20	0.10	-0.27	-0.50	-0.81	-0.73	-0.61	-1.14	-1.07
90°	0.09	0.13	0.19	0.25	0.15	-0.31	-0.30	-0.63	-0.97	-0.82	-0.99	-1.29
95°	0.07	0.10	0.15	0.27	0.22	-0.34	-0.21	-0.35	-0.85	-1.16	-1.05	-1.24
100°	0.04	0.05	0.08	0.26	0.30	-0.31	-0.26	-0.17	-0.49	-1.14	-1.36	-1.19
105°	0.00	0.00	0.01	0.21	0.36	-0.22	-0.36	-0.19	-0.23	-0.72	-1.42	-1.40
110°	-0.04	-0.05	-0.07	0.12	0.36	-0.11	-0.40	-0.33	-0.24	-0.37	-0.96	-1.40
115°	-0.07	-0.11	-0.14	0.01	0.31	-0.04	-0.29	-0.39	-0.42	-0.39	-0.54	-0.91
120°	-0.11	-0.15	-0.21	-0.11	0.19	-0.06	-0.13	-0.28	-0.51	-0.63	-0.58	-0.52
125°	-0.13	-0.18	-0.25	-0.22	0.03	-0.18	-0.05	-0.10	-0.35	-0.73	-0.89	-0.67
130°	-0.14	-0.20	-0.28	-0.29	-0.11	-0.38	-0.13	-0.04	-0.17	-0.52	-0.96	-1.03
135°	-0.14	-0.20	-0.28	-0.34	-0.24	-0.61	-0.38	-0.20	-0.16	-0.34	-0.70	-0.99
140°	-0.13	-0.19	-0.26	-0.34	-0.29	-0.78	-0.70	-0.54	-0.44	-0.46	-0.59	-0.72
145°	-0.12	-0.17	-0.22	-0.31	-0.28	-0.85	-0.95	-0.89	-0.86	-0.89	-0.89	-0.79
150°	-0.09	-0.13	-0.18	-0.25	-0.22	-0.81	-1.03	-1.09	-1.20	-1.36	-1.47	-1.30
155°	-0.07	-0.10	-0.13	-0.18	-0.13	-0.69	-0.93	-1.04	-1.25	-1.54	-1.87	-1.86
160°	-0.04	-0.06	-0.08	-0.12	-0.03	-0.54	-0.72	-0.82	-1.04	-1.37	-1.82	-1.96
165°	-0.03	-0.04	-0.05	-0.06	0.07	-0.40	-0.50	-0.55	-0.73	-0.99	-1.42	-1.58
170°	-0.01	-0.02	-0.02	-0.01	0.13	-0.28	-0.31	-0.32	-0.43	-0.63	-0.98	-1.06
175°	0.00	0.00	0.00	0.01	0.19	-0.21	-0.19	-0.17	-0.24	-0.39	-0.67	-0.69
180°	0.00	0.00	0.01	0.03	0.20	-0.19	-0.15	-0.11	-0.17	-0.30	-0.55	-0.55
185°	0.00	0.00	0.00	0.01	0.19	-0.21	-0.18	-0.16	-0.22	-0.38	-0.65	-0.68
190°	-0.01	-0.02	-0.02	-0.01	0.14	-0.28	-0.29	-0.30	-0.41	-0.62	-0.95	-1.05
195°	-0.03	-0.04	-0.04	-0.05	0.07	-0.40	-0.48	-0.53	-0.69	-0.98	-1.39	-1.58
200°	-0.04	-0.06	-0.08	-0.10	-0.02	-0.54	-0.70	-0.80	-1.01	-1.36	-1.80	-1.99
205°	-0.07	-0.10	-0.13	-0.18	-0.13	-0.69	-0.90	-1.01	-1.23	-1.55	-1.88	-1.92
210°	-0.09	-0.13	-0.18	-0.24	-0.22	-0.80	-1.00	-1.07	-1.20	-1.38	-1.50	-1.35
215°	-0.12	-0.17	-0.22	-0.29	-0.29	-0.83	-0.94	-0.89	-0.89	-0.93	-0.93	-0.79
220°	-0.13	-0.19	-0.26	-0.32	-0.30	-0.75	-0.70	-0.55	-0.47	-0.49	-0.59	-0.67
225°	-0.14	-0.21	-0.28	-0.31	-0.26	-0.58	-0.39	-0.22	-0.18	-0.33	-0.67	-0.90
230°	-0.14	-0.20	-0.28	-0.28	-0.13	-0.35	-0.14	-0.05	-0.16	-0.48	-0.92	-0.97
235°	-0.13	-0.19	-0.26	-0.20	0.03	-0.15	-0.05	-0.09	-0.33	-0.68	-0.88	-0.62
240°	-0.11	-0.15	-0.21	-0.10	0.18	-0.02	-0.12	-0.26	-0.47	-0.61	-0.58	-0.44
245°	-0.07	-0.11	-0.15	0.02	0.30	-0.01	-0.27	-0.38	-0.42	-0.37	-0.51	-0.83
250°	-0.04	-0.05	-0.07	0.12	0.37	-0.07	-0.38	-0.33	-0.24	-0.32	-0.89	-1.39
255°	0.00	0.00	0.00	0.21	0.38	-0.18	-0.37	-0.20	-0.21	-0.66	-1.37	-1.40
260°	0.04	0.05	0.07	0.27	0.33	-0.28	-0.27	-0.17	-0.45	-1.09	-1.35	-1.12
265°	0.07	0.09	0.13	0.27	0.25	-0.32	-0.22	-0.32	-0.81	-1.14	-1.01	-1.16
270°	0.09	0.13	0.18	0.25	0.18	-0.30	-0.30	-0.59	-0.95	-0.81	-0.94	-1.26
275°	0.10	0.14	0.21	0.20	0.13	-0.26	-0.48	-0.78	-0.72	-0.57	-1.11	-1.04
280°	0.10	0.15	0.21	0.15	0.10	-0.26	-0.66	-0.71	-0.41	-0.66	-1.07	-0.81
285°	0.10	0.14	0.20	0.09	0.11	-0.30	-0.71	-0.46	-0.29	-0.80	-0.80	-0.74
290°	0.09	0.12	0.18	0.05	0.11	-0.37	-0.60	-0.22	-0.40	-0.70	-0.65	-0.71
295°	0.07	0.11	0.15	0.02	0.12	-0.46	-0.40	-0.14	-0.52	-0.45	-0.66	-0.64
300°	0.06	0.09	0.13	0.00	0.11	-0.51	-0.22	-0.20	-0.46	-0.32	-0.67	-0.52
305°	0.05	0.07	0.10	-0.01	0.09	-0.52	-0.12	-0.29	-0.29	-0.34	-0.57	-0.40
310°	0.04	0.05	0.08	-0.01	0.07	-0.48	-0.13	-0.31	-0.14	-0.40	-0.44	-0.35
315°	0.02	0.03	0.06	-0.01	0.04	-0.38	-0.20	-0.24	-0.09	-0.38	-0.34	-0.31
320°	0.01	0.02	0.03	-0.01	0.01	-0.26	-0.25	-0.12	-0.11	-0.29	-0.30	-0.22
325°	0.00	0.01	0.02	0.02	-0.03	-0.15	-0.26	-0.03	-0.16	-0.17	-0.30	-0.10
330°	0.00	0.00	-0.01	0.01	-0.05	-0.07	-0.22	0.03	-0.19	-0.08	-0.28	-0.02
335°	-0.01	-0.01	-0.01	0.02	-0.06	-0.03	-0.18	0.04	-0.18	-0.02	-0.24	0.01
340°	-0.01	-0.01	-0.02	0.02	-0.05	-0.01	-0.12	0.04	-0.14	0.00	-0.17	0.01
345°	-0.01	-0.01	-0.01	0.00	-0.04	-0.01	-0.08	0.02	-0.09	0.00	-0.11	0.00
350°	-0.01	-0.01	-0.01	0.00	-0.02	-0.01	-0.05	0.00	-0.05	-0.01	-0.06	-0.01
355°	0.00	-0.01	-0.01	0.00	-0.02	-0.02	-0.03	-0.01	-0.03	-0.01	-0.03	-0.01

**Table A.22** Directional response for Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with the microphone preamplifier mounted directly on the analyzer, measured in a plane parallel to the display and along the microphone's axis, 4000 Hz – 10600 Hz, in dB

Angle	Frequency											
	4000 Hz	4500 Hz	5000 Hz	5600 Hz	6300 Hz	7100 Hz	8000 Hz	8500 Hz	9000 Hz	9500 Hz	10000 Hz	10600 Hz
0°	0.02	0.02	0.01	-0.01	-0.03	0.01	0.02	0.00	0.00	0.02	0.02	0.01
5°	0.01	0.01	-0.02	-0.03	-0.02	0.00	0.01	-0.03	-0.05	-0.04	-0.04	-0.01
10°	0.01	-0.02	-0.08	-0.11	0.01	-0.05	-0.06	-0.15	-0.20	-0.20	-0.19	-0.07
15°	-0.01	-0.09	-0.19	-0.27	-0.01	-0.08	-0.21	-0.31	-0.40	-0.43	-0.34	-0.12
20°	-0.05	-0.19	-0.31	-0.48	-0.17	-0.04	-0.34	-0.44	-0.46	-0.54	-0.36	-0.15
25°	-0.14	-0.30	-0.36	-0.61	-0.50	-0.05	-0.37	-0.47	-0.46	-0.61	-0.27	-0.19
30°	-0.23	-0.36	-0.28	-0.57	-0.71	-0.28	-0.40	-0.65	-0.78	-1.03	-0.63	-0.61
35°	-0.29	-0.35	-0.21	-0.57	-0.61	-0.58	-0.50	-0.81	-1.06	-1.24	-1.05	-1.07
40°	-0.29	-0.40	-0.33	-0.85	-0.79	-0.56	-0.80	-0.98	-1.24	-1.34	-1.33	-1.02
45°	-0.35	-0.59	-0.59	-1.14	-1.21	-0.91	-1.05	-1.03	-1.35	-1.75	-1.78	-1.70
50°	-0.52	-0.76	-0.62	-1.02	-1.13	-1.26	-1.15	-1.46	-1.68	-2.04	-2.00	-2.19
55°	-0.69	-0.70	-0.55	-1.05	-1.36	-1.38	-1.55	-1.49	-1.73	-2.17	-2.33	-2.22
60°	-0.70	-0.77	-0.91	-1.38	-1.68	-1.86	-1.87	-1.99	-2.25	-2.33	-2.63	-2.85
65°	-0.71	-1.08	-1.01	-1.24	-1.63	-1.74	-2.18	-2.20	-2.42	-3.01	-2.71	-3.19
70°	-0.85	-1.17	-1.00	-1.55	-1.89	-2.29	-2.60	-2.71	-2.75	-3.03	-3.29	-3.17
75°	-0.99	-1.14	-1.40	-1.73	-1.84	-2.12	-2.60	-3.04	-3.37	-3.44	-3.55	-3.72
80°	-1.08	-1.30	-1.30	-1.81	-2.18	-2.48	-3.02	-3.08	-3.68	-4.12	-3.83	-4.32
85°	-1.18	-1.39	-1.40	-2.20	-2.29	-2.38	-2.95	-3.48	-3.60	-4.46	-4.58	-4.47
90°	-1.42	-1.50	-1.52	-1.89	-2.63	-2.88	-3.32	-3.42	-4.07	-4.30	-4.85	-5.03
95°	-1.65	-1.76	-1.59	-2.30	-2.42	-2.92	-3.45	-3.76	-4.18	-4.51	-5.06	-5.09
100°	-1.65	-2.09	-2.01	-2.12	-2.69	-2.97	-3.63	-4.00	-4.41	-4.97	-4.83	-5.67
105°	-1.62	-2.12	-2.28	-2.74	-2.72	-3.07	-3.69	-4.04	-4.48	-5.34	-5.09	-5.94
110°	-1.75	-2.06	-2.42	-3.04	-3.23	-3.14	-3.58	-3.92	-4.40	-5.06	-5.76	-5.80
115°	-1.63	-2.06	-2.37	-3.16	-3.66	-3.98	-4.07	-4.16	-4.64	-4.70	-5.46	-5.38
120°	-1.04	-1.75	-2.06	-3.06	-3.67	-4.21	-4.85	-5.03	-4.97	-5.73	-5.22	-5.47
125°	-0.65	-1.16	-1.63	-2.38	-3.41	-4.24	-5.08	-5.73	-6.12	-6.67	-6.59	-6.85
130°	-0.97	-1.00	-1.09	-2.00	-2.43	-3.30	-4.68	-5.09	-5.89	-6.44	-7.46	-7.69
135°	-1.39	-1.51	-1.17	-1.54	-2.10	-2.44	-3.26	-4.03	-4.72	-5.91	-6.25	-6.74
140°	-1.22	-1.73	-1.82	-1.96	-2.01	-2.40	-2.79	-3.02	-3.52	-3.99	-4.64	-5.22
145°	-0.99	-1.39	-1.81	-2.63	-2.79	-2.75	-3.21	-3.46	-3.67	-4.24	-4.39	-4.54
150°	-1.33	-1.46	-1.53	-2.31	-2.96	-3.51	-3.85	-4.18	-4.48	-4.66	-4.80	-5.17
155°	-2.03	-2.19	-2.02	-2.33	-2.74	-3.12	-4.05	-4.37	-4.97	-5.78	-5.88	-6.03
160°	-2.40	-2.81	-2.87	-3.19	-3.47	-3.57	-3.99	-4.39	-4.72	-5.24	-5.72	-5.97
165°	-2.10	-2.58	-2.94	-3.64	-4.12	-4.59	-5.04	-5.41	-5.66	-6.12	-6.29	-6.27
170°	-1.51	-1.87	-2.19	-2.96	-3.47	-4.13	-4.94	-5.40	-6.00	-6.74	-7.20	-7.92
175°	-1.04	-1.28	-1.47	-2.10	-2.45	-2.91	-3.57	-3.84	-4.41	-5.10	-5.49	-6.15
180°	-0.87	-1.06	-1.19	-1.76	-2.02	-2.37	-2.92	-3.11	-3.57	-4.15	-4.42	-4.91
185°	-1.03	-1.27	-1.44	-2.07	-2.40	-2.86	-3.49	-3.77	-4.30	-4.98	-5.35	-6.03
190°	-1.49	-1.85	-2.14	-2.91	-3.41	-4.08	-4.82	-5.30	-5.89	-6.62	-7.09	-7.76
195°	-2.09	-2.58	-2.90	-3.64	-4.12	-4.55	-4.99	-5.40	-5.66	-6.03	-6.25	-6.26
200°	-2.42	-2.83	-2.89	-3.22	-3.45	-3.52	-3.99	-4.28	-4.60	-5.17	-5.66	-5.90
205°	-2.05	-2.20	-2.01	-2.29	-2.66	-3.10	-3.99	-4.35	-4.99	-5.67	-5.83	-6.00
210°	-1.34	-1.43	-1.45	-2.22	-2.89	-3.46	-3.80	-4.10	-4.38	-4.59	-4.71	-5.03
215°	-0.96	-1.31	-1.71	-2.61	-2.74	-2.66	-3.10	-3.38	-3.65	-4.13	-4.36	-4.47
220°	-1.14	-1.68	-1.81	-1.90	-1.93	-2.31	-2.76	-2.92	-3.42	-3.89	-4.42	-5.13
225°	-1.34	-1.52	-1.12	-1.45	-2.03	-2.34	-3.09	-3.81	-4.54	-5.63	-6.03	-6.49
230°	-1.00	-0.95	-0.95	-1.94	-2.29	-3.11	-4.49	-4.95	-5.76	-6.27	-7.16	-7.60
235°	-0.68	-1.02	-1.57	-2.23	-3.21	-4.13	-4.90	-5.47	-6.11	-6.61	-6.55	-6.85
240°	-0.97	-1.68	-2.00	-2.94	-3.59	-4.09	-4.80	-4.96	-4.95	-5.47	-5.19	-5.37
245°	-1.55	-2.01	-2.22	-3.04	-3.53	-3.95	-3.89	-4.06	-4.53	-4.56	-5.17	-5.35
250°	-1.65	-1.96	-2.36	-2.91	-3.17	-3.02	-3.53	-3.78	-4.35	-4.91	-5.69	-5.71
255°	-1.50	-2.09	-2.20	-2.62	-2.57	-2.93	-3.50	-4.00	-4.41	-5.20	-5.08	-5.77
260°	-1.62	-2.01	-1.91	-2.02	-2.51	-2.81	-3.56	-3.84	-4.34	-4.72	-4.88	-5.51
265°	-1.64	-1.70	-1.49	-2.18	-2.31	-2.86	-3.36	-3.62	-4.08	-4.39	-4.99	-4.85
270°	-1.37	-1.41	-1.50	-1.77	-2.42	-2.69	-3.08	-3.41	-3.92	-4.24	-4.80	-4.83
275°	-1.11	-1.35	-1.30	-2.07	-2.19	-2.34	-2.89	-3.43	-3.46	-4.41	-4.49	-4.39
280°	-1.00	-1.25	-1.26	-1.70	-2.04	-2.34	-2.97	-2.95	-3.58	-4.11	-3.79	-4.21
285°	-0.99	-1.05	-1.31	-1.67	-1.76	-1.97	-2.46	-2.94	-3.40	-3.36	-3.49	-3.57
290°	-0.82	-1.12	-0.95	-1.44	-1.74	-2.23	-2.44	-2.77	-2.71	-2.86	-3.21	-3.04
295°	-0.65	-1.03	-0.95	-1.18	-1.52	-1.59	-2.21	-2.12	-2.25	-2.92	-2.65	-3.15
300°	-0.67	-0.73	-0.82	-1.26	-1.59	-1.84	-1.74	-1.86	-2.27	-2.34	-2.72	-2.94
305°	-0.67	-0.69	-0.54	-1.00	-1.27	-1.25	-1.57	-1.55	-1.69	-2.15	-2.31	-2.17
310°	-0.50	-0.71	-0.56	-0.91	-1.03	-1.31	-1.05	-1.31	-1.56	-1.90	-1.84	-1.99
315°	-0.35	-0.55	-0.54	-1.07	-1.17	-0.82	-1.09	-1.06	-1.40	-1.83	-1.91	-1.75
320°	-0.31	-0.40	-0.32	-0.82	-0.66	-0.56	-0.73	-0.86	-1.17	-1.22	-1.23	-0.98
325°	-0.30	-0.36	-0.18	-0.49	-0.53	-0.56	-0.54	-0.83	-1.11	-1.30	-1.12	-1.07
330°	-0.23	-0.36	-0.24	-0.51	-0.68	-0.29	-0.37	-0.62	-0.74	-0.98	-0.58	-0.59
335°	-0.14	-0.31	-0.31	-0.59	-0.47	-0.08	-0.37	-0.45	-0.46	-0.63	-0.31	-0.21
340°	-0.06	-0.21	-0.28	-0.49	-0.13	-0.05	-0.37	-0.43	-0.48	-0.56	-0.40	-0.14
345°	-0.03	-0.11	-0.18	-0.26	0.04	-0.07	-0.24	-0.31	-0.40	-0.42	-0.36	-0.10
350°	-0.01	-0.06	-0.08	-0.10	0.07	-0.06	-0.10	-0.14	-0.21	-0.22	-0.21	-0.07
355°	-0.02	-0.02	-0.02	-0.02	0.05	-0.03	-0.03	-0.04	-0.06	-0.08	-0.08	-0.04

**Table A.23** Directional response for Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with the microphone preamplifier mounted directly on the analyzer, measured in a plane parallel to the display and along the microphone's axis, 11200 Hz – 20000 Hz, in dB

Angle	Frequency										
	11200 Hz	11800 Hz	12500 Hz	13200 Hz	14000 Hz	15000 Hz	16000 Hz	17000 Hz	18000 Hz	19000 Hz	20000 Hz
0°	0.01	0.01	0.01	0.01	0.03	0.04	0.03	-0.01	-0.03	-0.04	-0.03
5°	-0.03	-0.01	-0.03	-0.02	0.00	-0.02	0.01	-0.07	-0.09	-0.10	-0.07
10°	-0.12	-0.07	-0.13	-0.12	-0.08	-0.16	-0.06	-0.22	-0.16	-0.22	-0.14
15°	-0.26	-0.18	-0.20	-0.26	-0.21	-0.23	-0.31	-0.40	-0.31	-0.49	-0.37
20°	-0.43	-0.39	-0.41	-0.37	-0.37	-0.49	-0.81	-0.68	-0.65	-0.94	-0.76
25°	-0.55	-0.57	-0.90	-0.68	-0.56	-0.86	-0.99	-1.05	-0.86	-1.28	-1.23
30°	-0.67	-0.79	-0.99	-1.10	-0.95	-1.07	-1.64	-1.47	-1.27	-1.92	-1.92
35°	-1.03	-1.21	-1.52	-1.43	-1.30	-1.37	-1.89	-2.28	-1.89	-2.24	-2.57
40°	-1.02	-1.30	-1.68	-1.89	-1.96	-1.87	-2.19	-2.64	-2.59	-2.80	-3.16
45°	-1.81	-1.81	-2.17	-2.50	-2.27	-2.54	-2.69	-3.02	-3.40	-3.55	-3.82
50°	-1.99	-2.02	-2.44	-2.84	-2.87	-3.23	-3.34	-3.57	-4.04	-4.40	-4.63
55°	-2.30	-2.32	-2.72	-3.10	-3.32	-3.79	-3.88	-4.18	-4.57	-5.11	-5.28
60°	-3.08	-3.10	-3.51	-3.60	-3.89	-4.28	-4.60	-5.01	-5.07	-5.75	-6.33
65°	-3.49	-3.83	-4.13	-4.35	-4.43	-4.68	-5.33	-5.78	-5.88	-6.69	-7.04
70°	-3.69	-4.12	-4.69	-4.95	-5.05	-5.13	-5.84	-6.42	-6.74	-7.52	-7.72
75°	-3.82	-4.35	-5.09	-5.50	-5.80	-5.95	-6.56	-6.98	-7.40	-8.27	-8.68
80°	-4.35	-4.47	-5.32	-5.87	-6.28	-6.72	-7.49	-7.79	-7.94	-9.05	-9.81
85°	-5.06	-4.94	-5.38	-6.18	-6.61	-7.11	-7.77	-8.69	-8.70	-9.52	-10.06
90°	-5.43	-5.57	-6.01	-6.43	-7.07	-7.56	-8.03	-8.85	-9.28	-10.48	-10.73
95°	-5.83	-5.97	-6.55	-7.33	-7.66	-7.93	-8.57	-9.54	-10.22	-11.20	-11.46
100°	-5.62	-6.45	-6.93	-7.79	-8.30	-8.62	-8.93	-9.89	-10.30	-11.33	-12.60
105°	-5.98	-6.53	-6.96	-8.12	-8.44	-9.05	-9.99	-10.72	-10.64	-11.97	-12.41
110°	-6.40	-6.97	-7.44	-8.18	-8.41	-9.20	-10.33	-11.11	-11.51	-12.45	-12.89
115°	-6.53	-6.79	-7.82	-8.72	-8.90	-9.47	-10.30	-10.76	-11.80	-13.20	-14.11
120°	-5.99	-6.12	-7.52	-8.16	-8.90	-9.81	-10.83	-11.63	-12.41	-12.58	-13.15
125°	-6.41	-6.50	-7.70	-7.53	-8.03	-8.67	-10.09	-11.39	-12.24	-14.09	-15.23
130°	-8.16	-8.96	-8.96	-8.66	-9.19	-9.01	-9.73	-10.25	-10.50	-12.55	-12.93
135°	-7.84	-8.83	-9.02	-10.43	-12.09	-11.41	-11.96	-12.28	-11.79	-12.57	-12.46
140°	-6.08	-6.62	-7.62	-9.22	-10.27	-10.20	-12.15	-14.18	-15.07	-16.11	-17.16
145°	-4.88	-5.15	-6.27	-6.79	-7.38	-8.26	-9.96	-11.23	-11.50	-12.84	-14.52
150°	-5.49	-6.19	-6.36	-6.65	-7.03	-7.57	-8.32	-8.98	-9.38	-10.78	-11.69
155°	-6.45	-6.61	-7.29	-8.02	-8.49	-8.81	-9.69	-10.20	-10.20	-11.10	-11.78
160°	-6.57	-7.34	-8.13	-8.74	-9.07	-9.81	-10.25	-11.08	-11.19	-12.79	-14.04
165°	-6.38	-6.83	-7.47	-8.01	-8.70	-9.24	-10.56	-11.64	-12.36	-13.67	-14.06
170°	-8.37	-8.46	-9.02	-9.31	-9.66	-9.71	-10.26	-10.71	-10.74	-11.86	-12.92
175°	-7.06	-7.56	-8.39	-9.11	-9.73	-10.80	-11.58	-12.84	-13.04	-14.14	-14.74
180°	-5.63	-6.13	-6.85	-7.49	-7.94	-8.88	-9.69	-10.93	-11.40	-12.63	-13.32
185°	-6.88	-7.40	-8.27	-8.98	-9.58	-10.61	-11.41	-12.69	-13.00	-14.17	-14.84
190°	-8.26	-8.48	-9.11	-9.35	-9.70	-9.71	-10.27	-10.62	-10.72	-11.72	-12.86
195°	-6.29	-6.79	-7.48	-8.00	-8.49	-9.08	-10.43	-11.53	-12.59	-13.98	-14.48
200°	-6.56	-7.40	-8.25	-8.92	-9.18	-9.77	-10.27	-10.77	-11.06	-12.44	-13.97
205°	-6.29	-6.55	-7.35	-7.84	-8.33	-8.73	-9.79	-10.33	-10.47	-11.04	-11.80
210°	-5.56	-6.23	-6.60	-6.77	-6.91	-7.48	-8.22	-8.94	-9.53	-10.58	-11.57
215°	-4.71	-5.13	-6.23	-6.88	-7.16	-8.00	-9.54	-10.99	-11.64	-12.73	-14.22
220°	-5.86	-6.57	-7.60	-9.03	-10.10	-10.01	-11.72	-13.86	-15.00	-16.33	-17.19
225°	-7.53	-8.62	-9.05	-10.21	-11.87	-11.45	-12.15	-12.42	-11.90	-12.91	-12.69
230°	-8.09	-8.90	-9.15	-8.67	-9.14	-8.92	-9.83	-10.16	-10.40	-12.47	-13.02
235°	-6.46	-6.63	-7.65	-7.57	-7.92	-8.44	-10.11	-11.17	-12.00	-13.75	-14.75
240°	-5.91	-6.18	-7.42	-8.19	-8.75	-9.52	-10.87	-11.42	-12.16	-12.70	-13.33
245°	-6.26	-6.74	-7.89	-8.68	-8.95	-9.36	-10.30	-10.57	-11.49	-12.85	-13.73
250°	-6.12	-7.04	-7.59	-8.11	-8.34	-9.05	-10.40	-11.00	-11.34	-12.30	-13.26
255°	-5.88	-6.57	-7.02	-8.04	-8.39	-8.85	-9.83	-10.47	-10.60	-11.73	-12.22
260°	-5.46	-6.42	-7.04	-7.73	-8.23	-8.60	-8.94	-9.76	-10.25	-11.31	-12.77
265°	-5.78	-6.05	-6.71	-7.23	-7.39	-7.76	-8.51	-9.42	-10.14	-10.85	-11.60
270°	-5.30	-5.67	-6.27	-6.46	-6.92	-7.51	-8.07	-8.90	-9.38	-10.22	-10.71
275°	-4.95	-5.02	-5.60	-6.29	-6.66	-7.16	-7.78	-8.34	-8.56	-9.44	-9.91
280°	-4.22	-4.57	-5.42	-5.86	-6.12	-6.44	-7.34	-7.85	-7.83	-8.78	-9.82
285°	-3.74	-4.41	-5.10	-5.40	-5.53	-5.86	-6.71	-6.86	-7.37	-8.07	-8.79
290°	-3.61	-4.13	-4.65	-4.82	-4.91	-5.34	-5.76	-6.31	-6.68	-7.38	-7.53
295°	-3.47	-3.87	-4.05	-4.12	-4.39	-4.73	-5.08	-5.87	-5.60	-6.33	-7.14
300°	-3.14	-3.20	-3.48	-3.43	-3.94	-4.19	-4.63	-4.76	-5.11	-5.63	-6.15
305°	-2.34	-2.50	-2.84	-2.97	-3.43	-3.64	-4.09	-3.88	-4.42	-5.11	-5.44
310°	-1.88	-2.11	-2.62	-2.69	-2.91	-3.04	-3.51	-3.36	-3.77	-4.11	-4.34
315°	-1.73	-1.70	-2.29	-2.48	-2.22	-2.47	-2.86	-2.89	-3.14	-3.20	-3.53
320°	-1.09	-1.35	-1.64	-2.01	-1.79	-1.95	-2.28	-2.53	-2.37	-2.54	-3.01
325°	-0.94	-1.26	-1.58	-1.43	-1.34	-1.39	-1.85	-2.12	-1.67	-2.05	-2.46
330°	-0.71	-0.80	-1.06	-1.11	-0.98	-1.03	-1.66	-1.45	-1.21	-1.77	-1.78
335°	-0.52	-0.60	-0.96	-0.72	-0.55	-0.89	-1.07	-1.03	-0.83	-1.20	-1.10
340°	-0.44	-0.42	-0.43	-0.40	-0.38	-0.53	-0.82	-0.61	-0.52	-0.83	-0.74
345°	-0.26	-0.18	-0.27	-0.27	-0.29	-0.41	-0.41	-0.35	-0.24	-0.43	-0.30
350°	-0.12	-0.10	-0.18	-0.14	-0.12	-0.23	-0.09	-0.22	-0.10	-0.13	-0.06
355°	-0.05	-0.04	-0.06	-0.04	-0.06	-0.10	-0.02	-0.05	-0.01	-0.01	0.00

**Table A.24** Directional response for Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with the microphone preamplifier mounted directly on the analyzer, measured in a plane perpendicular to the display and along the microphone's axis, 500 Hz – 3550 Hz, in dB

Angle	Frequency											
	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz	2240 Hz	2500 Hz	2800 Hz	3150 Hz	3550 Hz
0°	0.00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01
5°	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.01	0.01	0.01	0.03	-0.01
10°	0.00	0.00	0.00	0.02	0.00	0.02	0.01	0.03	-0.01	0.00	0.02	-0.04
15°	0.00	-0.01	-0.01	0.03	-0.02	0.03	-0.02	0.06	-0.06	0.01	-0.03	-0.07
20°	-0.01	-0.01	-0.02	0.03	-0.03	0.04	-0.07	0.08	-0.11	0.02	-0.11	-0.07
25°	-0.02	-0.02	-0.03	0.04	-0.05	0.03	-0.12	0.11	-0.17	0.04	-0.23	-0.01
30°	-0.01	-0.02	-0.03	0.03	-0.04	-0.01	-0.19	0.12	-0.22	0.03	-0.37	0.06
35°	-0.01	-0.02	-0.02	0.02	-0.03	-0.08	-0.24	0.09	-0.22	-0.03	-0.48	0.12
40°	0.00	0.00	0.00	0.00	0.01	-0.18	-0.25	0.01	-0.17	-0.14	-0.52	0.06
45°	0.01	0.02	0.03	-0.01	0.04	-0.30	-0.21	-0.10	-0.11	-0.28	-0.50	-0.16
50°	0.03	0.04	0.06	-0.02	0.07	-0.41	-0.15	-0.20	-0.11	-0.34	-0.50	-0.43
55°	0.05	0.06	0.10	-0.03	0.09	-0.48	-0.12	-0.21	-0.22	-0.27	-0.63	-0.57
60°	0.06	0.09	0.13	-0.02	0.09	-0.51	-0.18	-0.15	-0.39	-0.19	-0.79	-0.54
65°	0.08	0.12	0.17	0.00	0.08	-0.49	-0.32	-0.10	-0.47	-0.27	-0.77	-0.61
70°	0.10	0.14	0.20	0.05	0.06	-0.41	-0.52	-0.14	-0.39	-0.49	-0.60	-0.85
75°	0.11	0.16	0.23	0.13	0.03	-0.34	-0.67	-0.32	-0.31	-0.64	-0.63	-0.88
80°	0.11	0.16	0.23	0.22	0.02	-0.30	-0.71	-0.57	-0.39	-0.53	-0.92	-0.65
85°	0.11	0.15	0.22	0.30	0.08	-0.33	-0.63	-0.69	-0.70	-0.45	-1.04	-0.77
90°	0.09	0.13	0.19	0.36	0.19	-0.38	-0.51	-0.62	-0.96	-0.68	-0.88	-1.08
95°	0.07	0.10	0.14	0.38	0.33	-0.38	-0.47	-0.46	-0.90	-1.11	-0.98	-0.96
100°	0.04	0.05	0.07	0.36	0.47	-0.30	-0.49	-0.39	-0.65	-1.15	-1.49	-0.90
105°	0.00	0.00	0.00	0.29	0.56	-0.13	-0.51	-0.45	-0.54	-0.78	-1.67	-1.52
110°	-0.04	-0.06	-0.09	0.17	0.57	0.06	-0.37	-0.48	-0.65	-0.59	-1.19	-1.81
115°	-0.09	-0.12	-0.17	0.05	0.47	0.20	-0.11	-0.31	-0.70	-0.77	-0.86	-1.19
120°	-0.13	-0.18	-0.25	-0.09	0.29	0.20	0.14	0.05	-0.44	-0.88	-1.07	-0.86
125°	-0.16	-0.22	-0.31	-0.21	0.08	0.04	0.23	0.35	0.01	-0.47	-1.20	-1.15
130°	-0.17	-0.25	-0.34	-0.31	-0.13	-0.23	0.08	0.39	0.30	0.13	-0.67	-1.06
135°	-0.17	-0.24	-0.34	-0.36	-0.28	-0.56	-0.29	0.10	0.20	0.36	-0.04	-0.27
140°	-0.16	-0.23	-0.31	-0.37	-0.34	-0.83	-0.73	-0.41	-0.28	0.02	0.00	0.23
145°	-0.13	-0.19	-0.27	-0.33	-0.32	-0.96	-1.08	-0.93	-0.93	-0.74	-0.65	-0.14
150°	-0.11	-0.16	-0.21	-0.28	-0.24	-0.93	-1.20	-1.22	-1.42	-1.49	-1.64	-1.21
155°	-0.08	-0.11	-0.16	-0.21	-0.12	-0.80	-1.11	-1.19	-1.51	-1.79	-2.31	-2.24
160°	-0.05	-0.08	-0.10	-0.14	0.01	-0.63	-0.88	-0.93	-1.26	-1.56	-2.26	-2.45
165°	-0.03	-0.04	-0.06	-0.06	0.11	-0.45	-0.63	-0.62	-0.89	-1.09	-1.75	-1.91
170°	-0.02	-0.02	-0.03	-0.01	0.19	-0.31	-0.42	-0.35	-0.55	-0.65	-1.20	-1.24
175°	0.00	-0.01	0.00	0.02	0.24	-0.22	-0.28	-0.17	-0.32	-0.36	-0.82	-0.77
180°	0.00	0.00	0.01	0.04	0.26	-0.19	-0.23	-0.09	-0.23	-0.24	-0.66	-0.57
185°	0.00	-0.01	0.00	0.03	0.25	-0.21	-0.25	-0.12	-0.26	-0.29	-0.73	-0.64
190°	-0.01	-0.02	-0.02	0.01	0.21	-0.29	-0.35	-0.25	-0.43	-0.51	-1.02	-1.00
195°	-0.03	-0.04	-0.05	-0.03	0.14	-0.41	-0.53	-0.47	-0.72	-0.90	-1.50	-1.59
200°	-0.05	-0.07	-0.09	-0.09	0.04	-0.58	-0.75	-0.76	-1.09	-1.38	-2.05	-2.23
205°	-0.07	-0.10	-0.14	-0.15	-0.08	-0.75	-0.97	-1.04	-1.40	-1.74	-2.31	-2.37
210°	-0.10	-0.15	-0.20	-0.23	-0.20	-0.90	-1.11	-1.17	-1.47	-1.67	-1.90	-1.62
215°	-0.13	-0.19	-0.26	-0.29	-0.30	-0.96	-1.07	-1.03	-1.15	-1.07	-1.00	-0.56
220°	-0.15	-0.22	-0.30	-0.32	-0.35	-0.88	-0.82	-0.64	-0.58	-0.30	-0.24	0.04
225°	-0.17	-0.24	-0.32	-0.34	-0.32	-0.66	-0.46	-0.16	-0.05	0.18	-0.08	-0.19
230°	-0.17	-0.24	-0.34	-0.29	-0.22	-0.36	-0.11	0.18	0.17	0.13	-0.54	-0.90
235°	-0.16	-0.23	-0.32	-0.21	-0.05	-0.08	0.07	0.25	0.02	-0.33	-1.10	-1.14
240°	-0.13	-0.19	-0.26	-0.10	0.14	0.10	0.05	0.07	-0.34	-0.74	-1.07	-0.79
245°	-0.10	-0.14	-0.19	0.01	0.32	0.14	-0.12	-0.21	-0.59	-0.70	-0.78	-0.92
250°	-0.05	-0.07	-0.10	0.13	0.42	0.05	-0.31	-0.36	-0.57	-0.51	-0.99	-1.63
255°	-0.01	-0.01	-0.01	0.22	0.44	-0.11	-0.40	-0.35	-0.49	-0.65	-1.59	-1.68
260°	0.03	0.04	0.06	0.28	0.38	-0.25	-0.38	-0.33	-0.60	-1.08	-1.64	-1.02
265°	0.06	0.09	0.13	0.30	0.28	-0.32	-0.37	-0.45	-0.87	-1.19	-1.09	-0.87
270°	0.08	0.12	0.17	0.28	0.17	-0.30	-0.47	-0.65	-1.00	-0.80	-0.84	-1.11
275°	0.10	0.14	0.20	0.22	0.09	-0.26	-0.64	-0.76	-0.79	-0.46	-1.03	-0.92
280°	0.10	0.15	0.21	0.16	0.06	-0.25	-0.78	-0.65	-0.46	-0.49	-1.06	-0.69
285°	0.10	0.14	0.21	0.08	0.07	-0.30	-0.76	-0.40	-0.32	-0.65	-0.78	-0.88
290°	0.08	0.12	0.18	0.01	0.10	-0.41	-0.60	-0.18	-0.40	-0.58	-0.68	-0.97
295°	0.07	0.10	0.15	-0.03	0.13	-0.51	-0.39	-0.12	-0.50	-0.36	-0.86	-0.66
300°	0.05	0.07	0.11	-0.05	0.14	-0.57	-0.22	-0.18	-0.46	-0.26	-0.94	-0.41
305°	0.03	0.05	0.07	-0.04	0.12	-0.55	-0.16	-0.27	-0.28	-0.37	-0.72	-0.42
310°	0.02	0.02	0.03	-0.04	0.08	-0.49	-0.18	-0.28	-0.14	-0.50	-0.45	-0.47
315°	0.00	0.00	0.01	-0.02	0.04	-0.37	-0.25	-0.18	-0.13	-0.46	-0.34	-0.39
320°	-0.01	-0.01	-0.02	0.00	0.00	-0.25	-0.31	-0.05	-0.21	-0.29	-0.35	-0.27
325°	-0.02	-0.02	-0.04	0.01	-0.04	-0.14	-0.31	0.05	-0.30	-0.10	-0.39	-0.19
330°	-0.02	-0.03	-0.05	0.02	-0.07	-0.05	-0.27	0.09	-0.32	0.02	-0.37	-0.16
335°	-0.02	-0.03	-0.05	0.03	-0.09	-0.01	-0.21	0.08	-0.29	0.07	-0.31	-0.14
340°	-0.02	-0.02	-0.03	0.02	-0.07	0.01	-0.14	0.06	-0.22	0.06	-0.22	-0.11
345°	-0.01	-0.02	-0.02	0.02	-0.06	0.00	-0.09	0.02	-0.14	0.04	-0.14	-0.07
350°	-0.01	-0.01	-0.01	0.00	-0.04	-0.01	-0.05	0.00	-0.08	0.01	-0.08	-0.03
355°	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.03	-0.02	-0.04	0.00	-0.05	-0.02

**Table A.25** Directional response for Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with the microphone preamplifier mounted directly on the analyzer, measured in a plane perpendicular to the display and along the microphone's axis, 4000 Hz – 10600 Hz, in dB

Angle	Frequency											
	4000 Hz	4500 Hz	5000 Hz	5600 Hz	6300 Hz	7100 Hz	8000 Hz	8500 Hz	9000 Hz	9500 Hz	10000 Hz	10600 Hz
0°	0.02	0.02	0.01	-0.01	-0.04	0.01	0.01	0.00	0.00	0.02	0.02	0.01
5°	0.04	0.01	0.01	-0.05	-0.09	0.03	0.00	-0.02	0.08	0.04	0.02	0.08
10°	0.07	0.03	0.03	-0.07	-0.20	0.03	-0.02	0.03	0.19	-0.02	-0.03	0.10
15°	0.10	0.03	0.07	-0.07	-0.36	-0.06	0.04	0.12	0.20	-0.30	-0.16	-0.04
20°	0.13	0.02	0.11	0.02	-0.42	-0.25	0.22	0.08	-0.15	-0.84	-0.35	-0.38
25°	0.12	-0.05	0.08	0.07	-0.26	-0.52	0.25	-0.37	-0.84	-1.08	-0.43	-0.65
30°	0.03	-0.16	-0.02	-0.05	-0.04	-0.58	-0.13	-0.68	-0.84	-0.61	-0.57	-0.69
35°	-0.15	-0.24	-0.16	-0.42	-0.34	-0.44	-0.52	-0.29	-0.75	-0.97	-1.43	-0.91
40°	-0.29	-0.24	-0.26	-0.57	-1.01	-0.77	-0.42	-0.54	-1.47	-1.81	-1.44	-0.99
45°	-0.28	-0.25	-0.33	-0.40	-0.94	-1.35	-0.60	-1.05	-1.02	-1.61	-1.42	-1.75
50°	-0.14	-0.42	-0.45	-0.49	-0.92	-0.95	-1.02	-0.98	-1.61	-2.21	-2.14	-1.85
55°	-0.14	-0.67	-0.54	-0.80	-1.56	-1.81	-0.89	-1.38	-1.82	-1.85	-2.69	-2.60
60°	-0.44	-0.69	-0.56	-0.94	-1.29	-1.70	-1.77	-1.44	-1.97	-2.75	-2.00	-2.55
65°	-0.74	-0.61	-0.74	-0.97	-1.47	-2.00	-1.44	-2.28	-2.28	-2.66	-3.34	-2.75
70°	-0.75	-0.88	-0.87	-1.10	-1.80	-2.25	-2.43	-1.95	-3.02	-3.08	-3.22	-3.76
75°	-0.80	-1.25	-0.80	-1.26	-1.80	-2.23	-2.10	-2.99	-2.66	-3.83	-3.35	-3.69
80°	-1.08	-1.19	-1.11	-1.30	-1.91	-2.66	-2.53	-2.85	-3.71	-3.50	-4.51	-3.74
85°	-0.96	-1.34	-1.55	-1.43	-2.15	-2.60	-2.82	-2.79	-4.00	-4.28	-4.07	-5.04
90°	-0.81	-1.56	-1.39	-1.85	-2.08	-2.80	-2.79	-3.58	-3.37	-5.03	-4.51	-4.83
95°	-1.18	-1.23	-1.71	-1.95	-2.71	-2.82	-3.03	-3.33	-4.18	-4.56	-5.07	-5.22
100°	-1.21	-1.51	-1.55	-2.06	-2.71	-3.28	-2.95	-3.52	-4.29	-4.62	-5.41	-5.07
105°	-1.02	-1.69	-1.50	-2.11	-2.89	-3.64	-3.60	-3.44	-4.16	-4.89	-5.33	-5.43
110°	-1.68	-1.42	-1.94	-1.95	-2.85	-3.45	-3.76	-4.65	-4.66	-5.15	-5.01	-5.87
115°	-2.03	-2.25	-1.69	-2.41	-2.77	-3.63	-3.69	-3.87	-5.20	-5.94	-6.15	-5.58
120°	-1.21	-2.39	-2.42	-2.20	-3.15	-3.52	-3.69	-4.57	-4.71	-5.14	-6.37	-6.68
125°	-0.95	-1.39	-2.38	-3.02	-3.09	-4.04	-4.07	-3.97	-4.73	-5.97	-5.70	-6.00
130°	-1.33	-1.48	-1.35	-2.40	-3.94	-3.97	-3.93	-4.84	-5.61	-5.70	-5.76	-6.17
135°	-0.94	-1.75	-1.66	-1.70	-2.45	-4.27	-4.66	-4.72	-5.01	-6.13	-7.09	-7.06
140°	0.00	-0.72	-1.53	-2.19	-2.74	-2.81	-3.38	-4.26	-5.44	-5.97	-6.29	-6.85
145°	0.18	0.04	-0.35	-1.24	-2.67	-3.67	-3.35	-3.52	-4.02	-4.60	-4.96	-5.75
150°	-0.73	-0.52	-0.23	-0.37	-1.10	-2.31	-3.14	-4.02	-4.88	-5.60	-5.51	-4.92
155°	-2.16	-2.11	-1.52	-1.31	-1.35	-1.57	-1.50	-1.92	-2.83	-3.94	-4.87	-5.63
160°	-2.89	-3.41	-3.23	-3.37	-3.66	-3.46	-2.84	-2.77	-3.03	-3.35	-3.61	-3.76
165°	-2.41	-3.12	-3.47	-4.17	-5.30	-6.10	-6.21	-6.53	-6.79	-7.01	-7.11	-6.60
170°	-1.57	-2.09	-2.44	-3.08	-4.04	-5.22	-5.81	-6.73	-7.70	-8.72	-9.81	-11.11
175°	-0.95	-1.31	-1.52	-1.94	-2.58	-3.36	-3.49	-4.06	-4.76	-5.53	-6.00	-6.88
180°	-0.69	-0.98	-1.13	-1.45	-1.96	-2.58	-2.49	-2.94	-3.51	-4.11	-4.44	-4.96
185°	-0.79	-1.12	-1.29	-1.64	-2.20	-2.87	-2.89	-3.43	-4.07	-4.74	-5.20	-5.77
190°	-1.25	-1.71	-1.99	-2.50	-3.29	-4.26	-4.77	-5.64	-6.52	-7.54	-8.47	-9.31
195°	-2.01	-2.66	-3.05	-3.70	-4.77	-5.98	-6.77	-7.35	-7.88	-8.48	-8.61	-8.29
200°	-2.69	-3.33	-3.47	-3.76	-4.38	-4.71	-4.07	-3.83	-4.01	-4.22	-4.08	-4.05
205°	-2.48	-2.64	-2.20	-2.03	-2.14	-2.16	-1.61	-1.89	-2.63	-3.42	-3.96	-4.76
210°	-1.29	-1.10	-0.65	-0.71	-1.17	-1.87	-2.59	-3.67	-4.77	-5.60	-5.86	-5.69
215°	-0.19	-0.22	-0.33	-1.03	-2.21	-3.52	-3.87	-3.65	-3.67	-3.94	-4.18	-4.68
220°	-0.01	-0.61	-1.30	-2.08	-2.79	-2.94	-2.30	-2.92	-4.31	-5.64	-6.43	-6.71
225°	-0.75	-1.60	-1.71	-1.67	-2.06	-2.98	-4.52	-5.31	-5.41	-5.90	-6.24	-6.94
230°	-1.35	-1.44	-1.09	-1.75	-3.16	-4.62	-3.90	-4.27	-5.46	-5.95	-6.02	-5.86
235°	-0.93	-1.05	-1.80	-2.89	-3.56	-3.63	-4.29	-4.41	-4.50	-5.44	-5.94	-6.31
240°	-0.84	-1.97	-2.66	-2.44	-2.89	-3.86	-3.25	-4.06	-5.02	-5.49	-6.18	-6.78
245°	-1.72	-2.47	-1.71	-2.19	-2.98	-3.30	-4.11	-4.23	-5.21	-5.76	-5.45	-5.70
250°	-1.91	-1.53	-1.77	-2.17	-2.61	-3.79	-3.72	-4.34	-4.36	-5.33	-5.87	-5.64
255°	-1.14	-1.54	-1.80	-1.89	-3.09	-3.56	-3.43	-3.79	-4.66	-4.90	-5.24	-5.34
260°	-1.09	-1.70	-1.35	-2.26	-2.77	-3.17	-3.41	-3.58	-4.08	-4.67	-5.09	-5.84
265°	-1.32	-1.22	-1.84	-2.07	-2.40	-3.25	-2.91	-3.35	-4.00	-4.92	-5.00	-5.29
270°	-0.95	-1.51	-1.60	-1.64	-2.47	-2.80	-2.89	-3.41	-3.94	-4.53	-4.58	-5.59
275°	-0.91	-1.62	-1.31	-1.66	-2.14	-2.63	-2.91	-2.99	-3.76	-4.24	-5.04	-4.39
280°	-1.19	-1.15	-1.18	-1.57	-1.88	-2.66	-2.46	-2.92	-3.72	-3.99	-4.28	-4.15
285°	-0.96	-1.05	-1.13	-1.16	-1.85	-2.48	-2.35	-3.10	-2.85	-3.98	-3.65	-3.93
290°	-0.67	-1.02	-0.99	-1.17	-1.77	-2.10	-2.56	-2.05	-3.30	-3.19	-3.39	-3.62
295°	-0.64	-0.93	-0.64	-1.06	-1.61	-2.24	-1.57	-2.55	-2.31	-2.87	-3.15	-2.73
300°	-0.59	-0.82	-0.62	-0.95	-1.30	-1.93	-1.98	-1.49	-2.18	-2.53	-2.42	-2.97
305°	-0.46	-0.58	-0.68	-0.84	-1.44	-1.76	-1.10	-1.57	-1.75	-2.37	-2.82	-2.97
310°	-0.37	-0.40	-0.53	-0.64	-1.27	-1.12	-1.08	-1.04	-1.80	-2.05	-1.97	-1.89
315°	-0.27	-0.41	-0.34	-0.46	-0.95	-1.61	-0.70	-1.08	-1.04	-2.01	-2.02	-1.97
320°	-0.11	-0.48	-0.28	-0.57	-0.87	-0.88	-0.53	-0.73	-1.40	-1.59	-1.61	-1.23
325°	0.04	-0.39	-0.26	-0.62	-0.50	-0.47	-0.59	-0.37	-1.00	-1.42	-1.42	-1.07
330°	0.11	-0.18	-0.11	-0.31	-0.35	-0.71	-0.25	-0.64	-0.67	-0.96	-0.75	-0.67
335°	0.10	0.00	0.06	0.01	-0.45	-0.62	0.10	-0.54	-0.89	-1.00	-0.78	-0.73
340°	0.03	0.07	0.14	0.14	-0.41	-0.31	0.14	-0.04	-0.60	-0.65	-0.58	-0.39
345°	-0.02	0.07	0.11	0.13	-0.23	-0.13	0.00	0.18	-0.25	-0.28	-0.29	-0.06
350°	-0.04	0.03	0.05	0.08	-0.07	-0.06	-0.07	0.14	-0.09	-0.11	-0.14	-0.01
355°	-0.03	0.00	0.01	0.05	0.02	-0.03	-0.04	0.06	-0.03	-0.05	-0.06	-0.03

**Table A.26** Directional response for Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with the microphone preamplifier mounted directly on the analyzer, measured in a plane perpendicular to the display and along the microphone's axis, 11200 Hz – 20000 Hz, in dB

	Frequency											
Angle	11200 Hz	11800 Hz	12500 Hz	13200 Hz	14000 Hz	15000 Hz	16000 Hz	17000 Hz	18000 Hz	19000 Hz	20000 Hz	
0°	0.01	0.00	0.01	0.01	0.03	0.04	0.01	-0.02	-0.04	-0.04	-0.04	
5°	0.03	0.04	0.06	0.02	-0.01	-0.01	-0.01	-0.06	-0.07	-0.07	-0.06	
10°	0.00	0.07	0.01	-0.05	-0.07	-0.12	-0.14	-0.17	-0.09	-0.23	-0.23	
15°	-0.16	0.11	-0.11	-0.17	-0.17	-0.15	-0.49	-0.18	-0.24	-0.65	-0.53	
20°	-0.48	-0.08	-0.33	-0.35	-0.35	-0.27	-0.77	-0.38	-0.65	-0.86	-0.65	
25°	-0.56	-0.60	-0.78	-0.54	-0.53	-0.85	-0.91	-0.93	-0.71	-1.35	-1.31	
30°	-0.40	-0.63	-1.01	-0.99	-0.92	-0.77	-1.60	-1.15	-1.26	-1.69	-1.72	
35°	-0.98	-1.03	-1.11	-1.29	-1.18	-1.38	-1.69	-1.85	-1.55	-2.32	-2.41	
40°	-1.17	-0.92	-1.79	-2.00	-1.71	-1.55	-2.16	-2.53	-2.20	-2.73	-3.07	
45°	-1.47	-1.64	-2.04	-2.00	-2.18	-1.98	-2.89	-2.87	-3.05	-3.38	-3.66	
50°	-1.82	-1.75	-1.88	-2.47	-2.90	-2.85	-3.23	-3.18	-3.75	-4.19	-4.30	
55°	-2.67	-2.33	-2.86	-3.25	-3.65	-3.40	-3.72	-3.73	-4.31	-5.09	-5.28	
60°	-2.55	-2.90	-3.25	-3.83	-3.75	-3.88	-4.42	-4.39	-4.91	-5.80	-6.20	
65°	-3.01	-3.09	-3.73	-3.93	-4.16	-4.03	-5.14	-5.23	-5.65	-6.26	-6.91	
70°	-3.55	-3.68	-4.14	-4.54	-4.55	-4.60	-5.28	-6.27	-6.24	-7.35	-7.60	
75°	-4.27	-4.05	-4.70	-5.10	-5.43	-5.33	-5.80	-6.53	-7.37	-8.03	-8.51	
80°	-4.34	-4.92	-4.96	-5.49	-5.90	-6.42	-6.91	-7.03	-7.66	-9.08	-9.34	
85°	-4.46	-5.16	-5.70	-5.71	-6.15	-6.89	-8.13	-8.46	-8.39	-9.31	-10.25	
90°	-5.40	-5.55	-6.14	-6.05	-6.73	-7.19	-8.58	-8.72	-9.11	-10.22	-10.89	
95°	-5.55	-5.72	-7.11	-6.71	-7.20	-8.00	-8.91	-8.95	-11.40	-11.72		
100°	-6.27	-5.94	-7.08	-7.51	-8.22	-8.29	-8.57	-9.27	-10.27	-11.47	-11.98	
105°	-6.17	-6.09	-7.60	-7.75	-8.06	-8.72	-9.87	-10.44	-10.67	-11.84	-12.92	
110°	-6.05	-6.05	-7.66	-7.96	-8.78	-9.07	-9.90	-10.62	-11.32	-12.25	-13.06	
115°	-5.86	-6.52	-7.64	-7.69	-8.77	-8.75	-10.32	-10.80	-11.99	-12.95	-14.29	
120°	-6.56	-7.01	-7.53	-7.85	-8.98	-8.43	-10.24	-10.63	-12.71	-12.97	-14.53	
125°	-6.84	-7.69	-8.27	-8.68	-9.42	-8.43	-10.33	-10.95	-11.55	-12.79	-14.19	
130°	-6.75	-7.03	-7.92	-8.72	-9.78	-9.28	-11.59	-11.84	-11.46	-13.57	-13.62	
135°	-6.63	-6.76	-7.76	-8.86	-9.24	-8.83	-11.19	-11.96	-11.72	-14.08	-15.05	
140°	-7.31	-8.28	-8.89	-9.53	-9.03	-9.15	-11.11	-11.71	-11.17	-13.08	-15.09	
145°	-6.84	-7.42	-8.36	-8.98	-9.23	-10.89	-12.66	-12.03	-11.82	-13.51	-15.34	
150°	-5.00	-5.49	-6.33	-7.44	-8.74	-9.74	-10.60	-10.36	-11.93	-13.74	-16.23	
155°	-6.16	-6.36	-7.25	-7.26	-7.18	-7.05	-8.10	-9.51	-10.78	-12.21	-13.58	
160°	-4.13	-4.65	-5.55	-6.53	-7.72	-8.62	-9.93	-9.93	-10.00	-10.50	-10.79	
165°	-6.23	-6.17	-6.35	-6.46	-6.42	-6.78	-7.70	-8.75	-9.58	-10.88	-12.31	
170°	-11.42	-12.09	-13.14	-13.46	-13.20	-12.76	-12.92	-12.53	-12.92	-13.25	-13.32	
175°	-7.76	-8.27	-9.48	-10.49	-11.73	-12.62	-14.60	-15.91	-16.87	-19.41	-22.17	
180°	-5.57	-5.83	-6.64	-7.35	-7.96	-8.46	-9.62	-10.57	-10.94	-12.26	-13.50	
185°	-6.42	-6.77	-7.69	-8.58	-9.39	-10.00	-11.50	-12.53	-13.17	-14.86	-16.58	
190°	-10.05	-10.96	-12.65	-13.98	-15.06	-15.49	-16.96	-16.31	-16.98	-17.40	-17.19	
195°	-8.09	-8.20	-8.32	-8.11	-7.94	-7.98	-8.32	-8.89	-9.39	-10.30	-11.54	
200°	-4.33	-4.57	-5.19	-5.93	-6.81	-7.73	-9.51	-10.42	-11.16	-12.33	-12.45	
205°	-5.63	-6.44	-7.81	-8.44	-8.26	-7.94	-8.21	-8.66	-9.35	-10.68	-12.42	
210°	-5.45	-5.46	-5.80	-6.26	-7.25	-8.40	-9.68	-9.76	-10.25	-11.58	-13.37	
215°	-5.54	-6.50	-7.84	-8.39	-8.48	-9.45	-11.78	-12.92	-12.64	-12.91	-14.04	
220°	-7.00	-7.50	-8.68	-9.90	-9.73	-8.80	-10.38	-12.29	-12.18	-12.17	-13.29	
225°	-7.23	-7.13	-7.37	-8.28	-9.93	-8.77	-9.82	-12.08	-13.28	-13.43	-15.00	
230°	-6.50	-7.33	-7.70	-7.88	-10.18	-10.29	-10.46	-11.68	-11.97	-12.99	-15.30	
235°	-6.57	-7.62	-8.89	-8.02	-8.83	-9.61	-10.44	-11.91	-11.14	-12.79	-13.35	
240°	-6.38	-6.38	-8.27	-8.32	-8.90	-9.13	-9.71	-11.02	-11.40	-13.42	-13.90	
245°	-6.68	-6.47	-7.94	-7.76	-8.34	-9.02	-10.40	-10.78	-11.21	-13.28	-14.40	
250°	-6.15	-6.17	-7.53	-8.13	-8.80	-8.44	-9.88	-11.10	-11.45	-12.73	-13.37	
255°	-6.14	-6.64	-7.45	-7.46	-8.44	-9.09	-9.82	-10.42	-10.77	-11.51	-13.52	
260°	-5.73	-6.24	-6.98	-7.90	-7.97	-8.36	-9.48	-9.63	-10.74	-11.34	-12.13	
265°	-5.40	-6.61	-6.47	-7.27	-7.81	-7.64	-8.66	-9.07	-9.83	-11.29	-12.53	
270°	-5.10	-5.80	-6.17	-6.69	-7.02	-7.83	-8.37	-9.00	-9.36	-10.66	-10.52	
275°	-5.06	-5.26	-5.36	-6.27	-6.59	-7.39	-8.27	-8.48	-8.82	-10.21	-10.69	
280°	-4.63	-4.38	-5.23	-5.40	-6.31	-6.80	-7.60	-7.49	-8.08	-8.80	-9.79	
285°	-3.99	-4.06	-4.55	-5.25	-5.79	-6.39	-6.51	-6.69	-7.15	-8.31	-8.82	
290°	-3.38	-3.63	-4.27	-4.88	-5.35	-5.59	-5.54	-6.21	-6.78	-7.64	-8.05	
295°	-3.24	-3.36	-4.08	-4.43	-4.84	-4.72	-5.06	-5.98	-5.80	-6.78	-7.38	
300°	-3.15	-3.44	-3.64	-3.96	-4.14	-4.21	-4.73	-4.98	-5.34	-5.76	-6.71	
305°	-2.86	-2.70	-2.86	-2.96	-3.67	-3.69	-4.16	-4.02	-4.87	-5.33	-5.83	
310°	-1.94	-1.90	-2.40	-2.56	-3.06	-3.11	-3.83	-3.43	-3.95	-4.56	-4.92	
315°	-1.73	-1.96	-2.55	-2.62	-2.51	-2.64	-3.11	-2.92	-3.20	-3.69	-4.12	
320°	-1.31	-1.04	-1.58	-2.07	-1.94	-1.98	-2.35	-2.83	-2.60	-2.95	-3.45	
325°	-1.19	-1.42	-1.62	-1.50	-1.57	-1.60	-1.94	-2.00	-1.90	-2.32	-2.69	
330°	-0.48	-0.57	-0.98	-1.18	-1.10	-1.01	-1.88	-1.62	-1.49	-2.05	-2.03	
335°	-0.78	-0.90	-0.99	-0.90	-0.76	-0.90	-1.09	-1.06	-0.78	-1.43	-1.56	
340°	-0.52	-0.34	-0.36	-0.34	-0.58	-0.57	-0.99	-0.66	-0.65	-1.01	-0.82	
345°	-0.02	0.08	-0.23	-0.22	-0.36	-0.30	-0.71	-0.26	-0.45	-0.79	-0.68	
350°	0.05	0.03	-0.25	-0.21	-0.12	-0.19	-0.18	-0.25	-0.03	-0.33	-0.24	
355°	0.00	-0.03	-0.13	-0.10	-0.03	-0.09	-0.02	-0.08	0.07	-0.04	-0.02	

**Table A.27** Sensitivity variations of Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with the microphone preamplifier mounted directly on the analyzer, at sound incidence angles within  $\pm\theta^\circ$  from the reference direction

Nominal Frequency	Exact Frequency	Max Variation $\pm 30^\circ$ dB	Max Variation $\pm 90^\circ$ dB	Max Variation $\pm 150^\circ$ dB
<b>500 Hz</b>	501.187 Hz	0.03	0.14	0.29
<b>630 Hz</b>	630.957 Hz	0.04	0.20	0.41
<b>800 Hz</b>	794.328 Hz	0.06	0.28	0.57
<b>1000 Hz</b>	1000 Hz	0.05	0.40	0.75
<b>1250 Hz</b>	1258.93 Hz	0.10	0.27	0.92
<b>1600 Hz</b>	1584.89 Hz	0.11	0.60	1.16
<b>2000 Hz</b>	1995.26 Hz	0.30	0.80	1.43
2240 Hz	2238.72 Hz	0.15	0.93	1.61
<b>2500 Hz</b>	2511.89 Hz	0.35	1.02	1.77
2800 Hz	2818.38 Hz	0.14	0.89	2.02
<b>3150 Hz</b>	3162.28 Hz	0.40	1.17	1.92
3550 Hz	3548.13 Hz	0.22	1.41	2.04
4000 Hz	3981.07 Hz	0.36	1.55	2.21
4500 Hz	4466.84 Hz	0.44	1.69	2.55
<b>5000 Hz</b>	5011.87 Hz	0.50	1.74	2.79
5600 Hz	5623.41 Hz	0.75	2.34	3.30
<b>6300 Hz</b>	6309.57 Hz	0.78	2.71	4.01
7100 Hz	7079.46 Hz	0.74	2.91	4.65
<b>8000 Hz</b>	7943.28 Hz	0.65	3.57	5.33
8500 Hz	8413.95 Hz	0.86	3.76	5.91
9000 Hz	8912.51 Hz	1.09	4.27	6.32
9500 Hz	9440.61 Hz	1.11	5.07	6.71
<b>10000 Hz</b>	10000 Hz	0.80	5.06	7.48
10600 Hz	10592.5 Hz	0.83	5.69	7.79
11200 Hz	11220.2 Hz	0.82	5.48	8.20
11800 Hz	11885.0 Hz	1.01	5.91	9.07
<b>12500 Hz</b>	12589.3 Hz	1.12	6.33	9.21
13200 Hz	13335.2 Hz	1.19	6.71	10.44
14000 Hz	14125.4 Hz	1.14	7.10	12.13
15000 Hz	14962.4 Hz	1.11	7.87	11.49
<b>16000 Hz</b>	15848.9 Hz	1.91	8.60	12.69
17000 Hz	16788.0 Hz	1.63	9.01	14.20
18000 Hz	17782.8 Hz	1.56	9.45	15.14
19000 Hz	18836.5 Hz	2.09	10.70	16.37
<b>20000 Hz</b>	19952.6 Hz	2.07	10.92	17.22

**Table A.28** Influence of Windscreen UA-1650 on directional response, with or without Microphone Preamplifier ZC-0032 connected to a microphone extension cable, 500 Hz – 3550 Hz, in dB

Angle	Frequency											
	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz	2240 Hz	2500 Hz	2800 Hz	3150 Hz	3550 Hz
0°	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
5°	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01
10°	-0.01	0.00	0.00	-0.01	-0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.00
15°	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	0.00	0.00	-0.01	0.01	0.00
20°	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	0.00	0.00	0.02	0.01
25°	-0.01	-0.01	0.00	-0.01	-0.01	-0.02	-0.01	-0.02	0.00	0.00	0.03	0.03
30°	-0.01	-0.01	0.00	-0.01	-0.02	-0.02	-0.02	-0.02	-0.01	0.00	0.04	0.04
35°	-0.01	-0.02	-0.01	-0.01	-0.03	-0.03	-0.03	-0.03	-0.02	0.01	0.05	0.06
40°	0.00	-0.01	-0.01	-0.02	-0.04	-0.04	-0.05	-0.03	-0.03	0.02	0.06	0.07
45°	-0.01	-0.02	-0.02	-0.02	-0.05	-0.05	-0.07	-0.04	-0.04	0.02	0.06	0.09
50°	0.00	-0.01	-0.02	-0.02	-0.06	-0.06	-0.08	-0.06	-0.05	0.01	0.07	0.11
55°	-0.01	-0.01	-0.02	-0.03	-0.07	-0.08	-0.10	-0.08	-0.06	-0.01	0.07	0.12
60°	-0.01	-0.01	-0.03	-0.04	-0.07	-0.10	-0.11	-0.11	-0.07	-0.01	0.07	0.14
65°	-0.01	-0.01	-0.03	-0.05	-0.08	-0.12	-0.12	-0.13	-0.10	-0.02	0.07	0.15
70°	-0.01	-0.01	-0.03	-0.05	-0.09	-0.13	-0.14	-0.14	-0.13	-0.04	0.06	0.15
75°	-0.02	-0.02	-0.04	-0.06	-0.09	-0.15	-0.16	-0.15	-0.15	-0.06	0.06	0.15
80°	-0.02	-0.02	-0.04	-0.06	-0.10	-0.16	-0.19	-0.17	-0.16	-0.09	0.04	0.14
85°	-0.03	-0.03	-0.04	-0.07	-0.11	-0.17	-0.22	-0.19	-0.18	-0.10	0.01	0.14
90°	-0.02	-0.02	-0.05	-0.07	-0.12	-0.18	-0.23	-0.22	-0.20	-0.11	-0.01	0.12
95°	-0.02	-0.03	-0.05	-0.07	-0.13	-0.18	-0.24	-0.24	-0.23	-0.14	-0.02	0.09
100°	-0.02	-0.03	-0.05	-0.07	-0.12	-0.19	-0.25	-0.25	-0.24	-0.17	-0.04	0.08
105°	-0.02	-0.02	-0.06	-0.07	-0.12	-0.19	-0.26	-0.26	-0.25	-0.19	-0.08	0.06
110°	-0.03	-0.03	-0.05	-0.08	-0.12	-0.19	-0.26	-0.27	-0.25	-0.19	-0.09	0.02
115°	-0.03	-0.04	-0.05	-0.07	-0.12	-0.19	-0.26	-0.27	-0.26	-0.18	-0.08	0.00
120°	-0.04	-0.04	-0.05	-0.07	-0.12	-0.19	-0.26	-0.26	-0.26	-0.18	-0.07	0.03
125°	-0.03	-0.03	-0.05	-0.07	-0.12	-0.18	-0.25	-0.25	-0.26	-0.18	-0.07	0.04
130°	-0.03	-0.04	-0.05	-0.07	-0.13	-0.18	-0.25	-0.24	-0.24	-0.17	-0.06	0.04
135°	-0.03	-0.04	-0.05	-0.07	-0.12	-0.17	-0.24	-0.23	-0.23	-0.15	-0.04	0.06
140°	-0.03	-0.04	-0.05	-0.07	-0.12	-0.16	-0.24	-0.22	-0.22	-0.13	-0.03	0.08
145°	-0.03	-0.04	-0.06	-0.08	-0.13	-0.15	-0.24	-0.22	-0.21	-0.12	-0.01	0.11
150°	-0.03	-0.04	-0.06	-0.08	-0.12	-0.15	-0.24	-0.22	-0.20	-0.12	0.00	0.12
155°	-0.03	-0.04	-0.06	-0.07	-0.13	-0.15	-0.23	-0.22	-0.20	-0.11	0.01	0.13
160°	-0.03	-0.04	-0.06	-0.07	-0.13	-0.15	-0.23	-0.21	-0.19	-0.11	0.02	0.13
165°	-0.03	-0.04	-0.06	-0.07	-0.13	-0.15	-0.23	-0.21	-0.19	-0.10	0.02	0.14
170°	-0.03	-0.04	-0.06	-0.07	-0.13	-0.15	-0.22	-0.21	-0.19	-0.10	0.03	0.15
175°	-0.04	-0.04	-0.06	-0.07	-0.13	-0.16	-0.22	-0.21	-0.19	-0.10	0.03	0.15
180°	-0.05	-0.05	-0.05	-0.07	-0.13	-0.16	-0.22	-0.21	-0.19	-0.10	0.03	0.15
185°	-0.03	-0.03	-0.06	-0.07	-0.12	-0.16	-0.23	-0.21	-0.19	-0.10	0.03	0.15
190°	-0.04	-0.05	-0.06	-0.07	-0.13	-0.16	-0.23	-0.22	-0.20	-0.11	0.02	0.14
195°	-0.03	-0.04	-0.06	-0.07	-0.13	-0.16	-0.23	-0.22	-0.20	-0.11	0.02	0.13
200°	-0.03	-0.04	-0.06	-0.07	-0.13	-0.16	-0.24	-0.22	-0.20	-0.11	0.02	0.13
205°	-0.03	-0.04	-0.06	-0.07	-0.13	-0.16	-0.24	-0.23	-0.21	-0.12	0.01	0.12
210°	-0.03	-0.04	-0.06	-0.07	-0.13	-0.16	-0.24	-0.23	-0.22	-0.12	0.00	0.11
215°	-0.03	-0.04	-0.06	-0.08	-0.13	-0.16	-0.25	-0.23	-0.22	-0.13	-0.01	0.10
220°	-0.04	-0.05	-0.06	-0.08	-0.13	-0.17	-0.25	-0.23	-0.22	-0.14	-0.03	0.08
225°	-0.04	-0.04	-0.06	-0.08	-0.13	-0.18	-0.25	-0.24	-0.23	-0.15	-0.05	0.05
230°	-0.03	-0.04	-0.06	-0.08	-0.13	-0.18	-0.25	-0.25	-0.24	-0.17	-0.07	0.04
235°	-0.03	-0.04	-0.06	-0.08	-0.13	-0.19	-0.26	-0.26	-0.26	-0.19	-0.07	0.04
240°	-0.03	-0.04	-0.06	-0.08	-0.12	-0.20	-0.26	-0.27	-0.26	-0.19	-0.07	0.03
245°	-0.03	-0.04	-0.06	-0.08	-0.13	-0.20	-0.27	-0.27	-0.26	-0.18	-0.08	0.00
250°	-0.03	-0.04	-0.05	-0.08	-0.13	-0.20	-0.26	-0.27	-0.26	-0.19	-0.09	0.01
255°	-0.03	-0.04	-0.06	-0.08	-0.13	-0.20	-0.26	-0.26	-0.25	-0.19	-0.08	0.06
260°	-0.02	-0.03	-0.05	-0.07	-0.13	-0.19	-0.25	-0.25	-0.25	-0.18	-0.04	0.08
265°	-0.03	-0.04	-0.05	-0.07	-0.13	-0.18	-0.24	-0.24	-0.23	-0.14	-0.01	0.09
270°	-0.02	-0.03	-0.05	-0.07	-0.12	-0.17	-0.23	-0.22	-0.21	-0.11	0.00	0.11
275°	-0.04	-0.04	-0.04	-0.07	-0.12	-0.16	-0.21	-0.20	-0.18	-0.10	0.01	0.15
280°	-0.02	-0.02	-0.04	-0.07	-0.10	-0.15	-0.19	-0.17	-0.16	-0.08	0.04	0.15
285°	-0.02	-0.03	-0.04	-0.06	-0.10	-0.14	-0.16	-0.15	-0.14	-0.05	0.06	0.15
290°	-0.02	-0.02	-0.04	-0.05	-0.09	-0.13	-0.14	-0.13	-0.12	-0.03	0.07	0.16
295°	-0.01	-0.01	-0.03	-0.05	-0.08	-0.11	-0.12	-0.12	-0.09	-0.01	0.07	0.16
300°	-0.02	-0.03	-0.03	-0.04	-0.07	-0.09	-0.11	-0.10	-0.06	0.00	0.08	0.15
305°	-0.01	-0.02	-0.03	-0.03	-0.06	-0.08	-0.09	-0.07	-0.05	0.01	0.08	0.14
310°	-0.01	-0.02	-0.02	-0.03	-0.05	-0.06	-0.08	-0.05	-0.04	0.02	0.08	0.12
315°	-0.02	-0.03	-0.02	-0.02	-0.04	-0.05	-0.06	-0.06	-0.03	0.03	0.07	0.11
320°	0.00	-0.01	-0.01	-0.02	-0.03	-0.03	-0.04	-0.02	-0.02	0.02	0.07	0.08
325°	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	0.00	0.02	0.07	0.07
330°	-0.01	-0.01	0.00	-0.01	-0.02	-0.01	-0.01	0.01	0.02	0.06	0.06	0.06
335°	0.00	-0.01	0.00	0.00	-0.01	0.00	-0.01	0.01	0.02	0.05	0.05	0.05
340°	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.04	0.04
345°	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.03	0.03	0.03
350°	-0.01	-0.01	0.00	0.00	0.01	0.00	0.01	0.01	0.01	0.02	0.02	0.02
355°	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.01	0.02	0.02	0.02

**Table A.29** Influence of Windscreen UA-1650 on directional response, with or without Microphone Preamplifier ZC-0032 connected to a microphone extension cable, 4000 Hz – 10600 Hz, in dB

Angle	Frequency											
	4000 Hz	4500 Hz	5000 Hz	5600 Hz	6300 Hz	7100 Hz	8000 Hz	8500 Hz	9000 Hz	9500 Hz	10000 Hz	10600 Hz
0°	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01	-0.01
5°	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	0.00	0.00	-0.02
10°	-0.01	-0.01	-0.02	-0.01	0.01	0.00	-0.06	-0.04	-0.02	0.02	0.00	-0.05
15°	-0.01	-0.02	-0.03	-0.01	0.03	0.02	-0.11	-0.10	-0.03	0.06	0.01	-0.08
20°	0.00	-0.03	-0.06	-0.02	0.06	0.05	-0.20	-0.18	-0.05	0.08	0.03	-0.10
25°	0.00	-0.04	-0.09	-0.03	0.09	0.10	-0.27	-0.26	-0.08	0.10	0.05	-0.11
30°	0.01	-0.05	-0.13	-0.06	0.10	0.14	-0.31	-0.36	-0.17	0.06	0.07	-0.11
35°	0.02	-0.06	-0.16	-0.08	0.12	0.19	-0.34	-0.50	-0.28	0.03	0.12	-0.07
40°	0.03	-0.07	-0.19	-0.11	0.15	0.28	-0.37	-0.56	-0.38	-0.04	0.08	-0.05
45°	0.04	-0.07	-0.24	-0.18	0.14	0.34	-0.32	-0.62	-0.54	-0.17	0.06	0.03
50°	0.06	-0.08	-0.28	-0.24	0.11	0.35	-0.25	-0.65	-0.59	-0.30	-0.03	0.00
55°	0.09	-0.07	-0.30	-0.27	0.10	0.43	-0.14	-0.58	-0.67	-0.40	-0.11	-0.01
60°	0.11	-0.06	-0.31	-0.34	0.02	0.42	-0.04	-0.51	-0.64	-0.47	-0.25	-0.08
65°	0.12	-0.05	-0.33	-0.40	0.00	0.41	0.05	-0.40	-0.61	-0.48	-0.30	-0.20
70°	0.14	-0.03	-0.33	-0.40	-0.04	0.35	0.11	-0.34	-0.51	-0.47	-0.32	-0.23
75°	0.15	-0.01	-0.32	-0.43	-0.10	0.29	0.10	-0.28	-0.48	-0.40	-0.32	-0.22
80°	0.15	-0.01	-0.32	-0.44	-0.10	0.24	0.01	-0.28	-0.46	-0.39	-0.25	-0.19
85°	0.14	-0.01	-0.33	-0.45	-0.12	0.23	-0.02	-0.35	-0.46	-0.40	-0.24	-0.13
90°	0.14	-0.02	-0.35	-0.47	-0.12	0.22	-0.17	-0.36	-0.51	-0.39	-0.24	-0.08
95°	0.12	-0.04	-0.38	-0.50	-0.15	0.26	-0.15	-0.42	-0.53	-0.42	-0.25	-0.08
100°	0.07	-0.08	-0.42	-0.55	-0.16	0.28	-0.22	-0.46	-0.54	-0.45	-0.27	-0.11
105°	0.05	-0.13	-0.47	-0.60	-0.20	0.32	-0.21	-0.46	-0.60	-0.49	-0.31	-0.18
110°	0.03	-0.17	-0.55	-0.68	-0.23	0.33	-0.22	-0.52	-0.63	-0.57	-0.42	-0.23
115°	-0.01	-0.20	-0.62	-0.77	-0.33	0.32	-0.22	-0.57	-0.76	-0.69	-0.49	-0.31
120°	-0.01	-0.25	-0.65	-0.84	-0.42	0.25	-0.26	-0.66	-0.86	-0.83	-0.67	-0.33
125°	0.02	-0.23	-0.68	-0.89	-0.47	0.16	-0.37	-0.82	-1.06	-1.03	-0.76	-0.42
130°	0.03	-0.20	-0.64	-0.88	-0.52	0.10	-0.43	-0.95	-1.27	-1.25	-0.96	-0.62
135°	0.05	-0.18	-0.60	-0.79	-0.45	0.09	-0.40	-0.94	-1.31	-1.31	-1.08	-0.76
140°	0.08	-0.15	-0.57	-0.77	-0.40	0.12	-0.35	-0.85	-1.12	-1.13	-0.93	-0.75
145°	0.10	-0.11	-0.52	-0.71	-0.36	0.13	-0.32	-0.79	-0.99	-0.86	-0.64	-0.52
150°	0.13	-0.07	-0.46	-0.65	-0.30	0.17	-0.28	-0.73	-0.92	-0.75	-0.47	-0.38
155°	0.15	-0.05	-0.43	-0.60	-0.25	0.20	-0.23	-0.63	-0.76	-0.59	-0.38	-0.31
160°	0.16	-0.03	-0.41	-0.57	-0.21	0.22	-0.19	-0.53	-0.63	-0.45	-0.24	-0.26
165°	0.16	-0.02	-0.39	-0.55	-0.20	0.25	-0.14	-0.48	-0.55	-0.35	-0.17	-0.20
170°	0.17	0.00	-0.38	-0.53	-0.21	0.27	-0.11	-0.44	-0.48	-0.29	-0.17	-0.17
175°	0.18	0.01	-0.36	-0.52	-0.21	0.27	-0.10	-0.41	-0.45	-0.27	-0.15	-0.19
180°	0.18	0.01	-0.37	-0.53	-0.22	0.27	-0.11	-0.41	-0.45	-0.29	-0.16	-0.21
185°	0.17	0.00	-0.37	-0.54	-0.23	0.26	-0.13	-0.44	-0.48	-0.32	-0.19	-0.23
190°	0.16	-0.01	-0.39	-0.56	-0.24	0.25	-0.15	-0.48	-0.52	-0.34	-0.21	-0.21
195°	0.15	-0.03	-0.41	-0.58	-0.23	0.25	-0.15	-0.50	-0.57	-0.37	-0.20	-0.21
200°	0.14	-0.04	-0.43	-0.59	-0.23	0.24	-0.18	-0.55	-0.66	-0.48	-0.27	-0.28
205°	0.13	-0.05	-0.45	-0.61	-0.27	0.20	-0.24	-0.64	-0.77	-0.60	-0.37	-0.30
210°	0.12	-0.08	-0.48	-0.66	-0.32	0.19	-0.29	-0.73	-0.92	-0.75	-0.47	-0.37
215°	0.10	-0.12	-0.53	-0.73	-0.37	0.16	-0.32	-0.79	-1.01	-0.88	-0.63	-0.49
220°	0.07	-0.15	-0.58	-0.79	-0.40	0.13	-0.35	-0.85	-1.14	-1.15	-0.93	-0.72
225°	0.04	-0.18	-0.61	-0.81	-0.46	0.10	-0.39	-0.95	-1.34	-1.34	-1.10	-0.74
230°	0.03	-0.20	-0.65	-0.89	-0.52	0.10	-0.43	-0.96	-1.30	-1.30	-1.01	-0.64
235°	0.03	-0.24	-0.70	-0.91	-0.48	0.14	-0.36	-0.85	-1.13	-1.09	-0.81	-0.43
240°	-0.01	-0.26	-0.67	-0.87	-0.44	0.24	-0.28	-0.68	-0.91	-0.89	-0.70	-0.33
245°	-0.02	-0.20	-0.63	-0.81	-0.35	0.30	-0.21	-0.57	-0.78	-0.72	-0.50	-0.30
250°	0.03	-0.18	-0.57	-0.71	-0.27	0.30	-0.20	-0.51	-0.66	-0.61	-0.45	-0.23
255°	0.06	-0.15	-0.49	-0.62	-0.22	0.30	-0.19	-0.47	-0.62	-0.52	-0.33	-0.18
260°	0.07	-0.08	-0.43	-0.57	-0.18	0.27	-0.20	-0.46	-0.56	-0.49	-0.29	-0.10
265°	0.11	-0.05	-0.39	-0.52	-0.16	0.27	-0.15	-0.43	-0.55	-0.45	-0.26	-0.06
270°	0.14	-0.03	-0.36	-0.48	-0.13	0.23	-0.14	-0.36	-0.54	-0.42	-0.26	-0.07
275°	0.14	-0.01	-0.34	-0.46	-0.12	0.25	-0.01	-0.35	-0.48	-0.42	-0.26	-0.12
280°	0.15	-0.01	-0.32	-0.44	-0.10	0.26	0.04	-0.29	-0.48	-0.42	-0.27	-0.19
285°	0.16	-0.01	-0.32	-0.43	-0.09	0.32	0.11	-0.29	-0.50	-0.43	-0.33	-0.21
290°	0.15	-0.02	-0.33	-0.40	-0.03	0.36	0.12	-0.35	-0.53	-0.49	-0.33	-0.21
295°	0.14	-0.03	-0.33	-0.39	0.02	0.43	0.05	-0.40	-0.63	-0.50	-0.30	-0.19
300°	0.12	-0.05	-0.31	-0.33	0.05	0.43	-0.01	-0.52	-0.66	-0.49	-0.25	-0.07
305°	0.10	-0.06	-0.29	-0.26	0.12	0.45	-0.14	-0.59	-0.69	-0.41	-0.11	0.00
310°	0.08	-0.07	-0.26	-0.23	0.13	0.39	-0.24	-0.65	-0.61	-0.30	-0.03	0.00
315°	0.06	-0.06	-0.22	-0.17	0.16	0.37	-0.31	-0.63	-0.54	-0.17	0.06	0.03
320°	0.05	-0.05	-0.17	-0.10	0.17	0.29	-0.37	-0.56	-0.38	-0.04	0.08	-0.05
325°	0.03	-0.04	-0.14	-0.06	0.14	0.20	-0.34	-0.49	-0.27	0.04	0.13	-0.07
330°	0.02	-0.03	-0.11	-0.03	0.12	0.16	-0.30	-0.35	-0.16	0.07	0.08	-0.10
335°	0.02	-0.02	-0.07	-0.01	0.11	0.12	-0.26	-0.24	-0.07	0.11	0.06	-0.09
340°	0.02	0.00	-0.04	0.01	0.09	0.07	-0.18	-0.16	-0.03	0.11	0.05	-0.08
345°	0.01	0.01	-0.01	0.01	0.06	0.04	-0.09	-0.08	-0.01	0.08	0.03	-0.06
350°	0.01	0.01	0.01	0.02	0.04	0.02	-0.03	-0.03	0.01	0.05	0.02	-0.03
355°	0.01	0.01	0.01	0.02	0.03	0.02	0.00	0.00	0.02	0.03	0.02	0.00

**Table A.30** Influence of Windscreen UA-1650 on directional response, with or without Microphone Preamplifier ZC-0032 connected to a microphone extension cable, 11200 Hz – 20000 Hz, in dB

Angle	Frequency										
	11200 Hz	11800 Hz	12500 Hz	13200 Hz	14000 Hz	15000 Hz	16000 Hz	17000 Hz	18000 Hz	19000 Hz	20000 Hz
0°	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02
5°	-0.03	-0.02	0.00	-0.01	-0.03	-0.01	0.00	-0.01	-0.02	-0.01	-0.03
10°	-0.08	-0.05	0.00	-0.03	-0.09	-0.02	0.01	-0.02	-0.04	-0.02	-0.08
15°	-0.16	-0.11	0.01	-0.05	-0.17	-0.09	0.04	-0.03	-0.11	-0.05	-0.15
20°	-0.25	-0.18	0.00	-0.09	-0.26	-0.20	0.04	-0.06	-0.20	-0.12	-0.22
25°	-0.35	-0.25	-0.01	-0.08	-0.36	-0.30	-0.07	-0.02	-0.27	-0.25	-0.31
30°	-0.46	-0.39	-0.09	-0.07	-0.38	-0.46	-0.16	-0.04	-0.28	-0.33	-0.37
35°	-0.49	-0.50	-0.18	-0.09	-0.40	-0.51	-0.33	-0.06	-0.21	-0.36	-0.40
40°	-0.52	-0.63	-0.30	-0.11	-0.33	-0.54	-0.40	-0.17	-0.08	-0.25	-0.37
45°	-0.46	-0.65	-0.41	-0.18	-0.31	-0.49	-0.40	-0.29	-0.02	-0.09	-0.30
50°	-0.43	-0.68	-0.53	-0.29	-0.29	-0.40	-0.38	-0.40	-0.16	-0.04	-0.29
55°	-0.36	-0.64	-0.57	-0.39	-0.32	-0.41	-0.39	-0.47	-0.39	-0.19	-0.36
60°	-0.38	-0.61	-0.58	-0.52	-0.43	-0.47	-0.46	-0.52	-0.58	-0.41	-0.44
65°	-0.45	-0.66	-0.63	-0.62	-0.55	-0.56	-0.53	-0.54	-0.65	-0.50	-0.53
70°	-0.51	-0.71	-0.70	-0.73	-0.66	-0.60	-0.56	-0.58	-0.63	-0.54	-0.81
75°	-0.51	-0.74	-0.73	-0.79	-0.80	-0.65	-0.59	-0.66	-0.71	-0.66	-0.90
80°	-0.45	-0.69	-0.73	-0.78	-0.90	-0.82	-0.74	-0.82	-0.80	-0.79	-0.85
85°	-0.37	-0.58	-0.70	-0.78	-0.94	-1.02	-1.01	-1.04	-0.80	-0.66	-0.77
90°	-0.32	-0.51	-0.64	-0.81	-0.95	-1.08	-1.14	-1.13	-0.83	-0.54	-0.91
95°	-0.29	-0.54	-0.68	-0.90	-0.91	-1.00	-0.93	-0.94	-0.81	-0.84	-1.70
100°	-0.33	-0.57	-0.75	-1.07	-0.94	-0.81	-0.65	-0.66	-0.86	-1.27	-1.98
105°	-0.36	-0.57	-0.74	-1.03	-1.05	-0.87	-0.57	-0.61	-0.88	-1.35	-1.35
110°	-0.39	-0.54	-0.61	-0.89	-1.09	-0.91	-0.80	-0.99	-0.99	-1.05	-0.90
115°	-0.42	-0.49	-0.51	-0.74	-1.10	-0.94	-0.86	-1.05	-1.12	-1.27	-1.01
120°	-0.40	-0.44	-0.50	-0.79	-1.10	-0.84	-0.82	-0.88	-1.32	-1.22	-1.30
125°	-0.48	-0.55	-0.64	-0.90	-1.04	-0.71	-0.58	-0.76	-1.30	-1.14	-1.29
130°	-0.70	-0.76	-0.96	-1.32	-1.09	-0.55	-0.48	-0.79	-0.94	-0.87	-0.95
135°	-0.92	-1.18	-1.61	-1.97	-1.32	-0.81	-0.82	-1.58	-0.59	-0.52	-0.82
140°	-0.99	-1.42	-1.93	-2.12	-1.62	-1.54	-1.96	-2.68	-1.05	-0.71	-1.78
145°	-0.86	-1.33	-1.70	-1.71	-1.58	-1.79	-2.53	-2.83	-1.56	-1.77	-3.84
150°	-0.80	-1.21	-1.29	-1.12	-1.14	-1.61	-2.29	-2.00	-1.49	-2.18	-4.05
155°	-0.74	-1.17	-1.15	-0.84	-0.84	-1.54	-1.89	-1.21	-0.94	-2.22	-2.77
160°	-0.71	-1.02	-0.88	-0.57	-0.77	-1.49	-1.73	-0.86	-0.77	-2.32	-1.91
165°	-0.67	-0.89	-0.66	-0.40	-0.68	-1.44	-1.37	-0.53	-0.64	-2.22	-1.47
170°	-0.58	-0.79	-0.47	-0.23	-0.59	-1.32	-1.16	-0.33	-0.57	-2.09	-1.28
175°	-0.57	-0.74	-0.47	-0.21	-0.58	-1.19	-1.07	-0.25	-0.43	-1.93	-1.08
180°	-0.60	-0.75	-0.48	-0.25	-0.60	-1.21	-1.08	-0.30	-0.43	-1.95	-1.03
185°	-0.62	-0.80	-0.54	-0.29	-0.64	-1.28	-1.22	-0.39	-0.49	-2.08	-1.24
190°	-0.61	-0.83	-0.51	-0.24	-0.60	-1.36	-1.25	-0.37	-0.56	-2.18	-1.38
195°	-0.67	-0.92	-0.70	-0.43	-0.70	-1.50	-1.54	-0.64	-0.62	-2.39	-1.76
200°	-0.73	-1.05	-0.95	-0.59	-0.74	-1.52	-1.88	-0.90	-0.69	-2.49	-2.34
205°	-0.73	-1.21	-1.24	-0.88	-0.83	-1.57	-2.09	-1.29	-0.79	-2.26	-3.02
210°	-0.80	-1.26	-1.40	-1.15	-1.08	-1.56	-2.44	-2.15	-1.37	-2.11	-4.31
215°	-0.82	-1.36	-1.80	-1.80	-1.54	-1.74	-2.59	-3.04	-1.46	-1.56	-4.08
220°	-0.96	-1.42	-2.02	-2.24	-1.68	-1.46	-1.99	-3.04	-1.21	-0.72	-2.45
225°	-0.89	-1.22	-1.73	-2.11	-1.49	-0.77	-0.94	-1.76	-0.53	-0.53	-1.05
230°	-0.68	-0.84	-1.08	-1.40	-1.11	-0.54	-0.56	-0.85	-0.82	-0.94	-1.40
235°	-0.47	-0.57	-0.71	-0.96	-1.03	-0.71	-0.71	-0.85	-1.14	-0.98	-2.13
240°	-0.39	-0.46	-0.56	-0.87	-1.08	-0.81	-0.99	-1.11	-1.14	-0.86	-1.81
245°	-0.41	-0.52	-0.59	-0.81	-1.06	-0.85	-1.00	-1.36	-1.03	-0.95	-1.15
250°	-0.37	-0.57	-0.70	-0.97	-1.05	-0.80	-0.82	-1.30	-1.04	-0.75	-0.95
255°	-0.33	-0.59	-0.82	-1.15	-1.07	-0.76	-0.55	-0.81	-0.97	-1.25	-1.60
260°	-0.29	-0.57	-0.83	-1.19	-0.98	-0.73	-0.65	-0.77	-0.88	-1.16	-2.36
265°	-0.26	-0.53	-0.76	-1.02	-0.95	-0.95	-0.95	-1.06	-0.83	-0.71	-1.96
270°	-0.29	-0.51	-0.71	-0.90	-0.97	-1.02	-1.19	-1.32	-0.86	-0.41	-1.04
275°	-0.35	-0.59	-0.75	-0.86	-0.94	-0.95	-1.07	-1.21	-0.89	-0.59	-0.90
280°	-0.43	-0.70	-0.78	-0.86	-0.90	-0.77	-0.77	-0.93	-0.86	-0.76	-1.00
285°	-0.50	-0.74	-0.80	-0.87	-0.80	-0.63	-0.61	-0.73	-0.71	-0.60	-1.07
290°	-0.50	-0.72	-0.77	-0.80	-0.66	-0.59	-0.60	-0.65	-0.61	-0.54	-0.92
295°	-0.44	-0.67	-0.70	-0.66	-0.53	-0.55	-0.57	-0.60	-0.65	-0.53	-0.66
300°	-0.37	-0.63	-0.62	-0.52	-0.39	-0.46	-0.50	-0.56	-0.60	-0.46	-0.49
305°	-0.37	-0.66	-0.59	-0.38	-0.29	-0.41	-0.43	-0.51	-0.42	-0.22	-0.40
310°	-0.44	-0.70	-0.54	-0.28	-0.27	-0.42	-0.42	-0.44	-0.17	-0.06	-0.32
315°	-0.48	-0.66	-0.41	-0.17	-0.32	-0.52	-0.45	-0.34	-0.03	-0.12	-0.36
320°	-0.52	-0.63	-0.29	-0.10	-0.35	-0.57	-0.45	-0.20	-0.08	-0.29	-0.42
325°	-0.48	-0.49	-0.17	-0.09	-0.40	-0.53	-0.37	-0.08	-0.22	-0.40	-0.44
330°	-0.45	-0.37	-0.07	-0.07	-0.39	-0.48	-0.19	-0.05	-0.29	-0.36	-0.40
335°	-0.34	-0.23	0.01	-0.07	-0.35	-0.32	-0.08	-0.01	-0.28	-0.27	-0.33
340°	-0.23	-0.15	0.02	-0.07	-0.25	-0.21	0.04	-0.03	-0.20	-0.13	-0.23
345°	-0.14	-0.08	0.03	-0.03	-0.17	-0.10	0.05	-0.02	-0.11	-0.05	-0.14
350°	-0.06	-0.03	0.03	-0.01	-0.09	-0.02	0.02	-0.01	-0.03	-0.02	-0.06
355°	-0.01	0.00	0.02	0.01	-0.01	0.01	0.02	0.01	0.00	0.00	0.00

**Table A.31** Directional response for Windscreen UA-1650, Microphone Type 4950 and Microphone Preamplifier ZC-0032, with the microphone preamplifier connected to a microphone extension cable, 500 Hz – 3550 Hz, in dB

Angle	Frequency											
	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz	2240 Hz	2500 Hz	2800 Hz	3150 Hz	3550 Hz
0°	0.01	0.01	0.01	0.01	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02
5°	0.01	0.02	0.01	0.01	0.03	0.03	0.03	0.03	0.02	0.03	0.02	0.02
10°	-0.01	0.00	0.00	0.00	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.00
15°	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	-0.01
20°	0.00	0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	-0.02	-0.04
25°	-0.01	-0.01	0.00	0.00	-0.01	-0.03	-0.02	-0.03	-0.02	-0.03	-0.05	-0.07
30°	-0.01	-0.01	-0.01	-0.02	-0.02	-0.04	-0.05	-0.05	-0.04	-0.05	-0.08	-0.11
35°	-0.02	-0.03	-0.02	-0.03	-0.04	-0.06	-0.08	-0.08	-0.08	-0.07	-0.11	-0.15
40°	0.00	-0.01	-0.03	-0.03	-0.07	-0.09	-0.11	-0.12	-0.13	-0.10	-0.16	-0.21
45°	-0.02	-0.03	-0.04	-0.05	-0.10	-0.12	-0.16	-0.16	-0.17	-0.13	-0.20	-0.26
50°	-0.01	-0.03	-0.05	-0.06	-0.12	-0.16	-0.20	-0.20	-0.23	-0.18	-0.23	-0.32
55°	-0.02	-0.03	-0.06	-0.08	-0.15	-0.20	-0.24	-0.25	-0.27	-0.24	-0.26	-0.37
60°	-0.02	-0.04	-0.07	-0.10	-0.17	-0.25	-0.29	-0.30	-0.32	-0.30	-0.30	-0.40
65°	-0.03	-0.04	-0.08	-0.12	-0.19	-0.29	-0.33	-0.35	-0.38	-0.37	-0.37	-0.42
70°	-0.03	-0.05	-0.09	-0.13	-0.21	-0.34	-0.38	-0.39	-0.44	-0.43	-0.44	-0.46
75°	-0.04	-0.06	-0.10	-0.16	-0.23	-0.37	-0.45	-0.44	-0.48	-0.49	-0.52	-0.53
80°	-0.04	-0.06	-0.11	-0.17	-0.26	-0.41	-0.51	-0.50	-0.52	-0.54	-0.61	-0.62
85°	-0.06	-0.08	-0.12	-0.19	-0.28	-0.44	-0.58	-0.57	-0.58	-0.58	-0.68	-0.71
90°	-0.05	-0.07	-0.13	-0.19	-0.30	-0.47	-0.63	-0.64	-0.64	-0.61	-0.72	-0.83
95°	-0.06	-0.08	-0.14	-0.19	-0.32	-0.49	-0.67	-0.70	-0.71	-0.67	-0.75	-0.90
100°	-0.06	-0.08	-0.14	-0.21	-0.32	-0.51	-0.70	-0.75	-0.77	-0.74	-0.79	-0.94
105°	-0.06	-0.08	-0.15	-0.21	-0.34	-0.53	-0.73	-0.79	-0.82	-0.80	-0.86	-0.96
110°	-0.06	-0.09	-0.15	-0.23	-0.34	-0.54	-0.75	-0.82	-0.86	-0.84	-0.91	-1.03
115°	-0.07	-0.09	-0.15	-0.22	-0.34	-0.54	-0.76	-0.84	-0.89	-0.87	-0.94	-1.08
120°	-0.07	-0.10	-0.15	-0.22	-0.34	-0.54	-0.76	-0.84	-0.91	-0.90	-0.96	-1.09
125°	-0.06	-0.09	-0.14	-0.21	-0.34	-0.53	-0.75	-0.83	-0.91	-0.91	-0.98	-1.10
130°	-0.06	-0.09	-0.15	-0.21	-0.33	-0.52	-0.74	-0.81	-0.90	-0.90	-0.99	-1.12
135°	-0.06	-0.09	-0.14	-0.21	-0.32	-0.49	-0.72	-0.78	-0.86	-0.87	-0.96	-1.10
140°	-0.06	-0.09	-0.14	-0.20	-0.31	-0.47	-0.70	-0.75	-0.83	-0.83	-0.92	-1.06
145°	-0.06	-0.08	-0.14	-0.19	-0.31	-0.45	-0.67	-0.72	-0.78	-0.78	-0.86	-0.99
150°	-0.06	-0.08	-0.13	-0.19	-0.29	-0.43	-0.63	-0.68	-0.73	-0.72	-0.79	-0.91
155°	-0.06	-0.08	-0.13	-0.18	-0.28	-0.41	-0.60	-0.64	-0.68	-0.66	-0.71	-0.82
160°	-0.06	-0.08	-0.12	-0.17	-0.28	-0.40	-0.57	-0.61	-0.64	-0.60	-0.65	-0.74
165°	-0.05	-0.08	-0.12	-0.16	-0.27	-0.39	-0.55	-0.58	-0.60	-0.56	-0.59	-0.67
170°	-0.05	-0.08	-0.12	-0.16	-0.26	-0.38	-0.53	-0.56	-0.57	-0.52	-0.55	-0.61
175°	-0.06	-0.08	-0.12	-0.16	-0.26	-0.37	-0.52	-0.55	-0.56	-0.50	-0.51	-0.58
180°	-0.07	-0.09	-0.12	-0.16	-0.26	-0.38	-0.52	-0.54	-0.56	-0.49	-0.51	-0.57
185°	-0.05	-0.07	-0.12	-0.17	-0.26	-0.38	-0.53	-0.55	-0.56	-0.50	-0.52	-0.58
190°	-0.06	-0.09	-0.13	-0.17	-0.27	-0.39	-0.54	-0.57	-0.59	-0.53	-0.55	-0.62
195°	-0.06	-0.08	-0.12	-0.18	-0.28	-0.40	-0.56	-0.59	-0.62	-0.57	-0.60	-0.68
200°	-0.06	-0.09	-0.13	-0.18	-0.29	-0.42	-0.59	-0.63	-0.66	-0.62	-0.67	-0.76
205°	-0.07	-0.09	-0.14	-0.19	-0.30	-0.44	-0.62	-0.67	-0.71	-0.67	-0.74	-0.84
210°	-0.07	-0.09	-0.14	-0.20	-0.32	-0.46	-0.66	-0.71	-0.76	-0.73	-0.81	-0.93
215°	-0.07	-0.09	-0.15	-0.21	-0.33	-0.48	-0.70	-0.76	-0.82	-0.79	-0.88	-1.01
220°	-0.08	-0.10	-0.16	-0.23	-0.35	-0.51	-0.72	-0.79	-0.86	-0.85	-0.95	-1.08
225°	-0.08	-0.10	-0.16	-0.23	-0.36	-0.54	-0.75	-0.82	-0.90	-0.89	-0.99	-1.12
230°	-0.07	-0.10	-0.16	-0.24	-0.37	-0.56	-0.78	-0.85	-0.93	-0.93	-1.01	-1.13
235°	-0.07	-0.10	-0.17	-0.25	-0.38	-0.58	-0.80	-0.88	-0.95	-0.95	-1.01	-1.11
240°	-0.08	-0.11	-0.17	-0.25	-0.38	-0.60	-0.81	-0.89	-0.95	-0.93	-0.99	-1.10
245°	-0.08	-0.11	-0.17	-0.26	-0.39	-0.60	-0.80	-0.88	-0.93	-0.91	-0.96	-1.10
250°	-0.08	-0.10	-0.17	-0.25	-0.39	-0.60	-0.80	-0.87	-0.90	-0.88	-0.95	-1.06
255°	-0.07	-0.11	-0.18	-0.26	-0.38	-0.59	-0.78	-0.84	-0.88	-0.85	-0.90	-0.99
260°	-0.06	-0.10	-0.17	-0.25	-0.38	-0.57	-0.75	-0.81	-0.84	-0.79	-0.82	-0.95
265°	-0.07	-0.10	-0.16	-0.24	-0.37	-0.55	-0.73	-0.76	-0.78	-0.71	-0.77	-0.93
270°	-0.07	-0.10	-0.15	-0.23	-0.35	-0.53	-0.69	-0.71	-0.70	-0.64	-0.74	-0.88
275°	-0.08	-0.10	-0.15	-0.22	-0.34	-0.50	-0.64	-0.64	-0.63	-0.60	-0.71	-0.79
280°	-0.06	-0.08	-0.14	-0.21	-0.31	-0.48	-0.58	-0.56	-0.57	-0.56	-0.66	-0.69
285°	-0.06	-0.08	-0.13	-0.20	-0.30	-0.45	-0.51	-0.50	-0.52	-0.52	-0.59	-0.58
290°	-0.05	-0.08	-0.13	-0.17	-0.28	-0.41	-0.45	-0.44	-0.47	-0.47	-0.52	-0.48
295°	-0.04	-0.06	-0.11	-0.16	-0.25	-0.37	-0.39	-0.40	-0.43	-0.42	-0.43	-0.42
300°	-0.04	-0.07	-0.10	-0.14	-0.23	-0.32	-0.34	-0.35	-0.38	-0.36	-0.35	-0.40
305°	-0.03	-0.05	-0.09	-0.13	-0.20	-0.28	-0.29	-0.30	-0.34	-0.30	-0.29	-0.39
310°	-0.03	-0.05	-0.08	-0.11	-0.19	-0.23	-0.25	-0.26	-0.29	-0.23	-0.25	-0.36
315°	-0.04	-0.06	-0.07	-0.10	-0.16	-0.20	-0.21	-0.22	-0.25	-0.18	-0.23	-0.32
320°	-0.02	-0.03	-0.05	-0.08	-0.13	-0.16	-0.18	-0.18	-0.19	-0.14	-0.19	-0.27
325°	-0.02	-0.04	-0.04	-0.07	-0.11	-0.13	-0.14	-0.15	-0.15	-0.11	-0.16	-0.20
330°	-0.02	-0.03	-0.03	-0.06	-0.07	-0.08	-0.08	-0.10	-0.08	-0.07	-0.10	-0.10
335°	-0.02	-0.03	-0.03	-0.06	-0.05	-0.06	-0.06	-0.07	-0.05	-0.05	-0.08	-0.07
340°	-0.01	-0.02	-0.02	-0.04	-0.05	-0.06	-0.06	-0.07	-0.05	-0.05	-0.08	-0.07
345°	-0.01	-0.01	-0.02	-0.04	-0.04	-0.05	-0.05	-0.06	-0.04	-0.03	-0.05	-0.04
350°	-0.01	-0.02	-0.01	-0.04	-0.02	-0.04	-0.04	-0.03	-0.03	-0.02	-0.04	-0.02
355°	0.00	0.00	-0.01	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.01

**Table A.32** Directional response for Windscreen UA-1650, Microphone Type 4950 and Microphone Preamplifier ZC-0032, with the microphone preamplifier connected to a microphone extension cable, 4000 Hz – 10600 Hz, in dB

Angle	Frequency											
	4000 Hz	4500 Hz	5000 Hz	5600 Hz	6300 Hz	7100 Hz	8000 Hz	8500 Hz	9000 Hz	9500 Hz	10000 Hz	10600 Hz
0°	0.02	0.02	0.01	-0.01	-0.05	0.02	0.03	0.00	0.00	0.03	0.03	0.02
5°	0.02	0.02	-0.01	-0.02	-0.05	0.00	0.00	-0.02	-0.02	0.02	0.01	-0.01
10°	0.00	0.00	-0.04	-0.04	-0.04	-0.04	-0.09	-0.09	-0.09	-0.02	-0.06	-0.12
15°	-0.04	-0.04	-0.10	-0.09	-0.04	-0.09	-0.23	-0.20	-0.22	-0.07	-0.15	-0.28
20°	-0.09	-0.09	-0.20	-0.16	-0.06	-0.18	-0.45	-0.34	-0.41	-0.17	-0.28	-0.50
25°	-0.14	-0.14	-0.32	-0.22	-0.12	-0.29	-0.68	-0.49	-0.66	-0.30	-0.46	-0.76
30°	-0.20	-0.21	-0.45	-0.28	-0.24	-0.43	-0.88	-0.72	-0.94	-0.53	-0.66	-1.03
35°	-0.27	-0.30	-0.58	-0.36	-0.43	-0.54	-1.03	-1.09	-1.16	-0.85	-0.84	-1.24
40°	-0.34	-0.42	-0.72	-0.49	-0.65	-0.55	-1.15	-1.45	-1.39	-1.26	-1.13	-1.53
45°	-0.41	-0.55	-0.85	-0.72	-0.86	-0.58	-1.28	-1.71	-1.87	-1.54	-1.56	-1.77
50°	-0.48	-0.69	-0.99	-0.97	-0.98	-0.77	-1.54	-1.80	-2.37	-1.77	-2.07	-2.13
55°	-0.55	-0.82	-1.14	-1.17	-1.07	-1.06	-1.74	-1.97	-2.65	-2.33	-2.20	-2.76
60°	-0.63	-0.93	-1.32	-1.36	-1.33	-1.37	-1.77	-2.30	-2.72	-2.84	-2.60	-3.16
65°	-0.70	-1.04	-1.51	-1.54	-1.63	-1.45	-1.95	-2.37	-3.15	-2.86	-3.29	-3.32
70°	-0.73	-1.16	-1.65	-1.72	-1.89	-1.57	-2.38	-2.47	-3.43	-3.26	-3.31	-4.15
75°	-0.73	-1.26	-1.80	-1.91	-2.18	-1.81	-2.66	-2.83	-3.55	-3.78	-3.55	-4.26
80°	-0.74	-1.31	-1.98	-2.02	-2.45	-2.06	-2.93	-3.11	-3.81	-4.07	-4.13	-4.29
85°	-0.80	-1.29	-2.15	-2.16	-2.66	-2.36	-3.15	-3.49	-3.97	-4.30	-4.64	-4.72
90°	-0.90	-1.30	-2.20	-2.38	-2.69	-2.83	-3.34	-3.79	-4.44	-4.29	-4.89	-5.34
95°	-1.03	-1.37	-2.18	-2.56	-2.80	-3.02	-3.62	-3.86	-4.79	-4.80	-4.75	-5.62
100°	-1.16	-1.52	-2.22	-2.60	-2.97	-2.98	-4.19	-4.22	-4.81	-5.16	-5.30	-5.50
105°	-1.22	-1.68	-2.35	-2.62	-3.06	-2.99	-4.32	-4.67	-5.24	-5.28	-5.65	-6.10
110°	-1.25	-1.76	-2.55	-2.76	-3.07	-3.03	-4.29	-4.77	-5.60	-5.72	-5.92	-6.46
115°	-1.31	-1.81	-2.67	-2.95	-3.18	-3.01	-4.25	-4.71	-5.67	-6.04	-6.29	-6.73
120°	-1.34	-1.86	-2.72	-3.07	-3.36	-3.10	-4.27	-4.74	-5.65	-6.05	-6.46	-6.84
125°	-1.33	-1.86	-2.74	-3.13	-3.45	-3.25	-4.43	-4.98	-5.84	-6.10	-6.35	-6.83
130°	-1.34	-1.84	-2.71	-3.12	-3.52	-3.36	-4.51	-5.15	-6.12	-6.37	-6.51	-6.91
135°	-1.34	-1.85	-2.69	-3.03	-3.44	-3.39	-4.45	-5.10	-6.15	-6.46	-6.65	-7.07
140°	-1.30	-1.82	-2.67	-3.01	-3.39	-3.38	-4.41	-4.97	-5.90	-6.27	-6.49	-7.02
145°	-1.23	-1.74	-2.60	-2.93	-3.33	-3.36	-4.43	-4.93	-5.74	-5.95	-6.16	-6.75
150°	-1.13	-1.63	-2.47	-2.81	-3.20	-3.26	-4.39	-4.89	-5.69	-5.83	-5.96	-6.59
155°	-1.02	-1.50	-2.31	-2.64	-3.01	-3.08	-4.24	-4.72	-5.46	-5.61	-5.79	-6.50
160°	-0.92	-1.37	-2.16	-2.46	-2.80	-2.86	-3.98	-4.42	-5.15	-5.29	-5.46	-6.28
165°	-0.83	-1.25	-2.01	-2.28	-2.61	-2.60	-3.64	-4.07	-4.75	-4.87	-5.05	-5.86
170°	-0.75	-1.15	-1.90	-2.13	-2.47	-2.38	-3.36	-3.75	-4.39	-4.49	-4.69	-5.44
175°	-0.71	-1.09	-1.81	-2.04	-2.37	-2.25	-3.18	-3.54	-4.15	-4.27	-4.43	-5.19
180°	-0.69	-1.07	-1.80	-2.02	-2.34	-2.20	-3.12	-3.47	-4.07	-4.19	-4.35	-5.11
185°	-0.72	-1.09	-1.82	-2.05	-2.37	-2.24	-3.19	-3.55	-4.16	-4.29	-4.46	-5.22
190°	-0.76	-1.16	-1.90	-2.15	-2.47	-2.37	-3.37	-3.75	-4.39	-4.52	-4.70	-5.45
195°	-0.84	-1.25	-2.02	-2.29	-2.62	-2.57	-3.60	-4.03	-4.72	-4.87	-5.03	-5.84
200°	-0.94	-1.37	-2.16	-2.45	-2.80	-2.81	-3.90	-4.37	-5.11	-5.29	-5.44	-6.26
205°	-1.05	-1.50	-2.32	-2.63	-3.01	-3.06	-4.18	-4.68	-5.43	-5.61	-5.71	-6.44
210°	-1.15	-1.63	-2.47	-2.81	-3.20	-3.21	-4.33	-4.84	-5.62	-5.77	-5.82	-6.50
215°	-1.24	-1.74	-2.59	-2.95	-3.31	-3.29	-4.35	-4.88	-5.69	-5.88	-6.00	-6.67
220°	-1.31	-1.81	-2.66	-3.03	-3.35	-3.32	-4.37	-4.95	-5.85	-6.22	-6.41	-7.02
225°	-1.35	-1.84	-2.69	-3.05	-3.42	-3.36	-4.44	-5.10	-6.10	-6.49	-6.62	-7.02
230°	-1.34	-1.85	-2.74	-3.14	-3.48	-3.33	-4.46	-5.10	-6.04	-6.43	-6.48	-6.90
235°	-1.33	-1.89	-2.79	-3.15	-3.40	-3.24	-4.35	-4.96	-5.86	-6.20	-6.33	-6.87
240°	-1.36	-1.90	-2.74	-3.06	-3.30	-3.09	-4.26	-4.79	-5.67	-6.08	-6.40	-6.93
245°	-1.35	-1.83	-2.65	-2.92	-3.15	-3.00	-4.22	-4.75	-5.64	-6.04	-6.26	-6.74
250°	-1.29	-1.78	-2.53	-2.76	-3.04	-2.99	-4.29	-4.76	-5.52	-5.83	-5.91	-6.39
255°	-1.25	-1.69	-2.35	-2.63	-2.99	-3.02	-4.27	-4.60	-5.26	-5.39	-5.46	-6.11
260°	-1.20	-1.52	-2.20	-2.60	-2.93	-3.00	-4.14	-4.29	-4.80	-5.06	-5.30	-5.73
265°	-1.09	-1.37	-2.14	-2.61	-2.76	-2.97	-3.71	-3.80	-4.58	-5.00	-4.90	-5.32
270°	-0.96	-1.26	-2.18	-2.50	-2.53	-2.96	-3.18	-3.62	-4.65	-4.50	-4.50	-5.72
275°	-0.83	-1.22	-2.22	-2.21	-2.49	-2.55	-2.95	-3.76	-4.09	-4.09	-4.84	-4.95
280°	-0.72	-1.27	-2.11	-1.92	-2.48	-1.99	-3.05	-3.30	-3.66	-4.21	-4.26	-4.20
285°	-0.68	-1.31	-1.87	-1.81	-2.24	-1.70	-2.75	-2.89	-3.55	-3.82	-3.70	-4.10
290°	-0.69	-1.25	-1.64	-1.71	-1.84	-1.59	-2.45	-2.65	-3.21	-3.51	-3.33	-3.95
295°	-0.71	-1.11	-1.49	-1.56	-1.55	-1.40	-2.21	-2.29	-3.06	-3.19	-3.01	-3.61
300°	-0.68	-0.95	-1.35	-1.31	-1.34	-1.26	-1.86	-2.17	-2.84	-2.89	-2.63	-3.15
305°	-0.60	-0.83	-1.20	-1.08	-1.10	-1.05	-1.73	-1.99	-2.63	-2.54	-2.04	-3.04
310°	-0.51	-0.72	-1.03	-0.91	-0.94	-0.81	-1.61	-1.75	-2.43	-1.91	-1.96	-2.37
315°	-0.42	-0.61	-0.84	-0.72	-0.78	-0.57	-1.33	-1.62	-2.05	-1.49	-1.68	-1.81
320°	-0.35	-0.50	-0.69	-0.51	-0.62	-0.54	-1.11	-1.50	-1.46	-1.34	-1.13	-1.73
325°	-0.29	-0.38	-0.56	-0.37	-0.42	-0.58	-0.99	-1.20	-1.13	-1.01	-0.79	-1.40
330°	-0.23	-0.28	-0.44	-0.28	-0.21	-0.50	-0.90	-0.78	-0.96	-0.60	-0.73	-1.04
335°	-0.17	-0.19	-0.31	-0.21	-0.05	-0.38	-0.76	-0.47	-0.75	-0.27	-0.59	-0.76
340°	-0.12	-0.12	-0.20	-0.15	0.03	-0.25	-0.53	-0.29	-0.50	-0.14	-0.38	-0.54
345°	-0.08	-0.08	-0.11	-0.09	0.07	-0.14	-0.30	-0.17	-0.28	-0.09	-0.21	-0.35
350°	-0.04	-0.04	-0.05	-0.04	0.07	-0.07	-0.14	-0.09	-0.12	-0.06	-0.11	-0.17
355°	-0.02	-0.03	-0.01	0.00	0.06	-0.02	-0.05	-0.02	-0.02	-0.03	-0.04	-0.06

**Table A.33** Directional response for Windscreen UA-1650, Microphone Type 4950 and Microphone Preamplifier ZC-0032 with the microphone preamplifier connected to a microphone extension cable, 11200 Hz – 20000 Hz, in dB

Angle	Frequency										
	11200 Hz	11800 Hz	12500 Hz	13200 Hz	14000 Hz	15000 Hz	16000 Hz	17000 Hz	18000 Hz	19000 Hz	20000 Hz
0°	0.01	0.01	0.01	0.01	0.05	0.06	0.04	-0.03	-0.05	-0.07	-0.07
5°	-0.03	-0.02	-0.01	-0.02	-0.01	0.02	0.01	-0.08	-0.11	-0.13	-0.15
10°	-0.18	-0.09	-0.09	-0.15	-0.18	-0.08	-0.07	-0.23	-0.29	-0.33	-0.43
15°	-0.39	-0.20	-0.25	-0.38	-0.40	-0.27	-0.22	-0.44	-0.54	-0.62	-0.86
20°	-0.60	-0.37	-0.55	-0.61	-0.60	-0.55	-0.51	-0.69	-0.79	-0.93	-1.26
25°	-0.82	-0.69	-0.91	-0.73	-0.84	-0.98	-1.03	-0.95	-1.13	-1.31	-1.53
30°	-1.10	-1.21	-1.20	-0.83	-1.22	-1.71	-1.56	-1.38	-1.69	-1.91	-2.17
35°	-1.46	-1.66	-1.41	-1.27	-1.79	-2.14	-1.99	-1.92	-2.16	-2.47	-2.99
40°	-1.90	-2.03	-1.91	-1.87	-1.94	-2.39	-2.68	-2.76	-2.56	-2.84	-3.36
45°	-2.20	-2.43	-2.55	-2.18	-2.30	-3.15	-3.41	-3.26	-3.10	-3.37	-4.13
50°	-2.54	-2.94	-3.02	-2.78	-2.98	-3.39	-3.55	-4.08	-4.17	-4.26	-4.99
55°	-2.72	-3.41	-3.53	-3.51	-3.31	-3.92	-4.51	-4.77	-4.69	-4.97	-5.67
60°	-3.18	-3.84	-3.99	-4.20	-4.01	-4.61	-4.86	-5.43	-5.95	-6.26	-6.88
65°	-3.86	-4.12	-4.79	-4.58	-4.85	-5.28	-5.63	-6.05	-6.41	-7.09	-7.80
70°	-3.85	-4.98	-5.01	-5.48	-5.39	-5.92	-6.50	-6.67	-7.26	-7.68	-8.56
75°	-4.66	-4.88	-5.95	-5.67	-6.27	-6.62	-6.96	-7.73	-8.02	-8.44	-9.56
80°	-5.00	-5.41	-6.06	-6.38	-6.77	-7.34	-8.09	-8.12	-9.26	-9.41	-10.03
85°	-5.11	-5.75	-6.38	-6.90	-7.18	-8.29	-8.58	-9.56	-9.34	-10.36	-11.19
90°	-5.29	-6.28	-6.53	-7.31	-7.78	-8.64	-9.32	-10.14	-10.10	-10.84	-12.15
95°	-5.94	-6.29	-7.65	-7.33	-8.25	-8.94	-9.80	-10.02	-11.18	-11.23	-13.76
100°	-6.21	-6.94	-7.57	-8.71	-8.37	-9.22	-9.71	-10.62	-11.25	-12.68	-14.05
105°	-6.21	-7.10	-8.06	-8.49	-9.38	-9.79	-10.09	-10.68	-11.80	-13.24	-13.98
110°	-6.75	-7.23	-8.06	-8.73	-9.36	-10.25	-10.86	-11.76	-12.23	-13.07	-13.99
115°	-7.06	-7.61	-8.23	-8.84	-9.67	-10.29	-11.17	-11.97	-13.01	-14.06	-14.55
120°	-7.14	-7.82	-8.59	-9.19	-10.04	-10.52	-11.17	-12.01	-13.10	-14.13	-15.20
125°	-7.16	-7.85	-8.79	-9.53	-10.25	-10.79	-11.37	-12.13	-13.31	-14.10	-15.16
130°	-7.21	-7.83	-8.83	-9.75	-10.21	-10.65	-11.54	-12.46	-13.40	-14.29	-15.06
135°	-7.45	-8.26	-9.35	-10.15	-10.10	-10.44	-11.56	-13.17	-12.94	-14.20	-15.33
140°	-7.48	-8.53	-9.70	-10.29	-10.37	-11.05	-12.21	-13.79	-12.89	-13.67	-15.95
145°	-7.25	-8.35	-9.41	-9.83	-10.23	-11.30	-12.84	-13.68	-13.18	-14.50	-17.31
150°	-7.15	-8.13	-8.89	-9.18	-9.68	-10.91	-12.55	-12.82	-12.85	-14.71	-17.43
155°	-7.09	-8.08	-8.68	-8.88	-9.39	-10.78	-11.97	-12.03	-12.28	-14.47	-15.96
160°	-6.94	-7.83	-8.29	-8.47	-9.26	-10.75	-11.79	-11.62	-12.17	-14.61	-14.99
165°	-6.54	-7.36	-7.70	-7.90	-8.76	-10.37	-11.18	-10.99	-11.78	-14.39	-14.46
170°	-6.03	-6.83	-7.05	-7.20	-8.05	-9.60	-10.37	-10.13	-10.91	-13.48	-13.57
175°	-5.73	-6.47	-6.70	-6.80	-7.59	-8.97	-9.74	-9.50	-10.12	-12.55	-12.59
180°	-5.63	-6.34	-6.58	-6.69	-7.43	-8.78	-9.53	-9.31	-9.84	-12.22	-12.19
185°	-5.75	-6.49	-6.74	-6.86	-7.62	-9.02	-9.85	-9.59	-10.12	-12.58	-12.66
190°	-6.02	-6.84	-7.06	-7.21	-8.04	-9.61	-10.41	-10.13	-10.85	-13.42	-13.60
195°	-6.49	-7.36	-7.72	-7.95	-8.77	-10.39	-11.32	-11.04	-11.68	-14.41	-14.74
200°	-6.90	-7.84	-8.36	-8.54	-9.22	-10.71	-11.89	-11.60	-11.98	-14.58	-15.31
205°	-7.01	-8.13	-8.80	-8.96	-9.31	-10.67	-12.04	-11.99	-12.02	-14.29	-16.04
210°	-7.07	-8.21	-9.00	-9.22	-9.56	-10.76	-12.59	-13.05	-12.85	-14.51	-17.80
215°	-7.19	-8.44	-9.52	-9.99	-10.24	-11.18	-12.86	-13.99	-13.03	-14.02	-17.64
220°	-7.44	-8.56	-9.76	-10.48	-10.40	-10.85	-12.38	-14.25	-13.11	-13.74	-16.56
225°	-7.35	-8.36	-9.56	-10.44	-10.27	-10.49	-11.80	-13.31	-12.95	-13.93	-15.44
230°	-7.25	-8.15	-9.05	-9.86	-10.26	-10.64	-11.43	-12.72	-13.15	-14.02	-15.26
235°	-7.23	-7.98	-8.80	-9.74	-10.35	-10.57	-11.52	-12.16	-12.97	-13.99	-15.97
240°	-7.15	-7.91	-8.75	-9.37	-9.85	-10.47	-11.31	-12.22	-13.13	-13.61	-15.89
245°	-7.00	-7.81	-8.30	-8.88	-9.78	-10.12	-11.22	-12.69	-12.76	-13.83	-14.16
250°	-6.72	-7.42	-8.14	-8.99	-9.34	-10.08	-11.21	-11.95	-12.42	-12.34	-14.12
255°	-6.34	-7.19	-8.16	-8.87	-9.39	-9.77	-10.02	-11.00	-11.53	-13.32	-13.93
260°	-6.01	-7.17	-7.93	-8.64	-8.77	-8.93	-9.80	-10.65	-11.40	-12.26	-14.63
265°	-6.20	-6.64	-7.28	-8.15	-7.86	-9.24	-9.60	-10.64	-10.49	-11.79	-13.22
270°	-5.45	-5.90	-7.32	-6.90	-8.41	-8.14	-9.96	-9.63	-11.07	-9.77	-12.38
275°	-4.73	-6.33	-6.14	-7.32	-7.18	-8.23	-8.60	-9.99	-9.05	-10.69	-10.82
280°	-5.06	-5.61	-6.07	-6.75	-6.71	-7.61	-7.74	-8.94	-8.82	-8.99	-10.85
285°	-4.82	-5.06	-5.92	-6.07	-6.30	-6.52	-7.54	-7.32	-8.10	-8.69	-9.48
290°	-4.27	-4.69	-5.55	-5.35	-5.69	-6.03	-6.45	-6.77	-7.47	-7.58	-8.39
295°	-3.77	-4.34	-4.89	-4.70	-5.19	-4.98	-6.04	-6.23	-6.23	-7.09	-7.74
300°	-3.40	-3.73	-4.37	-4.16	-4.13	-4.70	-5.04	-5.64	-5.55	-6.04	-6.91
305°	-2.59	-3.73	-3.50	-3.67	-3.48	-4.05	-4.32	-4.99	-4.94	-5.20	-5.84
310°	-2.50	-3.09	-3.15	-2.96	-2.84	-3.70	-3.82	-4.31	-4.04	-3.89	-4.65
315°	-2.25	-2.68	-2.40	-2.49	-2.46	-3.27	-3.31	-3.29	-3.22	-3.39	-4.02
320°	-1.80	-2.32	-1.91	-1.95	-1.99	-2.78	-3.03	-2.81	-2.56	-2.89	-3.33
325°	-1.51	-1.74	-1.45	-1.56	-1.79	-2.17	-2.16	-1.92	-2.16	-2.48	-2.82
330°	-1.22	-1.32	-1.10	-1.02	-1.48	-1.92	-1.70	-1.25	-1.56	-1.88	-2.20
335°	-0.85	-0.84	-0.88	-0.72	-0.96	-1.23	-1.33	-1.01	-1.15	-1.34	-1.49
340°	-0.58	-0.45	-0.64	-0.65	-0.63	-0.63	-0.65	-0.70	-0.69	-0.80	-1.07
345°	-0.38	-0.21	-0.33	-0.48	-0.48	-0.31	-0.27	-0.38	-0.38	-0.49	-0.80
350°	-0.20	-0.08	-0.13	-0.26	-0.31	-0.16	-0.13	-0.17	-0.16	-0.23	-0.38
355°	-0.07	-0.02	-0.03	-0.09	-0.13	-0.09	-0.05	-0.03	0.00	-0.02	-0.05

**Table A.34** Sensitivity variations for Windscreen UA-1650, Microphone Type 4950 and Microphone Preamplifier ZC-0032, with the microphone preamplifier connected to a microphone extension cable, at sound incidence angles within  $\pm\theta^\circ$  from the reference direction

Nominal Frequency	Exact Frequency	Max Variation $\pm 30^\circ$ dB	Max Variation $\pm 90^\circ$ dB	Max Variation $\pm 150^\circ$ dB
<b>500 Hz</b>	501.187 Hz	0.02	0.08	0.08
<b>630 Hz</b>	630.957 Hz	0.04	0.12	0.13
<b>800 Hz</b>	794.328 Hz	0.04	0.16	0.19
<b>1000 Hz</b>	1000 Hz	0.07	0.24	0.27
<b>1250 Hz</b>	1258.93 Hz	0.12	0.38	0.42
<b>1600 Hz</b>	1584.89 Hz	0.13	0.56	0.63
<b>2000 Hz</b>	1995.26 Hz	0.14	0.72	0.84
2240 Hz	2238.72 Hz	0.16	0.74	0.92
<b>2500 Hz</b>	2511.89 Hz	0.14	0.73	0.98
2800 Hz	2818.38 Hz	0.11	0.66	0.97
<b>3150 Hz</b>	3162.28 Hz	0.16	0.77	1.04
3550 Hz	3548.13 Hz	0.17	0.90	1.15
4000 Hz	3981.07 Hz	0.25	0.98	1.38
4500 Hz	4466.84 Hz	0.30	1.34	1.93
<b>5000 Hz</b>	5011.87 Hz	0.46	2.23	2.80
5600 Hz	5623.41 Hz	0.30	2.51	3.16
<b>6300 Hz</b>	6309.57 Hz	0.31	2.76	3.59
7100 Hz	7079.46 Hz	0.52	2.97	3.40
<b>8000 Hz</b>	7943.28 Hz	0.93	3.36	4.53
8500 Hz	8413.95 Hz	0.79	3.79	5.16
9000 Hz	8912.51 Hz	0.97	4.65	6.15
9500 Hz	9440.61 Hz	0.63	4.54	6.53
<b>10000 Hz</b>	10000 Hz	0.77	4.92	6.69
10600 Hz	10592.5 Hz	1.06	5.74	7.09
11200 Hz	11220.2 Hz	1.23	5.46	7.49
11800 Hz	11885.0 Hz	1.32	6.34	8.56
<b>12500 Hz</b>	12589.3 Hz	1.21	7.33	9.77
13200 Hz	13335.2 Hz	1.03	7.33	10.50
14000 Hz	14125.4 Hz	1.53	8.46	10.45
15000 Hz	14962.4 Hz	1.98	8.71	11.37
<b>16000 Hz</b>	15848.9 Hz	1.73	10.00	12.90
17000 Hz	16788.0 Hz	1.41	10.17	14.28
18000 Hz	17782.8 Hz	1.74	11.13	13.45
19000 Hz	18836.5 Hz	1.98	10.91	14.79
<b>20000 Hz</b>	19952.6 Hz	2.27	12.45	17.87

**Table A.35** Directional response for Windscreen UA-1650, Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with the microphone preamplifier mounted directly on the analyzer, measured in a plane parallel to the display and along the microphone's axis, 500 Hz – 3550 Hz, in dB

Angle	Frequency											
	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz	2240 Hz	2500 Hz	2800 Hz	3150 Hz	3550 Hz
0°	0.00	0.01	0.00	0.00	0.02	0.01	0.01	0.01	0.01	0.00	0.01	0.00
5°	0.00	0.01	0.01	0.01	0.02	0.02	0.01	0.02	0.00	0.01	0.00	0.01
10°	-0.01	-0.01	-0.01	0.01	0.00	0.01	-0.02	0.03	-0.02	0.02	-0.03	0.01
15°	0.00	0.00	-0.01	0.01	-0.03	0.01	-0.05	0.04	-0.06	0.02	-0.07	0.01
20°	0.00	0.00	-0.01	0.02	-0.03	0.00	-0.10	0.04	-0.11	0.01	-0.13	0.02
25°	-0.02	-0.02	-0.01	0.02	-0.05	-0.04	-0.16	0.05	-0.16	0.00	-0.19	0.03
30°	-0.01	-0.01	0.00	0.01	-0.05	-0.08	-0.22	0.03	-0.18	-0.05	-0.23	0.01
35°	-0.01	-0.01	0.00	0.00	-0.03	-0.17	-0.28	-0.03	-0.18	-0.13	-0.25	-0.06
40°	0.01	0.01	0.02	-0.02	-0.02	-0.29	-0.29	-0.13	-0.15	-0.25	-0.26	-0.15
45°	0.02	0.02	0.04	-0.05	0.01	-0.43	-0.26	-0.27	-0.14	-0.35	-0.29	-0.22
50°	0.04	0.05	0.07	-0.05	0.04	-0.55	-0.20	-0.36	-0.20	-0.40	-0.36	-0.27
55°	0.04	0.06	0.08	-0.05	0.04	-0.61	-0.21	-0.39	-0.33	-0.38	-0.49	-0.31
60°	0.06	0.08	0.11	-0.05	0.05	-0.63	-0.32	-0.32	-0.53	-0.37	-0.61	-0.40
65°	0.07	0.10	0.14	-0.04	0.04	-0.59	-0.51	-0.28	-0.62	-0.50	-0.64	-0.49
70°	0.08	0.12	0.17	-0.01	0.01	-0.51	-0.74	-0.37	-0.53	-0.75	-0.63	-0.59
75°	0.09	0.13	0.18	0.02	0.00	-0.44	-0.89	-0.61	-0.46	-0.87	-0.78	-0.65
80°	0.09	0.13	0.18	0.07	-0.03	-0.41	-0.87	-0.90	-0.59	-0.77	-1.06	-0.71
85°	0.08	0.12	0.17	0.13	-0.01	-0.43	-0.72	-1.00	-0.91	-0.71	-1.13	-0.93
90°	0.08	0.11	0.15	0.18	0.03	-0.48	-0.54	-0.85	-1.17	-0.94	-1.00	-1.18
95°	0.05	0.07	0.10	0.21	0.10	-0.52	-0.45	-0.59	-1.08	-1.30	-1.06	-1.15
100°	0.01	0.03	0.03	0.19	0.19	-0.50	-0.50	-0.42	-0.74	-1.32	-1.40	-1.12
105°	-0.01	-0.02	-0.05	0.14	0.24	-0.41	-0.62	-0.45	-0.48	-0.91	-1.50	-1.34
110°	-0.06	-0.08	-0.12	0.04	0.24	-0.30	-0.66	-0.60	-0.49	-0.56	-1.06	-1.38
115°	-0.10	-0.14	-0.19	-0.07	0.19	-0.23	-0.55	-0.66	-0.68	-0.57	-0.62	-0.91
120°	-0.14	-0.19	-0.26	-0.18	0.07	-0.25	-0.38	-0.54	-0.77	-0.82	-0.65	-0.49
125°	-0.15	-0.22	-0.30	-0.29	-0.09	-0.36	-0.30	-0.35	-0.61	-0.91	-0.96	-0.63
130°	-0.17	-0.24	-0.33	-0.36	-0.24	-0.56	-0.38	-0.28	-0.41	-0.69	-1.03	-0.99
135°	-0.17	-0.24	-0.33	-0.41	-0.36	-0.77	-0.62	-0.43	-0.39	-0.49	-0.75	-0.93
140°	-0.16	-0.23	-0.31	-0.41	-0.41	-0.94	-0.94	-0.76	-0.65	-0.60	-0.61	-0.63
145°	-0.14	-0.20	-0.28	-0.38	-0.41	-1.00	-1.19	-1.12	-1.07	-1.02	-0.90	-0.68
150°	-0.12	-0.17	-0.23	-0.33	-0.35	-0.96	-1.26	-1.31	-1.39	-1.47	-1.46	-1.17
155°	-0.10	-0.14	-0.18	-0.26	-0.26	-0.84	-1.16	-1.26	-1.45	-1.65	-1.86	-1.73
160°	-0.08	-0.10	-0.14	-0.19	-0.16	-0.69	-0.95	-1.04	-1.24	-1.47	-1.80	-1.83
165°	-0.05	-0.08	-0.10	-0.13	-0.06	-0.55	-0.73	-0.76	-0.92	-1.09	-1.40	-1.44
170°	-0.04	-0.06	-0.07	-0.08	0.01	-0.44	-0.53	-0.53	-0.62	-0.73	-0.95	-0.91
175°	-0.04	-0.05	-0.06	-0.06	0.06	-0.37	-0.41	-0.38	-0.43	-0.49	-0.64	-0.54
180°	-0.05	-0.05	-0.05	-0.04	0.07	-0.35	-0.37	-0.32	-0.36	-0.40	-0.53	-0.40
185°	-0.03	-0.03	-0.06	-0.06	0.06	-0.37	-0.41	-0.37	-0.42	-0.48	-0.62	-0.53
190°	-0.05	-0.06	-0.08	-0.08	0.01	-0.44	-0.52	-0.52	-0.60	-0.72	-0.93	-0.91
195°	-0.06	-0.08	-0.10	-0.12	-0.06	-0.56	-0.71	-0.75	-0.89	-1.09	-1.37	-1.44
200°	-0.07	-0.10	-0.14	-0.17	-0.15	-0.70	-0.93	-1.02	-1.22	-1.47	-1.79	-1.86
205°	-0.10	-0.14	-0.19	-0.25	-0.26	-0.85	-1.14	-1.24	-1.44	-1.67	-1.88	-1.79
210°	-0.12	-0.17	-0.24	-0.31	-0.35	-0.96	-1.25	-1.30	-1.41	-1.50	-1.50	-1.24
215°	-0.15	-0.21	-0.28	-0.36	-0.42	-0.99	-1.19	-1.12	-1.11	-1.05	-0.94	-0.70
220°	-0.17	-0.24	-0.32	-0.40	-0.43	-0.92	-0.95	-0.79	-0.69	-0.62	-0.62	-0.59
225°	-0.18	-0.25	-0.34	-0.39	-0.38	-0.75	-0.64	-0.46	-0.41	-0.48	-0.72	-0.85
230°	-0.17	-0.25	-0.34	-0.36	-0.26	-0.54	-0.39	-0.29	-0.40	-0.65	-0.99	-0.93
235°	-0.16	-0.23	-0.32	-0.28	-0.10	-0.34	-0.31	-0.35	-0.59	-0.86	-0.95	-0.58
240°	-0.14	-0.19	-0.27	-0.17	0.06	-0.22	-0.38	-0.53	-0.74	-0.80	-0.65	-0.41
245°	-0.11	-0.14	-0.20	-0.06	0.18	-0.21	-0.54	-0.65	-0.68	-0.55	-0.59	-0.82
250°	-0.07	-0.09	-0.13	0.05	0.24	-0.27	-0.65	-0.60	-0.50	-0.51	-0.98	-1.38
255°	-0.03	-0.04	-0.05	0.13	0.25	-0.38	-0.62	-0.46	-0.46	-0.85	-1.45	-1.34
260°	0.02	0.03	0.02	0.19	0.19	-0.47	-0.51	-0.42	-0.70	-1.27	-1.39	-1.04
265°	0.04	0.05	0.08	0.21	0.12	-0.50	-0.46	-0.56	-1.04	-1.28	-1.03	-1.08
270°	0.06	0.09	0.13	0.18	0.06	-0.47	-0.53	-0.81	-1.15	-0.92	-0.95	-1.14
275°	0.06	0.10	0.16	0.14	0.01	-0.43	-0.69	-0.97	-0.90	-0.67	-1.10	-0.90
280°	0.09	0.12	0.17	0.09	0.00	-0.41	-0.85	-0.88	-0.56	-0.74	-1.02	-0.66
285°	0.08	0.11	0.16	0.04	0.01	-0.44	-0.88	-0.61	-0.44	-0.85	-0.74	-0.58
290°	0.07	0.10	0.15	0.00	0.02	-0.50	-0.74	-0.36	-0.52	-0.72	-0.58	-0.55
295°	0.07	0.09	0.12	-0.02	0.04	-0.57	-0.52	-0.25	-0.61	-0.47	-0.59	-0.48
300°	0.05	0.06	0.10	-0.04	0.04	-0.61	-0.32	-0.29	-0.53	-0.32	-0.58	-0.37
305°	0.04	0.05	0.07	-0.04	0.03	-0.60	-0.21	-0.37	-0.34	-0.34	-0.49	-0.26
310°	0.03	0.04	0.06	-0.04	0.02	-0.53	-0.21	-0.37	-0.18	-0.38	-0.36	-0.22
315°	0.00	0.01	0.04	-0.03	0.00	-0.42	-0.26	-0.27	-0.12	-0.36	-0.27	-0.20
320°	0.01	0.01	0.02	-0.02	-0.02	-0.29	-0.29	-0.14	-0.13	-0.27	-0.23	-0.13
325°	0.00	-0.01	0.01	0.00	-0.05	-0.18	-0.29	-0.05	-0.16	-0.15	-0.23	-0.03
330°	-0.01	-0.02	-0.01	0.00	-0.06	-0.09	-0.24	0.02	-0.18	-0.06	-0.22	0.04
335°	-0.01	-0.02	-0.01	0.02	-0.06	-0.04	-0.18	0.04	-0.17	0.00	-0.19	0.06
340°	-0.01	-0.02	-0.02	0.01	-0.05	-0.01	-0.12	0.04	-0.13	0.02	-0.14	0.05
345°	-0.01	-0.01	-0.02	0.00	-0.04	-0.01	-0.07	0.02	-0.08	0.02	-0.08	0.03
350°	-0.01	-0.02	0.00	0.00	-0.02	0.00	-0.04	0.01	-0.04	0.01	-0.04	0.01
355°	0.00	-0.01	-0.01	0.01	-0.01	-0.01	-0.02	0.00	-0.02	0.00	-0.01	0.00

**Table A.36** Directional response for Windscreen UA-1650, Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with the microphone preamplifier mounted directly on the analyzer, measured in a plane parallel to the display and along the microphone's axis, 4000 Hz – 10600 Hz, in dB

Angle	Frequency											
	4000 Hz	4500 Hz	5000 Hz	5600 Hz	6300 Hz	7100 Hz	8000 Hz	8500 Hz	9000 Hz	9500 Hz	10000 Hz	10600 Hz
0°	0.01	0.01	-0.01	-0.02	-0.04	0.00	0.00	-0.02	-0.01	0.01	0.01	0.00
5°	0.00	0.00	-0.03	-0.04	-0.02	-0.01	-0.02	-0.05	-0.06	-0.04	-0.04	-0.03
10°	0.00	-0.03	-0.10	-0.13	0.02	-0.06	-0.12	-0.19	-0.22	-0.18	-0.19	-0.12
15°	-0.02	-0.11	-0.22	-0.28	0.02	-0.06	-0.32	-0.41	-0.43	-0.37	-0.33	-0.20
20°	-0.06	-0.22	-0.37	-0.50	-0.11	0.00	-0.54	-0.62	-0.51	-0.46	-0.34	-0.25
25°	-0.13	-0.33	-0.45	-0.65	-0.42	0.05	-0.64	-0.73	-0.54	-0.51	-0.22	-0.30
30°	-0.22	-0.41	-0.40	-0.62	-0.61	-0.14	-0.70	-1.01	-0.95	-0.97	-0.56	-0.72
35°	-0.27	-0.41	-0.36	-0.64	-0.49	-0.39	-0.84	-1.31	-1.34	-1.20	-0.93	-1.15
40°	-0.27	-0.47	-0.52	-0.96	-0.64	-0.28	-1.18	-1.54	-1.62	-1.38	-1.25	-1.07
45°	-0.31	-0.66	-0.83	-1.32	-1.07	-0.57	-1.37	-1.65	-1.88	-1.92	-1.73	-1.67
50°	-0.46	-0.83	-0.90	-1.26	-1.01	-0.91	-1.39	-2.10	-2.28	-2.34	-2.03	-2.20
55°	-0.61	-0.77	-0.85	-1.32	-1.26	-0.95	-1.70	-2.07	-2.40	-2.57	-2.45	-2.23
60°	-0.59	-0.83	-1.22	-1.72	-1.66	-1.44	-1.91	-2.50	-2.89	-2.80	-2.88	-2.93
65°	-0.59	-1.13	-1.34	-1.64	-1.63	-1.33	-2.14	-2.60	-3.02	-3.48	-3.01	-3.39
70°	-0.71	-1.19	-1.33	-1.95	-1.93	-1.95	-2.49	-3.05	-3.26	-3.49	-3.61	-3.40
75°	-0.84	-1.15	-1.72	-2.16	-1.94	-1.83	-2.50	-3.33	-3.86	-3.84	-3.87	-3.94
80°	-0.92	-1.31	-1.62	-2.25	-2.28	-2.24	-3.01	-3.37	-4.13	-4.52	-4.08	-4.51
85°	-1.04	-1.40	-1.73	-2.65	-2.41	-2.14	-2.98	-3.83	-4.06	-4.85	-4.81	-4.60
90°	-1.28	-1.52	-1.88	-2.36	-2.75	-2.65	-3.49	-3.78	-4.58	-4.70	-5.09	-5.11
95°	-1.53	-1.80	-1.96	-2.80	-2.57	-2.66	-3.60	-4.19	-4.71	-4.94	-5.31	-5.17
100°	-1.58	-2.17	-2.43	-2.67	-2.84	-2.68	-3.85	-4.46	-4.95	-5.42	-5.11	-5.78
105°	-1.57	-2.26	-2.75	-3.34	-2.92	-2.75	-3.89	-4.51	-5.07	-5.83	-5.40	-6.12
110°	-1.72	-2.23	-2.97	-3.72	-3.46	-2.81	-3.80	-4.44	-5.03	-5.63	-6.18	-6.03
115°	-1.64	-2.27	-2.98	-3.94	-3.99	-3.67	-4.28	-4.74	-5.40	-5.39	-5.94	-5.69
120°	-1.05	-1.99	-2.72	-3.89	-4.10	-3.96	-5.11	-5.70	-5.84	-6.56	-5.90	-5.80
125°	-0.64	-1.39	-2.32	-3.27	-3.88	-4.08	-5.45	-6.55	-7.18	-7.70	-7.36	-7.27
130°	-0.93	-1.20	-1.73	-2.88	-2.95	-3.20	-5.11	-6.04	-7.16	-7.68	-8.42	-8.31
135°	-1.34	-1.69	-1.77	-2.33	-2.55	-2.34	-3.66	-4.97	-6.04	-7.21	-7.33	-7.50
140°	-1.14	-1.89	-2.39	-2.73	-2.41	-2.28	-3.14	-3.87	-4.64	-5.12	-5.57	-5.97
145°	-0.88	-1.50	-2.32	-3.34	-3.15	-2.62	-3.53	-4.25	-4.66	-5.09	-5.04	-5.06
150°	-1.21	-1.54	-1.99	-2.95	-3.26	-3.33	-4.12	-4.91	-5.41	-5.41	-5.27	-5.54
155°	-1.88	-2.24	-2.44	-2.93	-2.99	-2.92	-4.28	-5.00	-5.73	-6.36	-6.26	-6.34
160°	-2.24	-2.84	-3.28	-3.76	-3.68	-3.34	-4.18	-4.92	-5.35	-5.69	-5.96	-6.24
165°	-1.94	-2.60	-3.33	-4.18	-4.33	-4.35	-5.18	-5.89	-6.21	-6.46	-6.46	-6.47
170°	-1.33	-1.87	-2.56	-3.48	-3.68	-3.86	-5.05	-5.85	-6.48	-7.03	-7.37	-8.09
175°	-0.87	-1.27	-1.83	-2.62	-2.66	-2.64	-3.67	-4.25	-4.85	-5.37	-5.63	-6.33
180°	-0.70	-1.06	-1.56	-2.29	-2.24	-2.11	-3.03	-3.52	-4.03	-4.44	-4.58	-5.12
185°	-0.86	-1.26	-1.81	-2.60	-2.63	-2.61	-3.62	-4.22	-4.78	-5.30	-5.55	-6.26
190°	-1.33	-1.86	-2.53	-3.47	-3.65	-3.83	-4.97	-5.78	-6.41	-6.96	-7.30	-7.97
195°	-1.95	-2.61	-3.31	-4.22	-4.36	-4.30	-5.14	-5.89	-6.22	-6.40	-6.45	-6.47
200°	-2.28	-2.87	-3.31	-3.81	-3.68	-3.29	-4.17	-4.82	-5.26	-5.65	-5.93	-6.18
205°	-1.93	-2.25	-2.46	-2.90	-2.93	-2.89	-4.23	-4.99	-5.76	-6.27	-6.20	-6.30
210°	-1.22	-1.51	-1.93	-2.88	-3.21	-3.26	-4.09	-4.83	-5.30	-5.34	-5.18	-5.39
215°	-0.86	-1.43	-2.24	-3.34	-3.10	-2.50	-3.42	-4.17	-4.66	-5.01	-5.00	-4.96
220°	-1.07	-1.83	-2.39	-2.69	-2.32	-2.18	-3.11	-3.77	-4.56	-5.04	-5.36	-5.85
225°	-1.30	-1.69	-1.73	-2.26	-2.49	-2.24	-3.48	-4.76	-5.88	-6.97	-7.12	-7.23
230°	-0.97	-1.14	-1.61	-2.83	-2.81	-3.01	-4.92	-5.91	-7.05	-7.57	-8.17	-8.24
235°	-0.65	-1.26	-2.27	-3.14	-3.69	-3.98	-5.26	-6.32	-7.24	-7.70	-7.36	-7.29
240°	-0.98	-1.94	-2.66	-3.81	-4.03	-3.85	-5.07	-5.64	-5.86	-6.36	-5.88	-5.70
245°	-1.57	-2.22	-2.85	-3.85	-3.88	-3.65	-4.10	-4.63	-5.31	-5.28	-5.67	-5.65
250°	-1.62	-2.14	-2.93	-3.61	-3.44	-2.72	-3.73	-4.29	-5.01	-5.52	-6.14	-5.94
255°	-1.45	-2.24	-2.69	-3.24	-2.79	-2.63	-3.69	-4.47	-5.03	-5.72	-5.41	-5.95
260°	-1.55	-2.09	-2.35	-2.59	-2.69	-2.54	-3.76	-4.29	-4.90	-5.21	-5.16	-5.62
265°	-1.53	-1.75	-1.88	-2.70	-2.47	-2.60	-3.51	-4.06	-4.63	-4.84	-5.25	-4.91
270°	-1.23	-1.44	-1.86	-2.25	-2.55	-2.46	-3.22	-3.78	-4.46	-4.66	-5.06	-4.89
275°	-0.97	-1.36	-1.64	-2.53	-2.31	-2.09	-2.90	-3.78	-3.93	-4.83	-4.75	-4.51
280°	-0.85	-1.26	-1.58	-2.14	-2.14	-2.08	-2.93	-3.25	-4.06	-4.53	-4.06	-4.39
285°	-0.83	-1.06	-1.63	-2.10	-1.85	-1.66	-2.36	-3.22	-3.90	-3.79	-3.82	-3.78
290°	-0.67	-1.13	-1.27	-1.84	-1.77	-1.87	-2.33	-3.12	-3.24	-3.36	-3.54	-3.26
295°	-0.51	-1.07	-1.28	-1.57	-1.50	-1.17	-2.16	-2.52	-2.88	-3.41	-2.95	-3.34
300°	-0.55	-0.78	-1.13	-1.59	-1.54	-1.41	-1.75	-2.39	-2.93	-2.83	-2.97	-3.01
305°	-0.57	-0.75	-0.83	-1.26	-1.16	-0.79	-1.71	-2.14	-2.37	-2.56	-2.42	-2.17
310°	-0.41	-0.78	-0.83	-1.14	-0.90	-0.93	-1.30	-1.95	-2.16	-2.20	-1.87	-1.99
315°	-0.28	-0.61	-0.76	-1.24	-1.01	-0.45	-1.40	-1.68	-1.94	-2.00	-1.85	-1.73
320°	-0.26	-0.45	-0.49	-0.92	-0.49	-0.28	-1.10	-1.42	-1.55	-1.26	-1.14	-1.03
325°	-0.27	-0.40	-0.32	-0.55	-0.40	-0.36	-0.88	-1.32	-1.38	-1.26	-0.99	-1.14
330°	-0.21	-0.39	-0.35	-0.54	-0.56	-0.12	-0.67	-0.97	-0.90	-0.91	-0.50	-0.70
335°	-0.12	-0.33	-0.39	-0.61	-0.36	0.04	-0.62	-0.69	-0.53	-0.52	-0.25	-0.31
340°	-0.05	-0.21	-0.32	-0.48	-0.04	0.02	-0.55	-0.59	-0.51	-0.45	-0.35	-0.22
345°	-0.01	-0.11	-0.19	-0.25	0.11	-0.03	-0.33	-0.39	-0.41	-0.34	-0.33	-0.16
350°	0.00	-0.05	-0.07	-0.08	0.12	-0.04	-0.13	-0.17	-0.21	-0.17	-0.19	-0.10
355°	0.00	-0.01	-0.01	0.00	0.07	-0.01	-0.03	-0.03	-0.04	-0.05	-0.06	-0.03

**Table A.37** Directional response for Windscreen UA-1650, Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with the microphone preamplifier mounted directly on the analyzer, measured in a plane parallel to the display and along the microphone's axis, 11200 Hz – 20000 Hz. in dB

Angle	Frequency										
	11200 Hz	11800 Hz	12500 Hz	13200 Hz	14000 Hz	15000 Hz	16000 Hz	17000 Hz	18000 Hz	19000 Hz	20000 Hz
0°	0.00	0.00	0.00	0.00	0.02	0.03	0.02	-0.02	-0.04	-0.05	-0.05
5°	-0.05	-0.03	-0.03	-0.03	-0.02	-0.03	0.01	-0.08	-0.10	-0.11	-0.10
10°	-0.20	-0.13	-0.12	-0.15	-0.17	-0.19	-0.04	-0.24	-0.21	-0.24	-0.21
15°	-0.42	-0.29	-0.19	-0.31	-0.38	-0.32	-0.27	-0.43	-0.42	-0.54	-0.52
20°	-0.68	-0.56	-0.41	-0.46	-0.63	-0.69	-0.77	-0.74	-0.85	-1.06	-0.98
25°	-0.90	-0.81	-0.91	-0.77	-0.91	-1.16	-1.06	-1.06	-1.13	-1.53	-1.54
30°	-1.13	-1.18	-1.08	-1.17	-1.33	-1.53	-1.80	-1.51	-1.56	-2.24	-2.28
35°	-1.52	-1.71	-1.70	-1.52	-1.69	-1.88	-2.21	-2.35	-2.10	-2.60	-2.97
40°	-1.53	-1.93	-1.97	-2.00	-2.29	-2.40	-2.59	-2.81	-2.67	-3.05	-3.53
45°	-2.28	-2.46	-2.58	-2.68	-2.58	-3.03	-3.09	-3.31	-3.42	-3.65	-4.12
50°	-2.42	-2.70	-2.97	-3.13	-3.16	-3.63	-3.71	-3.97	-4.19	-4.44	-4.92
55°	-2.67	-2.95	-3.29	-3.50	-3.64	-4.20	-4.27	-4.64	-4.97	-5.30	-5.64
60°	-3.46	-3.71	-4.09	-4.12	-4.32	-4.75	-5.07	-5.53	-5.64	-6.15	-6.77
65°	-3.93	-4.48	-4.77	-4.97	-4.98	-5.24	-5.86	-6.32	-6.52	-7.20	-7.58
70°	-4.20	-4.83	-5.39	-5.68	-5.71	-5.73	-6.40	-7.01	-7.37	-8.07	-8.52
75°	-4.34	-5.09	-5.81	-6.28	-6.60	-6.60	-7.15	-7.63	-8.11	-8.93	-9.59
80°	-4.80	-5.16	-6.06	-6.65	-7.17	-7.54	-8.23	-8.60	-8.74	-9.84	-10.66
85°	-5.43	-5.52	-6.08	-6.96	-7.55	-8.13	-8.78	-9.73	-9.51	-10.18	-10.83
90°	-5.75	-6.07	-6.66	-7.24	-8.02	-8.64	-9.17	-9.98	-10.11	-11.02	-11.63
95°	-6.12	-6.50	-7.23	-8.23	-8.57	-8.93	-9.50	-10.48	-11.03	-12.04	-13.16
100°	-5.95	-7.02	-7.69	-8.86	-9.25	-9.43	-9.58	-10.56	-11.16	-12.60	-14.58
105°	-6.34	-7.10	-7.70	-9.15	-9.50	-9.91	-10.56	-11.32	-11.52	-13.31	-13.77
110°	-6.79	-7.50	-8.05	-9.06	-9.49	-10.11	-11.13	-12.10	-12.50	-13.50	-13.78
115°	-6.94	-7.27	-8.33	-9.45	-10.00	-10.41	-11.17	-11.81	-12.92	-14.48	-15.12
120°	-6.38	-6.57	-8.02	-8.95	-10.00	-10.64	-11.65	-12.51	-13.72	-13.80	-14.44
125°	-6.89	-7.05	-8.34	-8.42	-9.07	-9.38	-10.67	-12.15	-13.54	-15.23	-16.53
130°	-8.85	-9.72	-9.92	-9.98	-10.28	-9.56	-10.21	-11.04	-11.44	-13.42	-13.88
135°	-8.75	-10.01	-10.63	-12.39	-13.41	-12.22	-12.78	-13.87	-12.38	-13.09	-13.27
140°	-7.07	-8.03	-9.55	-11.34	-11.89	-11.75	-14.11	-16.86	-16.12	-16.82	-18.94
145°	-5.74	-6.48	-7.98	-8.50	-8.96	-10.05	-12.49	-14.06	-13.07	-14.61	-18.36
150°	-6.29	-7.40	-7.65	-7.77	-8.17	-9.18	-10.61	-10.98	-10.88	-12.96	-15.73
155°	-7.19	-7.78	-8.44	-8.87	-9.33	-10.35	-11.58	-11.42	-11.15	-13.32	-14.55
160°	-7.28	-8.36	-9.01	-9.31	-9.84	-11.29	-11.98	-11.93	-11.95	-15.11	-15.95
165°	-7.05	-7.72	-8.12	-8.41	-9.38	-10.68	-11.93	-12.17	-13.01	-15.89	-15.54
170°	-8.95	-9.25	-9.49	-9.53	-10.25	-11.03	-11.41	-11.04	-11.31	-13.95	-14.20
175°	-7.63	-8.30	-8.85	-9.32	-10.31	-11.99	-12.65	-13.09	-13.47	-16.08	-15.82
180°	-6.23	-6.88	-7.34	-7.73	-8.54	-10.09	-10.77	-11.23	-11.83	-14.59	-14.35
185°	-7.50	-8.20	-8.81	-9.27	-10.22	-11.89	-12.63	-13.08	-13.49	-16.24	-16.08
190°	-8.87	-9.32	-9.62	-9.59	-10.30	-11.07	-11.51	-11.00	-11.29	-13.90	-14.24
195°	-6.96	-7.71	-8.18	-8.43	-9.19	-10.58	-11.97	-12.17	-13.22	-16.37	-16.23
200°	-7.28	-8.45	-9.20	-9.50	-9.92	-11.29	-12.15	-11.67	-11.75	-14.93	-16.31
205°	-7.02	-7.77	-8.59	-8.72	-9.16	-10.30	-11.87	-11.62	-11.27	-13.30	-14.82
210°	-6.36	-7.49	-8.00	-7.92	-7.99	-9.04	-10.66	-11.09	-10.90	-12.70	-15.88
215°	-5.53	-6.49	-8.03	-8.68	-8.71	-9.73	-12.13	-14.03	-13.10	-14.29	-18.30
220°	-6.82	-7.99	-9.61	-11.27	-11.77	-11.47	-13.71	-16.90	-16.21	-17.05	-19.64
225°	-8.42	-9.84	-10.78	-12.32	-13.36	-12.22	-13.08	-14.18	-12.43	-13.44	-13.74
230°	-8.77	-9.74	-10.23	-10.07	-10.25	-9.47	-10.39	-11.01	-11.21	-13.41	-14.41
235°	-6.93	-7.20	-8.37	-8.53	-8.96	-9.15	-10.81	-12.02	-13.14	-14.73	-16.89
240°	-6.30	-6.64	-7.98	-9.06	-9.83	-10.34	-11.85	-12.54	-13.30	-13.57	-15.14
245°	-6.67	-7.27	-8.48	-9.49	-10.00	-10.21	-11.31	-11.92	-12.52	-13.80	-14.88
250°	-6.49	-7.61	-8.28	-9.08	-9.39	-9.86	-11.22	-12.30	-12.39	-13.05	-14.21
255°	-6.21	-7.16	-7.84	-9.19	-9.45	-9.61	-10.38	-11.27	-11.57	-12.98	-13.82
260°	-5.74	-6.99	-7.87	-8.93	-9.20	-9.33	-9.58	-10.53	-11.13	-12.47	-15.13
265°	-6.05	-6.58	-7.47	-8.25	-8.34	-8.72	-9.46	-10.48	-10.97	-11.55	-13.56
270°	-5.59	-6.17	-6.98	-7.36	-7.89	-8.53	-9.27	-10.21	-10.24	-10.63	-11.75
275°	-5.30	-5.61	-6.34	-7.15	-7.61	-8.10	-8.85	-9.55	-9.45	-10.04	-10.82
280°	-4.64	-5.27	-6.21	-6.72	-7.03	-7.21	-8.11	-8.78	-8.68	-9.54	-10.81
285°	-4.24	-5.15	-5.89	-6.27	-6.33	-6.48	-7.32	-7.59	-8.08	-8.67	-9.85
290°	-4.11	-4.85	-5.42	-5.62	-5.57	-5.93	-6.35	-6.96	-7.29	-7.92	-8.45
295°	-3.91	-4.54	-4.75	-4.78	-4.92	-5.28	-5.64	-6.47	-6.25	-6.86	-7.80
300°	-3.52	-3.83	-4.11	-3.96	-4.34	-4.65	-5.13	-5.32	-5.71	-6.08	-6.64
305°	-2.71	-3.16	-3.44	-3.36	-3.73	-4.04	-4.53	-4.39	-4.84	-5.33	-5.84
310°	-2.32	-2.82	-3.15	-2.97	-3.19	-3.46	-3.93	-3.80	-3.93	-4.17	-4.67
315°	-2.20	-2.37	-2.70	-2.65	-2.55	-2.99	-3.31	-3.22	-3.17	-3.32	-3.89
320°	-1.61	-1.98	-1.93	-2.11	-2.14	-2.52	-2.73	-2.74	-2.45	-2.83	-3.44
325°	-1.43	-1.74	-1.75	-1.52	-1.74	-1.93	-2.22	-2.20	-1.89	-2.45	-2.90
330°	-1.16	-1.17	-1.14	-1.18	-1.36	-1.52	-1.85	-1.49	-1.50	-2.13	-2.18
335°	-0.86	-0.82	-0.94	-0.79	-0.91	-1.20	-1.16	-1.04	-1.11	-1.47	-1.43
340°	-0.66	-0.56	-0.41	-0.46	-0.64	-0.74	-0.77	-0.64	-0.73	-0.96	-0.97
345°	-0.40	-0.26	-0.24	-0.31	-0.46	-0.39	-0.35	-0.37	-0.34	-0.48	-0.44
350°	-0.18	-0.13	-0.15	-0.15	-0.20	-0.25	-0.06	-0.22	-0.13	-0.14	-0.11
355°	-0.05	-0.04	-0.04	-0.03	-0.07	-0.10	-0.01	-0.05	-0.01	-0.01	0.01

**Table A.38** Directional response for Windscreen UA-1650, Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with the microphone preamplifier mounted directly on the analyzer, measured in a plane perpendicular to the display and along the microphone's axis, 500 Hz – 3550 Hz, in dB

Angle	Frequency											
	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz	2240 Hz	2500 Hz	2800 Hz	3150 Hz	3550 Hz
0°	0.00	0.01	0.00	0.01	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.00
5°	0.00	0.01	0.01	0.02	0.02	0.01	0.02	0.01	0.01	0.00	0.02	-0.02
10°	-0.01	-0.01	-0.01	0.01	0.00	0.02	0.00	0.03	-0.01	0.00	0.02	-0.04
15°	-0.01	-0.01	-0.01	0.02	-0.02	0.02	-0.03	0.05	-0.06	0.00	-0.02	-0.06
20°	-0.01	-0.01	-0.02	0.02	-0.04	0.02	-0.08	0.07	-0.11	0.02	-0.09	-0.05
25°	-0.03	-0.03	-0.03	0.03	-0.06	0.00	-0.14	0.10	-0.17	0.04	-0.21	0.01
30°	-0.02	-0.03	-0.03	0.02	-0.06	-0.04	-0.21	0.11	-0.22	0.03	-0.33	0.10
35°	-0.02	-0.03	-0.03	0.00	-0.06	-0.11	-0.27	0.06	-0.23	-0.02	-0.44	0.18
40°	0.00	-0.01	-0.01	-0.02	-0.03	-0.22	-0.29	-0.02	-0.20	-0.13	-0.46	0.13
45°	0.00	0.00	0.01	-0.03	-0.01	-0.35	-0.28	-0.14	-0.15	-0.26	-0.44	-0.07
50°	0.03	0.03	0.04	-0.04	0.01	-0.47	-0.23	-0.26	-0.16	-0.33	-0.44	-0.32
55°	0.04	0.05	0.07	-0.06	0.02	-0.56	-0.22	-0.29	-0.28	-0.28	-0.55	-0.45
60°	0.05	0.08	0.10	-0.06	0.02	-0.61	-0.29	-0.26	-0.46	-0.21	-0.72	-0.40
65°	0.07	0.10	0.14	-0.05	0.00	-0.60	-0.44	-0.22	-0.56	-0.29	-0.70	-0.46
70°	0.09	0.12	0.17	0.00	-0.03	-0.55	-0.66	-0.28	-0.52	-0.53	-0.54	-0.70
75°	0.10	0.14	0.19	0.07	-0.07	-0.49	-0.84	-0.47	-0.46	-0.70	-0.58	-0.73
80°	0.10	0.14	0.19	0.16	-0.08	-0.46	-0.91	-0.74	-0.55	-0.62	-0.89	-0.50
85°	0.08	0.12	0.17	0.23	-0.03	-0.49	-0.85	-0.89	-0.88	-0.55	-1.03	-0.63
90°	0.08	0.11	0.14	0.29	0.07	-0.55	-0.75	-0.84	-1.16	-0.80	-0.89	-0.96
95°	0.04	0.07	0.09	0.32	0.20	-0.56	-0.71	-0.70	-1.13	-1.24	-1.00	-0.87
100°	0.01	0.02	0.02	0.28	0.35	-0.49	-0.74	-0.64	-0.90	-1.33	-1.53	-0.83
105°	-0.02	-0.03	-0.06	0.22	0.43	-0.32	-0.76	-0.71	-0.79	-0.98	-1.75	-1.46
110°	-0.07	-0.09	-0.14	0.10	0.45	-0.13	-0.63	-0.75	-0.90	-0.77	-1.28	-1.79
115°	-0.11	-0.16	-0.22	-0.03	0.35	0.01	-0.37	-0.58	-0.95	-0.96	-0.94	-1.19
120°	-0.16	-0.22	-0.30	-0.17	0.17	0.01	-0.11	-0.21	-0.70	-1.06	-1.14	-0.84
125°	-0.18	-0.26	-0.37	-0.28	-0.04	-0.14	-0.02	0.10	-0.24	-0.65	-1.27	-1.10
130°	-0.20	-0.28	-0.39	-0.38	-0.26	-0.41	-0.17	0.15	0.06	-0.03	-0.73	-1.02
135°	-0.20	-0.28	-0.39	-0.43	-0.40	-0.73	-0.53	-0.13	-0.02	0.21	-0.08	-0.21
140°	-0.19	-0.27	-0.36	-0.44	-0.46	-0.99	-0.97	-0.64	-0.50	-0.12	-0.03	0.31
145°	-0.16	-0.23	-0.32	-0.41	-0.45	-1.11	-1.32	-1.15	-1.14	-0.86	-0.66	-0.04
150°	-0.14	-0.19	-0.27	-0.36	-0.36	-1.09	-1.44	-1.44	-1.62	-1.61	-1.64	-1.08
155°	-0.11	-0.15	-0.21	-0.28	-0.24	-0.95	-1.34	-1.40	-1.71	-1.90	-2.30	-2.11
160°	-0.08	-0.12	-0.16	-0.21	-0.12	-0.78	-1.11	-1.15	-1.46	-1.67	-2.25	-2.32
165°	-0.06	-0.08	-0.11	-0.13	-0.02	-0.61	-0.85	-0.83	-1.08	-1.19	-1.73	-1.77
170°	-0.05	-0.06	-0.08	-0.08	0.07	-0.47	-0.64	-0.56	-0.73	-0.75	-1.17	-1.09
175°	-0.04	-0.05	-0.06	-0.05	0.12	-0.38	-0.51	-0.38	-0.51	-0.46	-0.79	-0.62
180°	-0.05	-0.05	-0.05	-0.02	0.14	-0.35	-0.45	-0.30	-0.42	-0.34	-0.63	-0.42
185°	-0.03	-0.03	-0.06	-0.04	0.13	-0.37	-0.48	-0.33	-0.46	-0.39	-0.70	-0.50
190°	-0.05	-0.06	-0.08	-0.06	0.08	-0.45	-0.58	-0.47	-0.63	-0.62	-0.99	-0.86
195°	-0.06	-0.08	-0.11	-0.10	0.01	-0.57	-0.76	-0.69	-0.92	-1.01	-1.49	-1.46
200°	-0.08	-0.11	-0.15	-0.16	-0.09	-0.74	-0.99	-0.98	-1.29	-1.50	-2.04	-2.10
205°	-0.11	-0.15	-0.20	-0.23	-0.21	-0.91	-1.21	-1.26	-1.62	-1.86	-2.31	-2.24
210°	-0.13	-0.19	-0.26	-0.30	-0.34	-1.06	-1.35	-1.40	-1.69	-1.79	-1.90	-1.51
215°	-0.16	-0.23	-0.31	-0.37	-0.43	-1.12	-1.32	-1.26	-1.38	-1.20	-1.01	-0.46
220°	-0.19	-0.26	-0.36	-0.40	-0.48	-1.05	-1.07	-0.87	-0.80	-0.44	-0.27	0.11
225°	-0.20	-0.28	-0.38	-0.41	-0.45	-0.83	-0.70	-0.39	-0.28	0.03	-0.13	-0.14
230°	-0.20	-0.28	-0.40	-0.36	-0.34	-0.55	-0.37	-0.07	-0.07	-0.04	-0.61	-0.86
235°	-0.19	-0.26	-0.38	-0.29	-0.17	-0.27	-0.18	0.00	-0.23	-0.52	-1.17	-1.09
240°	-0.17	-0.23	-0.32	-0.18	0.02	-0.10	-0.21	-0.20	-0.60	-0.93	-1.14	-0.76
245°	-0.13	-0.18	-0.25	-0.06	0.19	-0.06	-0.38	-0.48	-0.85	-0.89	-0.86	-0.92
250°	-0.08	-0.11	-0.16	0.06	0.29	-0.15	-0.58	-0.63	-0.83	-0.69	-1.08	-1.62
255°	-0.03	-0.05	-0.07	0.15	0.32	-0.31	-0.66	-0.61	-0.75	-0.85	-1.67	-1.62
260°	0.01	0.02	0.01	0.21	0.25	-0.44	-0.63	-0.58	-0.85	-1.26	-1.68	-0.93
265°	0.03	0.05	0.08	0.23	0.15	-0.50	-0.61	-0.69	-1.11	-1.33	-1.11	-0.78
270°	0.06	0.09	0.12	0.21	0.05	-0.47	-0.70	-0.87	-1.21	-0.91	-0.85	-1.00
275°	0.06	0.10	0.16	0.16	-0.02	-0.42	-0.85	-0.95	-0.97	-0.56	-1.02	-0.77
280°	0.09	0.12	0.17	0.09	-0.04	-0.40	-0.97	-0.82	-0.62	-0.57	-1.02	-0.53
285°	0.08	0.11	0.17	0.03	-0.03	-0.45	-0.92	-0.55	-0.46	-0.71	-0.72	-0.73
290°	0.07	0.10	0.14	-0.03	0.01	-0.53	-0.74	-0.32	-0.52	-0.61	-0.61	-0.81
295°	0.06	0.09	0.12	-0.07	0.06	-0.62	-0.51	-0.23	-0.59	-0.37	-0.78	-0.49
300°	0.04	0.05	0.08	-0.09	0.06	-0.66	-0.33	-0.27	-0.52	-0.26	-0.86	-0.26
305°	0.02	0.03	0.05	-0.08	0.05	-0.63	-0.25	-0.34	-0.33	-0.37	-0.64	-0.28
310°	0.01	0.01	0.01	-0.06	0.03	-0.54	-0.26	-0.33	-0.18	-0.48	-0.37	-0.34
315°	-0.02	-0.02	-0.01	-0.04	0.00	-0.42	-0.31	-0.22	-0.16	-0.44	-0.26	-0.28
320°	-0.01	-0.02	-0.03	-0.02	-0.03	-0.28	-0.35	-0.08	-0.22	-0.27	-0.28	-0.19
325°	-0.02	-0.04	-0.04	-0.01	-0.06	-0.16	-0.34	0.03	-0.30	-0.07	-0.32	-0.12
330°	-0.03	-0.04	-0.05	0.01	-0.08	-0.07	-0.28	0.08	-0.32	0.04	-0.32	-0.10
335°	-0.03	-0.04	-0.05	0.03	-0.09	-0.02	-0.21	0.08	-0.28	0.08	-0.26	-0.09
340°	-0.02	-0.03	-0.03	0.02	-0.07	0.00	-0.13	0.06	-0.20	0.08	-0.19	-0.07
345°	-0.01	-0.01	-0.02	0.02	-0.06	0.00	-0.08	0.03	-0.13	0.06	-0.12	-0.04
350°	-0.01	-0.02	-0.01	0.00	-0.03	0.00	-0.04	0.01	-0.06	0.03	-0.07	-0.01
355°	0.00	-0.01	-0.01	0.00	-0.01	-0.01	-0.02	0.00	-0.03	0.01	-0.03	0.00

**Table A.39** Directional response for Windscreen UA-0237, Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with the microphone preamplifier mounted directly on the analyzer, measured in a plane perpendicular to the display and along the microphone's axis, 4000 Hz – 10600 Hz, in dB

Angle	Frequency											
	4000 Hz	4500 Hz	5000 Hz	5600 Hz	6300 Hz	7100 Hz	8000 Hz	8500 Hz	9000 Hz	9500 Hz	10000 Hz	10600 Hz
0°	0.00	0.00	-0.01	-0.02	-0.05	0.00	0.00	-0.02	-0.01	0.01	0.01	0.00
5°	0.03	0.00	0.00	-0.06	-0.10	0.02	-0.02	-0.03	0.07	0.04	0.02	0.06
10°	0.06	0.01	0.02	-0.08	-0.19	0.02	-0.08	-0.02	0.17	0.00	-0.03	0.05
15°	0.09	0.01	0.04	-0.08	-0.33	-0.04	-0.07	0.02	0.17	-0.24	-0.15	-0.13
20°	0.13	-0.01	0.05	0.00	-0.36	-0.21	0.02	-0.10	-0.20	-0.76	-0.32	-0.48
25°	0.12	-0.09	-0.01	0.04	-0.17	-0.42	-0.02	-0.62	-0.92	-0.98	-0.38	-0.76
30°	0.04	-0.21	-0.14	-0.11	0.06	-0.44	-0.44	-1.04	-1.01	-0.55	-0.50	-0.80
35°	-0.13	-0.30	-0.32	-0.50	-0.22	-0.25	-0.86	-0.79	-1.03	-0.94	-1.31	-0.98
40°	-0.26	-0.30	-0.45	-0.68	-0.86	-0.50	-0.80	-1.10	-1.86	-1.85	-1.36	-1.04
45°	-0.23	-0.32	-0.57	-0.58	-0.80	-1.00	-0.92	-1.67	-1.55	-1.78	-1.36	-1.72
50°	-0.08	-0.50	-0.74	-0.73	-0.81	-0.59	-1.27	-1.63	-2.21	-2.51	-2.18	-1.85
55°	-0.05	-0.74	-0.84	-1.07	-1.46	-1.38	-1.03	-1.96	-2.49	-2.25	-2.81	-2.61
60°	-0.33	-0.75	-0.87	-1.28	-1.27	-1.28	-1.80	-1.95	-2.60	-3.22	-2.25	-2.63
65°	-0.62	-0.65	-1.07	-1.37	-1.48	-1.59	-1.40	-2.68	-2.89	-3.14	-3.64	-2.96
70°	-0.61	-0.90	-1.20	-1.50	-1.84	-1.90	-2.32	-2.29	-3.53	-3.54	-3.55	-3.99
75°	-0.65	-1.26	-1.13	-1.69	-1.90	-1.94	-2.00	-3.27	-3.14	-4.24	-3.67	-3.91
80°	-0.92	-1.20	-1.43	-1.73	-2.01	-2.42	-2.52	-3.13	-4.17	-3.89	-4.76	-3.93
85°	-0.82	-1.35	-1.88	-1.89	-2.27	-2.37	-2.84	-3.14	-4.46	-4.67	-4.30	-5.17
90°	-0.67	-1.58	-1.74	-2.32	-2.20	-2.57	-2.96	-3.94	-3.88	-5.43	-4.75	-4.92
95°	-1.07	-1.27	-2.08	-2.45	-2.86	-2.56	-3.18	-3.75	-4.71	-4.98	-5.32	-5.30
100°	-1.14	-1.59	-1.97	-2.61	-2.87	-3.00	-3.17	-3.98	-4.83	-5.08	-5.69	-5.19
105°	-0.97	-1.82	-1.97	-2.70	-3.08	-3.33	-3.81	-3.90	-4.75	-5.38	-5.64	-5.61
110°	-1.64	-1.59	-2.49	-2.63	-3.09	-3.12	-3.98	-5.17	-5.29	-5.72	-5.43	-6.10
115°	-2.04	-2.45	-2.31	-3.18	-3.10	-3.31	-3.91	-4.44	-5.96	-6.63	-6.63	-5.88
120°	-1.22	-2.64	-3.08	-3.03	-3.57	-3.27	-3.95	-5.24	-5.58	-5.98	-7.04	-7.01
125°	-0.93	-1.62	-3.07	-3.91	-3.57	-3.88	-4.44	-4.79	-5.79	-7.00	-6.46	-6.42
130°	-1.30	-1.68	-1.99	-3.28	-4.45	-3.87	-4.36	-5.79	-6.88	-6.95	-6.72	-6.79
135°	-0.89	-1.93	-2.26	-2.49	-2.90	-4.17	-5.06	-5.66	-6.32	-7.43	-8.17	-7.83
140°	0.08	-0.87	-2.10	-2.96	-3.14	-2.69	-3.73	-5.11	-6.56	-7.10	-7.23	-7.60
145°	0.28	-0.07	-0.87	-1.95	-3.03	-3.54	-3.68	-4.31	-5.01	-5.45	-5.61	-6.27
150°	-0.60	-0.59	-0.69	-1.02	-1.40	-2.13	-3.42	-4.76	-5.80	-6.35	-5.98	-5.30
155°	-2.01	-2.15	-1.95	-1.90	-1.60	-1.37	-1.73	-2.55	-3.59	-4.53	-5.24	-5.94
160°	-2.73	-3.44	-3.64	-3.93	-3.87	-3.24	-3.03	-3.31	-3.66	-3.80	-3.85	-4.02
165°	-2.25	-3.13	-3.86	-4.71	-5.50	-5.85	-6.35	-7.00	-7.34	-7.35	-7.29	-6.80
170°	-1.40	-2.09	-2.82	-3.61	-4.25	-4.95	-5.92	-7.18	-8.18	-9.01	-9.98	-11.28
175°	-0.77	-1.30	-1.88	-2.46	-2.79	-3.09	-3.60	-4.47	-5.20	-5.80	-6.14	-7.06
180°	-0.51	-0.98	-1.50	-1.98	-2.18	-2.31	-2.60	-3.35	-3.97	-4.40	-4.60	-5.17
185°	-0.62	-1.12	-1.66	-2.18	-2.42	-2.61	-3.03	-3.87	-4.55	-5.06	-5.39	-6.01
190°	-1.09	-1.72	-2.38	-3.06	-3.53	-4.01	-4.93	-6.12	-7.04	-7.88	-8.68	-9.51
195°	-1.86	-2.69	-3.46	-4.28	-5.01	-5.73	-6.92	-7.84	-8.45	-8.86	-8.81	-8.50
200°	-2.55	-3.37	-3.89	-4.35	-4.61	-4.47	-4.25	-4.37	-4.67	-4.70	-4.35	-4.33
205°	-2.36	-2.69	-2.65	-2.64	-2.41	-1.96	-1.85	-2.53	-3.40	-4.02	-4.33	-5.06
210°	-1.17	-1.18	-1.13	-1.37	-1.50	-1.68	-2.88	-4.39	-5.69	-6.35	-6.33	-6.06
215°	-0.09	-0.33	-0.86	-1.76	-2.58	-3.36	-4.20	-4.44	-4.68	-4.82	-4.81	-5.16
220°	0.06	-0.77	-1.88	-2.87	-3.18	-2.81	-2.65	-3.77	-5.46	-6.78	-7.37	-7.43
225°	-0.71	-1.78	-2.31	-2.49	-2.52	-2.88	-4.91	-6.26	-6.75	-7.24	-7.33	-7.68
230°	-1.32	-1.63	-1.74	-2.64	-3.68	-4.52	-4.33	-5.23	-6.75	-7.25	-7.03	-6.50
235°	-0.90	-1.29	-2.50	-3.80	-4.04	-3.49	-4.65	-5.26	-5.63	-6.53	-6.75	-6.75
240°	-0.85	-2.22	-3.33	-3.31	-3.33	-3.62	-3.53	-4.74	-5.93	-6.38	-6.88	-7.10
245°	-1.73	-2.68	-2.34	-2.99	-3.33	-3.00	-4.32	-4.80	-5.99	-6.49	-5.96	-6.00
250°	-1.88	-1.70	-2.34	-2.88	-2.87	-3.49	-3.92	-4.85	-5.02	-5.94	-6.32	-5.87
255°	-1.08	-1.69	-2.29	-2.51	-3.31	-3.26	-3.61	-4.26	-5.28	-5.42	-5.56	-5.51
260°	-1.02	-1.78	-1.79	-2.82	-2.95	-2.90	-3.61	-4.03	-4.64	-5.16	-5.38	-5.94
265°	-1.21	-1.27	-2.23	-2.59	-2.56	-2.99	-3.06	-3.78	-4.55	-5.37	-5.26	-5.35
270°	-0.81	-1.54	-1.96	-2.12	-2.60	-2.56	-3.03	-3.77	-4.49	-4.95	-4.84	-5.65
275°	-0.77	-1.63	-1.65	-2.13	-2.26	-2.39	-2.92	-3.35	-4.23	-4.66	-5.30	-4.51
280°	-1.04	-1.15	-1.51	-2.01	-1.98	-2.40	-2.42	-3.22	-4.20	-4.42	-4.55	-4.34
285°	-0.80	-1.06	-1.45	-1.60	-1.94	-2.16	-2.24	-3.39	-3.35	-4.42	-3.98	-4.14
290°	-0.51	-1.04	-1.32	-1.56	-1.80	-1.74	-2.44	-2.40	-3.84	-3.68	-3.72	-3.83
295°	-0.51	-0.97	-0.97	-1.44	-1.60	-1.81	-1.52	-2.94	-2.93	-3.37	-3.45	-2.92
300°	-0.47	-0.86	-0.93	-1.28	-1.24	-1.50	-1.99	-2.01	-2.83	-3.02	-2.67	-3.04
305°	-0.36	-0.64	-0.97	-1.10	-1.32	-1.31	-1.24	-2.16	-2.44	-2.78	-2.93	-2.96
310°	-0.29	-0.46	-0.80	-0.87	-1.14	-0.73	-1.33	-1.68	-2.41	-2.35	-2.00	-1.89
315°	-0.21	-0.47	-0.56	-0.63	-0.79	-1.24	-1.01	-1.71	-1.58	-2.17	-1.96	-1.94
320°	-0.07	-0.53	-0.45	-0.67	-0.70	-0.59	-0.90	-1.29	-1.78	-1.64	-1.52	-1.28
325°	0.07	-0.43	-0.40	-0.68	-0.36	-0.27	-0.93	-0.86	-1.27	-1.38	-1.28	-1.13
330°	0.13	-0.21	-0.22	-0.35	-0.23	-0.55	-0.55	-0.99	-0.83	-0.89	-0.67	-0.78
335°	0.12	-0.02	-0.01	0.00	-0.34	-0.50	-0.15	-0.78	-0.95	-0.89	-0.72	-0.82
340°	0.05	0.07	0.10	0.15	-0.32	-0.24	-0.04	-0.20	-0.63	-0.55	-0.53	-0.47
345°	0.00	0.07	0.10	0.14	-0.17	-0.09	-0.10	0.09	-0.26	-0.20	-0.26	-0.12
350°	-0.02	0.04	0.06	0.10	-0.03	-0.04	-0.10	0.11	-0.08	-0.07	-0.11	-0.04
355°	-0.02	0.01	0.02	0.06	0.05	-0.01	-0.04	0.06	-0.02	-0.02	-0.04	-0.03

**Table A.40** Directional response for Windscreen UA-1650, Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with the microphone preamplifier mounted directly on the analyzer, measured in a plane perpendicular to the display and along the microphone's axis, 11200 Hz – 20000 Hz, in dB

Angle	Frequency										
	11200 Hz	11800 Hz	12500 Hz	13200 Hz	14000 Hz	15000 Hz	16000 Hz	17000 Hz	18000 Hz	19000 Hz	20000 Hz
0°	0.00	-0.01	0.00	0.00	0.02	0.03	0.00	-0.03	-0.05	-0.05	-0.05
5°	0.00	0.02	0.05	0.00	-0.04	-0.02	-0.02	-0.07	-0.09	-0.08	-0.09
10°	-0.09	0.01	0.02	-0.08	-0.16	-0.14	-0.12	-0.19	-0.14	-0.26	-0.31
15°	-0.32	0.00	-0.10	-0.22	-0.34	-0.24	-0.45	-0.21	-0.35	-0.70	-0.68
20°	-0.73	-0.26	-0.33	-0.44	-0.61	-0.48	-0.73	-0.43	-0.85	-0.98	-0.87
25°	-0.92	-0.84	-0.78	-0.62	-0.89	-1.15	-0.98	-0.95	-0.97	-1.60	-1.62
30°	-0.87	-1.02	-1.10	-1.07	-1.30	-1.22	-1.76	-1.19	-1.54	-2.02	-2.08
35°	-1.47	-1.53	-1.30	-1.38	-1.58	-1.89	-2.02	-1.91	-1.76	-2.68	-2.81
40°	-1.69	-1.56	-2.09	-2.11	-2.04	-2.09	-2.56	-2.70	-2.27	-2.98	-3.44
45°	-1.93	-2.29	-2.45	-2.17	-2.49	-2.47	-3.28	-3.16	-3.07	-3.48	-3.96
50°	-2.24	-2.42	-2.41	-2.76	-3.19	-3.26	-3.61	-3.58	-3.91	-4.23	-4.59
55°	-3.04	-2.97	-3.43	-3.64	-3.97	-3.80	-4.11	-4.20	-4.70	-5.27	-5.64
60°	-2.93	-3.50	-3.83	-4.35	-4.18	-4.35	-4.88	-4.91	-5.49	-6.21	-6.64
65°	-3.46	-3.75	-4.36	-4.55	-4.71	-4.59	-5.66	-5.77	-6.30	-6.77	-7.45
70°	-4.06	-4.38	-4.83	-5.27	-5.21	-5.20	-5.85	-6.85	-6.87	-7.90	-8.40
75°	-4.79	-4.78	-5.43	-5.88	-6.22	-5.98	-6.39	-7.19	-8.08	-8.68	-9.42
80°	-4.80	-5.61	-5.69	-6.27	-6.79	-7.24	-7.65	-7.84	-8.46	-9.86	-10.20
85°	-4.83	-5.73	-6.40	-6.49	-7.09	-7.91	-9.14	-9.50	-9.19	-9.97	-11.02
90°	-5.72	-6.06	-6.78	-6.86	-7.68	-8.27	-9.72	-9.85	-9.94	-10.75	-11.79
95°	-5.84	-6.26	-7.79	-7.61	-8.10	-9.00	-9.84	-9.93	-10.66	-12.25	-13.42
100°	-6.59	-6.51	-7.84	-8.58	-9.16	-9.10	-9.22	-9.93	-11.13	-12.74	-13.95
105°	-6.53	-6.65	-8.34	-8.78	-9.11	-9.58	-10.44	-11.05	-11.56	-13.19	-14.28
110°	-6.45	-6.59	-8.27	-8.85	-9.87	-9.98	-10.70	-11.61	-12.31	-13.30	-13.96
115°	-6.27	-7.01	-8.15	-8.43	-9.88	-9.69	-11.18	-11.85	-13.11	-14.23	-15.30
120°	-6.95	-7.45	-8.03	-8.64	-10.08	-9.27	-11.05	-11.52	-14.03	-14.19	-15.83
125°	-7.32	-8.23	-8.91	-9.58	-10.46	-9.13	-10.91	-11.71	-12.85	-13.94	-15.49
130°	-7.44	-7.79	-8.88	-10.04	-10.87	-9.83	-12.07	-12.64	-12.40	-14.45	-14.57
135°	-7.54	-7.93	-9.37	-10.83	-10.55	-9.64	-12.01	-13.54	-12.31	-14.60	-15.87
140°	-8.30	-9.70	-10.82	-11.65	-10.65	-10.69	-13.07	-14.39	-12.22	-13.79	-16.87
145°	-7.69	-8.75	-10.06	-10.69	-10.81	-12.68	-15.19	-14.86	-13.38	-15.28	-19.18
150°	-5.80	-6.70	-7.63	-8.56	-9.89	-11.34	-12.90	-12.37	-13.43	-15.92	-20.27
155°	-6.90	-7.53	-8.40	-8.11	-8.01	-8.60	-9.99	-10.72	-11.72	-14.43	-16.35
160°	-4.85	-5.67	-6.43	-7.10	-8.49	-10.11	-11.66	-10.79	-10.76	-12.81	-12.70
165°	-6.90	-7.06	-7.01	-6.86	-7.10	-8.23	-9.07	-9.28	-10.23	-13.10	-13.78
170°	-12.00	-12.88	-13.60	-13.69	-13.79	-14.07	-14.08	-12.86	-13.49	-15.34	-14.60
175°	-8.34	-9.02	-9.95	-10.71	-12.31	-13.81	-15.68	-16.17	-17.30	-21.35	-23.25
180°	-6.17	-6.58	-7.12	-7.59	-8.56	-9.67	-10.69	-10.87	-11.37	-14.21	-14.53
185°	-7.04	-7.57	-8.23	-8.87	-10.04	-11.29	-12.72	-12.93	-13.66	-16.94	-17.82
190°	-10.66	-11.79	-13.16	-14.22	-15.66	-16.85	-18.20	-16.68	-17.54	-19.58	-18.56
195°	-8.77	-9.12	-9.03	-8.54	-8.64	-9.49	-9.86	-9.54	-10.02	-12.68	-13.30
200°	-5.06	-5.62	-6.14	-6.52	-7.55	-9.25	-11.39	-11.32	-11.85	-14.82	-14.78
205°	-6.36	-7.65	-9.05	-9.31	-9.09	-9.51	-10.30	-9.95	-10.14	-12.94	-15.43
210°	-6.25	-6.73	-7.20	-7.41	-8.33	-9.97	-12.11	-11.90	-11.62	-13.70	-17.68
215°	-6.37	-7.86	-9.64	-10.19	-10.02	-11.19	-14.37	-15.96	-14.09	-14.47	-18.12
220°	-7.96	-8.92	-10.70	-12.14	-11.40	-10.26	-12.37	-15.33	-13.39	-12.90	-15.73
225°	-8.12	-8.35	-9.10	-10.40	-11.42	-9.54	-10.76	-13.84	-13.81	-13.97	-16.05
230°	-7.18	-8.17	-8.78	-9.27	-11.29	-10.84	-11.02	-12.53	-12.79	-13.93	-16.70
235°	-7.03	-8.19	-9.60	-8.98	-9.87	-10.32	-11.15	-12.76	-12.29	-13.77	-15.49
240°	-6.77	-6.84	-8.83	-9.18	-9.98	-9.95	-10.69	-12.14	-12.54	-14.29	-15.71
245°	-7.09	-6.99	-8.54	-8.57	-9.39	-9.87	-11.40	-12.14	-12.24	-14.23	-15.55
250°	-6.52	-6.75	-8.23	-9.10	-9.85	-9.25	-10.70	-12.40	-12.49	-13.48	-14.32
255°	-6.46	-7.22	-8.27	-8.60	-9.51	-9.85	-10.37	-11.23	-11.74	-12.76	-15.12
260°	-6.01	-6.81	-7.81	-9.09	-8.95	-9.09	-10.13	-10.40	-11.62	-12.50	-14.50
265°	-5.67	-7.14	-7.22	-8.29	-8.76	-8.59	-9.61	-10.13	-10.66	-12.00	-14.50
270°	-5.40	-6.31	-6.88	-7.59	-7.99	-8.85	-9.57	-10.31	-10.22	-11.07	-11.56
275°	-5.41	-5.84	-6.10	-7.13	-7.53	-8.34	-9.35	-9.69	-9.72	-10.80	-11.59
280°	-5.06	-5.08	-6.01	-6.26	-7.21	-7.57	-8.37	-8.42	-8.94	-9.56	-10.79
285°	-4.49	-4.80	-5.35	-6.12	-6.59	-7.02	-7.12	-7.42	-7.87	-8.91	-9.89
290°	-3.88	-4.35	-5.03	-5.67	-6.01	-6.19	-6.13	-6.85	-7.40	-8.18	-8.97
295°	-3.68	-4.03	-4.77	-5.09	-5.37	-5.27	-5.63	-6.57	-6.45	-7.31	-8.04
300°	-3.52	-4.07	-4.27	-4.48	-4.53	-4.67	-5.23	-5.54	-5.94	-6.22	-7.21
305°	-3.23	-3.36	-3.45	-3.34	-3.96	-4.09	-4.59	-4.53	-5.29	-5.55	-6.23
310°	-2.38	-2.60	-2.93	-2.83	-3.34	-3.53	-4.25	-3.87	-4.12	-4.62	-5.24
315°	-2.21	-2.62	-2.96	-2.79	-2.83	-3.16	-3.56	-3.26	-3.22	-3.81	-4.49
320°	-1.83	-1.67	-1.87	-2.17	-2.29	-2.55	-2.80	-3.03	-2.68	-3.25	-3.87
325°	-1.68	-1.90	-1.78	-1.59	-1.97	-2.14	-2.31	-2.08	-2.12	-2.72	-3.13
330°	-0.93	-0.94	-1.05	-1.24	-1.49	-1.50	-2.07	-1.66	-1.79	-2.41	-2.43
335°	-1.11	-1.13	-0.98	-0.97	-1.12	-1.22	-1.17	-1.06	-1.05	-1.70	-1.89
340°	-0.75	-0.49	-0.34	-0.41	-0.84	-0.78	-0.95	-0.69	-0.86	-1.14	-1.05
345°	-0.16	0.00	-0.20	-0.26	-0.53	-0.40	-0.66	-0.28	-0.56	-0.84	-0.82
350°	-0.01	0.00	-0.22	-0.22	-0.21	-0.21	-0.15	-0.25	-0.06	-0.35	-0.29
355°	-0.01	-0.02	-0.11	-0.09	-0.05	-0.08	0.00	-0.07	0.07	-0.03	-0.01

**Table A.41** Sensitivity variations of Windscreen UA-1650, Microphone Type 4950, Microphone Preamplifier ZC-0032 and the analyzer with the microphone preamplifier mounted directly on the analyzer, at sound incidence angles within  $\pm\theta^\circ$  from the reference direction.

Nominal Frequency	Exact Frequency	Max Variation $\pm 30^\circ$ dB	Max Variation $\pm 90^\circ$ dB	Max Variation $\pm 150^\circ$ dB
<b>500 Hz</b>	501.187 Hz	0.03	0.13	0.30
<b>630 Hz</b>	630.957 Hz	0.06	0.19	0.42
<b>800 Hz</b>	794.328 Hz	0.06	0.24	0.59
<b>1000 Hz</b>	1000 Hz	0.04	0.38	0.76
<b>1250 Hz</b>	1258.93 Hz	0.11	0.16	0.92
<b>1600 Hz</b>	1584.89 Hz	0.12	0.68	1.14
<b>2000 Hz</b>	1995.26 Hz	0.30	0.99	1.46
2240 Hz	2238.72 Hz	0.12	1.11	1.59
<b>2500 Hz</b>	2511.89 Hz	0.33	1.22	1.74
2800 Hz	2818.38 Hz	0.14	1.02	2.00
<b>3150 Hz</b>	3162.28 Hz	0.35	1.15	1.92
3550 Hz	3548.13 Hz	0.20	1.35	2.10
4000 Hz	3981.07 Hz	0.36	1.41	2.33
4500 Hz	4466.84 Hz	0.49	1.70	2.75
<b>5000 Hz</b>	5011.87 Hz	0.55	2.06	3.43
5600 Hz	5623.41 Hz	0.79	2.80	4.08
6300 Hz	6309.57 Hz	0.72	2.86	4.57
7100 Hz	7079.46 Hz	0.60	2.70	4.57
<b>8000 Hz</b>	7943.28 Hz	0.73	3.51	5.47
8500 Hz	8413.95 Hz	1.15	4.05	6.66
9000 Hz	8912.51 Hz	1.18	4.75	7.41
9500 Hz	9440.61 Hz	1.02	5.47	7.74
<b>10000 Hz</b>	10000 Hz	0.74	5.32	8.45
10600 Hz	10592.5 Hz	0.88	5.71	8.37
11200 Hz	11220.2 Hz	1.17	5.75	8.86
11800 Hz	11885.0 Hz	1.19	6.33	10.02
<b>12500 Hz</b>	12589.3 Hz	1.19	7.03	10.87
13200 Hz	13335.2 Hz	1.25	7.59	12.40
14000 Hz	14125.4 Hz	1.51	8.04	13.43
15000 Hz	14962.4 Hz	1.56	8.89	12.71
<b>16000 Hz</b>	15848.9 Hz	2.09	9.73	15.21
17000 Hz	16788.0 Hz	1.70	10.35	16.94
18000 Hz	17782.8 Hz	1.86	10.31	16.29
19000 Hz	18836.5 Hz	2.46	11.12	17.11
<b>20000 Hz</b>	19952.6 Hz	2.49	11.84	20.32

**Table A.42** Microphone Type 4950 is not specified together with Outdoor Microphone Kit UA-140.

**Table A.43** Microphone Type 4950 is not specified together with Outdoor Microphone Kit UA-140.

**Table A.44** Microphone Type 4950 is not specified together with Outdoor Microphone Kit UA-140.

**Table A.45** Microphone Type 4950 is not specified together with Outdoor Microphone Kit UA-140.

**Table A.46** Microphone Type 4950 is not specified together with Outdoor Microphone Kit UA-140.

**Table A.47** Microphone Type 4950 is not specified together with Outdoor Microphone Kit UA-140.

**Table A.48** Microphone Type 4950 is not specified together with Outdoor Microphone Kit UA-140.

## A.6 Periodic Testing of Acoustical Frequency Responses

This section gives the adjustment data that must be applied to sound levels displayed in response to the sound pressure produced by Multifunction Acoustic Calibrator Type 4226, or in response to simulation of sound pressure by Electrostatic Actuator UA-0033, in order to obtain the equivalent sound levels that would be displayed under reference environmental conditions in response to plane progressive sinusoidal sound waves incident from the reference direction. See Table A.49 and Table A.50 to view the data.

**Table A.49** Acoustical test with Multifunction Acoustic Calibrator Type 4226. Adjustment data that must be applied to the readings of the analyzer in order to obtain equivalent sound levels that would be displayed in response to plane progressive sinusoidal sound waves incident from the reference direction

Nominal Frequency	Correction Data For Preamplifier Connected to an Extension Cable dB	Expanded Uncertainty dB	Correction Data For Preamplifier Mounted Directly on the Analyzer dB	Expanded Uncertainty dB
31.5 Hz	0.00	0.30	0.00	0.32
63 Hz	0.00	0.06	0.00	0.12
125 Hz	0.00	0.05	0.00	0.11
250 Hz	0.01	0.05	0.07	0.11
500 Hz	0.06	0.05	0.28	0.11
1000 Hz	0.14	0.05	0.05	0.11
2000 Hz	0.33	0.09	0.32	0.14
4000 Hz	1.17	0.11	1.11	0.19
8000 Hz	3.85	0.22	3.68	0.30
12500 Hz	7.36	0.27	7.45	0.34
16000 Hz	8.90	0.32	8.89	0.38

**Table A.50** Acoustical test with Electrostatic Actuator UA-0033. Adjustment data that must be applied to the readings of the analyzer in order to obtain equivalent sound levels that would be displayed in response to plane progressive sinusoidal sound waves incident from the reference direction

Nominal Frequency	Exact Frequency	Correction Data For Preamplifier Connected to an Extension Cable dB	Expanded Uncertainty dB	Correction Data For Preamplifier Mounted Directly on the Analyzer dB	Expanded Uncertainty dB
31.5 Hz	31.6228 Hz	-0.03	0.02	-0.03	0.10
63 Hz	63.0957 Hz	-0.01	0.02	-0.01	0.10
125 Hz	125.893 Hz	0.00	0.02	0.00	0.10
250 Hz	251.189 Hz	0.01	0.02	0.07	0.10
500 Hz	501.187 Hz	0.04	0.02	0.26	0.10
1000 Hz	1000.00 Hz	0.11	0.02	0.02	0.10
2000 Hz	1995.26 Hz	0.34	0.05	0.33	0.11
4000 Hz	3981.07 Hz	1.17	0.08	1.11	0.17
8000 Hz	7943.28 Hz	4.00	0.09	3.83	0.22
12500 Hz	12589.3 Hz	8.46	0.11	8.55	0.23
16000 Hz	15848.9 Hz	10.19	0.12	10.18	0.23

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**HEADQUARTERS:** Brüel & Kjær Sound & Vibration Measurement A/S · DK-2850 Nærum · Denmark  
Telephone: +45 7741 2000 · Fax: +45 4580 1405 · [www.bksv.com](http://www.bksv.com) · [info@bksv.com](mailto:info@bksv.com)

Local representatives and service organisations worldwide

