RION

Noise Dosimeter NB-14

Instruction Manual

Technical Guide

Organization of the NB-14 Instruction Manual

There are four types of instruction manuals for Noise Dosimeter NB-14.

Quick Start Guide

This manual describes the basic handling of Noise Dosimeter NB-14.

Hardware Guide

This manual describes the detailed instructions for handling Noise Dosimeter NB-14.

Software Guide

This manual describes the instructions for handling Noise Dosimeter Data Management AS-05 Viewer.

Technical Guide (This Document)

This manual is a technical guide to noise dosimeters and noise dosimetry, including the noise dosimeter performance, microphone structure and characteristics, and how the dedicated windscreens affect measurements.

You can download the instruction manuals from our “Occupational safety and health measures related to noise” web page.

https://osh.rion.co.jp/nb-14/qrcode-manual

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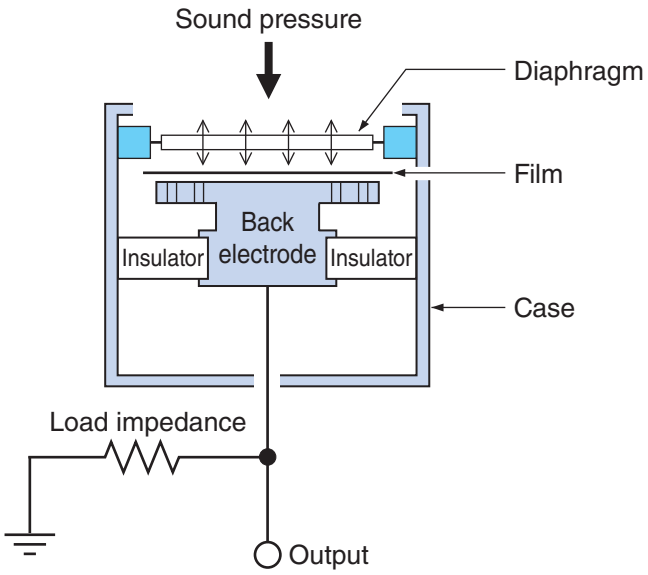
1 Microphone

Noise Dosimeter NB-14 is fitted with a free-field electret microphone UC-52 that is 1/2 inch in diameter.

1.1 Structure and how it works

As shown in the figure below, in general, the electret condenser microphone used for taking measurements consists of five parts: a diaphragm, film, back electrode, insulator, and case. Usually, a film holding an electric charge is fixed to the back electrode.
When sound pressure is applied to the diaphragm, the distance between the diaphragm and the back electrode changes, and therefore the capacitance formed between them changes. This change in capacitance is output as voltage.
The materials and characteristics of each component and their combinations will result in differences in the frequency, temperature, and humidity characteristics, etc. The high-frequency range is determined by the vibration resonant frequency.

Structure of the electret condenser microphone



1.2 Microphone UC-52 specifications

Model	UC-52
Nominal outer diameter	1/2 inches
Sensitivity level (representative value)	-33 dB (re. 1 V/Pa at 1 kHz, standard environmental conditions*)
Frequency response	20 Hz to 8 kHz
Capacitance (representative value)	19 pF
Dimensions	Φ13.2 mm × 12.0 mm
Weight	5.4 g

* Standard environment conditions: temperature = 23°C, humidity = 50% RH, air pressure = 101.325 kPa

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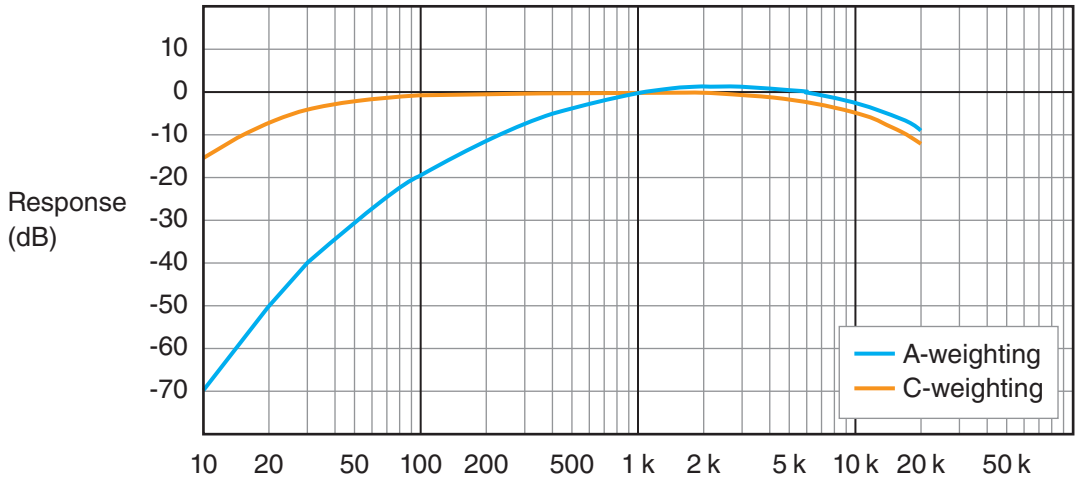
Frequency Weighting

Frequency weighting A and C of the sound level meter are achieved by frequency weighting circuits with electrical characteristics as shown in the following figure.



Characteristics of frequency weighting circuits

The perceived noise level is not determined by the sound pressure level alone. For example, even with the same sound pressure level, there is a difference in perceived loudness between low and high frequencies.
Values measured by A-weighting have been found to be relatively close to the perceived sound level, and A-weighting is used not only in Japan but also internationally for evaluating general environmental noise (measuring noise level).
C-weighting is almost a flat response, but the low-frequency range equal to or below 31.5 Hz and the high-frequency range equal to or above 8 kHz attenuate. C-weighting is used to measure sound pressure levels whilst excluding the effects of background noise such as wind, analyze frequencies, and evaluate impulsive noise.

3 Measurement Function

3.1 L_{Aeq} (Time-average sound level, equivalent continuous sound level)

L_{Aeq} (Time-average A-weighted sound level, equivalent continuous A-weighted sound level) is the sound level of continuous stationary sound, which over a given period of time has the same total energy as the fluctuating noise. It is defined by the following formula:

$$L_{\mathrm{Aeq},T} = 20 \log_{10} \left\{ \left[\left(\frac{1}{T} \right) \int_{t_1}^{t_2} p_{\mathrm{A}}^{2}(t)\, dt \right]^{1/2} / p_0 \right\}$$

t : Time variable of integration from an arbitrary start time at t_1 to the end of the interval at t_2
T : Time interval $T = t_2 - t_1$
$p_{\mathrm{A}}(t)$: A-weighted instantaneous sound pressure at running time t
p_0 : Reference sound pressure 20 µPa (2 x 10^{-5} N/m^2)

With NB-14, L_{Aeq} is calculated digitally using the following formula:

$$L_{\mathrm{Aeq}} = 20 \log_{10} \left\{ \left(\frac{1}{N} \sum_{i=1}^{N} p_{\mathrm{A}}^{2}(i) \right)^{1/2} / p_0 \right\}$$

N : Number of samples

The sampling cycle of NB-14 is 20.8 µs (48,000 samples per second).

3.2 L_{Cpeak} (C-weighted peak sound level)

The maximum absolute value of instantaneous C-weighted sound pressure within the measurement time can be measured.

3.3 DOSE [%]

The higher the level of noise and the longer the exposure time, the greater the impact on the human body. The permited level (permited limit) is 8 hours, 85 dB per day for example. DOSE is the ratio of the equivalent continuous A-weighted sound level L_{Aeq}(noise exposure level) of noise exposed in a day to the permitted level and is expressed by the following formula.

$$\mathrm{DOSE} = \frac{\text{Daily exposure}}{\text{Permitted level}}$$

The daily exposure is obtained by adding up L_{Aeq} (stored every second in NB-14) to which the worker is exposed during the workday.
The permitted level is a value determined from the criterion time and level, which is above example is 8 hours, 85 dB.
DOSE of 100% denotes the maximum permitted daily exposure.

3.4 Exchange rate [dB]

Exchange rate (ER) is the value [dB] that is used to calculate the permitted exposure time at the workplace when the measured equivalent continuous sound level exceeds the criterion level. Depending on the regulations, the DOSE can be calculated with a different criterion level and an exchange rate of 3 dB or 5 dB. For the values of the 85 dB criterion level and 3 dB exchange rate, if the measured equivalent continuous sound level is 88 dB, the daily permitted exposure time is 4 hours. If the measured equivalent continuous sound level is 91dB, the daily permitted exposure time should be cut in half.
Table 1 and Table 2 show the difference in noise exposure limit when the exchange rate is 3 and 5.
Table 1 shows the difference when the criterion level is 85 dB and 95 dB in Table 2. The DOSE in both cases is 100%.

Table 1. Noise Exposure Limits when Criterion Level = 85 dB.

Maximum Permitted Daily Duration [h]	Permitted Level [dB] (Exchange rate = 3 dB)	Permitted Level [dB] (Exchange rate = 5 dB)
8	85	85
4	88	90
2	91	95
1	94	100

Table 2. Noise Exposure Limits when Criterion Level = 90 dB.

Maximum Permitted Daily Duration [h]	Permitted Level [dB] (Exchange rate = 3 dB)	Permitted Level [dB] (Exchange rate = 5 dB)
8	90	90
4	93	95
2	96	100
1	99	105

The DOSE calculated by the equivalent continuous sound level values measured for 8 hours per day is shown in Tables 3 and 4. Table 3 shows the DOSE value when the criterion level is 85 dB and 90 dB in Table 4.

Table 3. The DOSE value [%] when Criterion Level = 85 dB.

DOSE [%]	L_{Aeq} [dB] (Exchange rate = 3 dB)	L_{Aeq} [dB] (Exchange rate = 5 dB)
50	82	80
100	85	85
200	88	90
400	91	95
800	94	100

Table 4. The DOSE value [%] when Criterion Level = 90 dB.

DOSE [%]	L_{Aeq} [dB] (Exchange rate = 3 dB)	L_{Aeq} [dB] (Exchange rate = 5 dB)
50	87	85
100	90	90
200	93	95
400	96	100
800	99	105

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Descriptions for IEC 61672-1 (JIS C 1509-1) / IEC 61252

4.1 Descriptions for IEC 616721 (JIS C 1509-1)

Standard paragraph No.	Description	See also	Explanation NB-14
4	**Reference environment conditions**		Ambient temperature: 23°C Static pressure: 101.325 kPa Relative humidity: 50%
5	**Performance specifications**		
5.1	**General**		
5.1.3	Classification of emissions and immunity	9.2.1 a)	Group X
5.1.4	Configuration and normal mode of operation	9.2.1 b)	Configuration • NB-14 • Dedicated windscreen Normal operating conditions • NB-14 with the dedicated windscreen attached » Instruction Manual: Hardware Guide [Name of Each Part / List of Accessories] [Charging Method]
5.1.5	Conformance class	9.2.1 a)	Class 2
5.1.6	Microphone format Instructions for proper use of sound level meters	9.2.1 c) 9.2.6 b)	UC-52 » Instruction Manual: Hardware Guide [Measuring Method]
5.1.7	Attaching the microphone	9.2.1 b)	No corresponding function
5.1.8	Computer software (Component)	9.2.2 j)	» Data Management Software AS-05 Viewer Instruction Manual [Operating Environment] [Installation Method]
5.1.10	All available frequency weighting features	9.2.2 c)	A-weighting, C-weighting
5.1.12	Nominal frequency of the level that can be measured in each level range (1 kHz, A) Functions and operation method of level range switch How to select the optimum level range	9.2.2 e) 9.2.2 f)	58 dB to 143 dB No corresponding function Not applicable
5.1.13	Reference sound pressure level, reference level range Reference direction and position of microphone reference point	9.2.6 a) 9.3 a), b), c)	94 dB Not applicable Reference incident direction and position of reference point (Fig. 1)
5.1.14	How the level retention function works and how to cancel the retained display	9.2.6 h)	Not applicable
5.1.15	Design targets and tolerance limits for electrical performance of electrical signal input equipment	9.3 h)	Capacitance of capacitor: 19 pF Tolerance limit: ± 3 pF
5.1.17	Maximum sound pressure level that the microphone can withstand Maximum voltage the preamp can withstand	9.3 j)	150 dB 11 Vp-p

Standard paragraph No.	Description	See also	Explanation NB-14
5.1.18	Characteristics and operations of each independent channel	9.2.1 e)	Not applicable (1 channel only)
5.1.19	Initial stabilization time (time from turning on the power until you can take measurements)	9.2.6 d)	< 90 s
5.2	**Adjustment at calibration check frequency**		
5.2.1	Model of sound calibrator used for calibration	9.2.4 a)	NC-75/NC-74 (RION)
5.2.3	Calibration procedure, adjustment values	9.2.4 c)	» Instruction Manual: Hardware Guide [Calibration Method]
5.3	**Corrections to indicated levels**		
5.3.1	**General**		
5.3.1.1	Correction value and expanded uncertainty of measurement	9.2.5 a)	Housing reflection » Refer to Table 5 and Fig. 3 Windscreen • Free field characteristics » Refer to Table 5 and Fig. 5 • Directional characteristics » Refer to Tables 9 and 10, and Fig. 7 and 8 • Random incidence response » Refer to Table 13 and Fig. 11 Microphone free field correction amount » Refer to Table 7
5.3.2	**Reflections and diffraction**		
5.3.2.1	Correction values for reflection and diffraction from housing	9.2.5 b)	Refer to Table 5 and Fig. 3
5.3.3	**Windscreens**		
5.3.3.1	Typical correction value for windscreen	9.2.5 c)	Free field characteristics » Refer to Table 5 and Fig. 5 Directional characteristics » Refer to Tables 9 and 10, and Fig. 7 and 8 Random incidence response » Refer to Table 13 and Fig. 11
5.3.3.2	Data on whether or not a windscreen is attached		Free field characteristics » Refer to Table 5 and Fig. 5 Directional characteristics » Refer to Tables 9 to 12 and Fig. 7 to 10 Random incidence response » Refer to Tables 13 and 14, and Fig. 11 and 12
5.3.3.3	Data for rotational asymmetry in relation to the microphone shaft		Not applicable
5.3.5	**Corrections for use during periodic testing**		
5.3.5.1 5.3.5.3	Correction value for multi-frequency sound calibrator	9.2.5 d) 9.3 d)	Refer to Table 7
5.4	**Directional response**		
5.4.5	Detailed table of relative directional characteristics	9.2.2 b)	» Refer to Tables 9 to 12

Standard paragraph No.	Description	See also	Explanation NB-14
5.5	**Frequency weightings**		
5.5.5	Table of directional index in relation to random incidence characteristics	9.3 e)	» Refer to Tables 13 and 14
5.5.8	Design targets and tolerances for optional frequency weighting	9.2.2 k)	No corresponding function
5.6	**Level linearity**		
5.6.10	Upper and lower limits of linear operating range of noise level	9.3 f)	Refer to Table 8
5.6.11	Starting point for level linearity calculation error testing	9.3 g)	Refer to Table 8
5.7	**Self-generated noise**		
5.7.1	Self-generated noise level (including microphone)	9.3 i)	A-weighting: 49 dB (Typical 46 dB) C-weighting: 49 dB (Typical 46 dB)
5.7.3	Self-generated noise level (when the input terminal of the electrical input device is shorted)	9.3 i)	Dummy microphone (19 pF) Maximum value: Same value as 5.7.1 Typical A: 46 dB C: 46 dB
5.7.5	Procedure for measuring fields with low-level sounds	9.2.6 c)	Not applicable
5.8	**Time weighting F and S**		
5.8.1	Available time weighting	9.2.2 d)	No corresponding function
5.11 - 5.12	**Overload indication, Under-range indication**		
5.11.1	Behavior of overload indication	9.2.6 j)	» Instruction Manual: Hardware Guide [Measuring Method]
5.12.2	Behavior of underrange indication	9.2.6 j)	» Instruction Manual: Hardware Guide [Measuring Method]
5.13	**C-weighted peak sound level**		
5.13.1	Level range in which L_{Cpeak} can be measured	9.2.2 i)	Refer to Table 8
5.17	**Thresholds**	9.2.6 k)	No corresponding function
5.18	**Display**		
5.18.1	Display method	9.2.2 g)	Main unit display » Instruction Manual: Hardware Guide [Measuring Method] Software display » Data Management Software AS-05 Viewer Instruction Manual [Viewing the Measurement Data]
5.18.2	Description of the display equipment (monitor)	9.2.2 g)	Main unit display » Instruction Manual: Hardware Guide [Measuring Method] Software display » Data Management Software AS-05 Viewer Instruction Manual
5.18.3	Description of the displayed measurement amount	9.2.2 g) 9.2.2 a)	» Instruction Manual: Hardware Guide [Specifications]

Standard paragraph No.	Description	See also	Explanation NB-14
5.18.4	Update cycle and conditions from the start of taking measurements until the first indicated value is displayed	9.2.2 g)	Not applicable
5.18.5	Method for downloading digital data	9.2.6 l)	» Data Management Software AS-05 Viewer Instruction Manual
5.19	**Analog or digital output**		
5.19.1	Electrical output terminal	9.2.6 n)	No corresponding function
5.20	**Timing facilities**		
5.20.1	Procedure for setting integration time and clock time	9.2.6 f)	» Data Management Software AS-05 Viewer Instruction Manual [Setting]
5.20.2	Minimum and maximum values of integral time	9.2.6 g)	Minimum value: 1 sec Maximum value: 12 h (depending on battery life)
5.21	**Radio frequency emissions and disturbances to a public power supply**		
5.21.1	Typical cable lengths and types, characteristics of devices connected by cables	9.2.6 m)	Not applicable
5.21.2	Operation modes and connected equipment that cause the highest radio frequency emissions	9.3 n)	Operation mode: Normal operation Connection type: No accessory connection
5.23	**Power supply**		
5.23.1	Method to check if the power supply voltage is sufficient	9.2.3 b)	» Instruction Manual: Hardware Guide [Measuring Method]
5.23.2	Maximum and minimum operable power supply voltages	9.3 k)	Not applicable (Powered only by built-in rechargeable batteries)
5.23.3	Compatible internal battery models	9.2.3 a)	» Instruction Manual: Hardware Guide [Specifications]
5.23.4	Continuous operating time under normal operating conditions with a fully charged battery	9.2.3 a)	» Instruction Manual: Hardware Guide [Specifications]
5.23.5	How to operate the device by way of an external power supply	9.2.3 c)	Not applicable
5.23.6	Nominal supply voltage and frequency and their respective tolerance limits	9.2.3 d)	Not applicable (Powered only by built-in rechargeable batteries)
6	**Environmental, electrostatic, and radio-frequency requirements**		
6.1	**General**		
6.1.2	Time it takes to adapt to changes in environmental conditions	9.3 l)	Temperature change: < 1 h Humidity change: < 1 h Static pressure change: < 5 min
6.2	**Static pressure**		
6.2.2	Measurement method when the static pressure is 65 kPa or more and less than 85 kPa	9.2.6 e)	In that environment, calibrates with Sound Calibrator NC-75/NC-74 and takes measurements.
6.3	**Air temperature**		
6.3.2	Components that operate only under specific environmental conditions	9.2.8 a)	None
6.5	**Electrostatic discharge**		
6.5.2	Effect of electrostatic discharge (deterioration or damage to performance/functions)	9.2.8 b)	Measurement values are temporarily affected when there is an electrostatic discharge

Standard paragraph No.	Description	See also	Explanation NB-14
6.6	**A.C. power-frequency and radio-frequency fields**		
6.6.1	Operation mode and connection state where the effects of power frequency magnetic fields and radio frequency electromagnetic fields are maximized	9.3 o)	Refer to Fig. 6-1 and 6-2 Operation mode: Normal operation Connection type: No accessory connection
6.6.5	Compliance with immunity standards for radio frequency electromagnetic fields above the specified field strengths	9.3 m)	Not applicable
6.6.10	Compliance with immunity standards for radio frequency electromagnetic fields below the specified sound levels	9.2.8 c)	Not applicable
6.7	**Mechanical vibration**	9.2.1 f)	Take measurements without subjecting the personal noise dosimeter to mechanical vibration.
7	**Provision for use with auxiliary devices**		
7.1	Correction value applied to measurement results when extending the distance between the preamp and sound level meter	9.2.7 b)	Not applicable
7.2	Typical values of the influence of accessory installation on sound level meter performance	9.2.7 a)	Dedicated windscreen • Free field characteristics » Refer to Table 5 and Fig. 5 • Directional characteristics » Refer to Tables 9 and 10, and Fig. 7 and 8 • Random incidence response » Refer to Table 13 and Fig. 11
7.3	Standards to be met when accessories are installed	9.2.1 d)	When the dedicated windscreen is attached Complies with IEC 61672-1 class 2 (JIS C 1509-1 class 2)
7.4	How to use a bandpass filter	9.2.7 c)	No corresponding function
7.5	How to connect accessories and how the connection affects the performance of the sound level meter	9.2.7 d)	» Instruction Manual: Hardware Guide [Charging Method] [Calibration Method]
9	**Instruction Manual**		
9.2	**Information for operation**		
9.2.1	**General**		
9.2.1 a)	Description of type, classification (X, Y, Z) and class	5.1.3 5.1.5	Refer to 5.1.3 Refer to 5.1.5
9.2.1 b)	Overall configuration, configuration in normal operating state (including windscreen)	5.1.4	Refer to 5.1.4
	How to install the microphone and windscreen	5.1.7	Refer to 5.1.7
9.2.1 c)	Microphone format	5.1.6	Refer to 5.1.6
9.2.1 d)	Compliance with standards when an extension cable is used	7.3	Refer to 7.3
9.2.1 e)	Characteristics and operations of each independent channel	5.1.18	Refer to 5.1.18
9.2.1 f)	Influence of mechanical vibration and how to reduce it	6.7	Refer to 6.7

Standard paragraph No.	Description	See also	Explanation NB-14
9.2.2	**Design features**		
9.2.2 a)	Measurable quantity	5.18.3	Refer to 5.18.3
9.2.2 b)	Directional characteristics	5.4.5	Refer to 5.4.5
9.2.2 c)	Frequency weightings that comply with standards	5.1.10 5.5.8	Refer to 5.1.10 Refer to 5.5.8
9.2.2 d)	Available time weighting	5.8.1	Refer to 5.8.1
9.2.2 e)	Upper and lower limits of linear operating range in A-weighted sound level (1 kHz)	5.1.12	Refer to 5.1.12
9.2.2 f)	How to operate the level range switch	5.1.12	Refer to 5.1.12
9.2.2 g)	Description of display equipment (monitor), standard compliance	5.18.1-2-3-4	Refer to 5.18.1-2-3-4
9.2.2 h)	Full linear operating range of A-weighted sound level (1 kHz)		Refer to Table 8
9.2.2 i)	Level range in which L_{Cpeak} can be measured	5.13.1	Refer to 5.13.1
9.2.2 j)	Computer software (Component)	5.1.8	Refer to 5.1.8
9.2.2 k)	Design targets and tolerance limits for measurement values for which the standard does not specify performance specifications	5.5.8	Refer to 5.5.8
9.2.3	**Power supply**		
9.2.3 a)	Recommended internal battery model, and continuous operating time under normal operating conditions with a fully charged battery	5.23.3 5.23.4	Refer to 5.23.3 Refer to 5.23.4
9.2.3 b)	How to check the power supply voltage	5.23.1	Refer to 5.23.1
9.2.3 c)	How to operate the device by way of an external power supply	5.23.5	Refer to 5.23.5
9.2.3 d)	Operating conditions and permissible range of commercial AC power supply	5.23.6	Refer to 5.23.6
9.2.4	**Adjustment at the calibration check frequency**		
9.2.4 a)	Model of sound calibrator used for calibration	5.2.1	Refer to 5.2.1
9.2.4 b)	Calibration check frequency		» Instruction Manual: Hardware Guide [Specifications]
9.2.4 c)	Calibration procedure, adjustment values	5.2.3	Refer to 5.2.3
9.2.5	**Corrections to indicated levels**		
9.2.5 a)	Correction value and expanded uncertainty of measurement	5.3.1.1	Refer to 5.3.1.1
9.2.5 b)	Typical values of influence from housing-related reflection and diffraction	5.3.2.1	Refer to 5.3.2.1
9.2.5 c)	Typical windscreen influence	5.3.3.1	Refer to 5.3.3.1
9.2.5 d)	Correction value for multi-frequency sound calibrator	5.3.5.1 5.3.5.3	Refer to 5.3.5.1 Refer to 5.3.5.3
9.2.6	**Operating the sound level meter**		
9.2.6 a)	Reference direction and position of microphone reference point	5.1.13	Refer to 5.1.13
9.2.6 b)	Influence from measurement procedure, housing, and operator	5.1.6	Refer to 5.1.6
9.2.6 c)	Procedure for measuring fields with low-level sounds	5.7.5	Refer to 5.7.5

Standard paragraph No.	Description	See also	Explanation NB-14
9.2.6 d)	Initial stabilization time (time from turning on the power until you can take measurements)	5.1.19	Refer to 5.1.19
9.2.6 e)	Measurement guidelines and procedures at 65-85 (kPa)	6.2.2	Refer to 6.2.2
9.2.6 f)	Procedure for setting integration time and clock time	5.20.1	Refer to 5.20.1
9.2.6 g)	Minimum and maximum values of integral time	5.20.2	Refer to 5.20.2
9.2.6 h)	How the level retention function works and how to cancel the retained display	5.1.14	Refer to 5.1.14
9.2.6 i)	Reset function for measurement results, time required from resetting to measurement reinitialization		Time required from this operation to reinitialize measuring: < 20 seconds Depending on the measurement time and the number of files in NB-14, it may take about 1 minute from the end of measurement to the next measurement.
9.2.6 j)	Behavior of overload indication and underrange indication	5.11.1 5.12.2	Refer to 5.11.1 Refer to 5.12.2
9.2.6 k)	Threshold function	5.17	Refer to 5.17
9.2.6 l)	Method for downloading digital data	5.18.5	Refer to 5.18.5
9.2.6 m)	Recommended lengths and types of typical cables	5.21.1	Refer to 5.21.1
9.2.6 n)	Recommended ranges of electrical output terminals	5.19.1	Refer to 5.19.1
9.2.7	**Accessories**		
9.2.7 a)	Typical values of the Influence of accessory installation on sound level meter performance	7.2	Refer to 7.2
9.2.7 b)	Correction value applied to measurement results when extending the distance between the preamp and sound level meter	7.1	Refer to 7.1
9.2.7 c)	How to use a bandpass filter	7.4	Refer to 7.4
9.2.7 d)	How to connect accessories and how the connection affects the performance of the sound level meter	7.5	Refer to 7.5
9.2.8	**Influence of variations in environmental conditions**		
9.2.8 a)	Components that operate only under specific environmental conditions	6.3.2	Refer to 6.3.2
9.2.8 b)	Influence of electrostatic discharge (deterioration or damage to performance/functions)	6.5.2	Refer to 6.5.2
9.2.8 c)	Compliance with immunity standard in relation to power frequency magnetic fields and radio frequency electromagnetic fields	6.6.10	Refer to Table 6 and 6.6.10
9.3	**Information for testing**		
9.3 a)	Reference sound pressure level	5.1.13	Refer to 5.1.13
9.3 b)	Reference level range	5.1.13	Refer to 5.1.13
9.3 c)	Microphone reference point	5.1.13	Refer to 5.1.13
9.3 d)	Correction value for multi-frequency sound calibrator	5.3.5.1 5.3.5.3	Refer to 5.3.5.1 Refer to 5.3.5.3
9.3 e)	Directional index in relation to random incidence	5.5.5	Refer to 5.5.5
9.3 f)	Upper and lower limits of linear operating range for A-weighted sound level	5.6.10	Refer to 5.6.10

Standard paragraph No.	Description	See also	Explanation
			NB-14
9.3 g)	Starting point for level linearity calculation error testing	5.6.11	Refer to 5.6.11
9.3 h)	Design targets and tolerance limits for electrical performance of electrical signal input equipment	5.1.15	Refer to 5.1.15
9.3 i)	Maximum noise floor level	5.7.1 5.7.3	Refer to 5.7.1/5.7.3
9.3 j)	Maximum sound pressure level that the microphone can withstand Maximum voltage the preamp can withstand	5.1.17	Refer to 5.1.17
9.3 k)	Maximum and minimum operable power supply voltages	5.23.2	Refer to 5.23.2
9.3 l)	Time it takes to adapt to changes in environmental conditions	6.1.2	Refer to 6.1.2
9.3 m)	Compliance with immunity standards for radio frequency fields above the specified field strengths	6.6.5	Refer to 6.6.5
9.3 n)	Operation modes and connected equipment that cause the highest radio frequency emissions	5.21.2	Refer to 5.21.2
9.3 o)	Operation mode and connection state where the effects of power frequency magnetic fields and radio frequency electromagnetic fields are maximized	6.6.1 6.6.3	Refer to 6.6.1 Refer to 6.6.3

4.2 Descriptions for IEC 61252

Standard paragraph No.	Description	Explanation
4.	**General performance requirements**	
4.1	Components and normal operating conditions	Components • NB-14 • Dedicated windscreen Normal operating conditions • NB-14 with the dedicated windscreen attached » Instruction Manual: Hardware Guide [Name of Each Part / List of Accessories] [Charging Method]
4.3	Means of electrical signal input	Dummy microphone Capacitance of capacitor: 19 pF Tolerance limit: ± 3 pF
4.4	Accessible test points	Not available
4.5	Noise exposure indicator display	Display method The ratio of noise exposure level is displayed by the LEVEL LEDs. » Instruction Manual: Hardware Guide [Measuring Method] How to convert the noise exposure level How to convert the noise exposure level • A percentage of a legal 241 limit of a physical quantity of exposure (DOSE (%)) Can be viewed by importing measurement data into the data management software AS-05 Viewer » Data Management Software AS-05 Viewer Instruction Manual • Noise exposure level (Pa^2•h) Can be calculated on our website using the equivalent noise level (A-weighted equivalent continuous sound level). » https://osh.rion.co.jp/convert_exposure/
4.6	Minimum increment for indicator display	Not applicable
4.7	Measuring range for sound level	» Instruction Manual: Hardware Guide [Specifications]
4.8 4.9	Measuring range for noise exposure level and sound level	Measurement frequency range » Instruction Manual: Hardware Guide [Specifications] Measuring range for noise exposure level and sound level » Instruction Manual: Hardware Guide [Specifications]
4.10	Display of noise level and noise exposure level	Not applicable
4.12	Power supply type and operating time, and how to check the remaining battery level in the case of battery operation	Power supply type and operating time » Instruction Manual: Hardware Guide [Specifications] How to check the remaining battery level » Instruction Manual: Hardware Guide [Measuring Method]

Standard paragraph No.	Description	Explanation
6.	**Absolute acoustical sensitivity**	
6.1 6.2	Calibration means for personal noise dosimeter	Compatible sound calibrators NC-75/NC-74 (RION) Calibration Method » Instruction Manual: Hardware Guide [Calibration Method]
7.	**Frequency weighting**	
7.1	Dosimeter frequency response with A-weighting	Refer to Table 5
8.	**Linearity of response to steady signal**	Refer to Table 8
11.	**Latching overload indicator**	
11.1	Behavior of latching overload indication	» Instruction Manual: Hardware Guide [Measuring Method]
12.	**Sensitivity to various environments**	
12.5	Effects of power frequency magnetic fields	Operation mode and connection state and orientation where the effects of power frequency magnetic fields are maximized: Refer to Fig. 6-1 Noise exposure level after an integration time of 1 hour in the direction of Figure 6-1, in a uniform alternating magnetic field of 80 A/m rms at a test frequency of 50 Hz or 60 Hz: 1.46×10^{-5} Pa^2•h (Typical value)
12.6	Effects of radio frequency electromagnetic fields	Operation mode and connection state and orientation where the effects of radio frequency electromagnetic fields are maximized: Refer to Fig. 6-2 Restrictions for use near electromagnetic radiation sources: To be used in an environment with field strength not exceeding the radio frequency electromagnetic field immunity test stipulated in IEC 61672-1:2013
12.7	Effects of electrostatic discharge	Restrictions for use near static electricity sources: To be used in an environment not exceeding the electrostatic discharge test voltage stipulated in IEC 61672-1:2013
12.8	Effects of mechanical vibration	Take measurements without subjecting the personal noise dosimeter to mechanical vibration.
13.	**Instrument marking**	
13.1	How to display or measure the noise exposure level	• A percentage of a legal 241 limit of a physical quantity of exposure (DOSE (%)) Can be viewed by importing measurement data into the data management software AS-05 Viewer » Data Management Software AS-05 Viewer Instruction Manual • Noise exposure level (Pa^2•h) Can be calculated on our website using the equivalent noise level (A-weighted equivalent continuous sound level). » https://osh.rion.co.jp/convert_exposure/

Standard paragraph No.	Description	Explanation
13.2	Display of the IEC 61252:1993 mark	Main unit: Refer to “Nameplate” Attachment position of the nameplate » Instruction Manual: Hardware Guide [Name of Each Part / List of Accessories]
14.	**Instruction Manual**	
a)	Recommendations when wearing personal noise dosimeter	» Instruction Manual: Hardware Guide [Measuring Method]
b)	Display level	Refer to 4.5 Refer to 13.1
c) d)	Measuring range for noise exposure level and sound level	Refer to 4.8 Refer to 4.9
e)	Measurement frequency range and acceptance limits	Measurement frequency range: Refer to 4.8 Refer to 4.9 Acceptance limits: IEC 61672-1 class 2 (JIS C 1509-1 class 2)
f)	Sound wave incident reference direction	Refer to Fig. 1
g)	Standard frequency	1 kHz
h)	Reference sound pressure level, reference integration time and reference noise exposure level	Reference sound pressure level: 94 dB Reference integration time and reference noise exposure level 8 hours 1.00 Pa^2•h
i)	Calibration procedure for personal noise dosimeter	Refer to 6.1 Refer to 6.2
j)	Recommended attachment method for microphone when measuring frequency response	With the windscreen removed from the device, attach the microphone by turning it clockwise. If a microphone is already attached to the device, check for looseness. Also, install a windscreen as necessary before measurement. Attachment and detachment methods for dedicated windscreen » Instruction Manual: Hardware Guide [Calibration Method]
k)	Recommended means of measuring electrical characteristics	Refer to 4.3
l)	Acceptable limits of electrical characteristics for dummy microphones	Refer to 4.3
m)	Free field characteristics	Refer to Table 5
n)	Typical deviations in noise exposure level due to positive and negative unipolar pulse responses	1% or less
o)	Operating environment range	Temperature: -10°C to 50°C Humidity: 10% to 90% RH (no condensation) Atmospheric pressure: 65 kPa to 108 kPa Charging temperature range: 5°C to 35°C
p)	Storage environmental conditions	Temperature: -10°C to 50°C Humidity: 10% to 90% RH (no condensation) Atmospheric pressure: 65 kPa to 108 kPa
q)	Effects of power frequency magnetic fields	Refer to 12.5

Standard paragraph No.	Description	Explanation
r)	Effects of radio frequency electromagnetic fields, electrostatic discharge and machine vibration	Refer to 12.6 Refer to 12.7 Refer to 12.8
s)	Battery type and continuous operating time	Refer to 4.12
t)	Recommended procedure for checking battery level	Refer to 4.12
u)	Recommended period for inspection and calibration by the manufacturer to maintain acoustic and electrical characteristics	Inspection and calibration by the manufacturer at least once a year are recommended to maintain performance
w)	Sound level that meets regulatory specifications for electromagnetic compatibility	74 dB
x)	Cables and accessories tested for compliance in emissions, power frequency magnetic field and radio frequency electromagnetic field immunity tests	Dedicated USB cable Dedicated windscreen
y)	Configuration of normal operating mode	Refer to 4.1
z)	Performance degradation or loss of function due to electrostatic discharge	Measurement values are temporarily affected when there is an electrostatic discharge
aa)	Reference direction for power frequency magnetic field and radio frequency electromagnetic field immunity tests	Refer to 12.5 Refer to 12.6
bb)	Settings and configuration that maximize the effects of exposure to radio frequency electromagnetic fields	Refer to 12.6
cc)	Operation mode and connected equipment that maximize the effects of exposure to power frequency magnetic fields	Refer to 12.5
15.	**Electromagnetic and electrostatic compatibility requirements and test procedures**	
15.4	**Immunity to power- and radio-frequency fields**	
15.4.7	Operation mode and connected equipment that maximize the effects of exposure	Refer to 12.5 Refer to 12.6
15.5	**Test procedures**	
15.5.1	**General**	
15.5.1.2	Configuration and settings at the time of testing	Refer to 12.5 Refer to 12.6
15.5.2	**Emission measurements**	
15.5.2.3	How to secure the cable when the microphone is connected to the personal noise dosimeter with a cable	Not applicable

4.3 NB-14 free field characteristics

Table 5. NB-14 free field characteristics

Nominal Frequency (Hz)	Exact Frequency (Hz)	Microphone Free-field Response (dB)		Influence of Case Reflection (dB)		Influence of Windscreen (dB)		NB-14 Electrical Response (dB)
		UC-52 (NB-14)	Expanded Uncertainty	NB-14	Expanded Uncertainty	NB-14	Expanded Uncertainty	
63	**63.096**	**0.0**	**0.3**	**0.0**	**0.15**	**0.0**	**0.10**	**0.0**
80	**79.433**	**0.0**	**0.3**	**0.0**	**0.15**	**0.0**	**0.10**	**0.0**
100	**100.00**	**0.0**	**0.3**	**0.0**	**0.15**	**0.0**	**0.10**	**0.0**
125	**125.89**	**0.0**	**0.3**	**0.0**	**0.15**	**0.0**	**0.10**	**0.0**
160	**158.49**	**0.0**	**0.3**	**0.1**	**0.15**	**0.0**	**0.10**	**0.0**
200	**199.53**	**0.0**	**0.2**	**0.1**	**0.15**	**0.0**	**0.10**	**0.0**
250	**251.19**	**0.0**	**0.2**	**0.3**	**0.15**	**0.0**	**0.10**	**0.0**
315	**316.23**	**0.0**	**0.2**	**0.4**	**0.15**	**0.0**	**0.10**	**0.0**
400	**398.11**	**0.0**	**0.2**	**0.4**	**0.15**	**0.0**	**0.10**	**0.0**
500	**501.19**	**0.0**	**0.2**	**0.3**	**0.15**	**0.0**	**0.10**	**0.0**
630	**630.96**	**0.0**	**0.2**	**0.4**	**0.15**	**0.0**	**0.10**	**0.0**
800	**794.33**	**0.0**	**0.2**	**0.5**	**0.15**	**0.0**	**0.10**	**0.0**
1000	**1000.0**	**0.0**	**0.2**	**0.8**	**0.15**	**0.0**	**0.10**	**0.0**
1060	1059.3	0.0	0.3	0.8	0.15	0.0	0.15	0.0
1120	1122.0	0.0	0.3	0.9	0.15	0.0	0.15	0.0
1180	1188.5	0.0	0.3	0.9	0.15	0.0	0.15	0.0
1250	**1258.9**	**0.0**	**0.3**	**1.1**	**0.15**	**0.0**	**0.15**	**0.0**
1320	1333.5	0.0	0.3	1.2	0.15	0.0	0.15	0.0
1400	1412.5	0.0	0.3	1.2	0.15	0.0	0.15	0.0
1500	1496.2	0.1	0.3	1.3	0.15	0.0	0.15	0.0
1600	**1584.9**	**0.1**	**0.3**	**1.3**	**0.15**	**0.0**	**0.15**	**0.0**
1700	1678.8	0.1	0.3	1.3	0.15	0.0	0.15	0.0
1800	1778.3	0.1	0.3	1.1	0.15	0.0	0.15	0.0
1900	1883.6	0.1	0.3	1.2	0.15	0.0	0.15	0.0
2000	**1995.3**	**0.2**	**0.3**	**1.0**	**0.15**	**0.0**	**0.15**	**0.0**
2120	2113.5	0.2	0.3	0.8	0.15	0.0	0.15	0.0
2240	2238.7	0.2	0.3	0.4	0.15	0.0	0.15	0.0
2360	2371.4	0.2	0.3	0.1	0.15	0.0	0.15	0.0
2500	**2511.9**	**0.3**	**0.3**	**-0.4**	**0.15**	**0.1**	**0.15**	**0.0**
2650	2660.7	0.3	0.3	-1.0	0.20	0.0	0.15	0.0
2800	2818.4	0.3	0.3	-1.4	0.20	0.0	0.15	0.0
3000	2985.4	0.4	0.3	-1.5	0.20	0.2	0.15	0.0
3150	**3162.3**	**0.4**	**0.3**	**-1.5**	**0.20**	**0.3**	**0.15**	**0.0**
3350	3349.7	0.4	0.3	-1.4	0.20	0.3	0.15	0.0
3550	3548.1	0.4	0.3	-1.3	0.20	0.4	0.15	0.0
3750	3758.4	0.4	0.3	-1.2	0.20	0.4	0.15	0.0
4000	**3981.1**	**0.4**	**0.3**	**-1.1**	**0.20**	**0.5**	**0.15**	**0.0**
4250	4217.0	0.4	0.3	-1.2	0.20	0.5	0.15	0.0
4500	4466.8	0.4	0.3	-0.7	0.20	0.5	0.15	0.0

Nominal Frequency (Hz)	Exact Frequency (Hz)	Microphone Free-field Response (dB)		Influence of Case Reflection (dB)		Influence of Windscreen (dB)		NB-14 Electrical Response (dB)
		UC-52 (NB-14)	Expanded Uncertainty	NB-14	Expanded Uncertainty	NB-14	Expanded Uncertainty	
4750	4731.5	0.3	0.3	0.2	0.20	0.4	0.15	0.0
5000	**5011.9**	**0.3**	**0.3**	**1.1**	**0.20**	**0.4**	**0.15**	**0.0**
5300	5308.8	0.2	0.3	1.3	0.30	0.4	0.20	0.0
5600	5623.4	0.2	0.3	1.7	0.30	0.4	0.20	0.0
6000	5956.6	0.1	0.3	1.6	0.30	0.3	0.20	0.0
6300	**6309.6**	**0.0**	**0.3**	**1.3**	**0.30**	**0.2**	**0.20**	**0.0**
6700	6683.4	-0.1	0.3	0.5	0.35	0.1	0.20	0.0
7100	7079.5	-0.2	0.3	-0.6	0.35	0.0	0.20	0.0
7500	7498.9	-0.4	0.3	-0.7	0.35	0.0	0.20	0.0
8000	**7943.3**	**-0.5**	**0.3**	**-0.1**	**0.35**	**0.1**	**0.20**	**0.0**

4.4 Reference incident direction and position of reference point

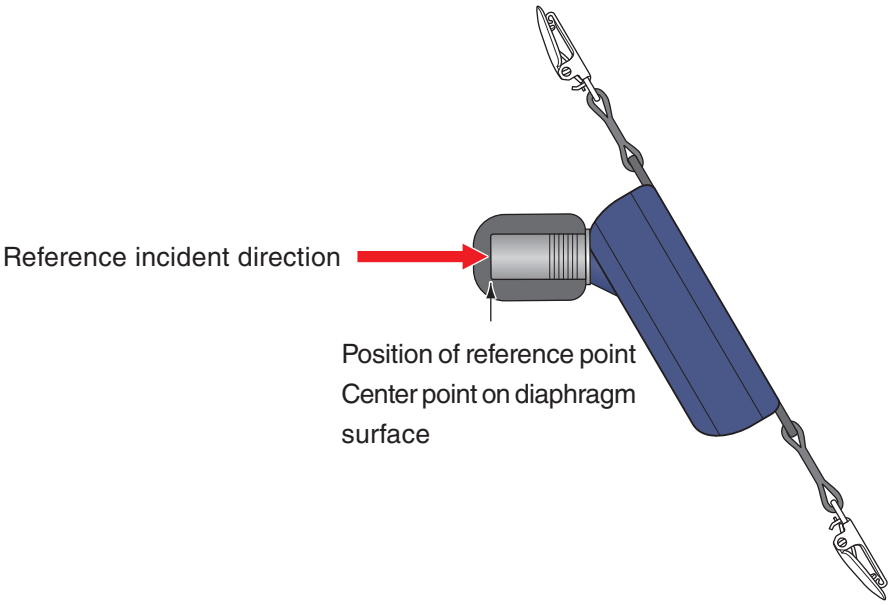


Fig. 1. Reference incident direction and position of reference point

4.5 Microphone frequency response

The frequency response of a free field microphone is represented by the response to the sound waves from the reference incident direction in a free field.
Below is an example of the frequency response of microphone UC-52.

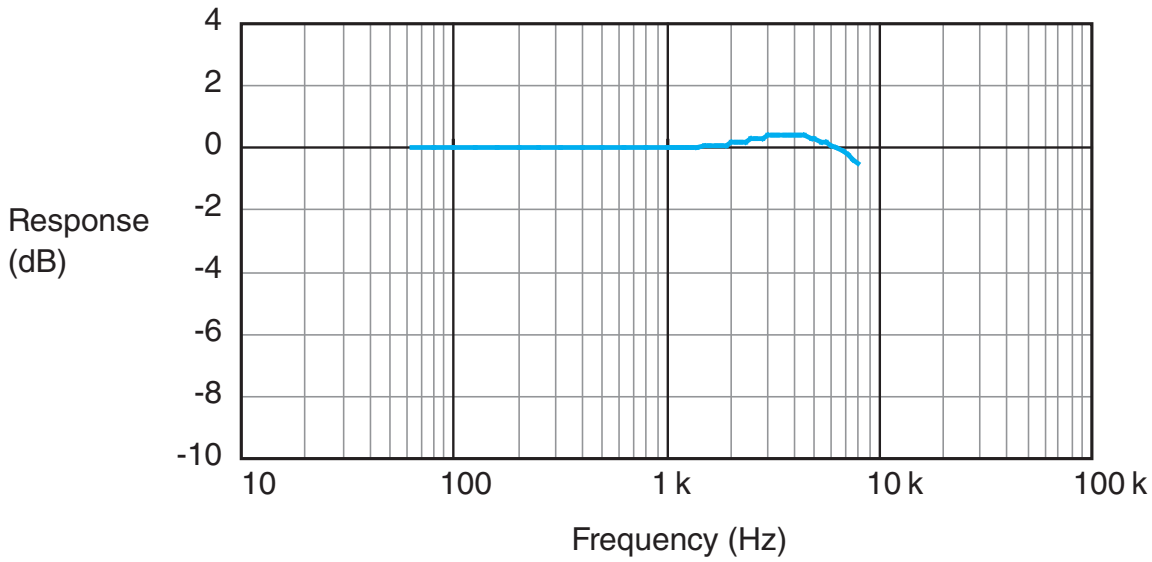


Figure 2. Frequency response of Microphone UC-52 (1 kHz reference)

4.6 Acoustic influence of housing

The NB-14 has a structure that minimizes reflections from the housing.
Below is an example of the acoustic influence from the housing.

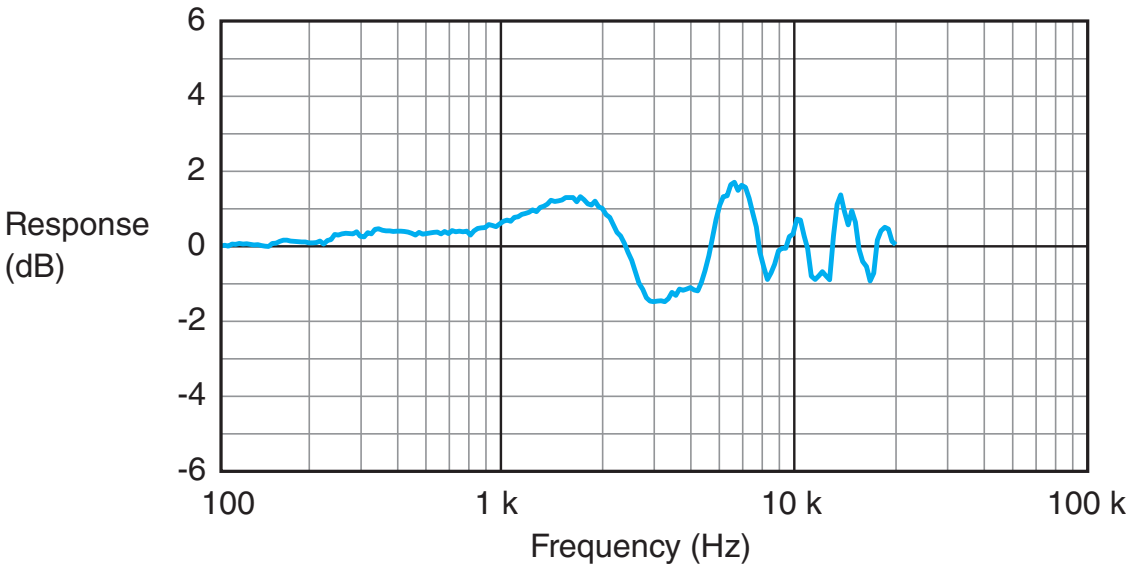


Fig. 3. Acoustic influence from housing

4.7 Effects of windscreen

Measurement errors due to wind noise can be a problem when taking measurements outdoors in the wind or of a ventilation system. Therefore, the NB-14 is used with the dedicated windscreen attached.
The characteristics of the dedicated windscreen are shown below.
The effect of the dedicated windscreen on the free field characteristics of NB-14 is within ±1.0 dB up to 8 kHz, as shown in Figure 5.

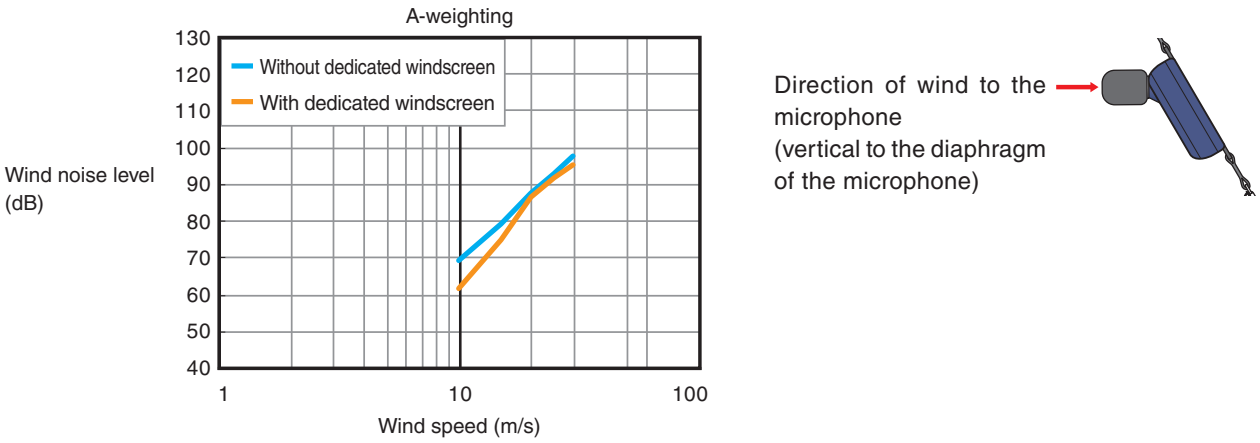


Fig. 4-1. Wind noise suppression with frequency weighting A (vertical)

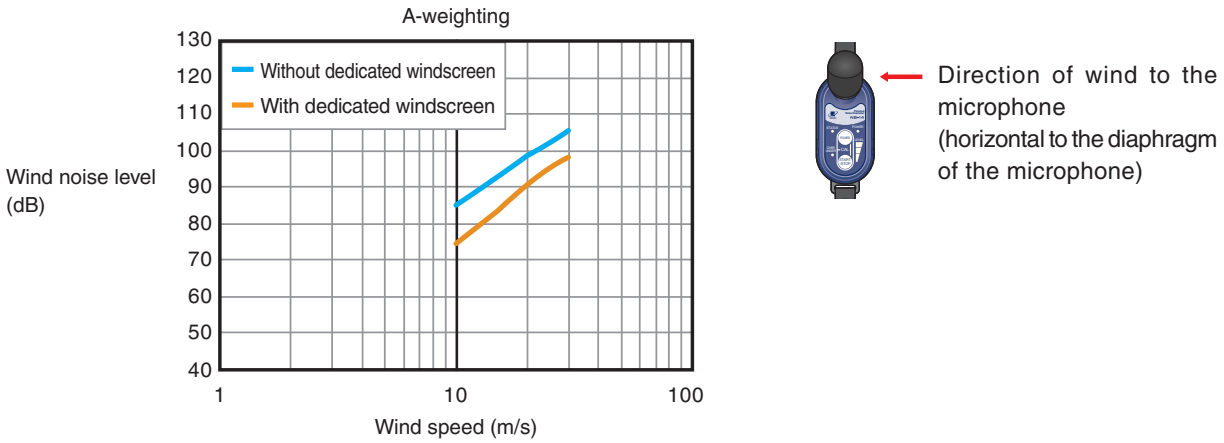


Fig. 4-2. Wind noise suppression with frequency weighting A (horizontal)

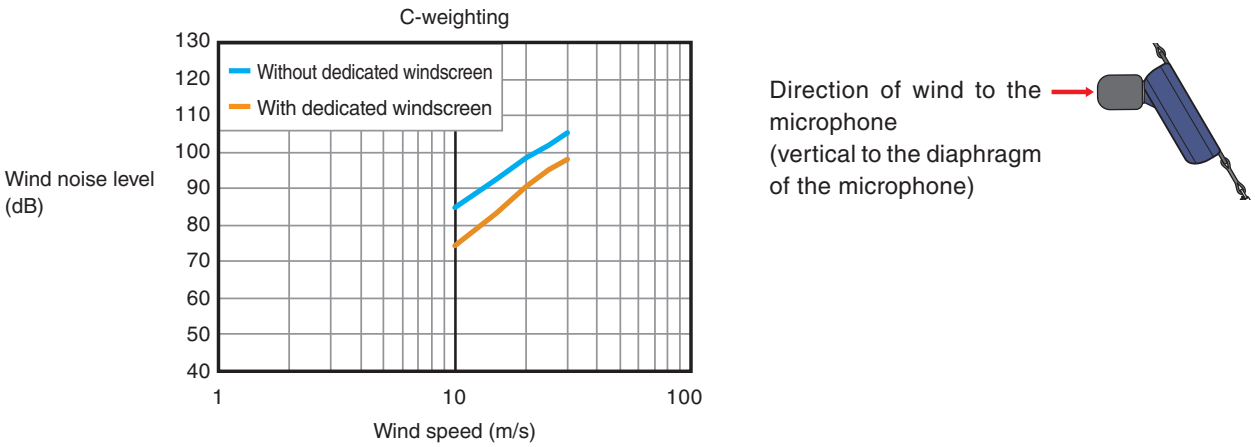


Fig. 4-3. Wind noise suppression with frequency weighting C (vertical)

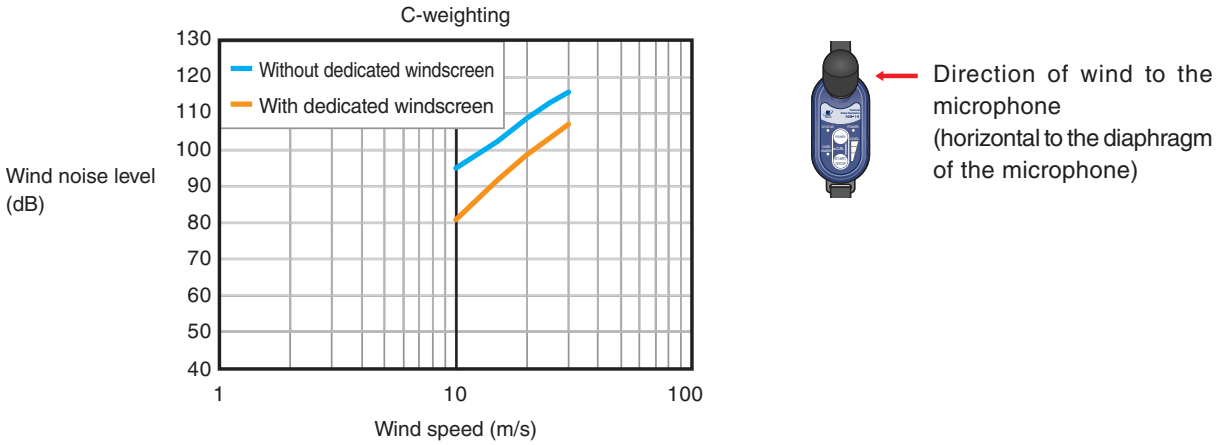


Fig. 4-4. Wind noise suppression with frequency weighting C (horizontal)

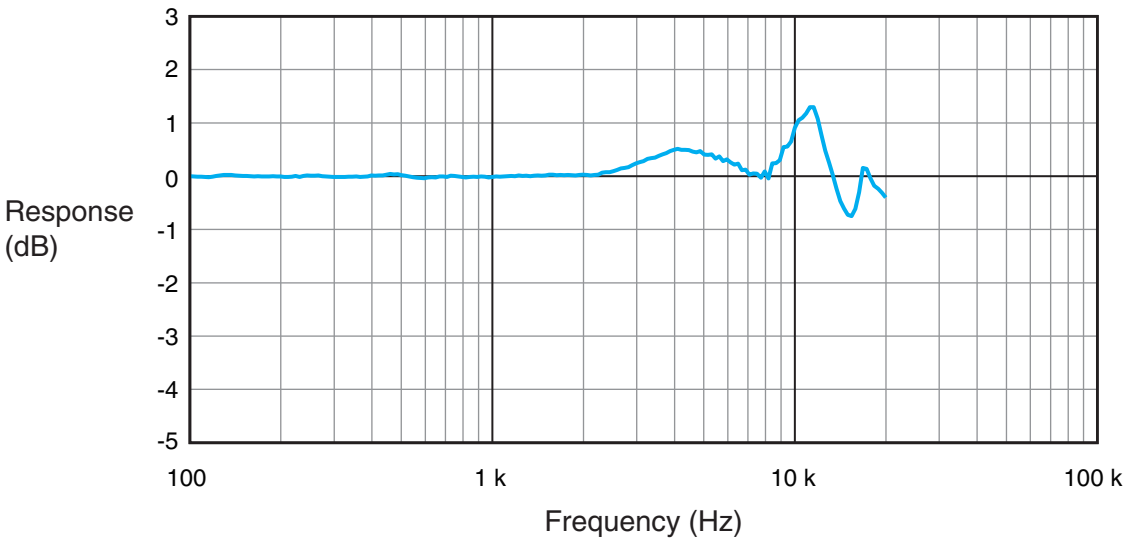


Fig. 5. Dedicated windscreen frequency response

4.8 Electromagnetic compatibility (EMC)

The following figures show the immunity test conditions (NB-14 direction, operation mode and connection state) against power frequency magnetic fields and radio frequency electromagnetic fields. A couple of things here.

1. Maybe the word field should be plural (change both uses to fields).
2. It looks like we could cut out the the second sentence to avoid redundancy.

Under these conditions, the effects of exposure to power frequency magnetic fields, radio frequency electromagnetic fields, and radio frequency emissions are at their largest. The immunity test against power frequency magnetic fields is conducted only in the placement shown in Fig. 6-1, and the immunity test against radio frequency electromagnetic fields is conducted in six directions based on the direction shown in Fig. 6-2.

* Noise dosimeter operation mode: Normal operation
Accessories: Only the dedicated windscreen is attached

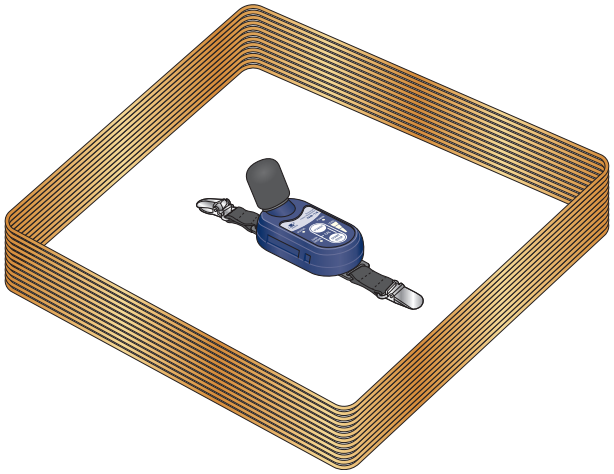


Fig. 6-1. Immunity test conditions for power frequency magnetic fields

* Noise dosimeter operation mode: Normal operation
Accessories: Only the dedicated windscreen is attached

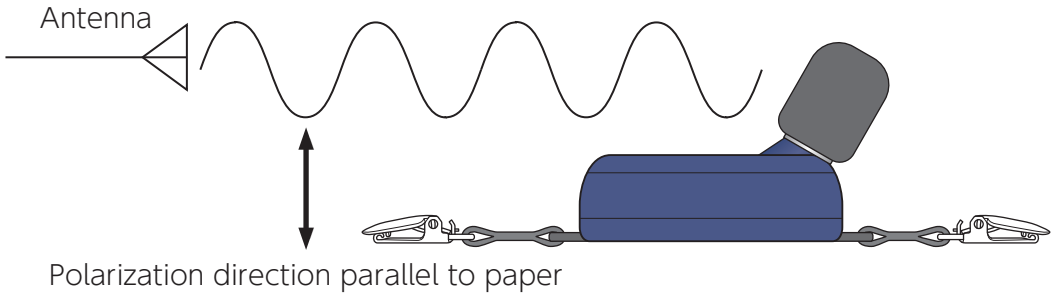


Fig. 6-2. Immunity test conditions for radio frequency electromagnetic fields

Table 6. Compliance with electromagnetic compatibility (EMC) standard

	NB-14
Immunity to power frequency magnetic fields	The specifications of IEC 61672-1 class 2 and IEC 61252 are satisfied
Immunity to radio frequency electromagnetic fields	The specifications of IEC 61672-1 class 2 and IEC 61252 are satisfied
Radio frequency emissions	The specifications of IEC 61252, IEC 61326-1 and VCCI are satisfied
Electrostatic discharge	The specifications of IEC 61672-1 class 2 and IEC 61252 are satisfied

4.9 Microphone free field correction amount

Table 7. Microphone free field correction amount (when calibrating sound pressure with a sound calibrator)

Nominal frequency (Hz)	Exact frequency (Hz)	UC-52 (NB-14) correction amount (dB)	Expanded uncertainty (dB)
31.5	31.623	0.0	0.20
63	63.096	0.0	0.20
125	125.89	0.0	0.20
250	251.19	0.0	0.20
500	501.19	0.0	0.20
1000	1000.0	0.1	0.20
2000	1995.3	0.3	0.25
4000	3981.1	1.3	0.25
8000	7943.3	3.2	0.30

4.10 Upper and lower limits of linear operating range for sound pressure level

Table 8. Upper and lower limits of linear operating range for sound pressure level (dB)

A-weighting

	20 Hz	31.5 Hz	1 kHz	4 kHz	8 kHz
Upper limit	92.0	103.0	143.0	143.0	141.0
Start point	74.0	94.0	94.0	94.0	94.0
Lower limit	58.0	58.0	58.0	58.0	58.0

C-weighting

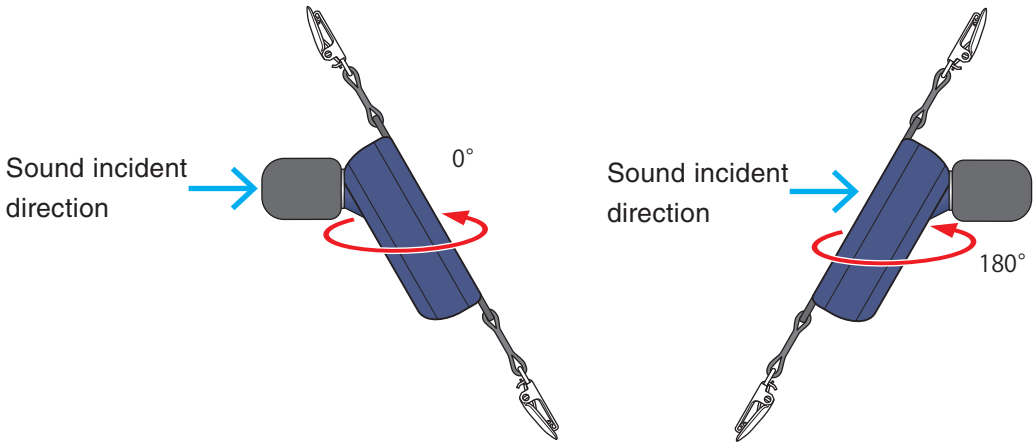
	20 Hz	31.5 Hz	1 kHz	4 kHz	8 kHz
Upper limit	136.0	140.0	143.0	142.0	140.0
Start point	94.0	94.0	94.0	94.0	94.0
Lower limit	58.0	58.0	58.0	58.0	58.0

Measurement range

	L_{Aeq}	L_{Ceq}	L_{Cpeak}
Upper limit	143.0	143.0	146.0
Lower limit	58.0	58.0	75.0

4.11 Directional characteristics

The directional characteristics of the noise dosimeter are expressed as the difference between the measurement value of the reference incident direction (0°) and the measurement value of any incident angle θ.
The electret condenser microphone used in the NB-14 is a pressure-type microphone, so it is primarily omnidirectional. However, at higher frequencies, it becomes directional due to the effects of structure-related diffraction and dents. The following figures show the directional characteristics of NB-14.



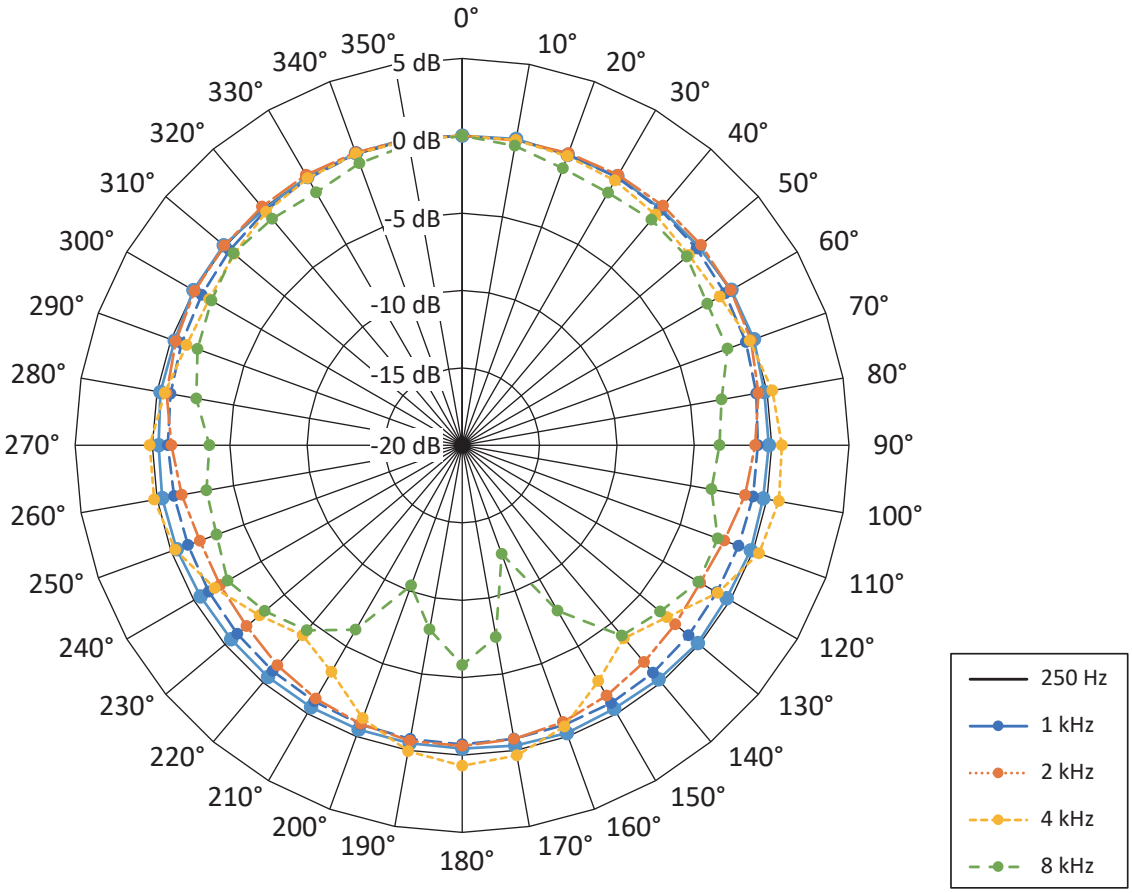


Fig. 7. Directional characteristics of NB-14 (horizontal direction)

Table 9. Directional characteristics of NB-14 (horizontal direction)

Angle	Nominal frequency / exact frequency (Hz)							
(degrees)	250/251.19	315/316.23	400/398.11	500/501.19	630/630.96	800/794.33	1000/1000.0	1250/1258.9
0°	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10°	0.05	0.08	0.03	0.02	-0.03	0.02	0.02	-0.04
20°	0.12	0.10	0.09	0.13	-0.03	0.04	0.01	-0.09
30°	0.12	0.12	0.13	0.22	-0.05	0.01	0.00	-0.08
40°	0.11	0.07	0.07	0.12	-0.12	-0.07	-0.10	-0.27
50°	0.08	0.04	-0.01	0.08	-0.22	-0.15	-0.21	-0.44
60°	-0.04	-0.01	-0.01	0.01	-0.19	-0.28	-0.38	-0.61
70°	0.05	-0.02	0.00	0.01	-0.19	-0.31	-0.49	-0.75
80°	-0.04	-0.05	-0.04	-0.15	-0.19	-0.40	-0.70	-0.99
90°	-0.10	-0.10	-0.17	-0.21	-0.23	-0.47	-0.89	-1.19
100°	-0.20	-0.15	-0.13	-0.28	-0.23	-0.52	-0.91	-1.33
110°	-0.20	-0.18	-0.25	-0.31	-0.25	-0.56	-1.00	-1.40
120°	-0.27	-0.25	-0.29	-0.38	-0.22	-0.55	-1.01	-1.38
130°	-0.21	-0.21	-0.19	-0.26	-0.13	-0.52	-0.90	-1.22
140°	-0.21	-0.21	-0.21	-0.24	-0.11	-0.44	-0.83	-1.11
150°	-0.26	-0.25	-0.26	-0.24	-0.13	-0.45	-0.77	-1.03
160°	-0.36	-0.37	-0.28	-0.26	-0.17	-0.44	-0.78	-0.96
170°	-0.37	-0.35	-0.34	-0.28	-0.15	-0.43	-0.76	-0.93
180°	-0.27	-0.29	-0.25	-0.18	-0.14	-0.42	-0.68	-0.86
190°	-0.35	-0.35	-0.34	-0.15	-0.21	-0.42	-0.74	-0.88
200°	-0.32	-0.32	-0.36	-0.19	-0.24	-0.46	-0.82	-0.95
210°	-0.35	-0.36	-0.40	-0.25	-0.20	-0.56	-0.92	-1.09
220°	-0.34	-0.39	-0.37	-0.35	-0.26	-0.57	-0.97	-1.23
230°	-0.38	-0.40	-0.38	-0.35	-0.30	-0.62	-1.05	-1.36
240°	-0.37	-0.40	-0.43	-0.34	-0.27	-0.64	-1.10	-1.43
250°	-0.37	-0.34	-0.36	-0.33	-0.35	-0.68	-1.15	-1.50
260°	-0.31	-0.35	-0.37	-0.31	-0.32	-0.64	-1.11	-1.41
270°	-0.30	-0.35	-0.38	-0.37	-0.27	-0.63	-0.99	-1.26
280°	-0.22	-0.23	-0.24	-0.20	-0.24	-0.55	-0.88	-1.04
290°	-0.21	-0.18	-0.20	-0.18	-0.24	-0.49	-0.71	-0.85
300°	-0.21	-0.16	-0.16	-0.11	-0.22	-0.37	-0.58	-0.66
310°	-0.09	-0.08	-0.11	-0.03	-0.16	-0.27	-0.40	-0.48
320°	-0.04	-0.03	-0.03	0.06	-0.14	-0.16	-0.23	-0.37
330°	-0.04	0.05	0.01	0.11	-0.10	-0.08	-0.09	-0.24
340°	0.02	0.07	0.08	0.20	-0.03	0.00	0.03	-0.09
350°	0.11	0.08	0.06	0.20	-0.01	0.08	0.07	-0.05

Angle	Nominal frequency / exact frequency (Hz)							
(degrees)	**1600/1584.9**	**2000/1995.3**	2240/2238.7	**2500/2511.9**	2800/2818.4	**3150/3162.3**	3550/3548.1	**4000/3981.1**
0°	**0.00**	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**
10°	**0.02**	**0.00**	-0.02	**0.05**	0.07	**0.02**	-0.05	**0.01**
20°	**0.08**	**0.09**	0.09	**0.24**	0.27	**0.01**	-0.22	**-0.11**
30°	**0.11**	**0.18**	0.26	**0.56**	0.57	**0.04**	-0.40	**-0.24**
40°	**0.02**	**0.21**	0.43	**0.89**	0.91	**0.15**	-0.67	**-0.54**
50°	**-0.11**	**0.15**	0.52	**1.18**	1.28	**0.46**	-0.63	**-0.87**
60°	**-0.33**	**0.04**	0.60	**1.36**	1.60	**0.92**	-0.26	**-0.77**
70°	**-0.57**	**-0.15**	0.61	**1.45**	1.84	**1.41**	0.32	**-0.23**
80°	**-0.98**	**-0.56**	0.32	**1.26**	1.83	**1.64**	0.77	**0.35**
90°	**-1.38**	**-1.06**	-0.19	**0.79**	1.49	**1.59**	0.90	**0.65**
100°	**-1.57**	**-1.44**	-0.65	**0.17**	1.04	**1.26**	0.68	**0.77**
110°	**-1.83**	**-1.99**	-1.28	**-0.58**	0.20	**0.40**	-0.16	**0.41**
120°	**-1.90**	**-2.24**	-1.69	**-1.14**	-0.61	**-0.71**	-1.63	**-0.94**
130°	**-1.71**	**-2.02**	-1.55	**-1.09**	-0.79	**-1.40**	-2.81	**-2.72**
140°	**-1.54**	**-1.73**	-1.20	**-0.68**	-0.35	**-1.17**	-2.80	**-3.73**
150°	**-1.38**	**-1.32**	-0.71	**0.04**	0.47	**-0.17**	-1.41	**-2.41**
160°	**-1.22**	**-0.97**	-0.30	**0.62**	1.18	**0.84**	-0.09	**-0.66**
170°	**-1.16**	**-0.73**	-0.04	**1.06**	1.61	**1.43**	0.66	**0.33**
180°	**-1.10**	**-0.59**	0.11	**1.23**	1.80	**1.75**	0.99	**0.70**
190°	**-1.24**	**-0.63**	-0.07	**1.19**	1.54	**1.37**	0.40	**0.06**
200°	**-1.44**	**-0.85**	-0.43	**0.86**	0.94	**0.63**	-0.62	**-1.25**
210°	**-1.68**	**-1.11**	-0.93	**0.35**	0.11	**-0.49**	-2.00	**-3.11**
220°	**-1.90**	**-1.45**	-1.44	**-0.19**	-0.67	**-1.44**	-2.94	**-3.98**
230°	**-2.10**	**-1.83**	-1.78	**-0.71**	-1.03	**-1.68**	-2.65	**-2.92**
240°	**-2.20**	**-1.95**	-1.86	**-0.39**	-0.56	**-1.10**	-1.65	**-1.55**
250°	**-2.15**	**-1.98**	-1.38	**-0.06**	0.23	**0.12**	-0.33	**-0.27**
260°	**-1.94**	**-1.61**	-0.79	**0.70**	1.02	**0.84**	0.23	**0.21**
270°	**-1.68**	**-1.21**	-0.32	**1.24**	1.51	**1.17**	0.38	**0.17**
280°	**-1.30**	**-0.62**	0.11	**1.74**	1.76	**1.24**	0.11	**-0.51**
290°	**-0.99**	**-0.32**	0.39	**1.73**	1.69	**1.09**	-0.18	**-1.05**
300°	**-0.66**	**-0.05**	0.55	**1.56**	1.44	**0.73**	-0.47	**-1.14**
310°	**-0.44**	**0.07**	0.55	**1.29**	1.07	**0.32**	-0.59	**-0.76**
320°	**-0.21**	**0.12**	0.45	**0.89**	0.68	**0.02**	-0.53	**-0.31**
330°	**-0.04**	**0.17**	0.32	**0.59**	0.42	**-0.12**	-0.42	**-0.07**
340°	**0.04**	**0.12**	0.18	**0.32**	0.20	**-0.07**	-0.16	**0.04**
350°	**0.10**	**0.11**	0.07	**0.15**	0.13	**-0.04**	-0.11	**0.00**

Angle	Nominal frequency / exact frequency (Hz)					
(degrees)	4500/4466.8	**5000/5011.9**	5600/5623.4	**6300/6309.6**	7100/7079.5	**8000/7943.3**
0°	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**
10°	0.02	**-0.21**	0.02	**0.08**	0.16	**-0.35**
20°	-0.14	**-0.77**	-0.07	**0.03**	0.48	**-0.96**
30°	-0.40	**-1.52**	-0.40	**-0.14**	0.64	**-1.15**
40°	-0.63	**-2.38**	-1.26	**-0.38**	0.46	**-0.98**
50°	-0.94	**-2.93**	-2.63	**-1.02**	0.58	**-1.04**
60°	-1.34	**-3.17**	-3.48	**-2.31**	0.36	**-1.71**
70°	-1.53	**-3.40**	-3.31	**-3.78**	-0.91	**-1.75**
80°	-1.12	**-3.45**	-3.56	**-3.84**	-1.90	**-2.98**
90°	-0.79	**-2.89**	-3.55	**-3.77**	-2.13	**-3.37**
100°	-0.45	**-2.72**	-2.95	**-3.55**	-1.51	**-3.65**
110°	-0.52	**-2.70**	-3.11	**-3.08**	-1.02	**-2.43**
120°	-1.29	**-2.88**	-3.48	**-3.56**	-1.76	**-2.37**
130°	-3.11	**-4.28**	-4.20	**-4.23**	-2.28	**-3.30**
140°	-5.50	**-7.37**	-7.05	**-6.27**	-3.77	**-3.96**
150°	-4.99	**-8.05**	-10.29	**-11.12**	-8.30	**-7.67**
160°	-2.60	**-4.85**	-7.11	**-9.47**	-9.62	**-12.53**
170°	-0.97	**-2.84**	-4.34	**-5.66**	-5.12	**-7.42**
180°	-0.52	**-2.26**	-3.62	**-4.81**	-3.94	**-5.80**
190°	-0.86	**-3.16**	-4.71	**-6.00**	-5.76	**-7.93**
200°	-2.51	**-5.44**	-7.80	**-9.53**	-9.77	**-10.38**
210°	-4.75	**-7.94**	-9.80	**-9.89**	-6.60	**-6.26**
220°	-5.11	**-6.84**	-6.88	**-6.15**	-3.28	**-4.40**
230°	-3.23	**-4.31**	-4.24	**-4.47**	-2.38	**-3.36**
240°	-1.42	**-2.79**	-3.24	**-3.93**	-1.37	**-2.50**
250°	-0.42	**-2.21**	-3.35	**-3.56**	-0.85	**-3.13**
260°	-0.18	**-2.41**	-3.57	**-3.76**	-1.68	**-3.24**
270°	-0.48	**-2.87**	-3.70	**-3.91**	-1.97	**-3.67**
280°	-1.17	**-3.17**	-3.83	**-3.91**	-2.54	**-2.57**
290°	-1.48	**-2.98**	-4.05	**-3.94**	-1.01	**-1.81**
300°	-1.21	**-2.91**	-3.65	**-2.61**	-0.20	**-1.31**
310°	-0.99	**-2.79**	-2.52	**-1.32**	0.00	**-0.71**
320°	-0.85	**-2.25**	-1.28	**-0.63**	0.49	**-0.90**
330°	-0.51	**-1.38**	-0.46	**-0.40**	0.63	**-1.13**
340°	-0.17	**-0.65**	-0.06	**-0.11**	0.48	**-0.60**
350°	0.16	**-0.25**	0.08	**0.00**	0.20	**-0.24**

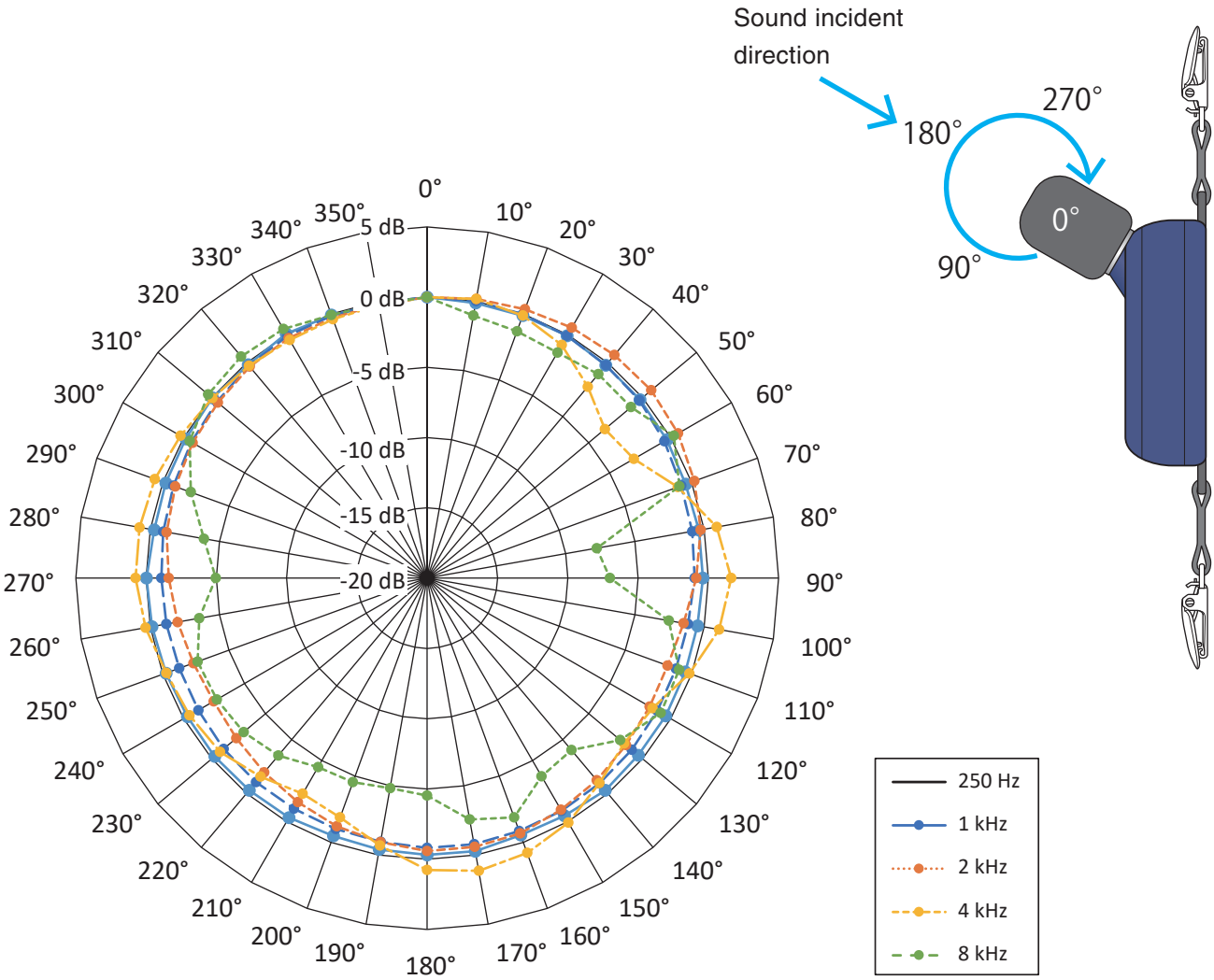


Fig. 8. Directional characteristics of NB-14 (vertical direction)

Table 10. Directional characteristics of NB-14 (vertical direction)

Angle	Nominal frequency / exact frequency (Hz)							
(degrees)	250/251.19	315/316.23	400/398.11	500/501.19	630/630.96	800/794.33	1000/1000.0	1250/1258.9
0°	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10°	0.02	-0.01	-0.09	-0.08	-0.01	-0.05	0.02	0.01
20°	-0.04	-0.07	-0.09	-0.08	-0.05	-0.13	-0.02	-0.04
30°	-0.03	-0.10	-0.13	-0.13	-0.03	-0.13	-0.09	-0.04
40°	-0.11	-0.12	-0.20	-0.19	-0.16	-0.27	-0.21	-0.25
50°	-0.08	-0.14	-0.19	-0.12	-0.14	-0.27	-0.30	-0.38
60°	-0.16	-0.20	-0.24	-0.23	-0.22	-0.44	-0.50	-0.66
70°	-0.27	-0.29	-0.39	-0.39	-0.29	-0.56	-0.76	-0.94
80°	-0.24	-0.29	-0.34	-0.35	-0.25	-0.59	-0.86	-1.08
90°	-0.25	-0.30	-0.35	-0.43	-0.25	-0.66	-0.98	-1.27
100°	-0.29	-0.38	-0.40	-0.45	-0.32	-0.70	-1.15	-1.49
110°	-0.35	-0.40	-0.42	-0.49	-0.35	-0.68	-1.16	-1.50
120°	-0.36	-0.37	-0.42	-0.37	-0.29	-0.63	-1.10	-1.39
130°	-0.29	-0.37	-0.39	-0.33	-0.19	-0.61	-1.01	-1.30
140°	-0.32	-0.39	-0.38	-0.25	-0.24	-0.56	-0.93	-1.19
150°	-0.35	-0.39	-0.36	-0.28	-0.31	-0.52	-0.88	-1.12
160°	-0.32	-0.37	-0.33	-0.19	-0.22	-0.51	-0.85	-1.01
170°	-0.31	-0.38	-0.37	-0.16	-0.20	-0.49	-0.78	-0.91
180°	-0.40	-0.37	-0.36	-0.19	-0.21	-0.51	-0.80	-0.90
190°	-0.52	-0.51	-0.40	-0.44	-0.17	-0.57	-0.95	-0.92
200°	-0.42	-0.46	-0.34	-0.43	-0.16	-0.59	-1.01	-0.99
210°	-0.42	-0.42	-0.38	-0.45	-0.18	-0.64	-1.05	-1.08
220°	-0.35	-0.36	-0.30	-0.34	-0.11	-0.62	-1.05	-1.14
230°	-0.27	-0.36	-0.26	-0.29	-0.11	-0.62	-1.10	-1.23
240°	-0.27	-0.33	-0.29	-0.33	-0.22	-0.67	-1.20	-1.34
250°	-0.26	-0.35	-0.29	-0.32	-0.26	-0.69	-1.23	-1.37
260°	-0.23	-0.28	-0.21	-0.25	-0.24	-0.66	-1.16	-1.30
270°	-0.20	-0.27	-0.18	-0.23	-0.21	-0.64	-1.08	-1.17
280°	-0.28	-0.28	-0.27	-0.40	-0.30	-0.57	-0.94	-1.07
290°	-0.09	-0.15	-0.25	-0.36	-0.30	-0.50	-0.79	-0.89
300°	-0.10	-0.16	-0.17	-0.34	-0.22	-0.41	-0.64	-0.73
310°	-0.13	-0.09	-0.17	-0.26	-0.18	-0.30	-0.48	-0.58
320°	0.09	0.04	-0.03	-0.06	-0.08	-0.10	-0.25	-0.38
330°	0.04	0.04	0.06	0.00	-0.03	-0.07	-0.11	-0.24
340°	0.03	-0.01	-0.01	-0.08	-0.08	-0.09	-0.14	-0.21
350°	-0.02	-0.03	0.01	-0.03	-0.06	-0.07	-0.10	-0.14

Angle	Nominal frequency / exact frequency (Hz)							
(degrees)	**1600/1584.9**	**2000/1995.3**	2240/2238.7	**2500/2511.9**	2800/2818.4	**3150/3162.3**	3550/3548.1	**4000/3981.1**
0°	**0.00**	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**
10°	**0.09**	**0.17**	0.12	**-0.01**	-0.36	**-0.60**	-0.26	**0.17**
20°	**0.18**	**0.36**	0.37	**0.24**	-0.49	**-1.23**	-0.88	**-0.10**
30°	**0.23**	**0.58**	0.76	**0.85**	-0.15	**-1.55**	-1.65	**-0.84**
40°	**0.18**	**0.72**	1.12	**1.48**	0.53	**-1.13**	-2.51	**-2.22**
50°	**0.10**	**0.81**	1.48	**2.20**	1.55	**0.07**	-2.24	**-3.50**
60°	**-0.26**	**0.62**	1.52	**2.48**	2.36	**1.35**	-0.84	**-3.02**
70°	**-0.72**	**0.22**	1.21	**2.41**	2.74	**2.25**	0.81	**-1.03**
80°	**-1.07**	**-0.24**	0.70	**1.99**	2.67	**2.55**	1.85	**0.92**
90°	**-1.53**	**-0.86**	-0.08	**1.23**	2.01	**2.02**	1.87	**1.64**
100°	**-1.89**	**-1.48**	-0.88	**0.26**	0.99	**1.00**	1.07	**1.08**
110°	**-2.03**	**-1.79**	-1.37	**-0.40**	0.06	**-0.10**	-0.08	**-0.14**
120°	**-1.98**	**-1.73**	-1.43	**-0.48**	-0.41	**-0.77**	-1.05	**-1.48**
130°	**-1.83**	**-1.53**	-1.22	**-0.27**	-0.28	**-0.62**	-1.06	**-1.71**
140°	**-1.66**	**-1.23**	-0.83	**0.16**	0.22	**0.07**	-0.32	**-0.95**
150°	**-1.48**	**-0.97**	-0.44	**0.59**	0.75	**0.82**	0.58	**0.09**
160°	**-1.34**	**-0.67**	-0.14	**1.08**	1.20	**1.30**	1.18	**0.81**
170°	**-1.23**	**-0.58**	0.02	**1.22**	1.37	**1.47**	1.41	**1.15**
180°	**-1.26**	**-0.57**	-0.03	**1.13**	1.25	**1.18**	1.08	**0.77**
190°	**-1.45**	**-0.92**	-0.39	**0.60**	0.71	**0.30**	-0.01	**-0.69**
200°	**-1.65**	**-1.21**	-0.86	**0.06**	0.00	**-0.72**	-1.32	**-1.89**
210°	**-1.88**	**-1.59**	-1.39	**-0.51**	-0.80	**-1.63**	-1.99	**-2.29**
220°	**-2.00**	**-1.96**	-1.73	**-0.96**	-1.17	**-1.56**	-1.56	**-1.57**
230°	**-2.11**	**-2.28**	-1.86	**-1.05**	-0.98	**-1.01**	-0.94	**-0.75**
240°	**-2.15**	**-2.47**	-1.74	**-0.95**	-0.53	**-0.42**	-0.30	**-0.48**
250°	**-2.14**	**-2.30**	-1.46	**-0.44**	-0.10	**-0.02**	0.12	**-0.25**
260°	**-1.95**	**-1.97**	-1.09	**-0.17**	0.25	**0.36**	0.46	**0.34**
270°	**-1.75**	**-1.61**	-0.77	**0.10**	0.52	**0.66**	0.79	**0.75**
280°	**-1.50**	**-1.18**	-0.54	**0.33**	0.78	**0.79**	0.95	**0.77**
290°	**-1.24**	**-0.94**	-0.36	**0.41**	0.97	**1.01**	1.04	**0.62**
300°	**-1.02**	**-0.73**	-0.25	**0.46**	1.06	**1.08**	0.93	**0.27**
310°	**-0.73**	**-0.56**	-0.17	**0.47**	1.12	**1.13**	0.75	**-0.06**
320°	**-0.44**	**-0.35**	-0.08	**0.53**	1.15	**1.12**	0.50	**-0.27**
330°	**-0.30**	**-0.28**	-0.12	**0.47**	1.01	**0.95**	0.31	**-0.43**
340°	**-0.28**	**-0.30**	-0.19	**0.20**	0.66	**0.66**	0.19	**-0.40**
350°	**-0.17**	**-0.22**	-0.16	**0.07**	0.34	**0.41**	0.10	**-0.27**

Angle	Nominal frequency / exact frequency (Hz)					
(degrees)	4500/4466.8	**5000/5011.9**	5600/5623.4	**6300/6309.6**	7100/7079.5	**8000/7943.3**
0°	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**
10°	0.36	**-0.16**	0.23	**0.15**	-0.32	**-1.02**
20°	0.79	**-0.25**	0.01	**0.21**	-0.30	**-1.31**
30°	0.50	**0.31**	0.04	**-0.44**	-0.06	**-1.46**
40°	-0.23	**-0.26**	0.34	**-0.52**	-0.72	**-1.05**
50°	-2.12	**-1.63**	-0.46	**-0.19**	-0.21	**-1.07**
60°	-4.40	**-3.59**	-2.33	**-2.02**	-0.12	**0.26**
70°	-3.55	**-5.11**	-4.37	**-4.37**	-4.00	**-0.90**
80°	-0.78	**-3.15**	-4.57	**-4.98**	-6.66	**-7.75**
90°	0.98	**-0.97**	-2.60	**-3.37**	-3.72	**-7.00**
100°	0.96	**-0.30**	-1.40	**-1.79**	-1.23	**-2.53**
110°	-0.38	**-1.09**	-1.68	**-1.58**	-0.43	**-0.93**
120°	-2.25	**-3.08**	-3.71	**-3.20**	-1.23	**-0.81**
130°	-2.95	**-4.63**	-5.91	**-5.28**	-3.13	**-2.08**
140°	-1.85	**-4.45**	-6.52	**-6.76**	-5.49	**-4.03**
150°	-0.29	**-2.70**	-4.24	**-5.17**	-4.97	**-3.71**
160°	0.93	**-1.07**	-2.16	**-3.14**	-2.55	**-1.89**
170°	1.30	**-0.58**	-1.79	**-2.49**	-1.99	**-2.56**
180°	0.49	**-1.42**	-2.69	**-3.91**	-4.48	**-4.53**
190°	-1.65	**-3.08**	-5.17	**-6.12**	-5.36	**-4.83**
200°	-2.59	**-4.25**	-4.76	**-5.81**	-3.78	**-4.55**
210°	-2.49	**-3.14**	-4.17	**-5.29**	-4.65	**-4.48**
220°	-1.26	**-3.07**	-3.95	**-5.78**	-3.93	**-3.53**
230°	-1.06	**-2.80**	-4.03	**-4.35**	-2.96	**-2.95**
240°	-0.94	**-2.18**	-3.13	**-3.56**	-2.58	**-2.72**
250°	-0.11	**-1.50**	-2.62	**-3.46**	-2.94	**-2.63**
260°	0.26	**-1.16**	-2.72	**-3.98**	-3.27	**-3.54**
270°	0.22	**-1.35**	-3.09	**-4.90**	-3.84	**-4.96**
280°	-0.09	**-1.71**	-3.88	**-5.66**	-4.59	**-3.88**
290°	-0.54	**-2.27**	-4.60	**-5.64**	-3.30	**-2.10**
300°	-0.88	**-2.70**	-4.43	**-4.28**	-1.35	**-0.49**
310°	-0.90	**-2.75**	-3.40	**-2.63**	0.04	**0.33**
320°	-0.61	**-2.23**	-2.17	**-1.57**	0.69	**0.59**
330°	-0.39	**-1.42**	-1.25	**-0.95**	0.84	**0.47**
340°	-0.28	**-0.60**	-0.71	**-0.55**	0.67	**-0.07**
350°	-0.17	**-0.13**	-0.47	**-0.19**	0.25	**-0.17**

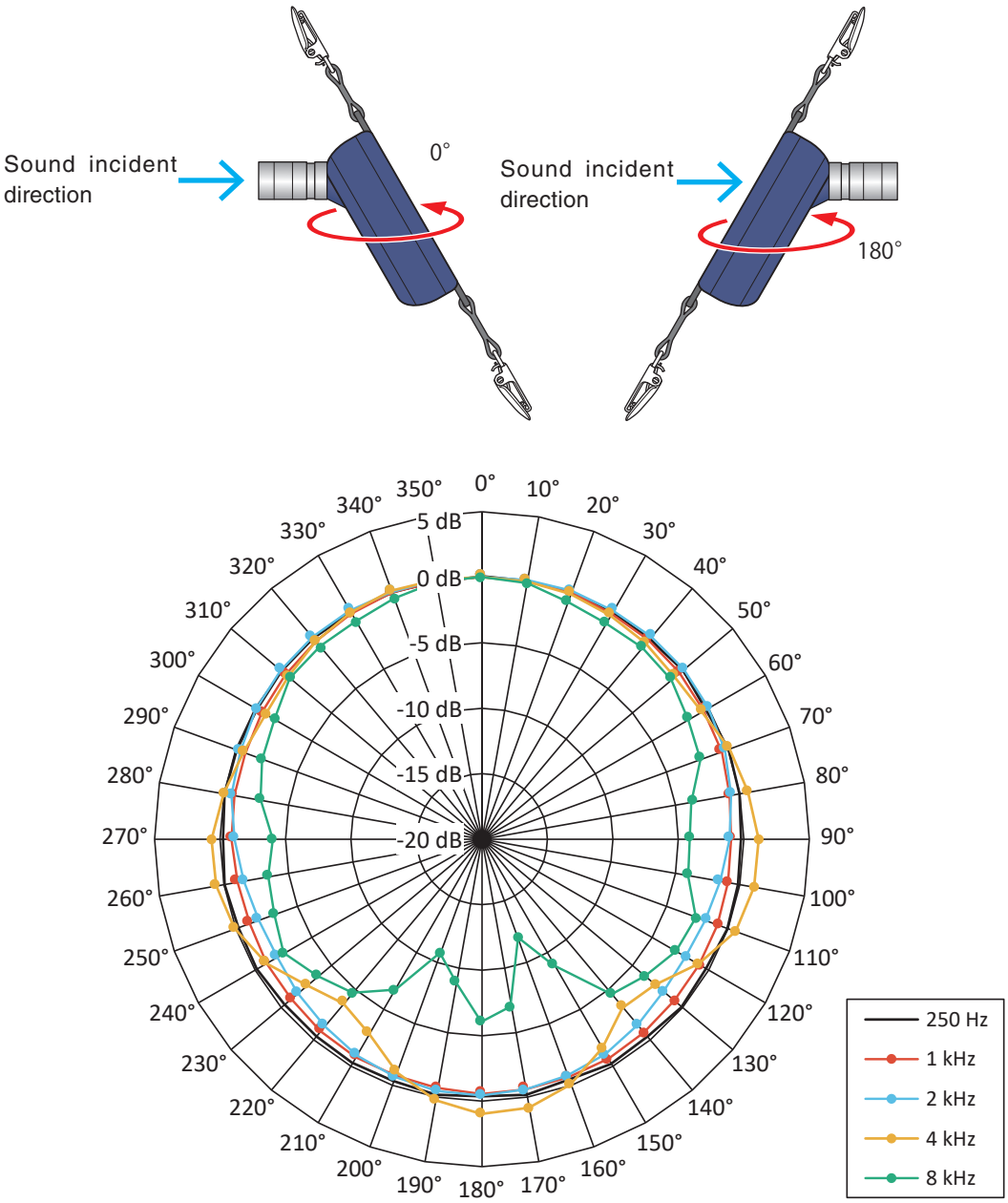


Fig. 9. Directional characteristics of NB-14 without the dedicated windscreen attached (horizontal direction)

Table 11. Directional characteristics of NB-14 without the dedicated windscreen attached (horizontal direction)

Angle	Nominal frequency / exact frequency (Hz)							
(degrees)	250/251.19	315/316.23	400/398.11	500/501.19	630/630.96	800/794.33	1000/1000.0	1250/1258.9
0°	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10°	0.01	-0.02	0.04	0.10	0.00	-0.01	-0.04	0.00
20°	0.02	0.01	0.08	0.19	-0.02	-0.02	-0.02	-0.03
30°	0.02	0.01	0.06	0.17	-0.12	-0.03	-0.11	-0.18
40°	-0.01	0.00	-0.01	0.13	-0.18	-0.14	-0.18	-0.30
50°	-0.06	-0.05	-0.01	0.15	-0.22	-0.18	-0.27	-0.45
60°	-0.05	0.00	-0.01	0.14	-0.22	-0.25	-0.39	-0.59
70°	-0.07	-0.03	-0.01	0.13	-0.29	-0.29	-0.53	-0.78
80°	-0.17	-0.11	-0.12	-0.01	-0.36	-0.38	-0.74	-1.02
90°	-0.18	-0.16	-0.14	-0.11	-0.29	-0.52	-0.89	-1.19
100°	-0.06	-0.04	-0.11	-0.19	-0.30	-0.47	-0.91	-1.31
110°	-0.03	-0.03	-0.05	-0.04	-0.24	-0.40	-0.82	-1.31
120°	-0.12	-0.09	-0.10	-0.09	-0.28	-0.41	-0.84	-1.34
130°	-0.19	-0.12	-0.13	-0.08	-0.29	-0.40	-0.83	-1.24
140°	-0.20	-0.13	-0.16	-0.15	-0.24	-0.37	-0.75	-1.03
150°	-0.20	-0.12	-0.15	-0.13	-0.18	-0.28	-0.66	-0.86
160°	-0.27	-0.23	-0.20	-0.24	-0.19	-0.27	-0.66	-0.80
170°	-0.29	-0.24	-0.27	-0.29	-0.20	-0.33	-0.65	-0.77
180°	-0.24	-0.23	-0.24	-0.20	-0.12	-0.29	-0.59	-0.74
190°	-0.33	-0.37	-0.33	-0.30	-0.11	-0.39	-0.71	-0.80
200°	-0.41	-0.46	-0.37	-0.43	-0.12	-0.50	-0.77	-0.90
210°	-0.40	-0.40	-0.42	-0.42	-0.18	-0.54	-0.84	-1.03
220°	-0.43	-0.39	-0.37	-0.44	-0.21	-0.58	-0.94	-1.13
230°	-0.41	-0.38	-0.35	-0.33	-0.21	-0.59	-0.99	-1.23
240°	-0.42	-0.43	-0.34	-0.29	-0.31	-0.66	-1.06	-1.38
250°	-0.38	-0.43	-0.36	-0.31	-0.33	-0.69	-1.15	-1.46
260°	-0.32	-0.35	-0.29	-0.31	-0.29	-0.63	-1.09	-1.38
270°	-0.22	-0.27	-0.25	-0.31	-0.17	-0.59	-0.92	-1.16
280°	-0.22	-0.33	-0.28	-0.36	-0.05	-0.52	-0.86	-0.89
290°	-0.19	-0.28	-0.28	-0.38	-0.11	-0.44	-0.78	-0.75
300°	-0.14	-0.29	-0.24	-0.36	-0.08	-0.40	-0.64	-0.57
310°	-0.19	-0.23	-0.22	-0.29	-0.06	-0.34	-0.50	-0.38
320°	-0.08	-0.19	-0.13	-0.24	-0.02	-0.25	-0.38	-0.24
330°	-0.01	-0.02	-0.02	-0.05	0.05	-0.09	-0.17	-0.11
340°	0.03	-0.02	0.04	0.06	0.03	-0.02	-0.04	0.01
350°	-0.03	-0.03	0.00	-0.03	0.00	-0.01	-0.05	-0.02

Angle	Nominal frequency / exact frequency (Hz)							
(degrees)	**1600/1584.9**	**2000/1995.3**	2240/2238.7	**2500/2511.9**	2800/2818.4	**3150/3162.3**	3550/3548.1	**4000/3981.1**
0°	**0.00**	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**
10°	**-0.02**	**0.01**	0.00	**0.10**	0.04	**0.00**	0.01	**-0.01**
20°	**0.04**	**0.10**	0.12	**0.27**	0.27	**0.02**	-0.12	**-0.06**
30°	**0.00**	**0.14**	0.24	**0.56**	0.54	**0.01**	-0.41	**-0.30**
40°	**-0.06**	**0.18**	0.40	**0.94**	0.94	**0.21**	-0.53	**-0.53**
50°	**-0.18**	**0.14**	0.54	**1.29**	1.38	**0.61**	-0.42	**-0.72**
60°	**-0.35**	**0.04**	0.57	**1.54**	1.78	**1.20**	0.01	**-0.53**
70°	**-0.59**	**-0.19**	0.53	**1.58**	2.01	**1.68**	0.69	**0.12**
80°	**-0.98**	**-0.60**	0.23	**1.29**	1.96	**1.90**	1.09	**0.71**
90°	**-1.38**	**-1.11**	-0.24	**0.79**	1.63	**1.82**	1.30	**1.12**
100°	**-1.58**	**-1.52**	-0.82	**0.09**	1.07	**1.37**	0.92	**1.17**
110°	**-1.60**	**-1.82**	-1.27	**-0.47**	0.43	**0.57**	-0.12	**0.60**
120°	**-1.61**	**-2.02**	-1.56	**-0.97**	-0.28	**-0.53**	-1.73	**-0.90**
130°	**-1.51**	**-1.91**	-1.43	**-1.00**	-0.46	**-1.08**	-2.83	**-2.74**
140°	**-1.36**	**-1.54**	-1.00	**-0.47**	0.01	**-0.66**	-2.26	**-3.21**
150°	**-1.13**	**-1.11**	-0.42	**0.28**	0.89	**0.44**	-0.77	**-1.61**
160°	**-1.09**	**-0.78**	-0.09	**0.85**	1.52	**1.29**	0.46	**-0.04**
170°	**-1.04**	**-0.56**	0.12	**1.26**	1.92	**1.83**	1.14	**0.86**
180°	**-1.03**	**-0.44**	0.16	**1.51**	2.00	**1.98**	1.33	**1.01**
190°	**-1.25**	**-0.54**	-0.12	**1.40**	1.70	**1.53**	0.63	**0.24**
200°	**-1.44**	**-0.68**	-0.47	**1.08**	1.18	**0.77**	-0.41	**-1.07**
210°	**-1.66**	**-0.99**	-0.93	**0.56**	0.37	**-0.29**	-1.74	**-2.84**
220°	**-1.87**	**-1.40**	-1.40	**-0.10**	-0.41	**-1.24**	-2.63	**-3.65**
230°	**-2.03**	**-1.70**	-1.69	**-0.41**	-0.73	**-1.45**	-2.32	**-2.62**
240°	**-2.17**	**-1.99**	-1.72	**-0.44**	-0.38	**-0.71**	-1.09	**-1.06**
250°	**-2.15**	**-1.93**	-1.37	**0.06**	0.40	**0.33**	-0.01	**0.05**
260°	**-1.95**	**-1.62**	-0.82	**0.79**	1.22	**1.16**	0.60	**0.57**
270°	**-1.62**	**-1.11**	-0.24	**1.42**	1.79	**1.56**	0.83	**0.62**
280°	**-1.34**	**-0.64**	0.21	**1.82**	1.93	**1.63**	0.61	**-0.01**
290°	**-1.06**	**-0.38**	0.44	**1.77**	1.80	**1.40**	0.23	**-0.69**
300°	**-0.81**	**-0.12**	0.53	**1.62**	1.54	**0.95**	-0.27	**-1.00**
310°	**-0.59**	**-0.01**	0.55	**1.33**	1.14	**0.45**	-0.48	**-0.77**
320°	**-0.39**	**0.06**	0.49	**0.89**	0.68	**0.12**	-0.33	**-0.31**
330°	**-0.17**	**0.10**	0.38	**0.51**	0.35	**-0.01**	-0.08	**0.02**
340°	**-0.06**	**0.07**	0.24	**0.29**	0.16	**0.01**	0.06	**0.13**
350°	**-0.04**	**0.00**	0.08	**0.06**	0.02	**0.00**	0.06	**0.07**

Angle	Nominal frequency / exact frequency (Hz)					
(degrees)	4500/4466.8	**5000/5011.9**	5600/5623.4	**6300/6309.6**	7100/7079.5	**8000/7943.3**
0°	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**
10°	-0.19	**-0.17**	-0.01	**-0.01**	0.13	**-0.18**
20°	-0.31	**-0.75**	-0.11	**-0.14**	0.36	**-0.77**
30°	-0.61	**-1.60**	-0.67	**-0.35**	0.35	**-1.05**
40°	-0.79	**-2.46**	-1.60	**-0.65**	0.20	**-0.88**
50°	-0.97	**-2.97**	-2.97	**-1.35**	0.23	**-1.06**
60°	-1.10	**-3.12**	-3.72	**-2.97**	-0.09	**-1.77**
70°	-1.06	**-3.30**	-3.49	**-4.28**	-1.41	**-2.20**
80°	-0.62	**-3.32**	-3.68	**-4.04**	-2.41	**-3.73**
90°	-0.26	**-2.65**	-3.36	**-3.72**	-2.34	**-4.12**
100°	0.10	**-2.32**	-2.69	**-3.28**	-1.64	**-3.93**
110°	0.25	**-2.39**	-2.73	**-2.98**	-1.12	**-2.60**
120°	-0.62	**-2.88**	-3.25	**-3.35**	-1.65	**-2.80**
130°	-2.60	**-4.48**	-4.37	**-4.13**	-2.29	**-3.68**
140°	-4.97	**-7.61**	-7.55	**-6.80**	-4.22	**-4.53**
150°	-4.02	**-7.25**	-9.74	**-11.54**	-8.88	**-8.96**
160°	-1.73	**-4.04**	-6.21	**-8.53**	-8.76	**-11.96**
170°	-0.21	**-2.17**	-3.75	**-4.99**	-4.64	**-7.04**
180°	0.23	**-1.83**	-3.20	**-4.40**	-3.78	**-6.04**
190°	-0.45	**-2.97**	-4.77	**-6.07**	-6.39	**-8.86**
200°	-2.02	**-5.12**	-7.55	**-9.22**	-9.92	**-10.71**
210°	-4.31	**-7.43**	-9.37	**-9.34**	-6.78	**-6.78**
220°	-4.72	**-6.42**	-6.59	**-6.05**	-3.55	**-4.74**
230°	-2.71	**-3.98**	-4.01	**-4.42**	-2.63	**-3.68**
240°	-1.03	**-2.41**	-3.03	**-4.00**	-1.53	**-2.55**
250°	-0.05	**-1.85**	-3.16	**-3.56**	-1.05	**-3.15**
260°	0.28	**-1.92**	-3.41	**-3.54**	-1.87	**-3.42**
270°	0.02	**-2.40**	-3.45	**-3.75**	-2.30	**-4.03**
280°	-0.92	**-2.75**	-3.73	**-4.06**	-3.00	**-2.88**
290°	-1.32	**-2.65**	-4.25	**-4.12**	-1.70	**-2.15**
300°	-1.17	**-2.78**	-3.94	**-2.86**	-0.70	**-1.69**
310°	-1.16	**-2.69**	-2.75	**-1.59**	-0.42	**-0.86**
320°	-1.17	**-2.05**	-1.50	**-0.93**	0.10	**-0.82**
330°	-0.86	**-1.24**	-0.59	**-0.53**	0.45	**-0.85**
340°	-0.45	**-0.55**	-0.19	**-0.25**	0.31	**-0.47**
350°	-0.15	**-0.19**	-0.11	**-0.07**	0.04	**-0.12**

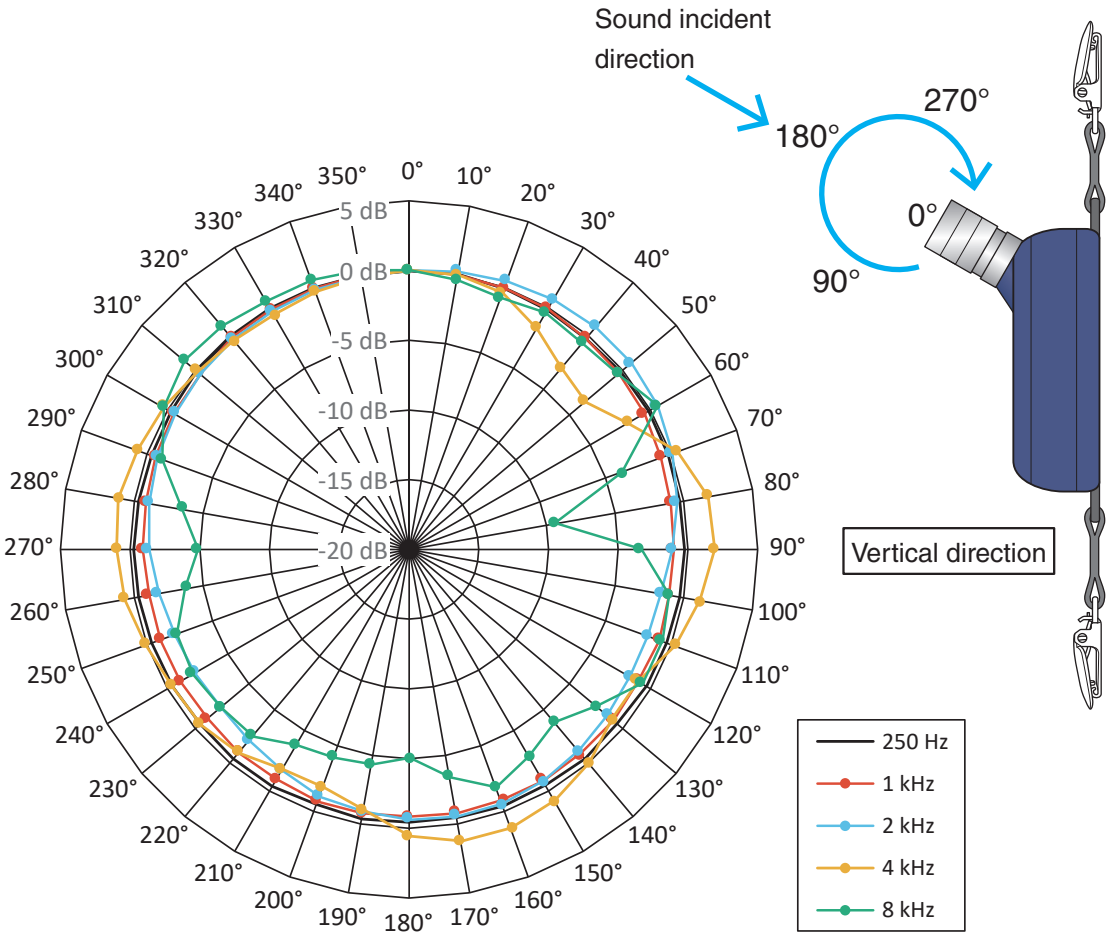


Fig. 10. Directional characteristics of NB-14 without the dedicated windscreen attached (vertical direction)

Table 12. Directional characteristics of NB-14 without the dedicated windscreen attached (vertical direction)

Angle	Nominal frequency / exact frequency (Hz)							
(degrees)	250/251.19	315/316.23	400/398.11	500/501.19	630/630.96	800/794.33	1000/1000.0	1250/1258.9
0°	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10°	-0.01	-0.04	-0.02	0.05	-0.04	-0.01	-0.02	-0.03
20°	-0.04	-0.03	0.01	0.02	-0.09	-0.08	-0.08	-0.07
30°	-0.09	-0.11	-0.07	-0.03	-0.20	-0.11	-0.13	-0.17
40°	-0.15	-0.14	-0.09	-0.04	-0.19	-0.19	-0.26	-0.29
50°	-0.20	-0.18	-0.11	-0.09	-0.24	-0.33	-0.43	-0.52
60°	-0.23	-0.22	-0.14	-0.19	-0.27	-0.43	-0.59	-0.73
70°	-0.26	-0.29	-0.22	-0.34	-0.34	-0.53	-0.82	-1.00
80°	-0.28	-0.28	-0.29	-0.37	-0.35	-0.55	-0.97	-1.21
90°	-0.31	-0.32	-0.29	-0.39	-0.34	-0.61	-1.05	-1.34
100°	-0.28	-0.28	-0.30	-0.32	-0.35	-0.63	-1.09	-1.42
110°	-0.28	-0.24	-0.23	-0.30	-0.40	-0.56	-0.93	-1.06
120°	-0.37	-0.39	-0.37	-0.35	-0.33	-0.58	-1.06	-1.34
130°	-0.38	-0.43	-0.40	-0.39	-0.28	-0.59	-0.97	-1.18
140°	-0.37	-0.40	-0.46	-0.42	-0.23	-0.52	-0.90	-1.02
150°	-0.38	-0.40	-0.44	-0.44	-0.20	-0.51	-0.83	-0.90
160°	-0.38	-0.44	-0.40	-0.41	-0.17	-0.47	-0.82	-0.80
170°	-0.40	-0.43	-0.40	-0.41	-0.18	-0.45	-0.78	-0.76
180°	-0.34	-0.41	-0.41	-0.32	-0.16	-0.44	-0.78	-0.78
190°	-0.41	-0.31	-0.25	-0.21	-0.16	-0.48	-0.74	-0.87
200°	-0.40	-0.31	-0.28	-0.32	-0.39	-0.49	-0.74	-0.64
210°	-0.37	-0.34	-0.29	-0.26	-0.28	-0.57	-0.90	-1.10
220°	-0.32	-0.32	-0.26	-0.23	-0.33	-0.56	-0.97	-1.25
230°	-0.30	-0.30	-0.27	-0.23	-0.27	-0.57	-1.02	-1.30
240°	-0.31	-0.27	-0.23	-0.26	-0.27	-0.62	-1.01	-1.34
250°	-0.25	-0.18	-0.23	-0.30	-0.30	-0.60	-0.98	-1.26
260°	-0.25	-0.21	-0.24	-0.28	-0.29	-0.56	-0.97	-1.18
270°	-0.11	-0.15	-0.16	-0.25	-0.23	-0.52	-0.87	-1.07
280°	-0.08	-0.15	-0.17	-0.19	-0.21	-0.43	-0.77	-0.89
290°	-0.06	-0.09	-0.13	-0.15	-0.21	-0.35	-0.60	-0.73
300°	0.01	-0.13	-0.11	-0.13	-0.13	-0.21	-0.47	-0.57
310°	-0.08	-0.08	-0.10	-0.22	-0.13	-0.22	-0.38	-0.45
320°	0.02	-0.04	-0.06	-0.16	-0.05	-0.10	-0.21	-0.27
330°	0.00	-0.06	-0.07	-0.16	-0.02	-0.05	-0.16	-0.15
340°	-0.01	-0.04	-0.06	-0.16	-0.01	-0.07	-0.09	-0.07
350°	-0.07	-0.04	-0.06	-0.08	0.03	-0.03	-0.07	-0.01

Angle	Nominal frequency / exact frequency (Hz)							
(degrees)	**1600/1584.9**	**2000/1995.3**	2240/2238.7	**2500/2511.9**	2800/2818.4	**3150/3162.3**	3550/3548.1	**4000/3981.1**
0°	**0.00**	**0.00**	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**
10°	**0.09**	**0.20**	0.20	**0.17**	-0.21	**-0.65**	-0.43	**-0.06**
20°	**0.16**	**0.45**	0.50	**0.53**	-0.17	**-1.15**	-1.14	**-0.51**
30°	**0.23**	**0.66**	0.97	**1.28**	0.44	**-1.10**	-2.00	**-1.70**
40°	**0.10**	**0.77**	1.33	**1.96**	1.27	**-0.25**	-2.21	**-3.05**
50°	**-0.15**	**0.71**	1.57	**2.51**	2.27	**1.16**	-1.23	**-3.56**
60°	**-0.47**	**0.48**	1.49	**2.65**	2.95	**2.40**	0.55	**-1.90**
70°	**-0.91**	**0.02**	1.05	**2.34**	3.09	**3.01**	1.97	**0.42**
80°	**-1.31**	**-0.55**	0.35	**1.68**	2.71	**2.87**	2.44	**1.78**
90°	**-1.65**	**-1.13**	-0.38	**0.83**	1.92	**2.14**	2.12	**1.91**
100°	**-1.85**	**-1.68**	-0.99	**-0.09**	0.89	**1.18**	1.32	**1.11**
110°	**-2.25**	**-1.82**	-1.35	**-0.53**	0.33	**0.43**	0.39	**0.25**
120°	**-1.90**	**-1.72**	-1.21	**-0.49**	-0.14	**-0.11**	-0.42	**-1.14**
130°	**-1.79**	**-1.47**	-0.98	**-0.15**	0.15	**0.17**	-0.22	**-1.01**
140°	**-1.58**	**-1.15**	-0.57	**0.40**	0.75	**0.85**	0.54	**-0.06**
150°	**-1.43**	**-0.84**	-0.26	**0.91**	1.31	**1.46**	1.27	**0.81**
160°	**-1.31**	**-0.64**	-0.04	**1.29**	1.65	**1.76**	1.70	**1.31**
170°	**-1.27**	**-0.56**	0.01	**1.38**	1.70	**1.72**	1.68	**1.28**
180°	**-1.30**	**-0.62**	-0.15	**1.19**	1.43	**1.26**	1.11	**0.59**
190°	**-1.38**	**-0.85**	-0.48	**0.68**	0.84	**0.45**	-0.05	**-0.94**
200°	**-1.88**	**-1.14**	-0.83	**0.18**	0.36	**-0.23**	-1.13	**-1.80**
210°	**-1.72**	**-1.66**	-1.30	**-0.67**	-0.69	**-1.12**	-1.37	**-1.72**
220°	**-1.83**	**-2.07**	-1.60	**-1.14**	-0.92	**-0.75**	-0.82	**-0.94**
230°	**-1.95**	**-2.29**	-1.69	**-0.98**	-0.61	**-0.25**	-0.40	**-0.38**
240°	**-1.98**	**-2.23**	-1.52	**-0.60**	-0.10	**0.18**	0.09	**-0.25**
250°	**-1.89**	**-2.03**	-1.23	**-0.20**	0.34	**0.56**	0.46	**0.14**
260°	**-1.74**	**-1.66**	-0.92	**0.19**	0.66	**0.81**	0.77	**0.74**
270°	**-1.56**	**-1.28**	-0.65	**0.42**	0.93	**1.06**	1.07	**1.08**
280°	**-1.24**	**-1.02**	-0.35	**0.45**	1.16	**1.50**	1.47	**1.21**
290°	**-0.98**	**-0.73**	-0.16	**0.58**	1.34	**1.62**	1.44	**0.84**
300°	**-0.74**	**-0.55**	-0.09	**0.60**	1.42	**1.62**	1.24	**0.37**
310°	**-0.64**	**-0.43**	-0.07	**0.52**	1.31	**1.50**	0.99	**-0.12**
320°	**-0.45**	**-0.32**	-0.07	**0.39**	1.18	**1.35**	0.68	**-0.40**
330°	**-0.32**	**-0.28**	-0.09	**0.27**	0.97	**1.16**	0.56	**-0.48**
340°	**-0.24**	**-0.23**	-0.14	**0.11**	0.62	**0.86**	0.49	**-0.36**
350°	**-0.16**	**-0.15**	-0.11	**-0.04**	0.26	**0.49**	0.38	**-0.15**

Angle	Nominal frequency / exact frequency (Hz)					
(degrees)	4500/4466.8	**5000/5011.9**	5600/5623.4	**6300/6309.6**	7100/7079.5	**8000/7943.3**
0°	0.00	**0.00**	0.00	**0.00**	0.00	**0.00**
10°	0.33	**-0.14**	-0.12	**0.39**	-0.46	**-0.42**
20°	0.24	**0.39**	-0.53	**-0.06**	0.24	**-0.87**
30°	-0.24	**0.24**	-0.08	**-0.81**	-0.34	**-0.46**
40°	-1.73	**-0.69**	-0.45	**-0.28**	-0.89	**-0.70**
50°	-3.97	**-2.39**	-1.90	**-1.13**	0.33	**-0.45**
60°	-4.96	**-4.67**	-3.72	**-3.49**	-1.70	**0.51**
70°	-2.11	**-4.53**	-5.47	**-5.28**	-5.86	**-3.84**
80°	0.52	**-1.70**	-4.47	**-4.52**	-5.33	**-9.41**
90°	1.36	**0.14**	-2.23	**-2.72**	-2.26	**-3.42**
100°	0.66	**-0.12**	-1.60	**-1.50**	-0.56	**-1.09**
110°	-0.37	**-0.55**	-1.67	**-1.53**	-0.40	**-0.72**
120°	-2.44	**-3.46**	-5.10	**-4.20**	-2.00	**-0.70**
130°	-2.31	**-4.17**	-6.81	**-6.43**	-4.32	**-2.47**
140°	-0.86	**-2.87**	-5.64	**-6.47**	-5.40	**-3.85**
150°	0.45	**-0.96**	-3.21	**-4.01**	-3.37	**-2.88**
160°	1.26	**0.34**	-1.87	**-2.47**	-2.01	**-1.78**
170°	1.17	**0.26**	-2.30	**-2.67**	-2.47	**-3.43**
180°	0.05	**-1.26**	-3.55	**-4.60**	-5.18	**-5.04**
190°	-1.55	**-3.02**	-5.31	**-5.97**	-5.35	**-4.31**
200°	-2.33	**-3.75**	-4.90	**-5.80**	-4.04	**-4.11**
210°	-1.81	**-2.49**	-3.98	**-5.34**	-5.10	**-3.73**
220°	-0.81	**-2.48**	-3.91	**-5.39**	-3.75	**-2.48**
230°	-0.84	**-1.89**	-3.87	**-3.84**	-2.82	**-2.34**
240°	-0.40	**-1.18**	-2.77	**-3.28**	-2.69	**-2.01**
250°	0.38	**-0.61**	-2.44	**-3.17**	-3.08	**-2.18**
260°	0.57	**-0.20**	-2.67	**-4.04**	-3.45	**-3.58**
270°	0.46	**-0.45**	-3.19	**-5.28**	-4.85	**-4.76**
280°	0.09	**-1.35**	-4.15	**-6.02**	-4.89	**-3.34**
290°	-0.32	**-2.21**	-4.99	**-5.61**	-2.89	**-1.07**
300°	-0.76	**-2.68**	-4.83	**-3.97**	-0.92	**0.44**
310°	-1.02	**-2.45**	-3.65	**-2.27**	0.26	**1.05**
320°	-0.97	**-1.73**	-2.44	**-1.25**	0.67	**0.95**
330°	-0.76	**-0.74**	-1.52	**-0.62**	0.69	**0.58**
340°	-0.52	**0.13**	-0.83	**-0.29**	0.56	**0.50**
350°	-0.33	**0.34**	-0.35	**-0.01**	0.41	**0.35**

4.12 Random incidence response

The random incidence response represents the random incidence sensitivity level in a diffuse field minus the free field sensitivity level in the free field.
The high-frequency response is lower in a diffuse field than in a free field.

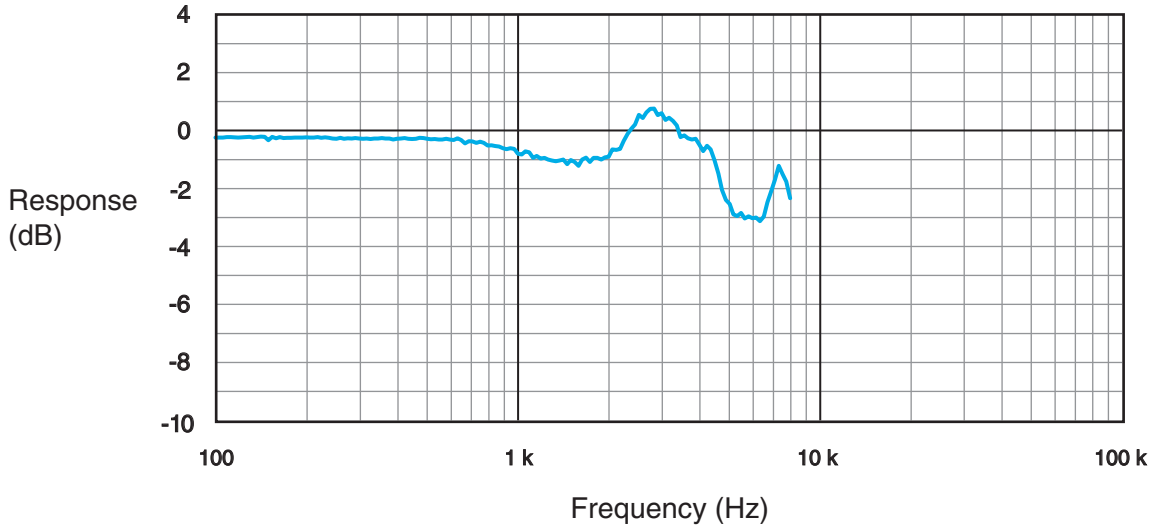


Fig. 11. NB-14 random incidence response (with the dedicated windscreen installed)

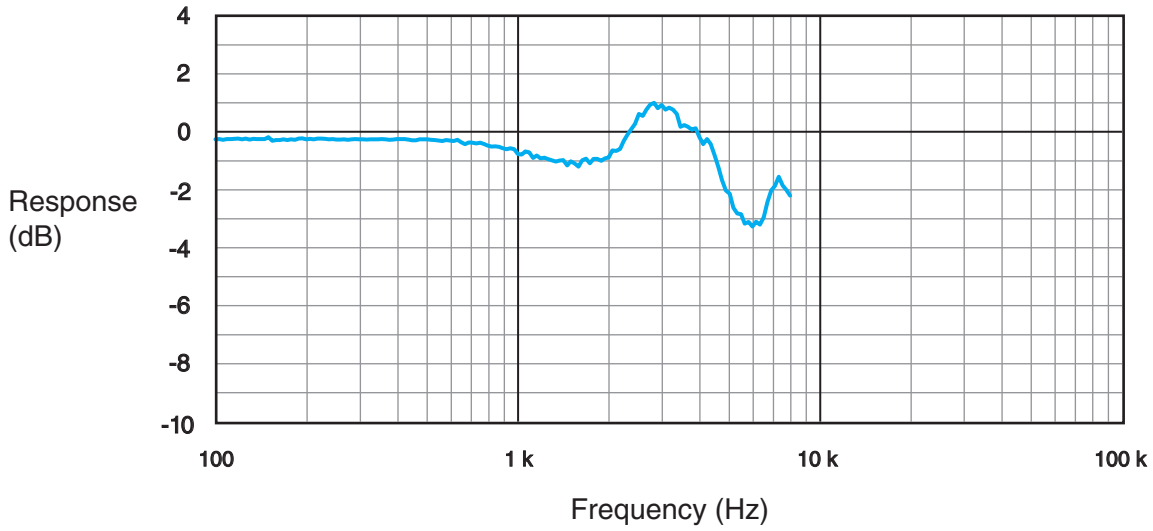


Fig. 12. NB-14 random incidence response (without the dedicated windscreen installed)

Table 13. NB-14 random incidence response (with the dedicated windscreen installed)

Nominal frequency (Hz)	Exact frequency (Hz)	NB-14 random incidence response (dB)
63	**63.096**	**-0.2**
80	**79.433**	**-0.2**
100	**100.00**	**-0.2**
125	**125.89**	**-0.2**
160	**158.49**	**-0.2**
200	**199.53**	**-0.2**
250	**251.19**	**-0.2**
315	**316.23**	**-0.2**
400	**398.11**	**-0.2**
500	**501.19**	**-0.2**
630	**630.96**	**-0.2**
800	**794.33**	**-0.5**
1000	**1000.0**	**-0.7**
1060	1059.3	-0.7
1120	1122.0	-0.9
1180	1188.5	-0.9
1250	**1258.9**	**-0.9**
1320	1333.5	-1.0
1400	1412.5	-0.9
1500	1496.2	-1.0
1600	**1584.9**	**-1.2**
1700	1678.8	-0.9
1800	1778.3	-0.9
1900	1883.6	-0.9
2000	**1995.3**	**-0.8**
2120	2113.5	-0.6
2240	2238.7	-0.3
2360	2371.4	0.1
2500	**2511.9**	**0.6**
2650	2660.7	0.7
2800	2818.4	0.8
3000	2985.4	0.7
3150	**3162.3**	**0.5**
3350	3349.7	0.2
3550	3548.1	-0.1
3750	3758.4	-0.3
4000	**3981.1**	**-0.4**
4250	4217.0	-0.5
4500	4466.8	-1.0
4750	4731.5	-2.0
5000	**5011.9**	**-2.5**
5300	5308.8	-2.9
5600	5623.4	-3.0
6000	5956.6	-3.0
6300	**6309.6**	**-3.1**
6700	6683.4	-2.4
7100	7079.5	-1.6
7500	7498.9	-1.4
8000	**7943.3**	**-2.3**

Table 14. NB-14 random incidence response (without the dedicated windscreen installed)

Nominal frequency (Hz)	Exact frequency (Hz)	NB-14 random incidence response (dB)
63	**63.096**	**-0.2**
80	**79.433**	**-0.2**
100	**100.00**	**-0.2**
125	**125.89**	**-0.2**
160	**158.49**	**-0.2**
200	**199.53**	**-0.2**
250	**251.19**	**-0.2**
315	**316.23**	**-0.2**
400	**398.11**	**-0.2**
500	**501.19**	**-0.2**
630	**630.96**	**-0.2**
800	**794.33**	**-0.4**
1000	**1000.0**	**-0.7**
1060	1059.3	-0.6
1120	1122.0	-0.8
1180	1188.5	-0.9
1250	**1258.9**	**-0.9**
1320	1333.5	-1.0
1400	1412.5	-0.9
1500	1496.2	-1.0
1600	**1584.9**	**-1.1**
1700	1678.8	-0.9
1800	1778.3	-0.9
1900	1883.6	-0.9
2000	**1995.3**	**-0.8**
2120	2113.5	-0.6
2240	2238.7	-0.3
2360	2371.4	0.2
2500	**2511.9**	**0.7**
2650	2660.7	0.8
2800	2818.4	1.1
3000	2985.4	1.0
3150	**3162.3**	**0.9**
3350	3349.7	0.7
3550	3548.1	0.3
3750	3758.4	0.1
4000	**3981.1**	**-0.1**
4250	4217.0	-0.2
4500	4466.8	-0.7
4750	4731.5	-1.6
5000	**5011.9**	**-2.1**
5300	5308.8	-2.8
5600	5623.4	-3.1
6000	5956.6	-3.2
6300	**6309.6**	**-3.1**
6700	6683.4	-2.4
7100	7079.5	-1.8
7500	7498.9	-1.8
8000	**7943.3**	**-2.1**

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