

DELTA Test Report



*Acoustic Test Report according to IEC 60118-0, 1, 2, 6 on
DREAM D-9 manufactured by Widex*

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Name and type	Widex DREAM D-9
Serial number	# 1012 # 1013 # 1020 # 1023
General description	BTE
Report number	PR214_11
Number of pages	41
Annexes	A, B
Client	Widex Nymøllevvej 6 3540 Lynge Danmark
Contact Person	Ole Gelsbo
Reception date	01-11-2011
Test date	07-11-2011
Climatic conditions	Temperature : 23°C Barometric pressure : 102 kPa Humidity : 44 %
Test methods	IEC 60118 - 0, 1, 2, 6 & DQP-86001
Test Software version	TAL HM 5.0.5
Test program version	TAL010
Co-Reader	JHA
Test personnel	LFN

Responsible



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Technical-Audiological Lab.

The present report describes results of measurements on hearing instruments, identified by name, type and serial number. The laboratory can not guarantee, that these data applies on the entire production.



Test object

<i>External controls and switches accessible for user</i>	Volume control Program switch
<i>Preset controls</i>	-
<i>Electrical input</i>	Yes
<i>Battery, IEC type</i>	13
<i>Hook</i>	Without filter



The manufacturer states that the below listed instruments has the same electro acoustical characteristics as DREAM D-9.

- DREAM440 D-9
- DREAM330 D-9
- DREAM220 D-9
- DREAM110 D-9

Electro Acoustical Properties

Climatic requirements

The climate in the testing laboratory is registered. The IEC 60118-0 standard states the following requirements which were fulfilled during test (see page 2):

Temperature: $23 \pm 5^{\circ}\text{C}$

Air pressure: $101.3 +5/-20 \text{ kPa}$

Humidity: 40 - 80 %

Test setup

The measurements are carried out in a free field, in accordance with IEC 60118-0 substitution method.

The test object is connected to the Ear Simulator (IEC 60318-4) using tubing with dimension $\text{Ø}2 \times 25 \text{ mm}$.

The loudspeaker and the test object are placed in an anechoic chamber 1.2 metres above the grating floor 0.8 metres apart.

Hearing aid adjustments and list of accessories

The hearing aid is programmed by the manufacturer.

For full-on gain the test setting 2 mic omni full-on gain is used.

For reference test gain control position the test setting 2 mic omni testmode gain is used.

Measurements

Reference test frequency is 2500 Hz.

All sound pressures are expressed in dB relative $20 \mu\text{Pa}$.

Uncertainties

Frequency: $\pm 0.5 \%$

Current: $\pm 0.5 \%$

Sound Pressure Level, 200 Hz - 4000 Hz: $\pm 1.5 \text{ dB}$

Sound Pressure Level, 4000 Hz - 8000 Hz: $\pm 1.9 \text{ dB}$

The uncertainty primarily due to tolerances on the control microphone and the IEC 60318-4 coupler.

Attack time: $\pm 1.1 \text{ ms}$ The uncertainty primarily due to "slew rate" on the loudspeaker.

Recovery time : $\pm 10 \text{ ms}$ The uncertainty primarily due to Test system.

DATA (Primary results)

Maximum output : 132 dB SPL at 4149 Hz
 Maximum acoustic gain : 69 dB at 2630 Hz
 Reference test gain : 49 dB at 2500 Hz
 Current consumption : 0.9 mA (according to IEC 60118-0.7.11)
 Electrical sensitivity : 1.2 mV = -59 dB relative to 1 V (according to IEC 60118-6.3.2)
 Input impedance : 37 KOhm at 2500 Hz

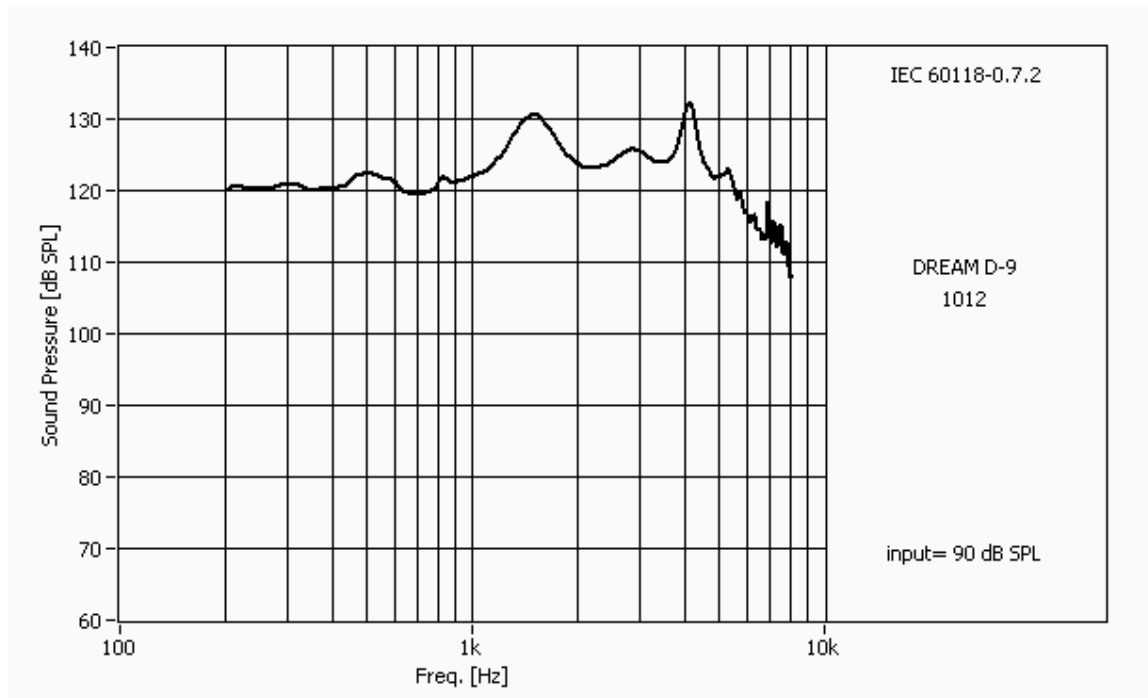
Reference measurements

	# 1012	# 1013*	# 1020*	# 1023*
OSPL90 (dB SPL)				
Maximum	132	132	132	132
2500 Hz	124	124	124	124
Full-on gain (dB)				
Maximum	69	70	69	70
2500 Hz	65	65	65	64
Maximum sensitivity of the induction pick-up coil (dB SPL for an input of 1 mA/m)				
Maximum	101	102	102	103
2500 Hz	97	99	100	99

Reference measurement are made on 3 hearing instruments, identified by the serial number stated in the table above (marked by *).

IEC 60118-0.7.2 : Output sound pressure level response, OSPL90

HA adjustment: Full-on gain.

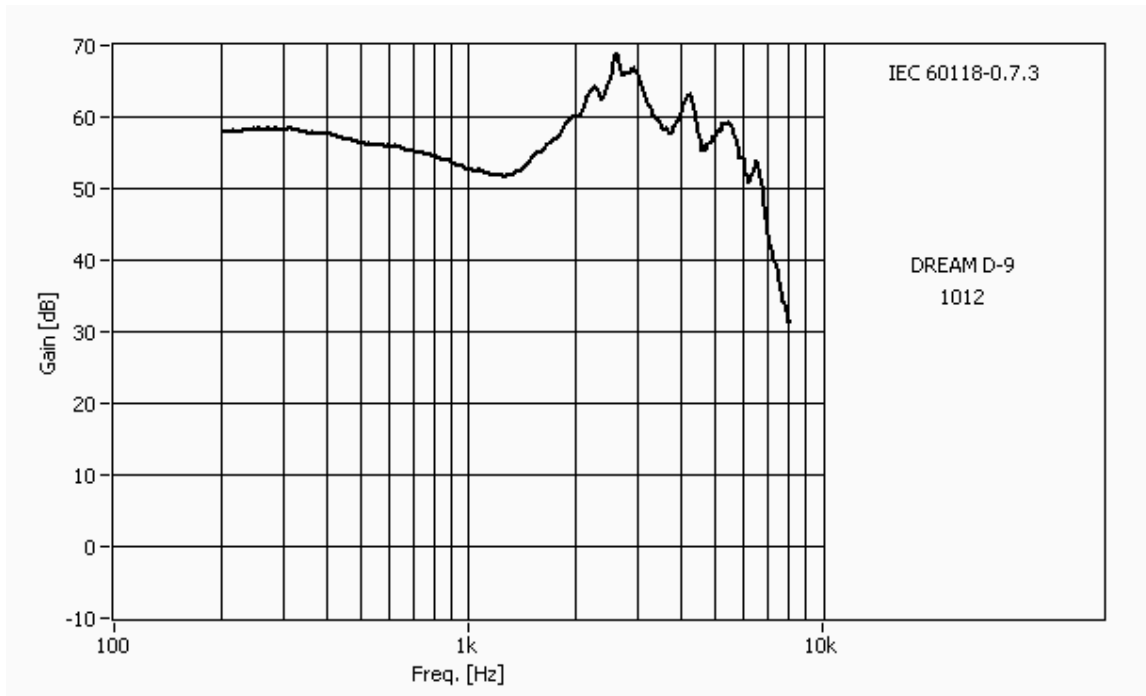


Input = 90 dB SPL.

Frequency response of the sound pressure level obtained in the ear simulator using an input of 90 dB SPL.

IEC 60118-0.7.3 : Full-on acoustic gain

HA adjustment: Full-on gain.

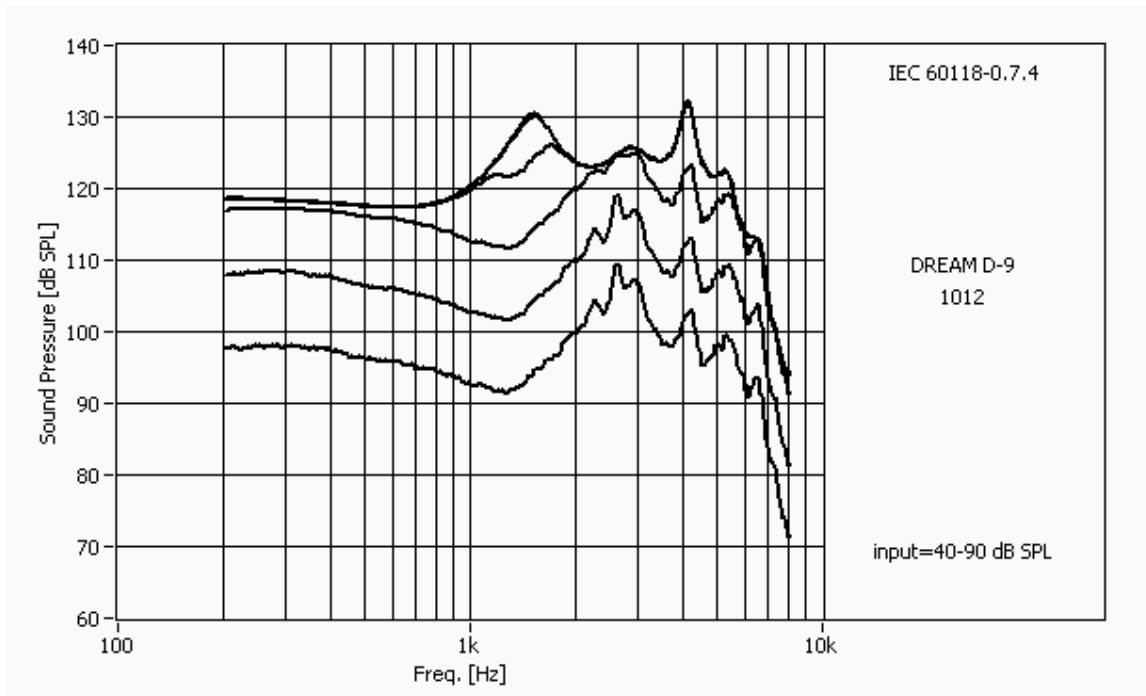


Input = 50 dB SPL.

Measurement of full-on acoustic gain obtainable with the hearing aid.

IEC 60118-0.7.4 : Comprehensive frequency response

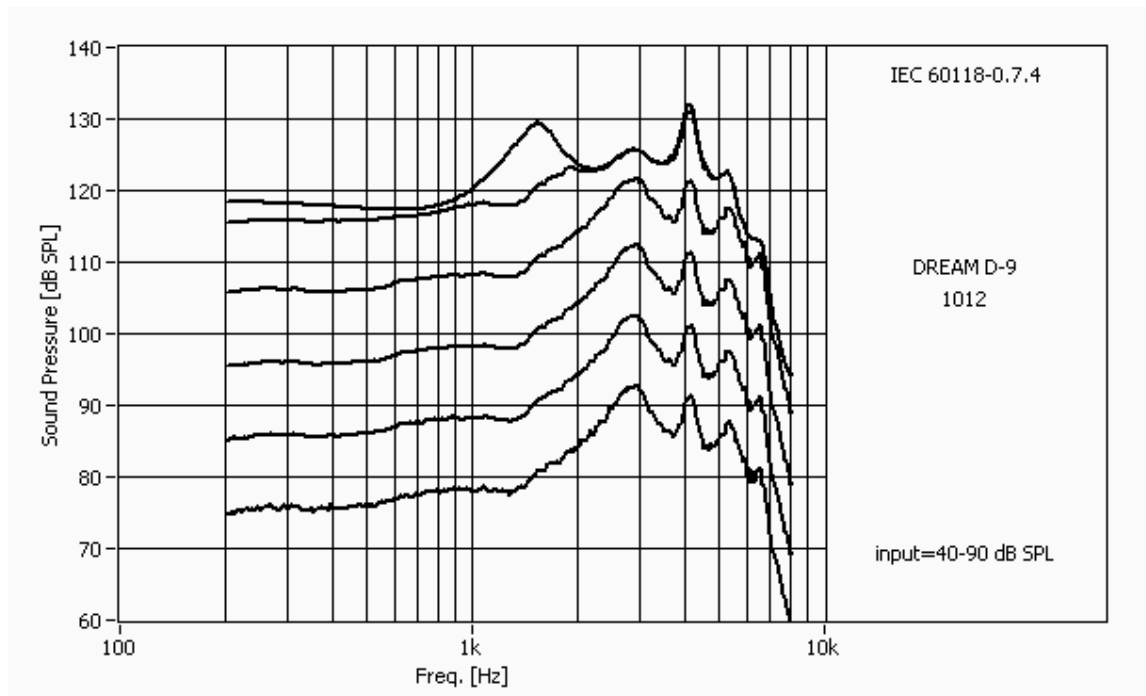
HA adjustment: Full-on gain.



Input = 40, 50, 60, 70, 80 and 90 dB SPL.

IEC 60118-0.7.4 : Comprehensive frequency response

HA adjustment: Reference test gain control position.



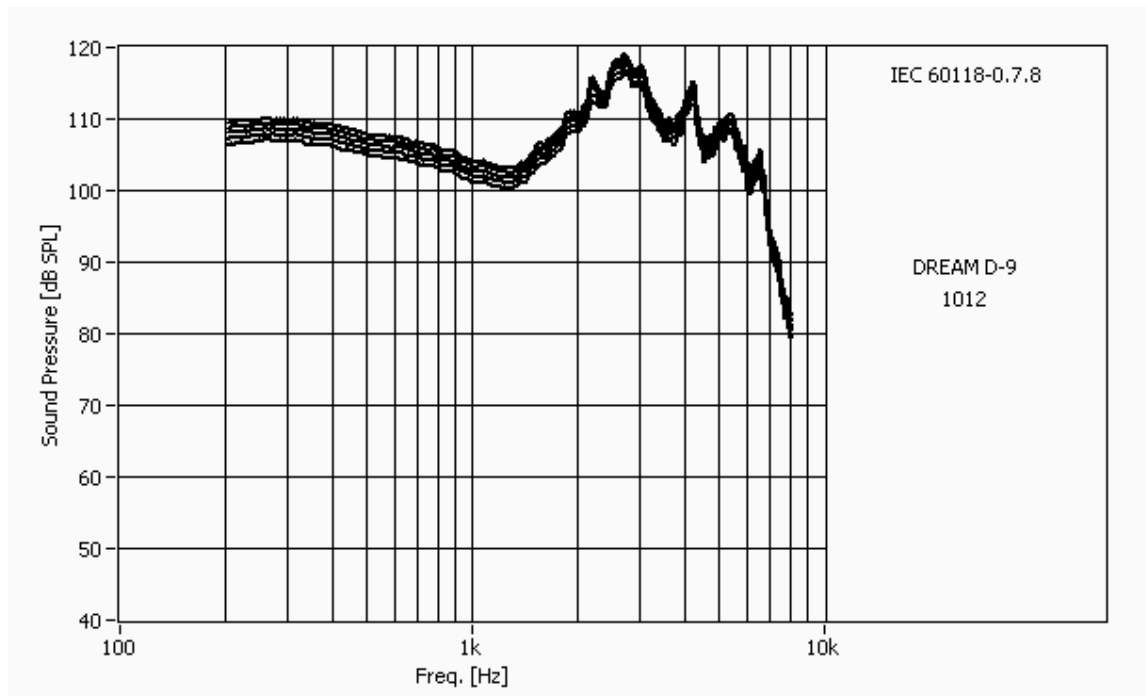
Input = 40, 50, 60, 70, 80 and 90 dB SPL.

The curve for 60 dB SPL input is the 'Basic frequency response'.

Reference test gain = 49 dB.

IEC 60118-0.7.8 : Effect on full-on acoustic gain of variation of battery supply voltage

HA adjustment: Full-on gain



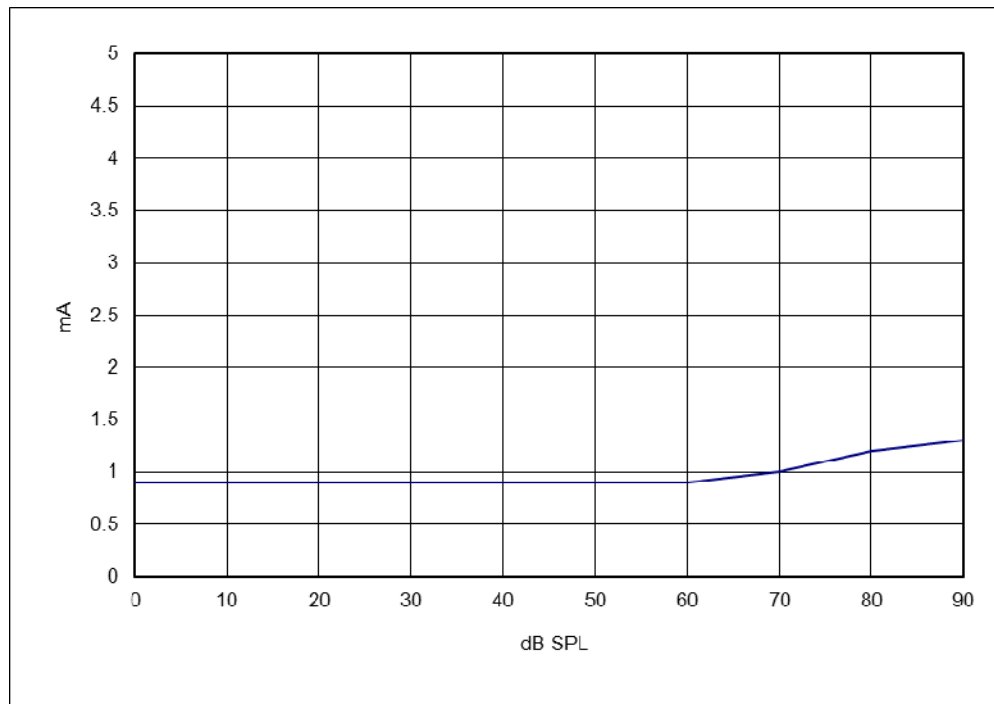
Input = 50 dB SPL.

Supply voltage: 1.1 V, 1.2 V, 1.3 V, 1.4 V, 1.5 V.

Full-on gain dependence of supply voltage.

IEC 60118-0.7.11 : Battery current

HA adjustment: Reference test gain control position.



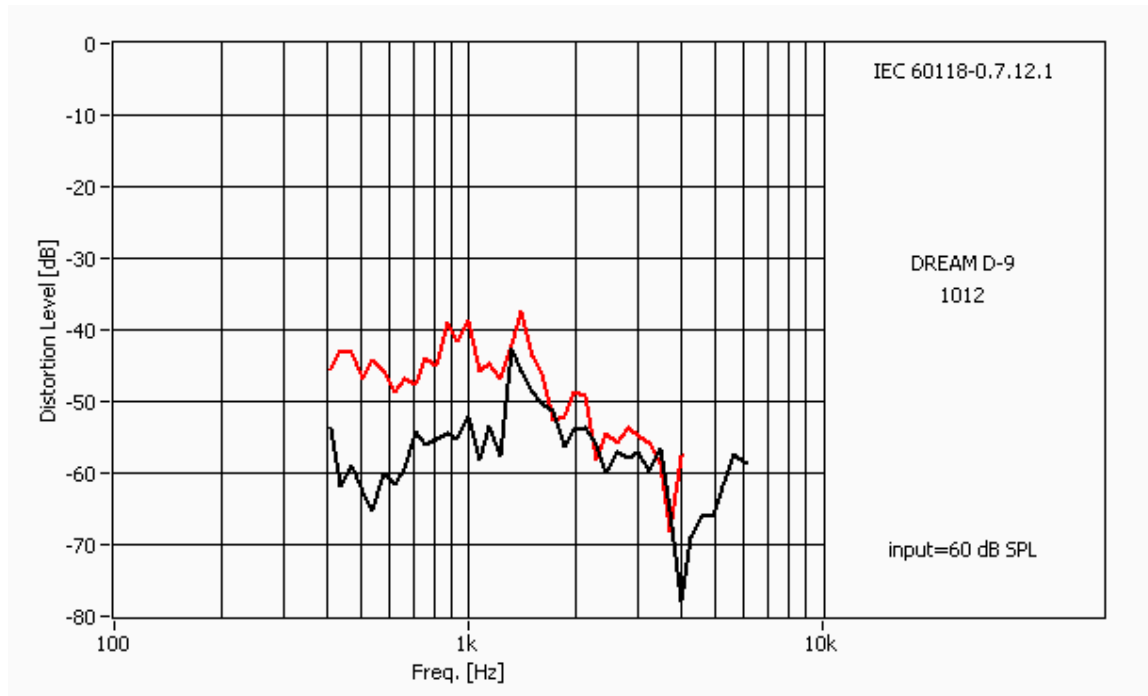
Input = 0, 40, 50, 60, 70, 80 and 90 dB SPL.

Frequency = 2500 Hz

Measurement of the relation between input sound pressure level and battery current.

IEC 60118-0.7.12.1 : Measurement of nonlinearities (harmonic distortion)

HA adjustment: Reference test gain control position.



Input = 60 dB SPL.

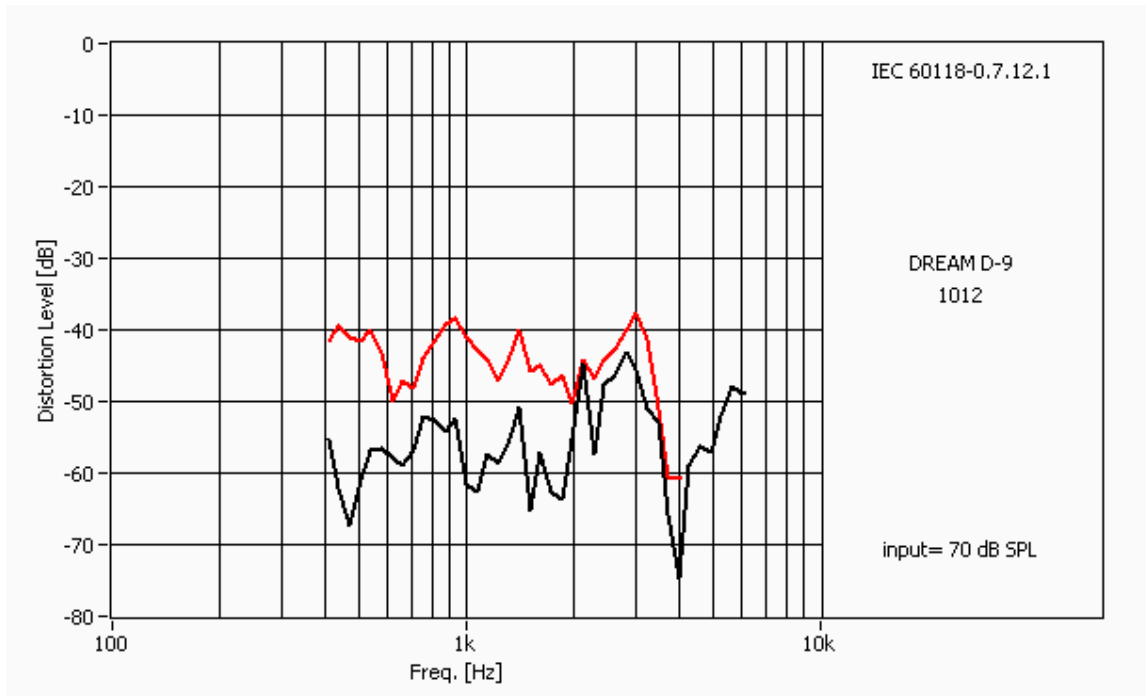
Measurement of amplitude nonlinearities in the hearing instrument 2nd order (Black), 2nd & 3rd order (Red). Harmonic distortion is measured by means of Test system with a frequency resolution of 10 points per octave.

Conversion between dB and % THD

dB	%
-10	32
-20	10
-26	5
-30	3
-40	1

IEC 60118-0.7.12.1 : Measurement of nonlinearities (harmonic distortion)

HA adjustment: Reference test gain control position.



Input = 70 dB SPL.

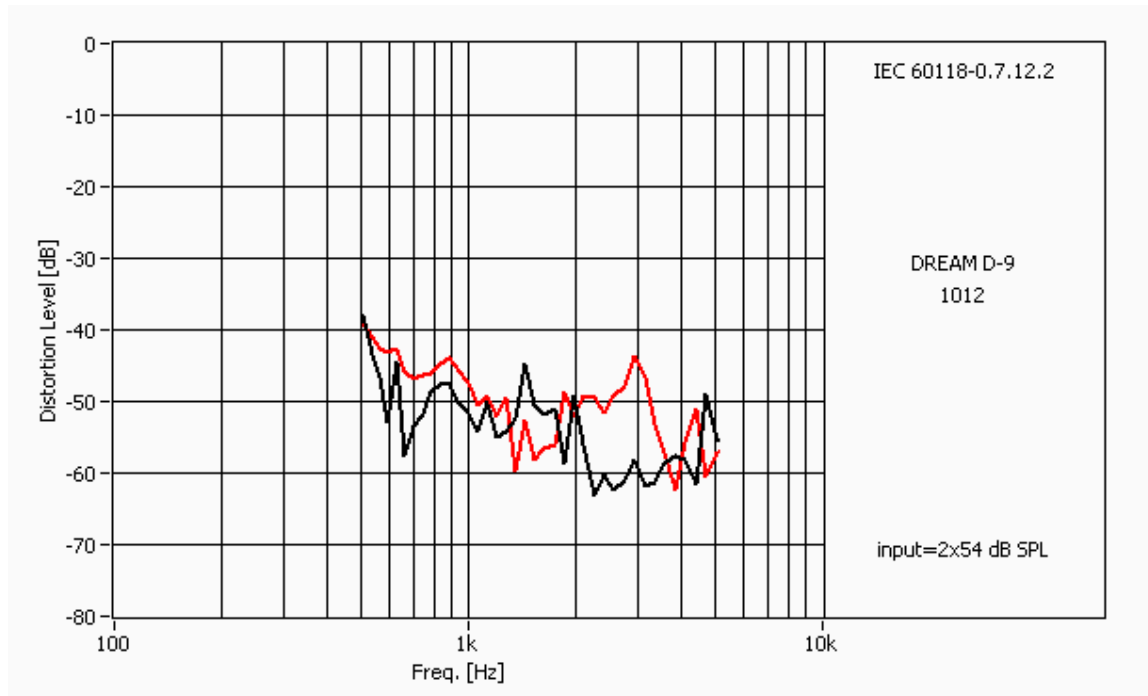
Measurement of amplitude nonlinearities in the hearing instrument 2nd order (Black), 2nd & 3rd order (Red). Harmonic distortion is measured by means of Test system with a frequency resolution of 10 points per octave.

Conversion between dB and % THD

dB	%
-10	32
-20	10
-26	5
-30	3
-40	1

IEC 60118-0.7.12.2 : Measurement of nonlinearities (intermodulation distortion)

HA adjustment: Reference test gain control position.



Input = 2 x 54 dB SPL.

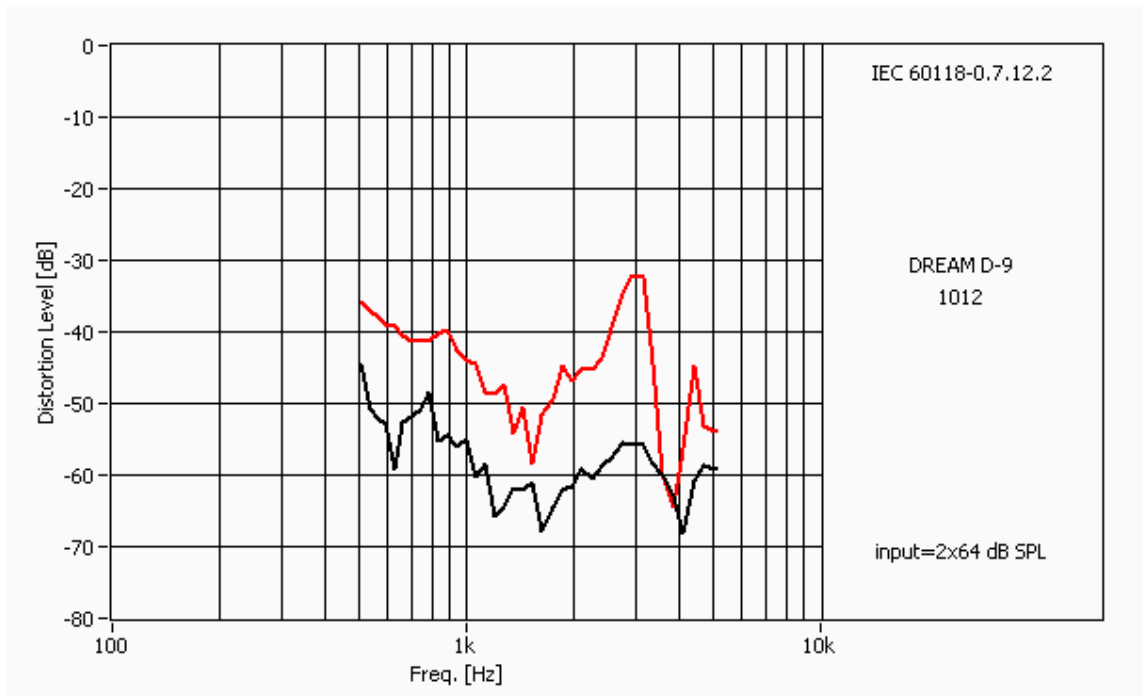
Measurement of amplitude nonlinearities in the hearing aid. Intermodulation products of 2nd order (Black) and 3rd order (Red), relative to the level of the fundamental tone. $F_2 = F_1 + 125$ Hz. Distortion is measured by means of Test system with a frequency resolution of 10 points per octave.

Conversion between dB and % THD

dB	%
-10	32
-20	10
-26	5
-30	3
-40	1

IEC 60118-0.7.12.2 : Measurement of nonlinearities (intermodulation distortion)

HA adjustment: Reference test gain control position.



Input = 2 x 64 dB SPL.

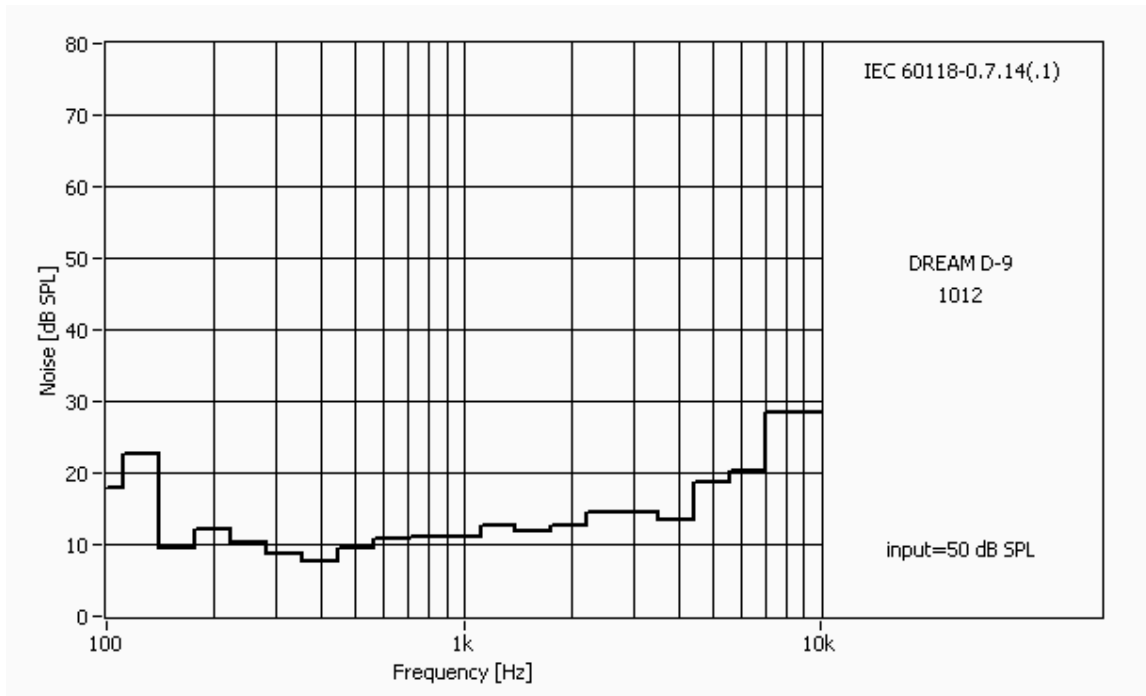
Measurement of amplitude nonlinearities in the hearing aid. Intermodulation products of 2nd order (Black) and 3rd order (Red), relative to the level of the fundamental tone. $F_2 = F_1 + 125$ Hz. Distortion is measured by means of Test system with a frequency resolution of 10 points per octave.

Conversion between dB and % THD

dB	%
-10	32
-20	10
-26	5
-30	3
-40	1

IEC 60118-0.7.14.1 : Internal noise generated in the hearing instrument (1/3 octave)

HA adjustment: Reference test gain control position.

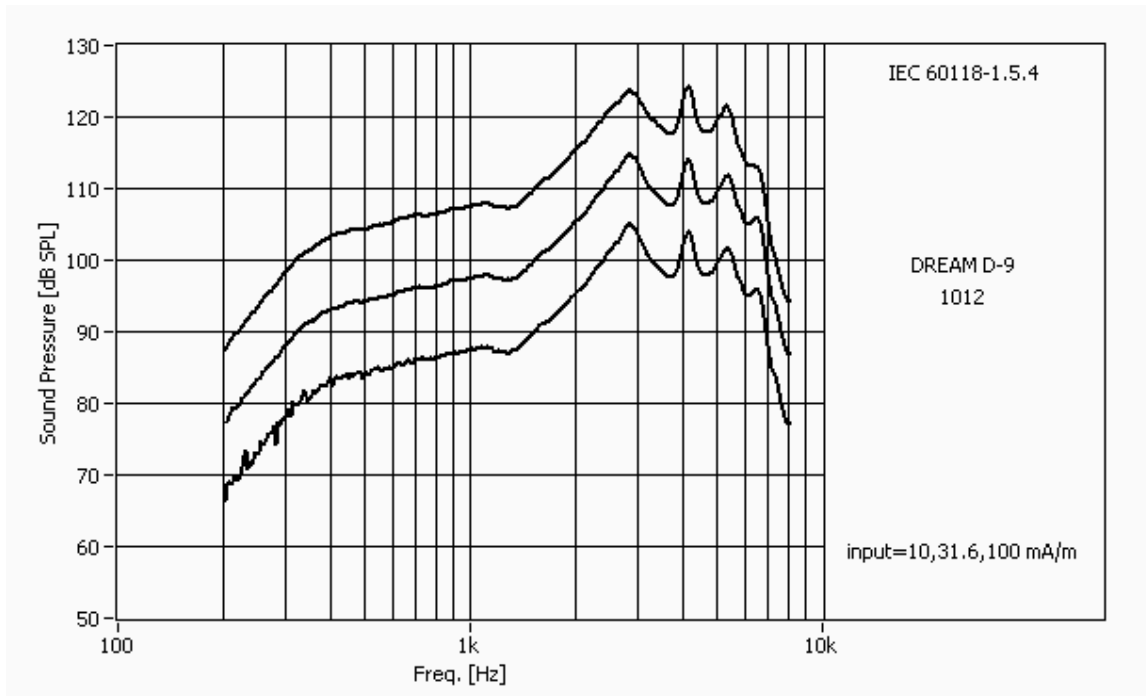


Input = 50 dB SPL.

The purpose of the measurement is to determine the internally generated noise in the hearing aid (input related).

IEC 60118-1.5.4 : Basic frequency response

HA adjustment: Reference test gain control position.



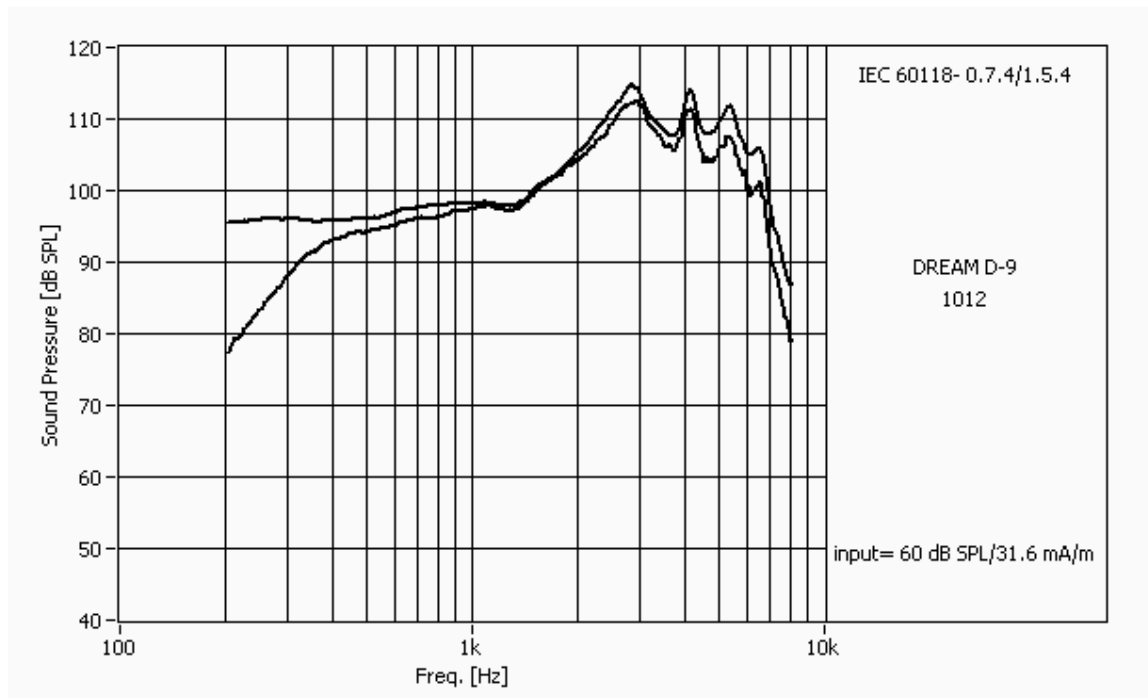
Input = 10.0 mA/m, 31.6 mA/m and 100 mA/m.

HA frequency response of the induction pick-up coil.

T position.

IEC 60118-1.5.4 : Basic frequency response (continued)

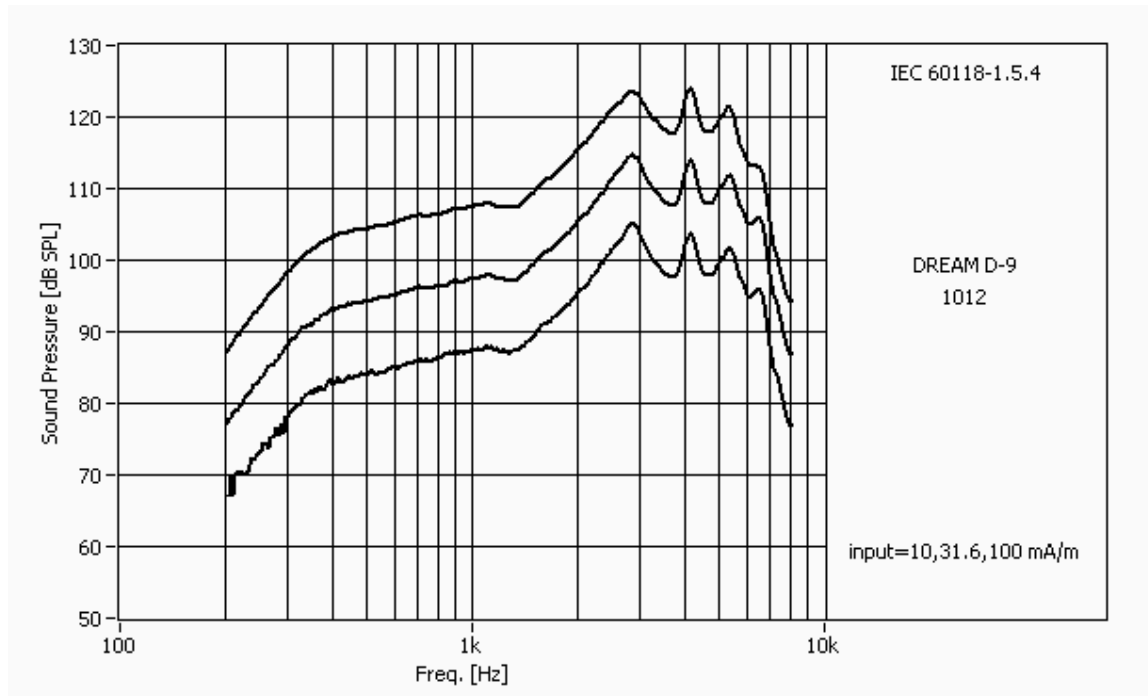
HA adjustment: Reference test gain control position.



HA frequency responses for inductive and acoustical input, respectively 31.6 mA/m and 60 dB SPL.

IEC 60118-1.5.4 : Basic frequency response

HA adjustment: Reference test gain control position.



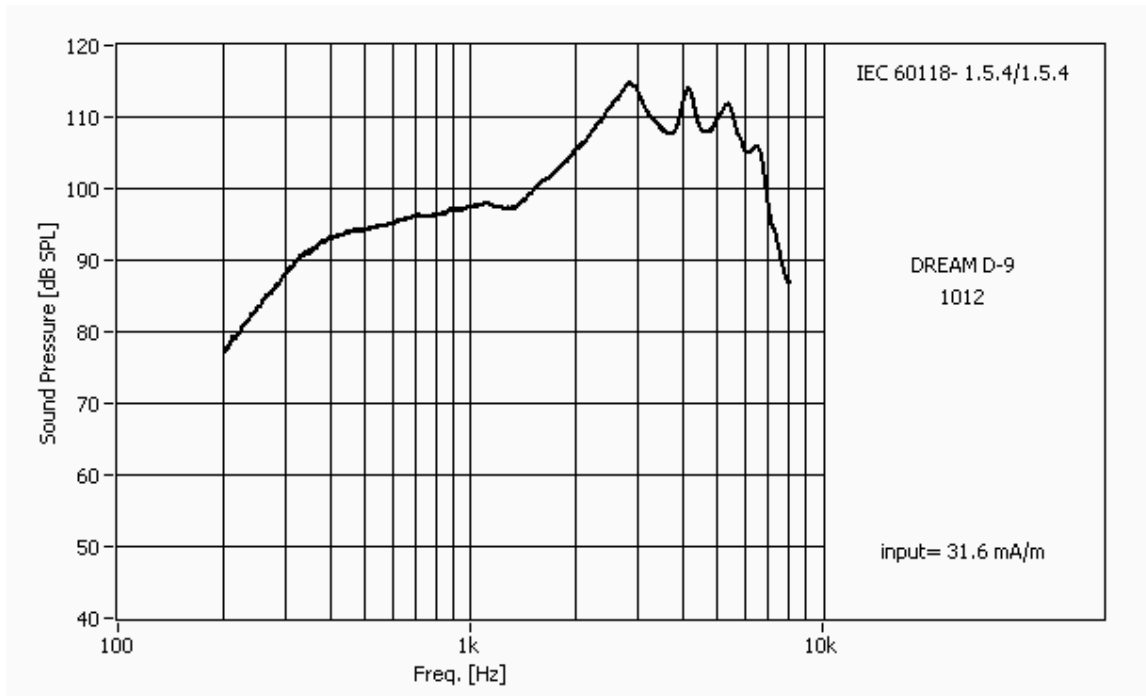
Input = 10.0 mA/m, 31.6 mA/m and 100 mA/m.

HA frequency response of the induction pick-up coil.

MT position.

IEC 60118-1.5.4 : Basic frequency response (continued)

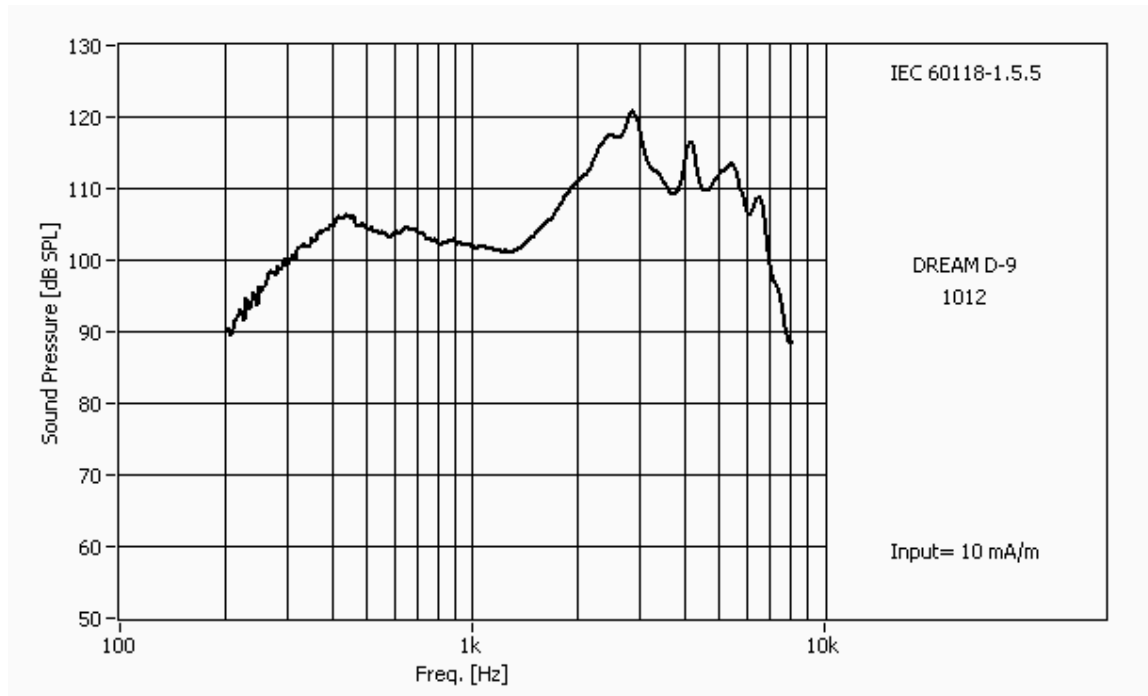
HA adjustment: Reference test gain control position.



HA frequency responses for an inductive input of 31.6 mA/m for T and MT position.

IEC 60118-1.5.5 : Frequency response with full-on gain control setting

HA adjustment: Full-on gain.



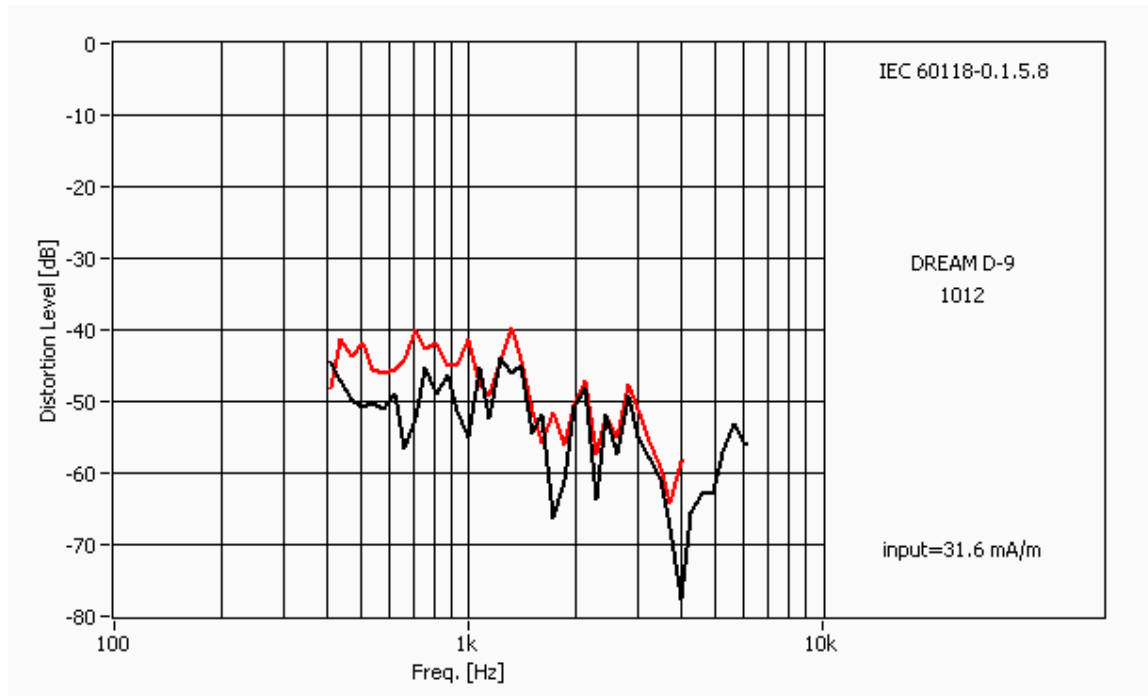
Input = 10.0 mA/m.

Maximum sensitivity for an input of 1 mA/m: 101 dB SPL.

Sensitivity at 2500 Hz for an input of 1 mA/m: 97 dB SPL.

IEC 60118-1.5.8 : Measurement of nonlinearities (harmonic distortion, magnetic input)

HA adjustment: Reference test gain control position.



Input = 31.6 mA/m.

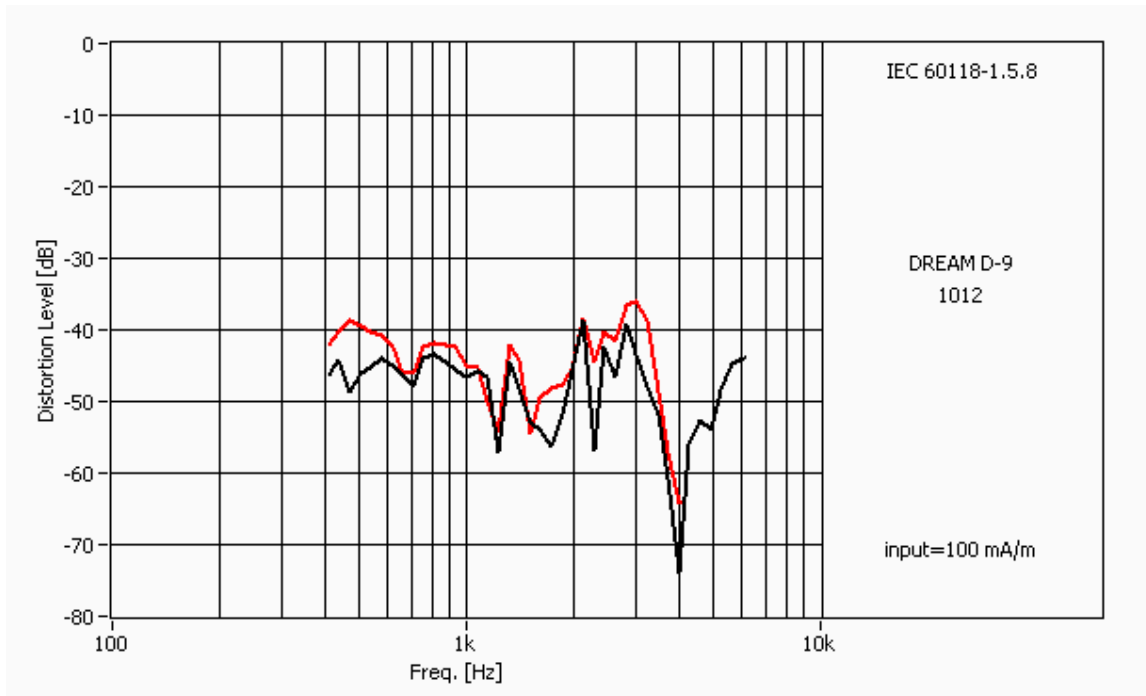
Measurement of amplitude nonlinearities in the hearing instrument 2nd order (Black), 2nd & 3rd order (Red). Harmonic distortion is measured by means of Test system with a frequency resolution of 10 points per octave.

Conversion between dB and % THD

dB	%
-10	32
-20	10
-26	5
-30	3
-40	1

IEC 60118-1.5.8 : Measurement of nonlinearities (harmonic distortion, magnetic input)

HA adjustment: Reference test gain control position.



Input = 100 mA/m.

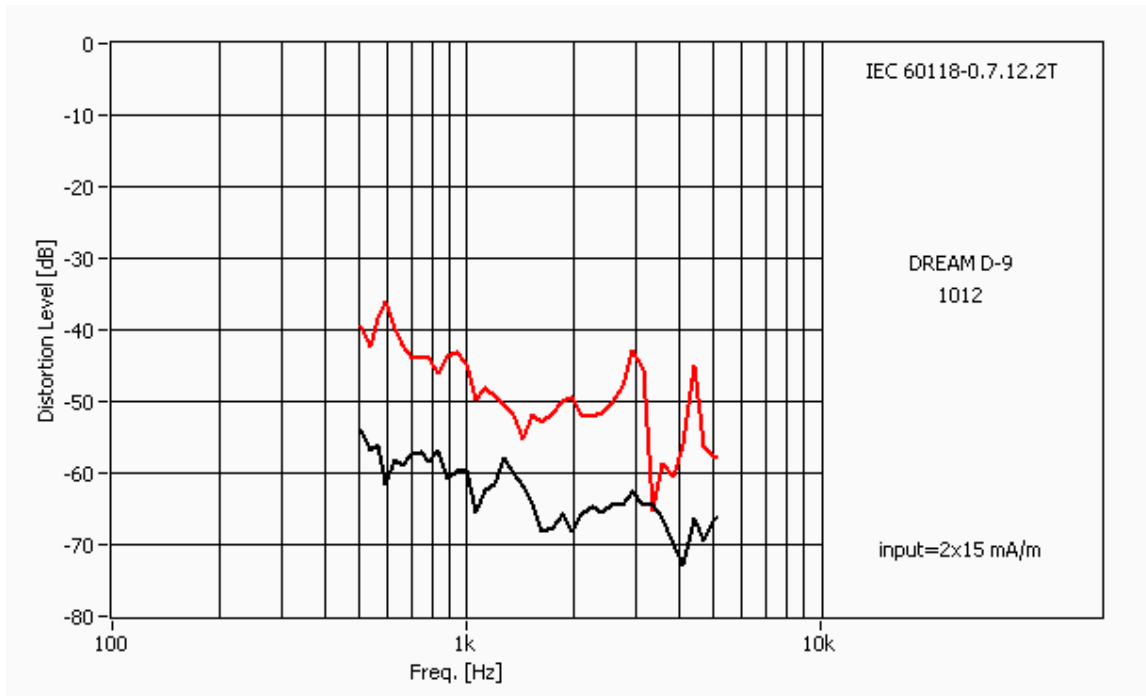
Measurement of amplitude nonlinearities in the hearing instrument 2nd order (Black), 2nd & 3rd order (Red). Harmonic distortion is measured by means of Test system with a frequency resolution of 10 points per octave.

Conversion between dB and % THD

dB	%
-10	32
-20	10
-26	5
-30	3
-40	1

IEC 60118 : Measurement of nonlinearities (intermodulation distortion, magnetic input)*

HA adjustment: Reference test gain control position.



Input = 2 x 15.8 mA/m.

Measurement of amplitude nonlinearities in the hearing aid. Intermodulation products of 2nd order (Black) and 3rd order (Red), relative to the level of the fundamental tone. F2 = F1+125 Hz. Distortion is measured by means of Test system with a frequency resolution of 10 points per octave.

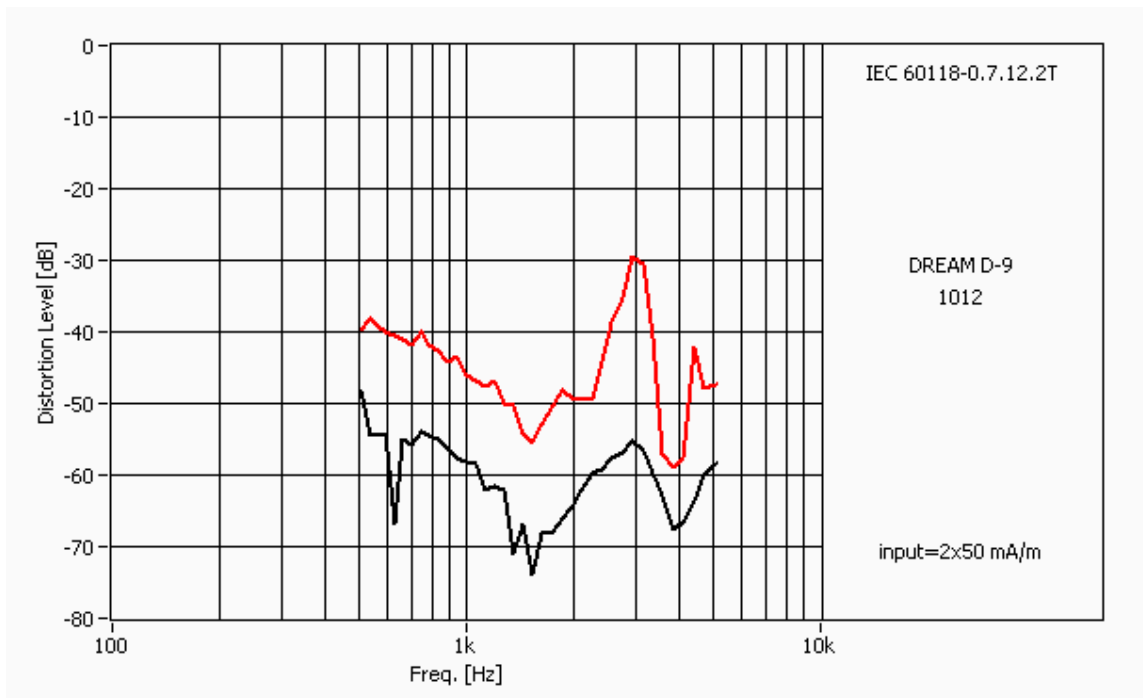
Conversion between dB and % THD

dB	%
-10	32
-20	10
-26	5
-30	3
-40	1

* Intermodulation distortion with magnetic input is not a part of IEC 60118 at the moment.

IEC 60118 : Measurement of nonlinearities (intermodulation distortion, magnetic input)*

HA adjustment: Reference test gain control position.



Input = 2 x 50 mA/m.

Measurement of amplitude nonlinearities in the hearing aid. Intermodulation products of 2nd order (Black) and 3rd order (Red), relative to the level of the fundamental tone. $F_2 = F_1 + 125$ Hz. Distortion is measured by means of Test system with a frequency resolution of 10 points per octave.

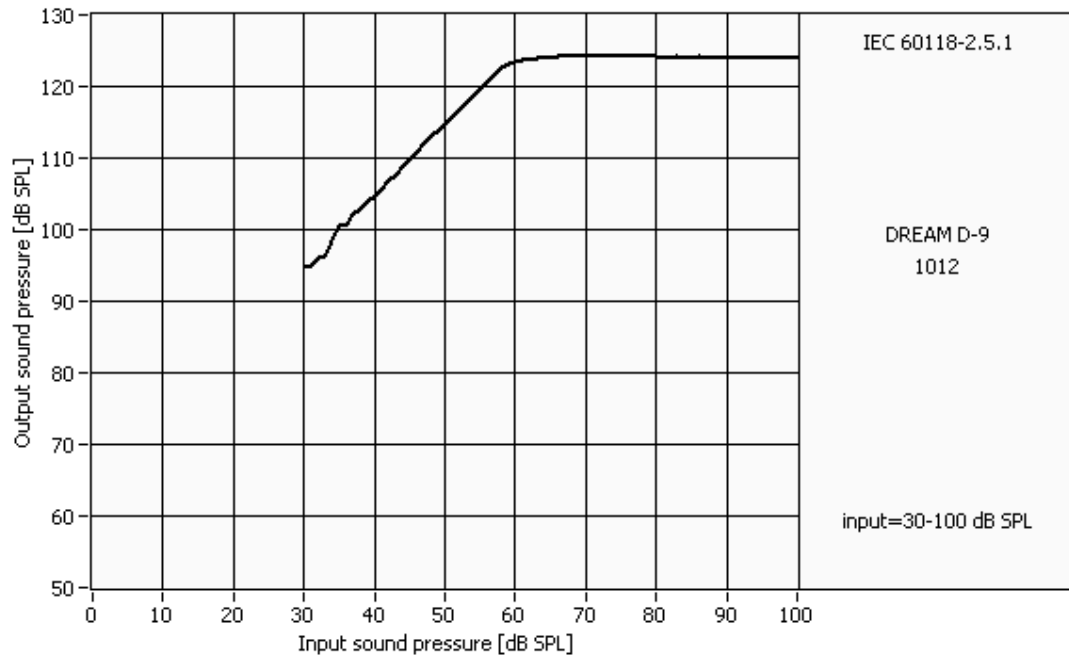
Conversion between dB and % THD

dB	%
-10	32
-20	10
-26	5
-30	3
-40	1

* Magnetic input is not a part of IEC 60118 at the moment.

IEC 60118-2.5.1 : Steady-state input/output graph (AGC systems)

HA adjustment: Full-on gain.

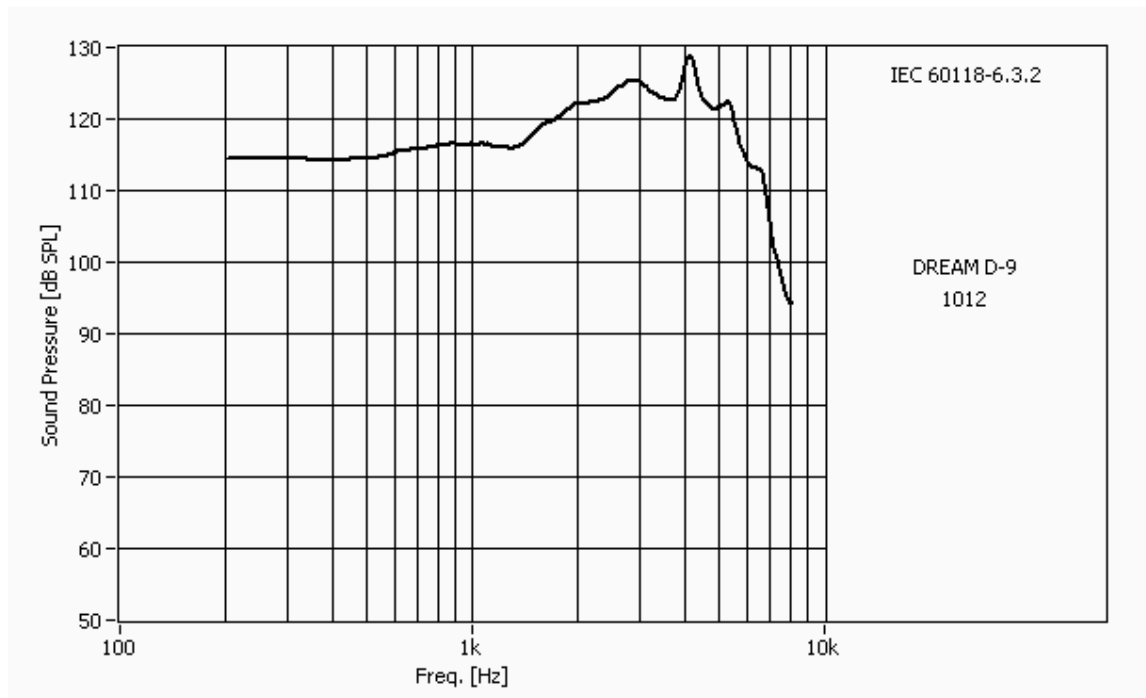


Test frequency = 2500 Hz.

Measurement of the relation between input sound pressure level and output sound pressure level.

IEC 60118-6.3.2 : Electrical input

HA adjustment: Reference test gain control position.



Input = 2.0 mV.

HA frequency response with electrical input.

Electrical sensitivity corresponding to an acoustic input of 70 dB SPL at 2500 Hz: 1.2 mV.

Annex A

Reference measurements

Beside the complete documentation in the main test report, measurements on additional samples are obtained for documentation of the Nordic Requirement Specifications clause 5 regarding consistency between samples. Primary data are stated by numbers in the main test report. The enclosed curves on each hearing aid are

IEC 60118-0.7.2 - Output sound pressure level, OSPL90.

IEC 60118-0.7.3 - Full-on acoustic gain.

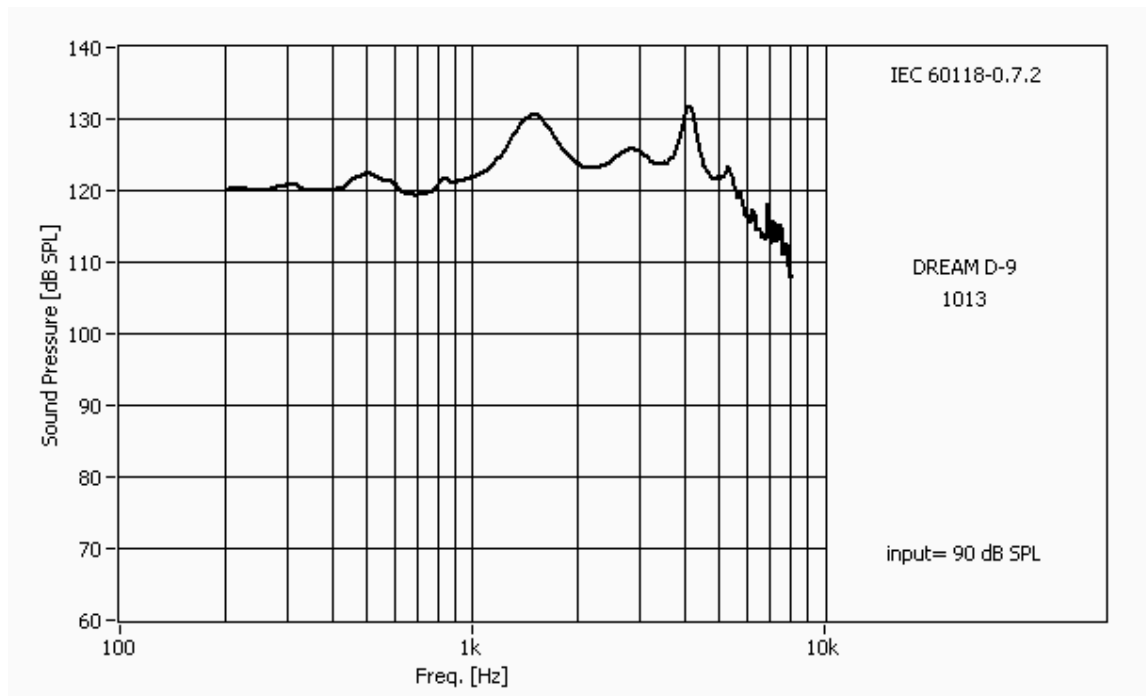
and if the hearing aid is equipped with an induction pick-up coil:

IEC 60118-1.5.5 - Frequency response with full-on gain control setting.

The hearing aids used for reference measurements are identified by name and serial number in the window beside the curve.

IEC 60118-0.7.2 : Output sound pressure level response, OSPL90

HA adjustment: Full-on gain.

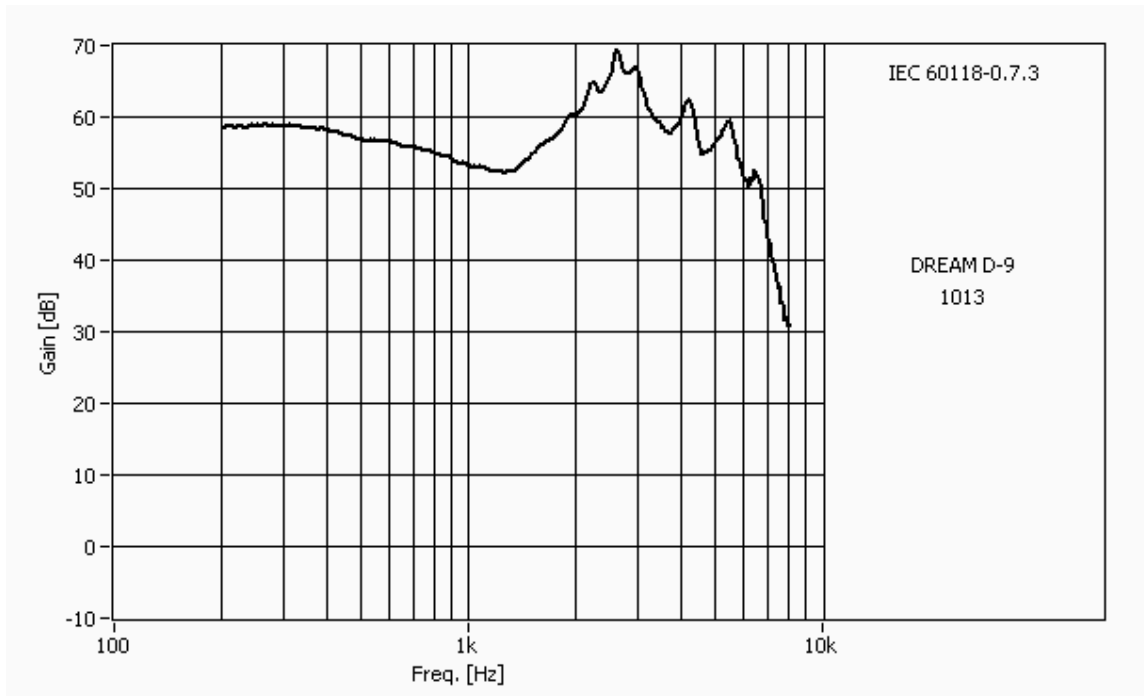


Input = 90 dB SPL.

Frequency response of the sound pressure level obtained in the ear simulator using an input of 90 dB SPL.

IEC 60118-0.7.3 : Full-on acoustic gain

HA adjustment: Full-on gain.

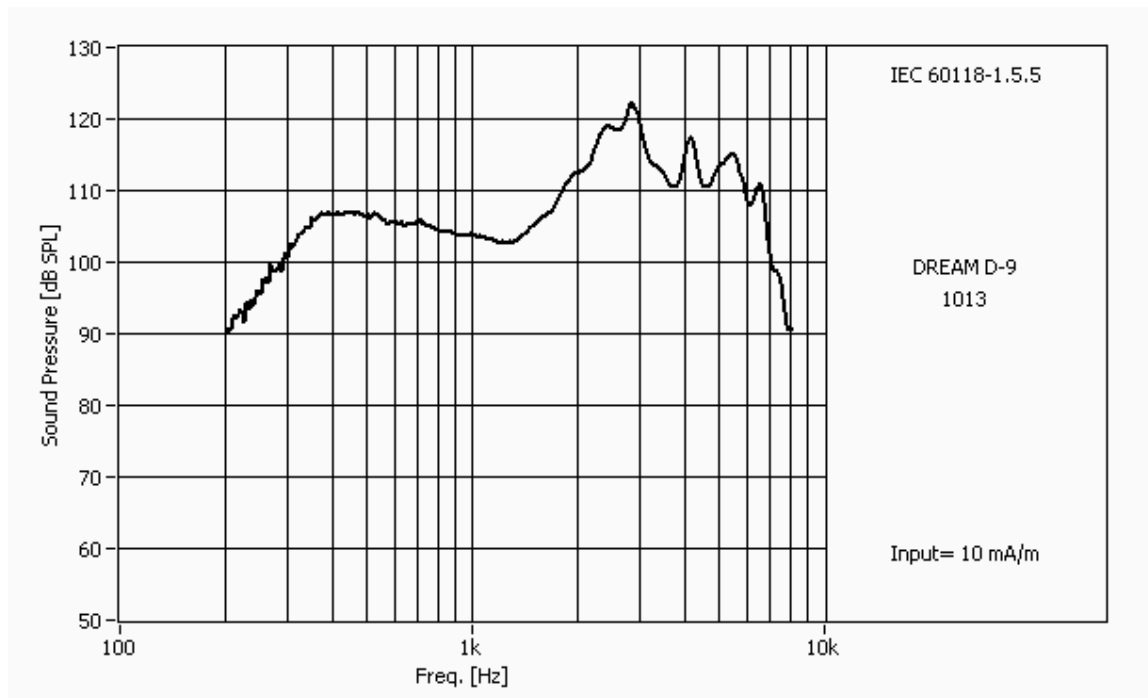


Input = 50 dB SPL.

Measurement of full-on acoustic gain obtainable with the hearing aid.

IEC 60118-1.5.5 : Frequency response with full-on gain control setting

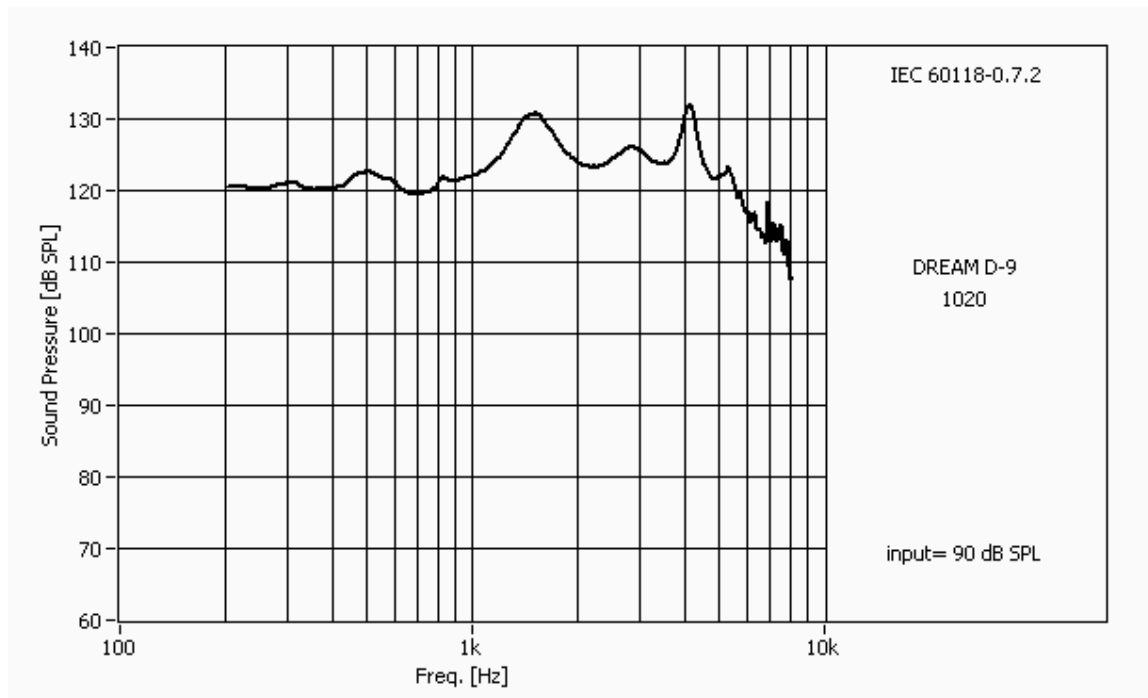
HA adjustment: Full-on gain.



Input = 10.0 mA/m.

IEC 60118-0.7.2 : Output sound pressure level response, OSPL90

HA adjustment: Full-on gain.

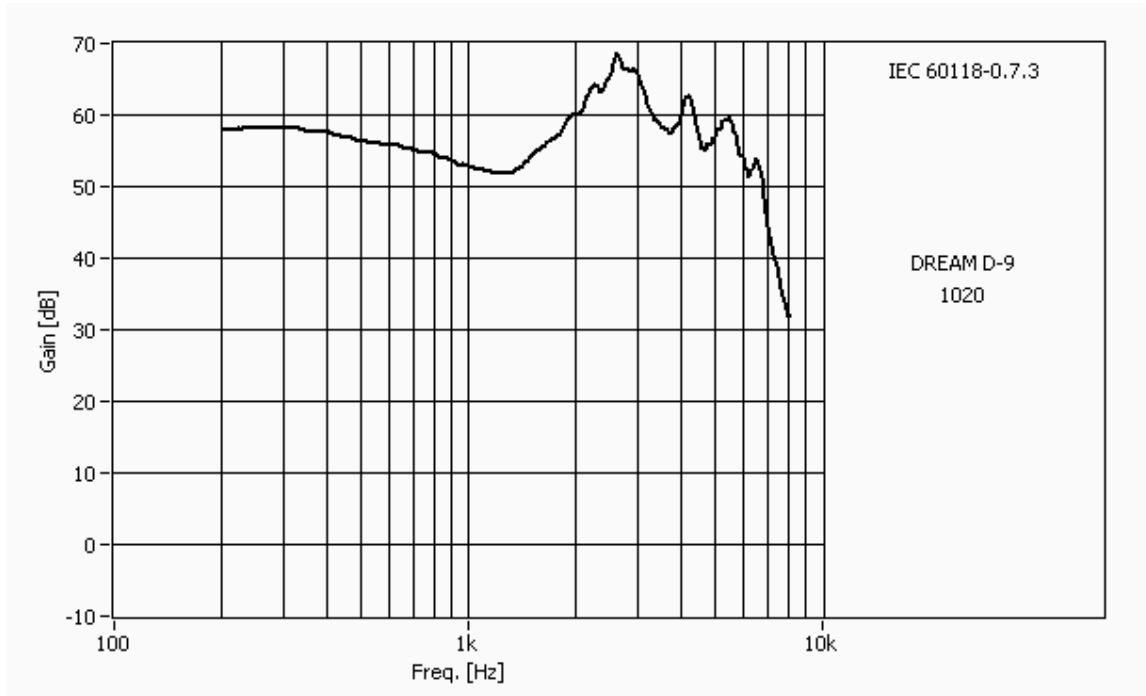


Input = 90 dB SPL.

Frequency response of the sound pressure level obtained in the ear simulator using an input of 90 dB SPL.

IEC 60118-0.7.3 : Full-on acoustic gain

HA adjustment: Full-on gain.

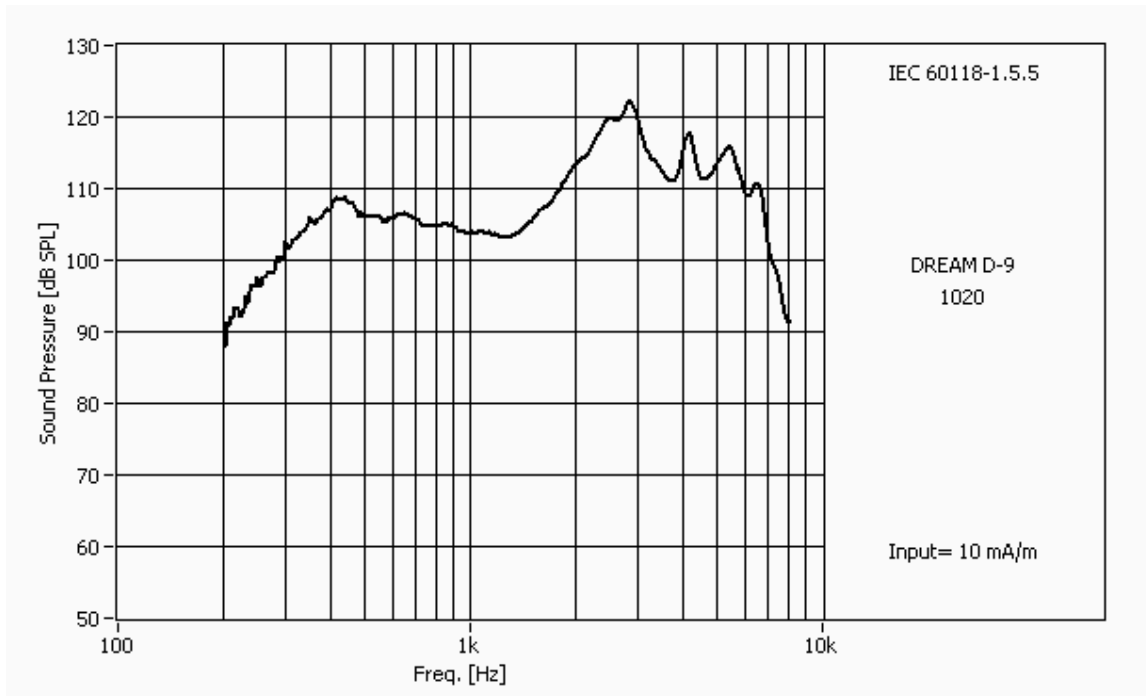


Input = 50 dB SPL.

Measurement of full-on acoustic gain obtainable with the hearing aid.

IEC 60118-1.5.5 : Frequency response with full-on gain control setting

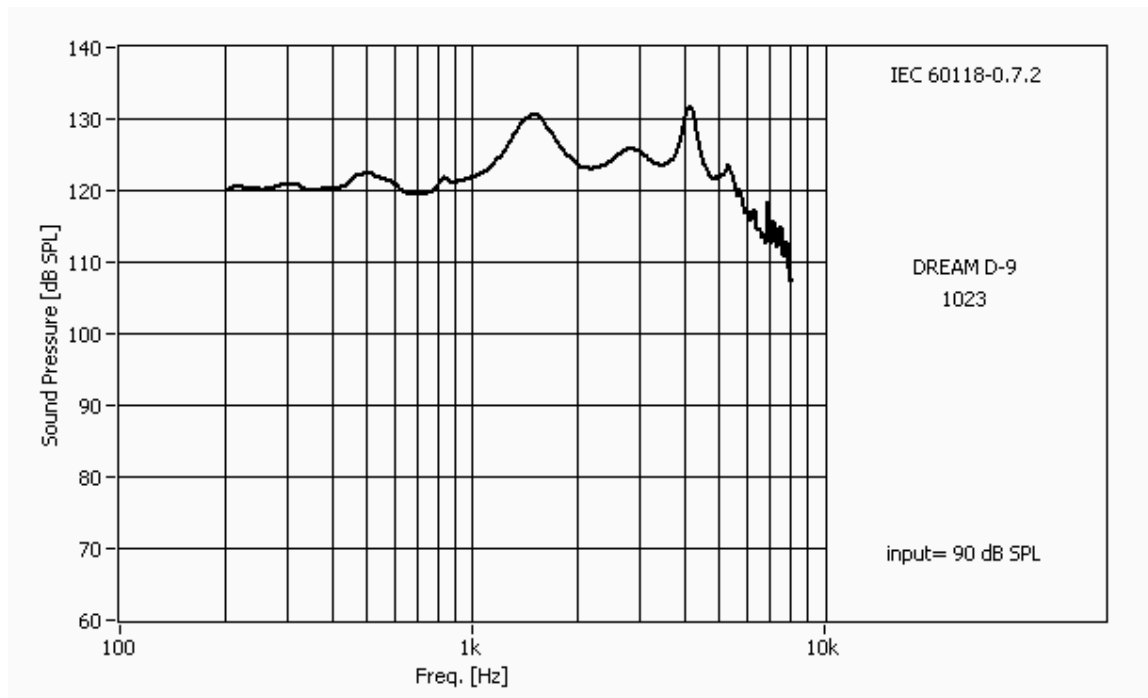
HA adjustment: Full-on gain.



Input = 10.0 mA/m.

IEC 60118-0.7.2 : Output sound pressure level response, OSPL90

HA adjustment: Full-on gain.

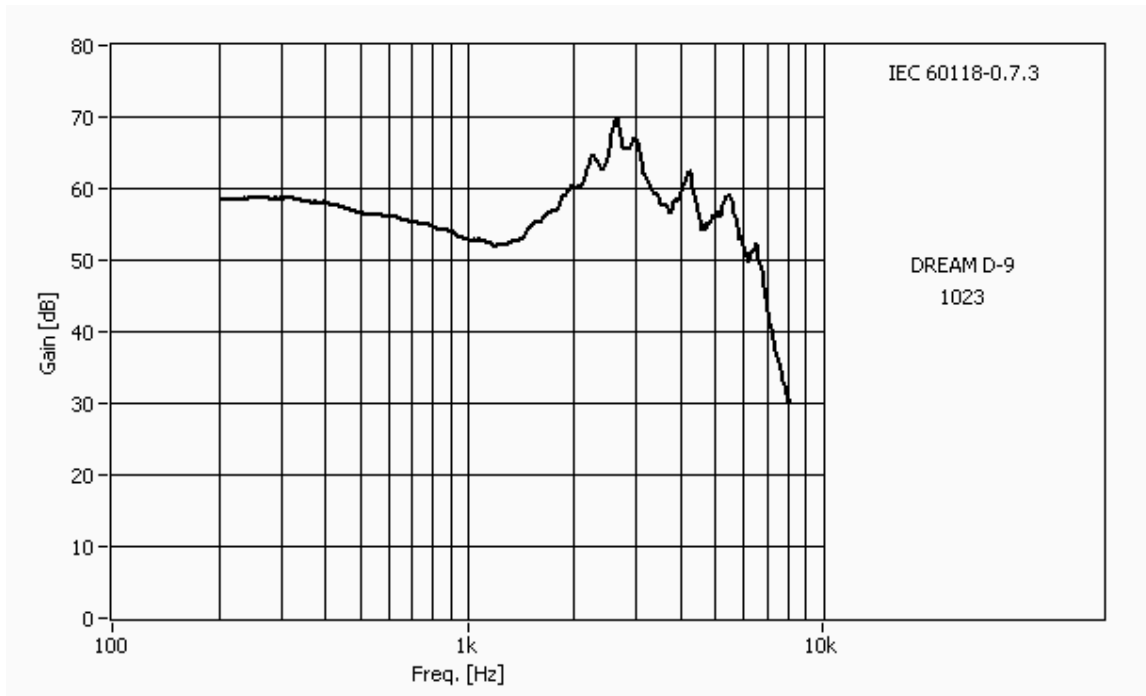


Input = 90 dB SPL.

Frequency response of the sound pressure level obtained in the ear simulator using an input of 90 dB SPL.

IEC 60118-0.7.3 : Full-on acoustic gain

HA adjustment: Full-on gain.

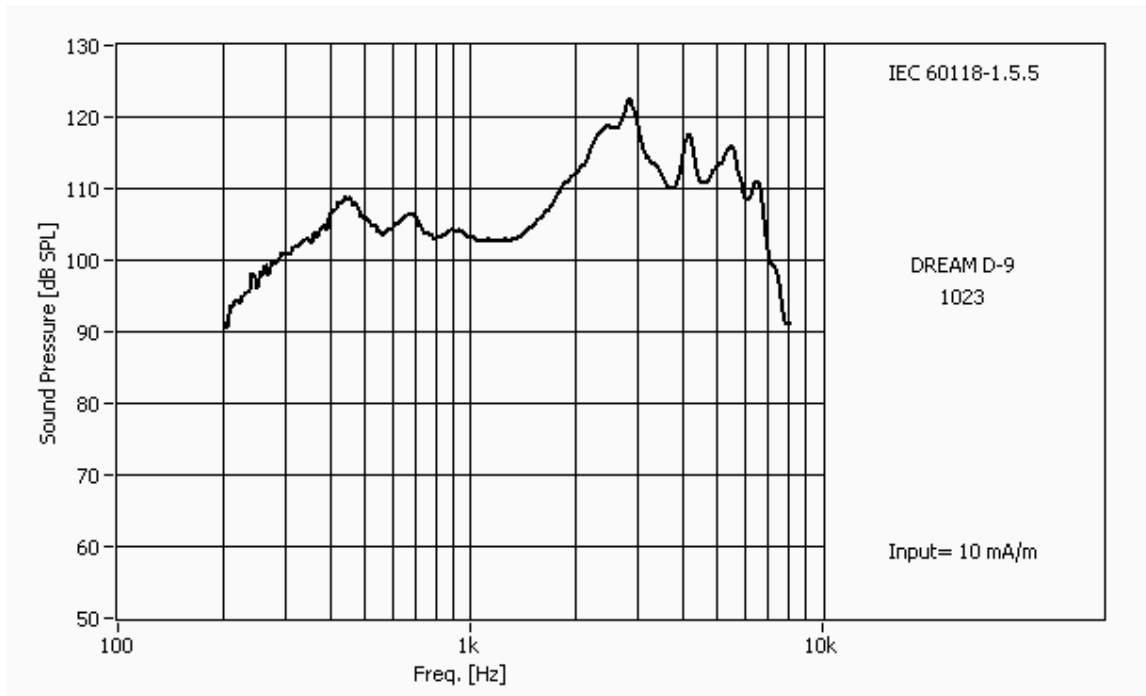


Input = 50 dB SPL.

Measurement of full-on acoustic gain obtainable with the hearing aid.

IEC 60118-1.5.5 : Frequency response with full-on gain control setting

HA adjustment: Full-on gain.



Input = 10.0 mA/m.

Annex B
(Outside scope of accreditation)

Nordic Requirement Specifications 7th Edition, March 2007

Test object: Widex DREAM D-9

Nordic Requirement Specification, General

The measurements are performed according to the IEC Publication 60118-0, 60118-1, 60118-2, 60118-6.

Nordic requirement specification (shall)

Obtained

4.1 – Marking

The hearing aid shall be marked with the name of the manufacturer, a type designation and the serial number. Custom made hearing aid shall be provided with identification for left or right side.

Yes

4.3.3 – Battery and battery cassette

The battery compartment shall be distinctly marked with a + symbol for battery polarity.
The hearing aid shall not be damaged by incorrect insertion of the battery.
The battery cassette and the battery compartment shall be attached to the hearing aid casing.

Yes

4.3.4 – Induction pick-up coil

In a vertical magnetic field as described in IEC 60118-1 the sensitivity of the pick-up coil shall not increase by more than 2 dB when the hearing aid is tilted in any direction from the position as worn on a head-and-torso simulator.

Yes

4.3.5 – Electrical input and output connection

The socket and the plug for connecting an earphone shall conform to the IEC 60118-12 *Dimensions of electrical connector systems*.

Yes

4.3.6 – Control and switches

All controls on the hearing aid which influences the output level shall be mounted such that output level increases when the control knob is moved upwards or clockwise or fro left to right of forwards. For hearing aid intended for the left ear only, however the user gain control shall be mounted in such a way that an upward, forward or an anti-clockwise operation of the control knob increases the output level. This requirement shall also apply turn-off switches operating in vertical directions.

Yes

Nordic Requirement Specification, Electroacoustical Requirements

The measurements are performed according to the IEC Publication 60118-0, 60118-1, 60118-2, 60118-6.

<i>Nordic requirement specification (shall)</i>	Obtained	IEC 60118
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5.1 - Maximum Sound Pressure Level

If the maximum output sound pressure level exceeds 132 dB, the hearing aid shall be supplied with a label warning against auditory hazard.	-	0.7.1 0.7.2
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5.2 - Resonances

For the frequency range below 3500 Hz the difference between peaks and valleys closer than 2/3 octave in the frequency response curve shall not exceed 8 dB. This requirement shall apply to the basic frequency response curve and to the OSPL90 curve.	Yes	0.7.2 0.7.4
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5.4 - Function of controls

There shall be an agreement between the marking of a control and the adjusted quantity. All controls shall show reasonable proportionality between the change of the continuous or stepped position and the adjusted quantity.	-	0.7.6
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5.4.2 - User gain control

If the frequency response is changed by the operation of the gain control this shall be documented and justified by the supplier.	-	0.7.6
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Nordic Requirement Specification, Electroacoustical Requirements

The measurements are performed according to the IEC Publication 60118-0, 60118-1, 60118-2, 60118-6.

Nordic requirement specification (shall) Obtained IEC 60118

5.5 - Non-linear distortion

For input signals in the range 400 - 3000 Hz the harmonic distortion of the hearing aid shall not exceed 10% at a signal level of 70 dB SPL or 100 mA/m. Yes 0.7.12
1.5.8

At an input level of 60 dB SPL or 31.6 mA/m neither component shall exceed 5%. Yes

The requirement apply for the highest of the 2nd and 3rd components.

For intermodulation the requirement is valid in the frequency range $500 \text{ Hz} < f_2 < 5000 \text{ Hz}$

5.6 - Internal noise

The equivalent input noise level measured in third octave bands in accordance to IEC 118-0 clause 7.14.2 shall not exceed the values in row 1 from the table below. Yes 0.7.14

Third –octave bands	500	630	800	1000-3150	Hz
SPL	19	18	17	16	dB

The requirement does not apply to frequencies and settings for which the gain is < 5 dB.

5.7 - Induction pickup

An inductive input signal of 31.6 mA/m shall give the same output signal level as an acoustical input signal (using the m-position) of 55-67 dB SPL in the frequency range 500-4000. Yes 1.5.4

For hearing aids without volume control the requirement is 57-65 dB SPL in the frequency range 500-4000.

The output of T and MT position shall not deviate more than 2 dB in the frequency range 500 to 4000 Hz.

5.9 - Electrical input

The input sensitivity shall be in the range 0.5 mV to 10 mV. Yes 6.3.2

5.13 - Immunity against other technical equipment

The input related interference level (IRIL) shall be stated and be < 55 dB SPL. Yes 13.6.1