Technical Report
C/24366/T01

Project

The Laboratory Measurement of Improvement of Impact Sound Insulation of Various Solid Floor Coverings

Prepared for

JES Acoustics

By

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Report Revision History

Revision	Date	Comments

Summary

Tests have been done in SRL's Laboratory at Holbrook House, Sudbury, Suffolk, to determine the improvement of impact sound insulation of various solid floor coverings in accordance with BS EN ISO 10140-3:2010.

From these measurements the required results have been derived and are presented in both tabular and graphic form in Data Sheets 1-3.

The results are given in 1/3rd octave bands over the frequency range 100Hz to 5kHz, which is beyond that required by the test standard. Measurements outside the standard frequency range are not UKAS accredited.

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Contents

1.0 Details of Measurements

1.1 Location

Sound Research Laboratories

Holbrook House

Little Waldingfield

Sudbury

Suffolk

CO10 0TF

1.2 Test Dates

15 & 16 April 2019

1.3 Testers

Kieron Farrow and Allen Smalls of SRL Technical Services Limited

1.4 Instrumentation and Apparatus Used

Make	Description	Type
Abtronix	Microphone Multiplexer	
E D I	Microphone Power Supply Unit	
Norwegian Electronics	Real Time Analyser	830

Norsonic	Tapping Machine	NOR-211
Brüel & Kjaer	Windshields	UA0237
	Pre Amplifiers	2669C
	Microphone Calibrator	4231
Larson Davis	12mm Condenser Microphone	2560, 377A60
Oregon Scientific	Temperature & Humidity & Probe	THGR810
TOA	Graphic Equalizer	E-1231
QSC Audio	Power Amplifier	RMX 1450
G.R.A.S	Pre Amplifier	26AK

1.5 References

BS EN ISO 717-2:2013	Rating of sound insulation in buildings and of building elements Impact Sound Insulation.
BS EN ISO 10140-3:2010	Laboratory measurement of sound insulation of building elements – Part 3: Measurement of impact sound insulation.

2.0 Description of Test

2.1 Description of Sample

Tests was completed on various solid floor coverings with nominal dimensions of 3.4m x 3.2m, giving an area of 10.88m^2. The samples had thicknesses of 19mm, 22mm and 15mm. Please see Drawing 1 and Section 3.0 Results for more details.

Sampling plan:	Enough for testing only
Sample condition:	New
Details supplied by:	JES Acoustics
Sample installed by:	JES Acoustics

2.2 Sample Delivery date

11 April 2019

2.3 Test Procedures

The sample was mounted/located and tested in accordance with the relevant standard. The method and procedure is described in Appendix A. The measurement uncertainty is given in Appendix B.

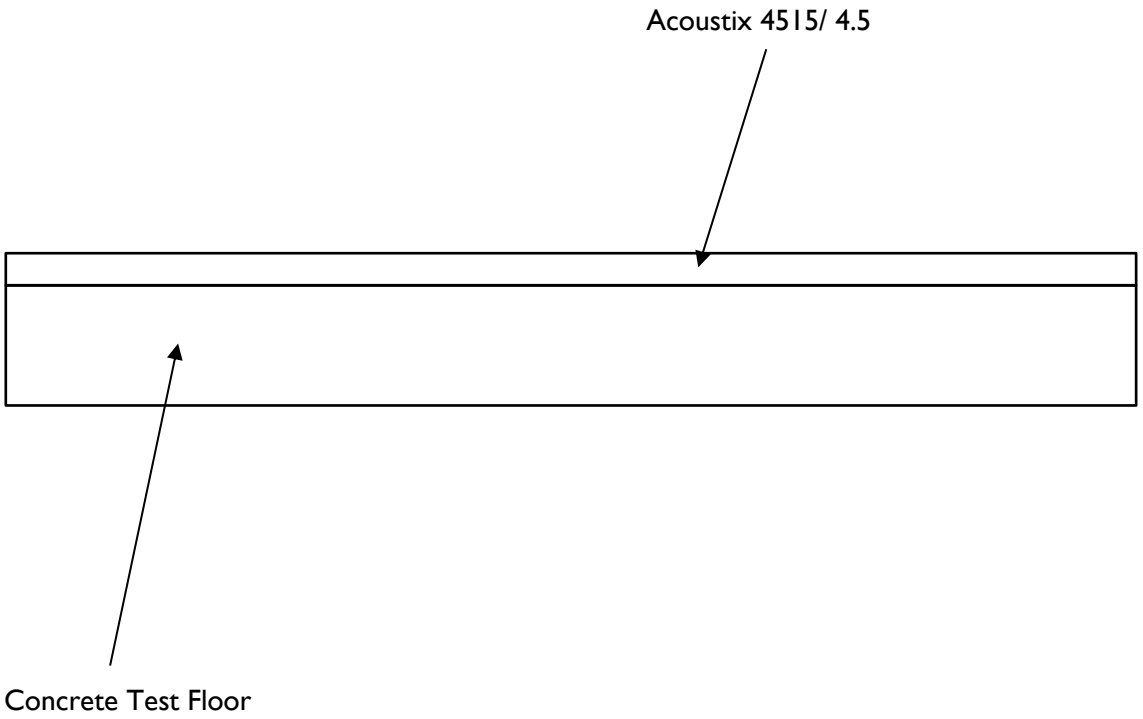
3.0 Results

The results of the measurements and subsequent analysis are given in Data Sheets 1-3 and summarised below.

Results relate only to the items received and tested.

SRL Test No.	Description in Brief	ΔL_w dB
A1	Acoustix 4515/ 4.5	17
A2	Acoustix 3912/ 6	16
A3	Acoustix 4515/ 3	18

Drawing 1 – Example of Floor Test Setup (Test A1)



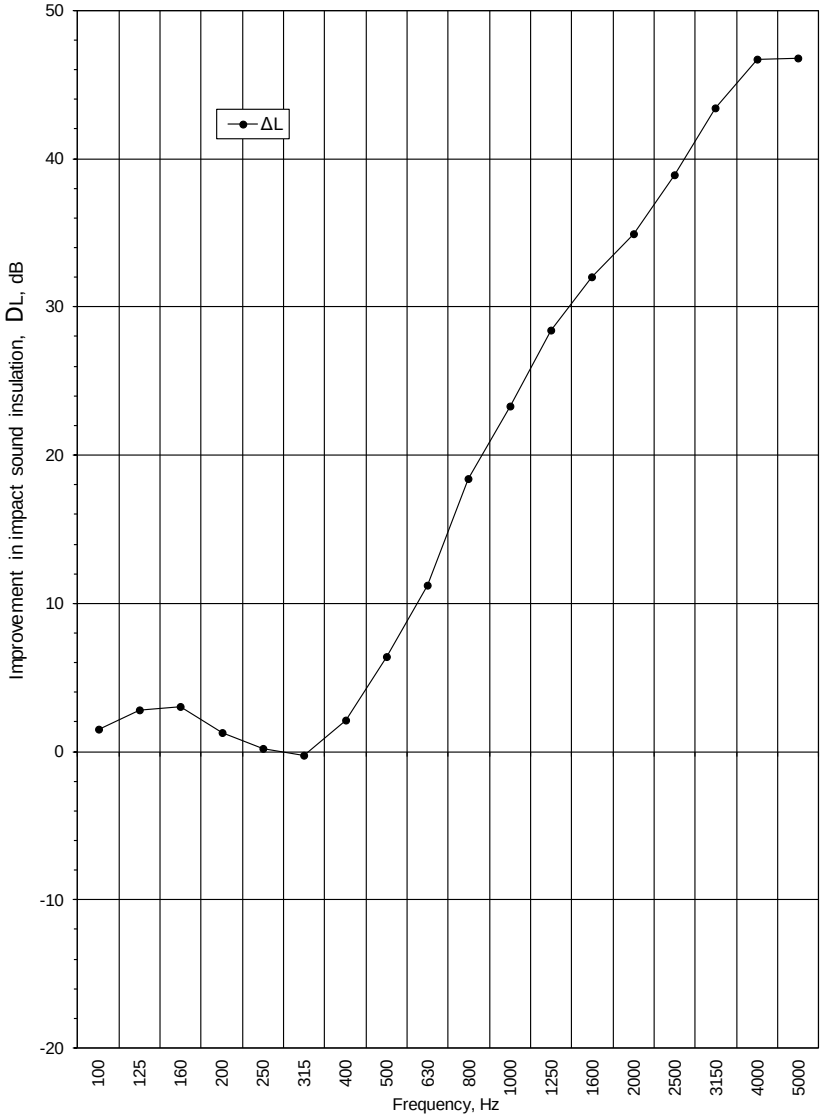
Data Sheet 1

Improvement in impact sound insulation measured according to BS EN ISO 10140-3 : 2010
Laboratory measurements of the improvement of impact sound insulation by floor coverings on a heavyweight standard floor

Test Number:	A1	**Sample mass:**	4.4 kg/m²	**Test Room:**	**Source**	**Receiving**	
Test Date:	15/04/2019	**Thickness:**	19 mm	**Air temperature:**	11.4	11.5	°C
Client:	JES Acoustics	**Length:**	3.4 m	**Air Humidity:**	55	46	%
Method of mounting:	Adhesive	**Width:**	3.2 m	**Air Pressure:**	1010 mbar		
Receiving room volume:	300m³						
Product identification:	Acoustix 4515/ 4.5						

The sample did not suffer visible damage during the test

Freq f Hz	$L_{n,0}$ Third octave dB	**ΔL Third octave dB**
100	67.5	**1.5**
125	68.7	**2.8**
160	70.2	**3.0**
200	69.9	**1.3**
250	70.4	**0.2**
315	71.5	**-0.3**
400	72.1	**2.1**
500	72.5	**6.4**
630	73.2	**11.2**
800	73.5	**18.4**
1000	74.1	**23.3**
1250	75.4	**28.4**
1600	76.6	**32.0**
2000	77.3	**34.9**
2500	77.9	**38.9**
3150	77.8	**43.4**
4000	76.8	**46.7**
5000	74.3	**46.8**



$L_{n,0}$: Is the normalised impact sound pressure level of the bare heavyweight test floor.
ΔL : Is the improvement in impact sound insulation resulting from the installation of the test floor covering.
* Denotes results corrected for background # Denotes results at background

Rating according to BS EN ISO 717-2:2013 — Results are based on a test made with an artificial source under laboratory conditions.

Weighted reduction of impact sound pressure level of sample and (spectrum adaptation term)	**ΔL_w (C_{Id}) = 17 (-11) dB**
Weighted normalised impact sound pressure level of bare reference floor and (spectrum adaptation term)	$L_{n,r,0,w}$ ($C_{I,r,0}$) = 78 (-11) dB
Weighted normalised impact sound pressure level of reference floor with sample and (spectrum adaptation term)	$L_{n,r,w}$ ($C_{I,r}$) = 61 (0) dB

v3

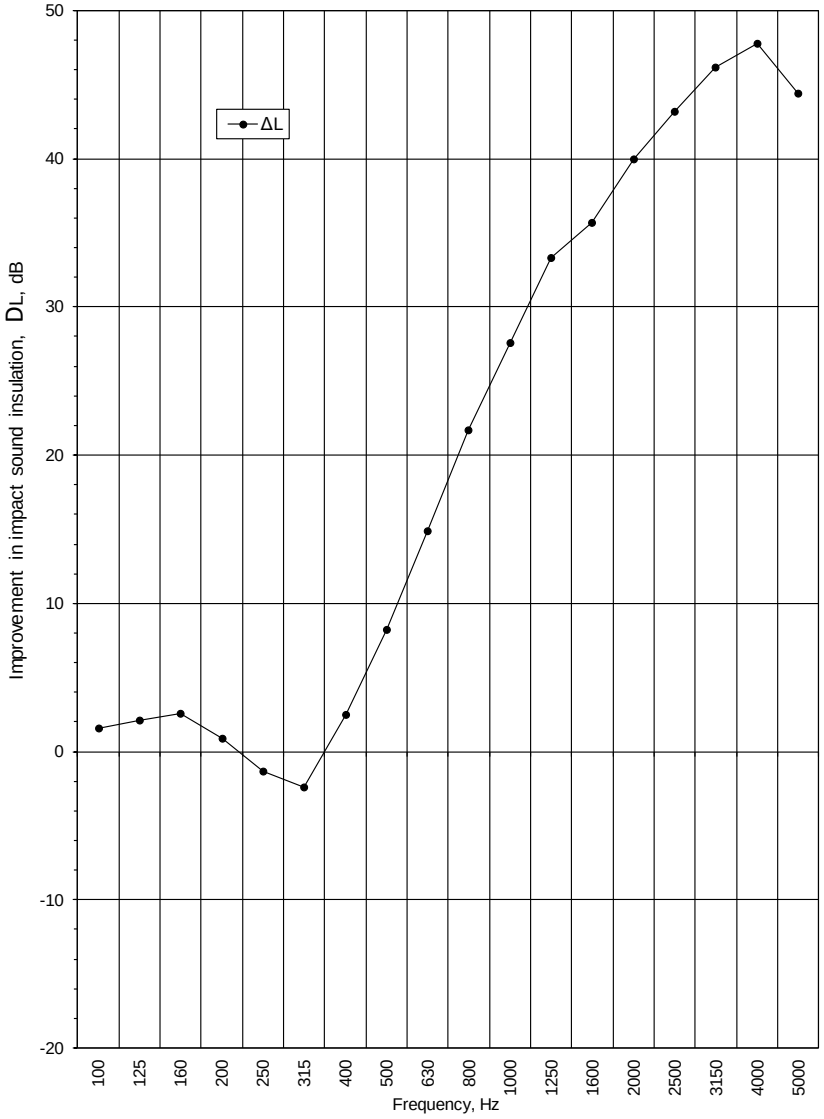
Data Sheet 2

Improvement in impact sound insulation measured according to BS EN ISO 10140-3 : 2010
Laboratory measurements of the improvement of impact sound insulation by floor coverings on a heavyweight standard floor

Test Number:	A2	**Sample mass:**	6.75 kg/m²	**Test Room:**	**Source**	**Receiving**	
Test Date:	16/04/2019	**Thickness:**	22 mm	**Air temperature:**	11.7	11.4	°C
Client:	JES Acoustics	**Length:**	3.4 m	**Air Humidity:**	58	47	%
Method of mounting:	Adhesive	**Width:**	3.2 m	**Air Pressure:**	1007 mbar		
Receiving room volume:	300m³						
Product identification:	Acoustix 3912/ 6						

The sample did not suffer visible damage during the test

Freq f Hz	$L_{n,0}$ Third octave dB	**ΔL Third octave dB**
100	66.0	**1.6**
125	67.9	**2.1**
160	69.8	**2.6**
200	70.0	**0.9**
250	70.4	**-1.3**
315	71.2	**-2.4**
400	72.0	**2.5**
500	72.8	**8.2**
630	73.1	**14.9**
800	73.2	**21.7**
1000	74.1	**27.6**
1250	75.4	**33.3**
1600	76.6	**35.7**
2000	77.4	**40.0**
2500	77.9	**43.2**
3150	78.0	**46.2**
4000	77.0	**47.8**
5000	74.5	**44.4**



$L_{n,0}$: Is the normalised impact sound pressure level of the bare heavyweight test floor.
ΔL : Is the improvement in impact sound insulation resulting from the installation of the test floor covering.
* Denotes results corrected for background # Denotes results at background

Rating according to BS EN ISO 717-2:2013 — Results are based on a test made with an artificial source under laboratory conditions.

Weighted reduction of impact sound pressure level of sample and (spectrum adaptation term)	**ΔL_w (C_{Id}) = 16 (-11) dB**
Weighted normalised impact sound pressure level of bare reference floor and (spectrum adaptation term)	$L_{n,r,0,w}$ ($C_{I,r,0}$) = 78 (-11) dB
Weighted normalised impact sound pressure level of reference floor with sample and (spectrum adaptation term)	$L_{n,r,w}$ ($C_{I,r}$) = 62 (0) dB

v3

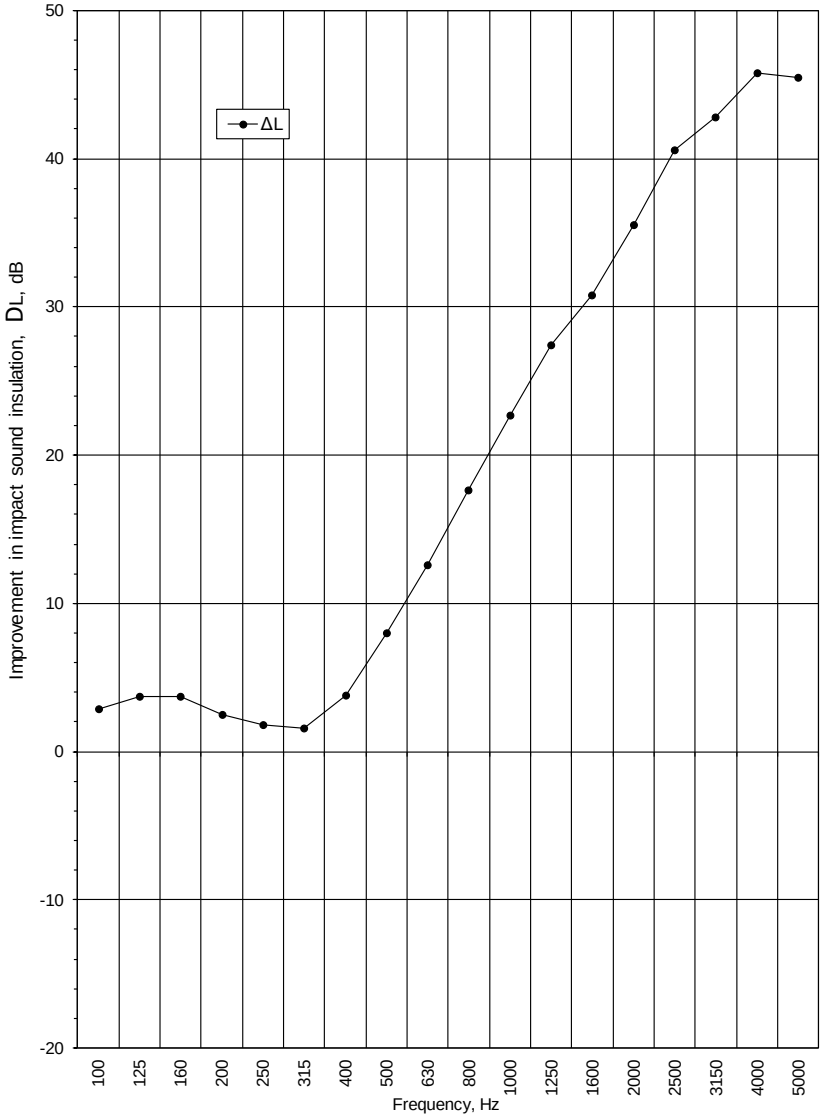
Data Sheet 3

Improvement in impact sound insulation measured according to BS EN ISO 10140-3 : 2010
Laboratory measurements of the improvement of impact sound insulation by floor coverings on a heavyweight standard floor

Test Number:	A3	**Sample mass:**	10.54 kg/m²	**Test Room:**	**Source**	**Receiving**	
Test Date:	16/04/2019	**Thickness:**	15 mm	**Air temperature:**	11.8	11.5	°C
Client:	JES Acoustics	**Length:**	3.4 m	**Air Humidity:**	58	47	%
Method of mounting:	Adhesive	**Width:**	3.2 m	**Air Pressure:**	1007 mbar		
Receiving room volume:	300m³						
Product identification:	Acoustix 4515/ 3						

The sample did not suffer visible damage during the test

Freq f Hz	$L_{n,0}$ Third octave dB	**ΔL Third octave dB**
100	66.3	**2.9**
125	68.6	**3.7**
160	70.1	**3.7**
200	70.3	**2.5**
250	70.3	**1.8**
315	71.3	**1.6**
400	72.0	**3.8**
500	72.8	**8.0**
630	73.2	**12.6**
800	73.3	**17.6**
1000	74.1	**22.7**
1250	75.5	**27.4**
1600	76.7	**30.8**
2000	77.4	**35.5**
2500	78.0	**40.6**
3150	78.1	**42.8**
4000	77.2	**45.8**
5000	74.8	**45.5**



$L_{n,0}$: Is the normalised impact sound pressure level of the bare heavyweight test floor.
ΔL : Is the improvement in impact sound insulation resulting from the installation of the test floor covering.
* Denotes results corrected for background # Denotes results at background

Rating according to BS EN ISO 717-2:2013 — Results are based on a test made with an artificial source under laboratory conditions.

Weighted reduction of impact sound pressure level of sample and (spectrum adaptation term)	**ΔL_w (C_{Id}) = 18 (-11) dB**
Weighted normalised impact sound pressure level of bare reference floor and (spectrum adaptation term)	$L_{n,r,0,w}$ ($C_{I,r,0}$) = 78 (-11) dB
Weighted normalised impact sound pressure level of reference floor with sample and (spectrum adaptation term)	$L_{n,r,w}$ ($C_{I,r}$) = 60 (0) dB

v3

Appendix A - Test Procedure

Measurement of The Improvement of Impact Sound Insulation by a Floor Covering on a Reference floor in Accordance With BS EN ISO 10140-3: 2010 & BS EN ISO 10140-1: 2010 (Appendix H) - Category II & III (Large Samples) – TP32

In the laboratory, impact sound reduction is determined from the difference a sample floor covering makes to the sound pressure levels generated by a standard impact machine. The impact machine, known as a tapping machine, is operated standing first on a concrete slab and then on the test sample installed on that slab. The test floor for the installation of the test samples measures 3.7m by 3.5mand is 160mm thick. The test sample is installed on top of the roof of a reverberation room, which is acoustically "live", and the sound pressure levels are measured in that room. The test is done under conditions which restrict the transmission of sound other than directly through the sample and test slab. The measured sound pressure levels are corrected for the amount of sound absorption in the reverberation room.

The reverberation room, which has a volume of 300 cubic metres, is constructed from 215mm brick which is internally plastered with a reinforced concrete roof and floor. The room is isolated from the surrounding structure by resilient mountings and seals, ensuring good acoustic isolation. Reverberation time measurements are done to calibrate the reverberation room.

With the tapping machine operating on the bare concrete roof slab, the resulting sound pressure levels in the room are sampled using a spaced array of microphones connected to a real time analyser. The signal is filtered into one-third octave bandwidths, integrated and averaged. Six microphones are used with minimum separating distances as follows:

- 0.7m between microphone positions
- 0.7m between any microphone position and room boundaries or diffusers
- 1.0m between any microphone position and the upper floor being excited by the tapping machine

The procedure is repeated with the tapping machine at three further positions. The individual values for the different positions are arithmetically averaged to give the impact sound pressure level ($L_{i,0}$). This is corrected to a reference room absorption, referred to as normalising, to give the normalised impact sound pressure levels ($L_{n,0}$) for the bare concrete slab.

$$L_{n,0}=L_{i,0}+10\log\frac{A}{A_{ref}} \text{ in decibels}$$

Where A is the actual absorption of the test chamber A_{ref} is the reference room absorption of $10m^2$.

The test sample, which is at least $10m^2$ in area, is placed on top of the concrete slab. The whole procedure is then repeated, with the tapping machine at four different locations, to obtain the normalised impact sound pressure levels with covering (L_i) and the corresponding normalised levels (L_n).

The reduction of impact sound pressure level (improvement of impact sound insulation) ΔL, for a given frequency band is determined as follows:

$$\Delta L = L_{n0} - L_n$$

The Weighted Impact Sound Improvement Index ΔL_w, is a single figure rating of impact sound reduction and is calculated in accordance with BS EN ISO 717-2:2013.

The impact sound pressure levels for the test floor with a test sample depend to small extent on the particular test floor itself. To standardise these levels they are adjusted by calculation to what they would be if the bare concrete slab were replaced by a reference floor. The impact sound pressure levels that would be produced on the bare reference floor ($L_{n,0}$) are defined in BS EN ISO 717-2:2013. Using these, the impact sound pressure levels for the sample on the reference floor ($L_{n,r}$) and the corresponding weighted level ($L_{n,w,r}$) are calculated in accordance with the same standard.

<u>Optional Procedure for Category II Samples</u>

The assembled floor covering may be tested under load. To simulate normal furnishing, weights are uniformly distributed over the sample floor, at least one for each square meter of sample area. The average load over the sample is between 20 and $25kg/m^2$. The thickness of the floor sample under load is noted.

Measurements under load may be done as an alternative or in addition to measurements on the unloaded sample.

Appendix B - Measurement Uncertainty

Measurement Uncertainty - BS EN ISO 10140-3: 2010; BS EN ISO 10140-1:2010 (Appendix H) – TP32

The following values of uncertainty are based on a standard uncertainty multiplied by a coverage factor of k = 2, which provides a level of confidence of approximately 95%.

Frequency, Hz	Uncertainty, ± dB
100	1.2
125	1.2
160	1.2
200	1.2
250	1.2
315	0.8
400	0.8
500	0.8
630	0.8
800	1.2
1000	1.2
1250	1.2
1600	1.5
2000	2.2
2500	2.2
3150	2.2

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