EUSKO JAURLARITZA GOBIERNO VASCO

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Eraikuntzaren Kalitate Kontrolerako Laborategia

DEPARTAMENTO DE PLANIFICACIÓN TERRITORIAL, VIVIENDA Y TRANSPORTES
Dirección de Vivienda, Suelo y Arquitectura
Laboratorio de Control de Calidad de la Edificación

AKUSTIKA ARLOA kudeatzailea:
ACOUSTICS AREA operated by
tecnalia
MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

Test Report No. B2021-LACUS-IN-160 A_En

Laboratory measurement of improvement of sound insulation

TEST SPECIMEN: ACOUSTIC SUSPENDED CEILING (SENOR+ChovA) EI120:

- SE-SRC (SENOR)
- SE-60M/DS (HYBRID) (SENOR)
- SE-CN (SENOR)
- SE-BEC-10X80 (SENOR)
- 60 mm PROFILES
- SE-F/RAPID 60 DS2 (SENOR)
- SE-MONT-BICAPA-40 (SENOR)
- ChovANAPA 4cm PANEL 600 (ChovA)
- ViscoLAM AUTOADHESIVA (ChovA)
- 25 mm plasterboard

APPLICANT: SUSPENSIONES ELÁSTICAS DEL NORTE, S.L. (SENOR)
Polígono industrial El Garrotal, Parcela 10 – Módulos 4 y 5
14700 Palma del Río, Córdoba, España

USED STANDARDS:

UNE-EN ISO 10140-1:2016 Annex G. "Acoustical linings. Improvement of airborne sound insulation".

UNE-EN ISO 10140-2:2011. "Acoustics. Laboratory measurement of sound insulation of building elements. Measurement of airborne sound insulation".

UNE-EN ISO 10140-1:2016, Annex H: "Floor coverings. Improvement of impact sound insulation".

UNE-EN ISO 10140-3:2011+A1:2015: "Acoustics. Laboratory measurement of sound insulation of building elements. Measurement of impact sound insulation".

ORIGINAL REPORT ISSUE DATE: 11th March 2022 **TRANSLATION DATE:** 1st April 2022

Signature:
Technical Consultant
Susana Lopez de Aretxaga

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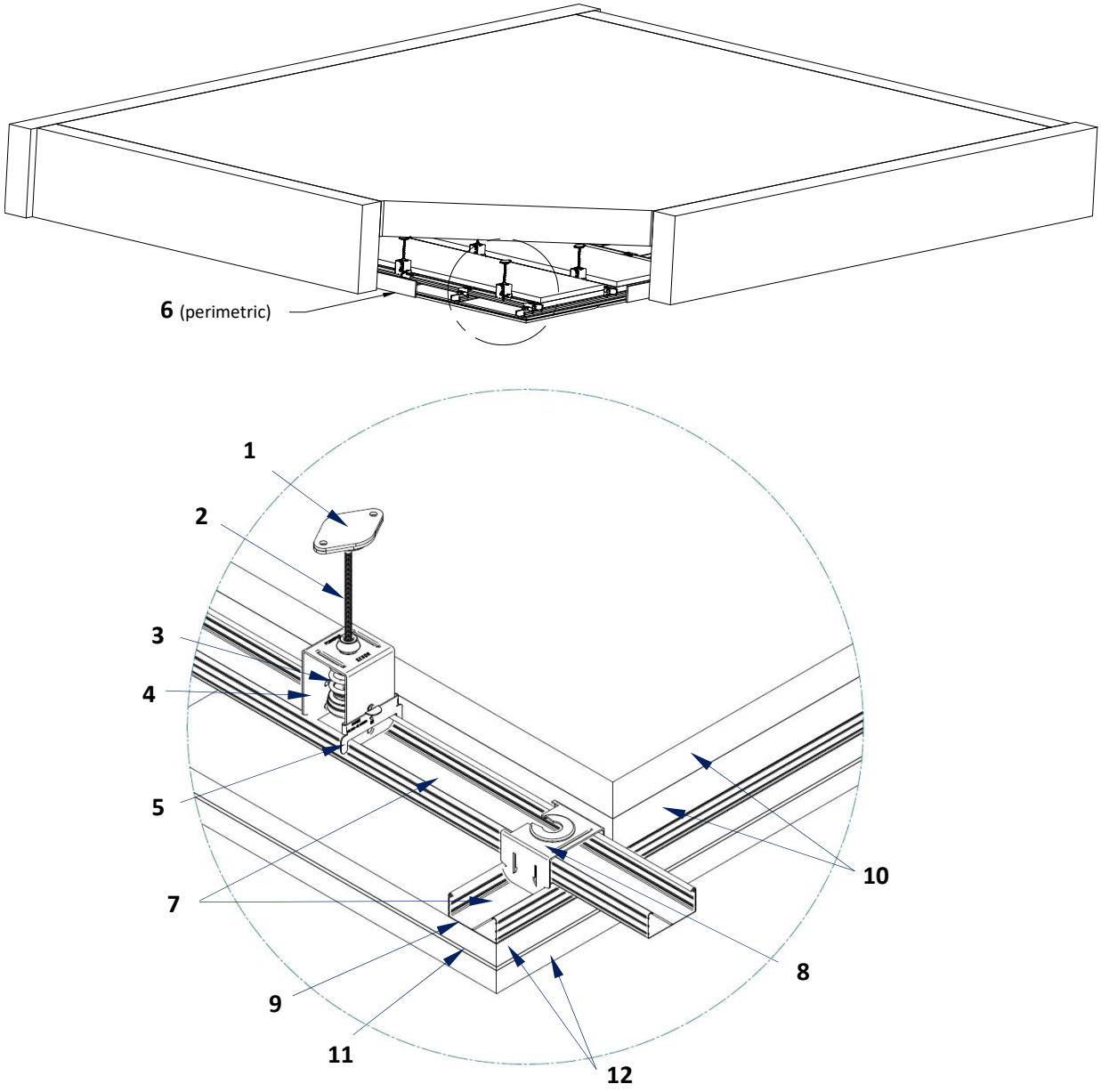
THIS REPORT CONTAINS: Total number of pages: 16

1. TEST SPECIMEN DESCRIPTION

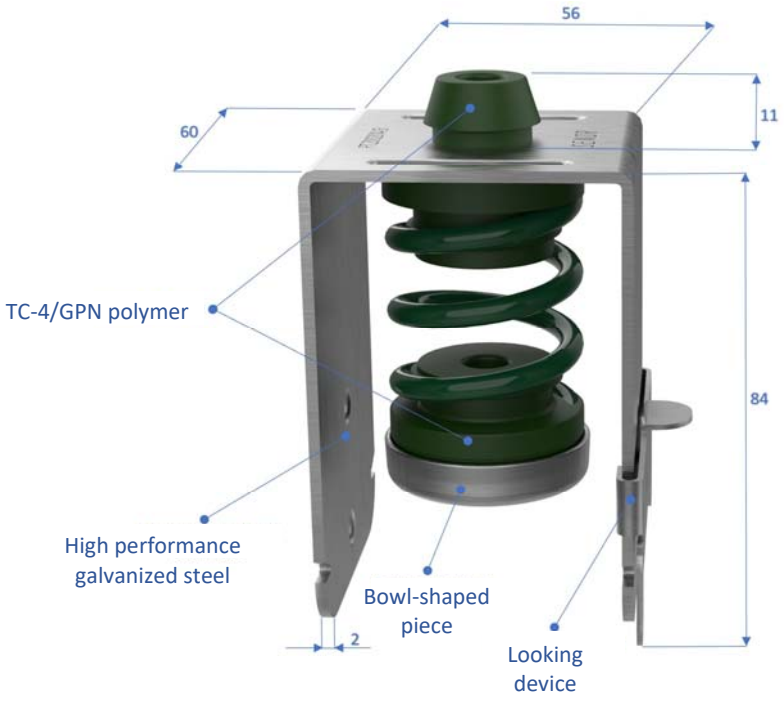
The test specimen consists of a suspended ceiling, with the following composition according to the information provided by the applicant:



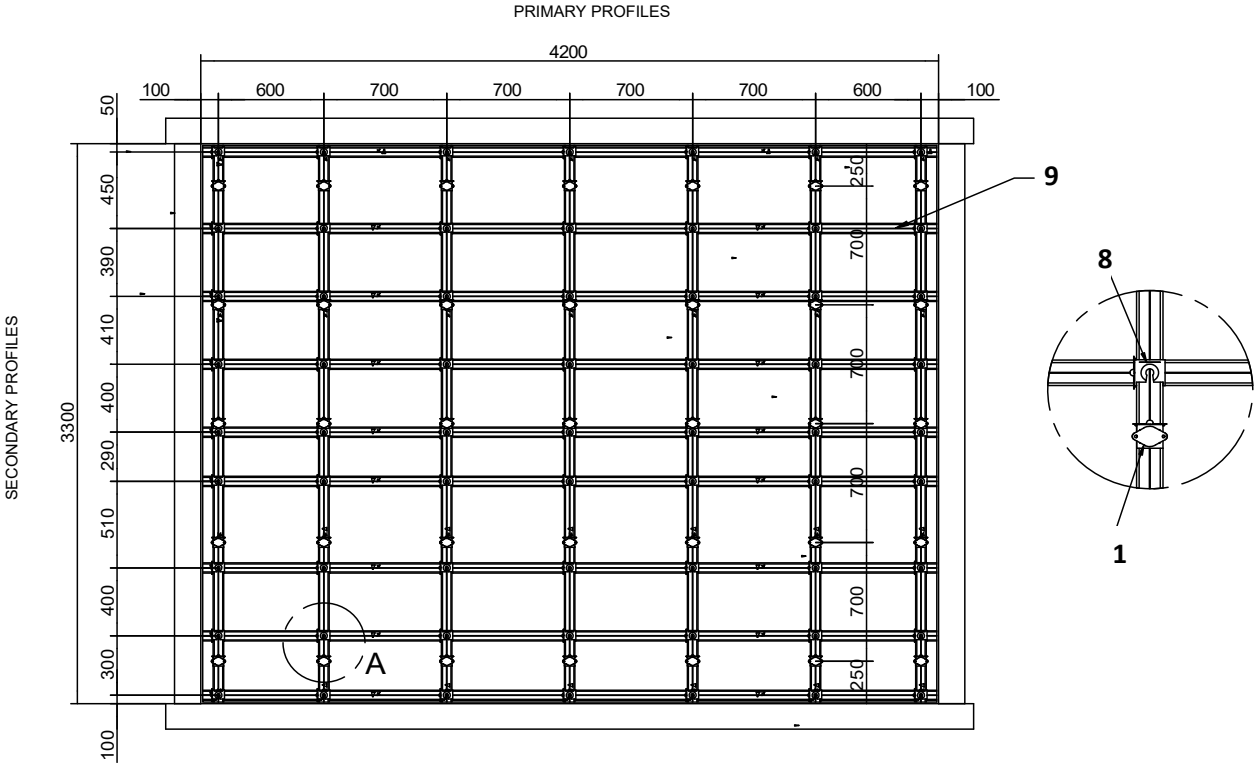
1. SE-SRC
2. M6 threaded rod
3. SE-60M/DS (HYBRID)
4. SE-CN
5. LOCKING DEVICE
6. SE-BEC-10x80
7. 60 mm PROFILES (CD 60/27 Z1)
8. SE-F/RAPID 60 DS2
9. SE-MONT-BICAPA-40
10. ChovANAPA 4cm PANEL 600 (2 units)
11. ViscoLAM AUTOADHESIVA
12. 25 mm plasterboard

Chamber between floor and interior layer plasterboards: 240 mm
Test specimen thickness: 299,5 mm

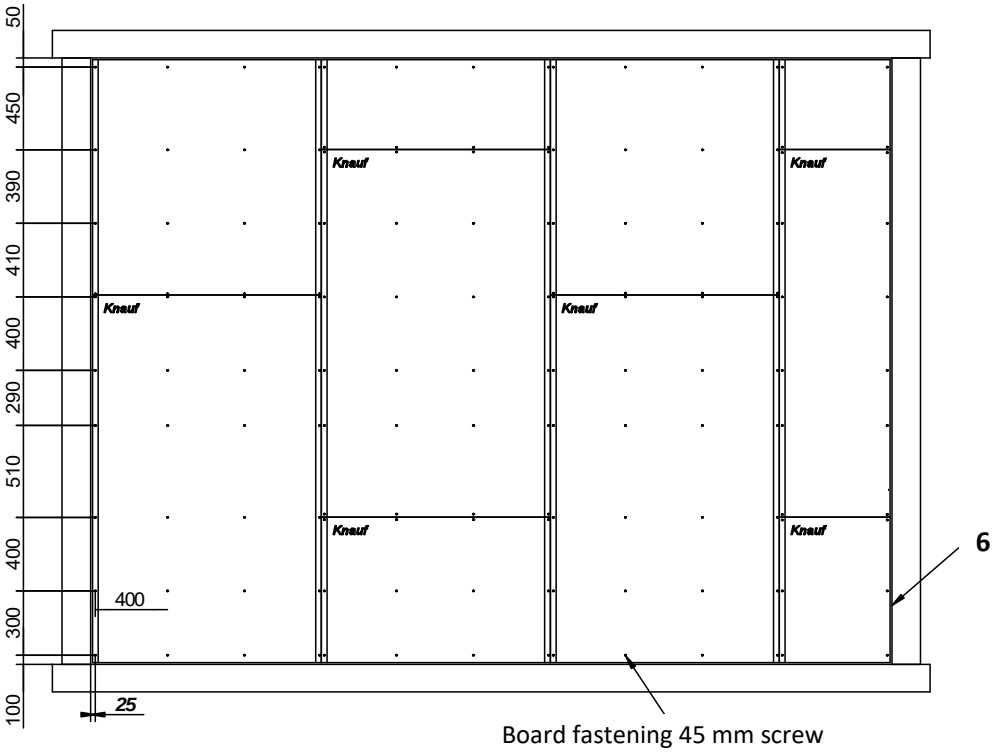
Sketch 1



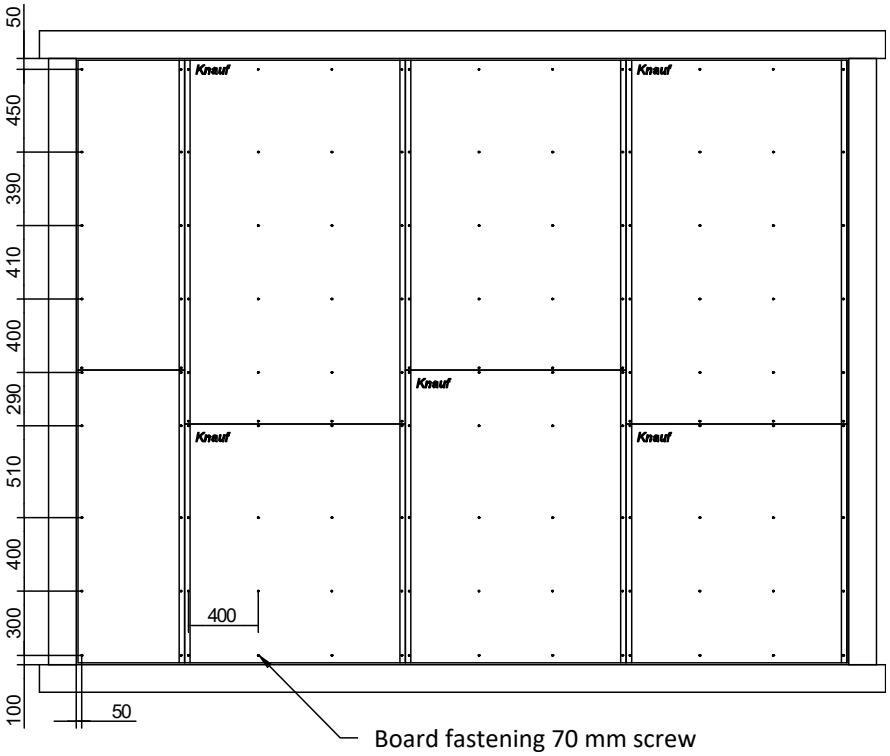
Sketch 2 (cotes in mm)



Sketch 3 (cotes in mm)



Sketch 4 (cotes in mm). Interior layer



Sketch 5 (cotes in mm). Exterior layer

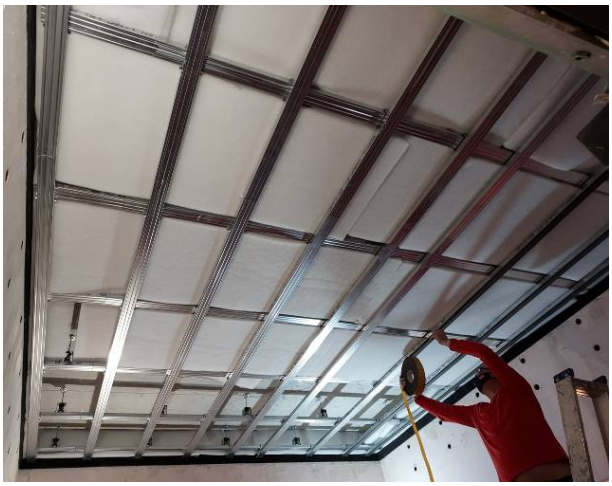
Description of materials and details of mounting:

- SE-SRC (SENOR): Oval-shaped threaded sole made of high-quality galvanized steel, with BEC EPDM CR-130 strip (3 mm de thick) adhered on surface against floor. With central hole in metric. Fastened to the floor at 2 points by metal screw anchor.
- SE-60M/DS (HYBRID) (SENOR): Acoustic Hanger composed of structure of high-quality galvanized steel + double polymer core + helicoidal metallic spring + locking device. 35 units fastened according to sketch 3.
- SE-CN (SENOR): Bowl-shaped piece of DC03 cold-rolled steel with zinc-finish and 1,5 mm thick. With central hole in metric.
- SE-F/RAPID 60 DS2 (SENOR): Connecting piece for primary and secondary profiles (trestle), of high-quality galvanized steel, 1,5 mm thick + double locking device.
- SE-MONT-BICAPA-40 (SENOR): Decoupling band (as separator between plasterboards and metallic structure reducing the transmission of vibrations between both materials). Self-adhesive, 5,5 mm thick and 4 cm wide. Composed of 2,5 mm EPDM + 3 mm cross-linked polyethylene. It is adhered to secondary profiles.
- SE-BEC-10x80 (SENOR): EPDM CR-130 Microcellular self-adhesive acoustic strip (10 mm thick x 8 cm wide), adhered on the perimeter.
- ChovANAPA 4cm PANEL 600 (ChovA): Polyester fiber (40 mm thick and 14 kg/m^3).

  2 layers inserted on the entire surface on secondary profiles and 1 layer inserted along perimeter between floor and secondary profiles.
- ViscoLAM AUTOADHESIVA (ChovA): High density viscoelastic membrane in roll (4 mm thick and 5,9 kg/m^2).

  Adhered to plasterboards of the interior layer. Sections butt jointed each other and against SE-BEC strip, with staggered joints with respect to plasterboards.
- CD 60/27 Z1 (KNAUF): Primary and secondary profile of steel, 60x27 mm and 0,6 mm thick. Longitudinal union of profiles by means of 'CD longitudinal conector for CD 60/27' pieces.
- 25 mm plasterboard: Fire-proof laminated gypsum board KNAUF-DF 25 BA (25 mm thick and 20,6 kg/m^2).

  Assembly and mechanical fixation plasterboards-profile according to sketch 4 and 5. Plasterboards butt jointed each other and against SE-BEC-10x80 strip. Plasterboards of exterior layer with staggered joints with respect to the boards of interior layer. Sealing of exterior layer: joint tape and KNAUF Unik (30') joint compound between boards and KNAUF Unik (30') joint compound along perimeter between platerboards and SE-BEC strip.

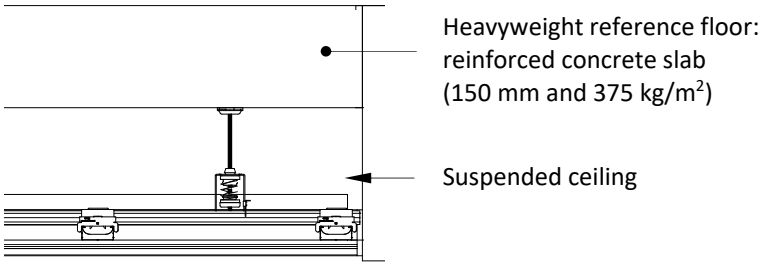


Photos of assembly of test specimen

View of test specimen in the acoustic rooms

Test arrangement:

Suspended ceiling mechanically fixed on the lower face of the heavyweight reference floor. Dimensions of test specimen: 4,2 x 3,3 m (surface 13,86 m^2).



Sketch of test specimen (B2021-159-M865) on the heavyweight reference floor

Floor covering of Category II according to UNE-EN ISO 10140-1:2016.

Material selected and delivered by: SENOR, Asfaltos Chova, S.A (ChovA) and KNAUF; each company provided its material as indicated in the test specimen description.

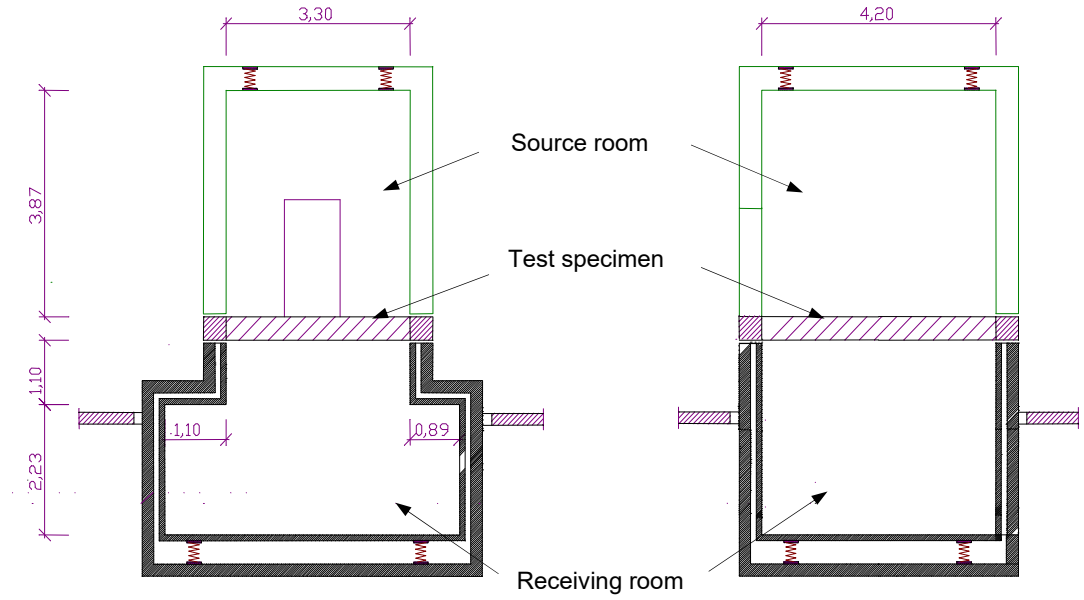
Assembly performed by: SENOR

Assembly end date: 25th November 2021

Heavyweight reference floor according to UNE-EN ISO 10140-5:2011, Annex C, provided by the laboratory in its final condition.

2. TEST FACILITIES

The test is performed in the vertical transmission rooms of the laboratory, composed of a source and a receiving room. The receiving room is formed by a concrete outer enclosure of 20 cm of thickness and a concrete inner enclosure of 10 cm of thickness, both acoustically disconnected. The source room, of 40 cm of thickness, is formed by a double enclosure of metal profile and gypsum board, both acoustically disconnected. The mobility of the source room allows the assembly of the test specimen outside and its later movement into the test rooms. Laboratory test facilities comply with the requirements of UNE-EN ISO 10140-5:2011.



Sketch of vertical transmission acoustic rooms

3. EQUIPMENT AND TEST CONDITIONS

	Vertical source Room	Vertical receiving Room
Microphones	Brüel & Kjær 4943; Serial No. 3188436	Brüel & Kjær 4943; Serial No. 3188435
Preamplifiers	Brüel & Kjær 2669; Serial No. 1948764	Brüel & Kjær 2669; Serial No. 2025844
Sound sources	Brüel & Kjær 4296; Serial No. 2071420	BR112 T/A
Booms	Brüel & Kjær 3923; Serial No. 2036584	Brüel & Kjær 3923; Serial No. 2036585
Tapping machine	Brüel & Kjær 3207; Serial No. 02675448	

	Control room
Analyser	Nor850-MF1; Serial No. 8501186
Amplifier	LAB 300; Serial No. 970-967
Equalizer	Sony, SRP-E100; Serial No. 400238
Calibrator	Brüel & Kjær 4231; Serial No. 2061476
Atmospheric conditions meter	Rotronic BL-1D; Serial No. A19060062

Measurement uncertainty of atmospheric conditions:	
Air temperature	±0,5 ºC
Air humidity	±4 %
Atmospheric pressure	±2 mbar

4. TEST PROCEDURE AND AVALUATION

4.1 Improvement of airborne sound insulation

The improvement of airborne sound insulation of a lining is characterized by the sound reduction improvement index (ΔR). For its determination, the measurement of airborne sound insulation is performed according to UNE-EN ISO 10140-2:2011, both for the basic element and basic element + lining.

The sound reduction improvement index (ΔR) of a lining placed on a basic element, for the one-third octave band from 100 Hz to 5 kHz, is obtained according to standard UNE-EN ISO 10140-1:2016 - Annex G, as the difference between the sound reduction indices of the basic element with and without the lining, as detailed in the equation:

$$\Delta R = R_{with} - R_{without}$$

R_{with}: Sound reduction index of the basic element with lining, from 100 to 5000 Hz

$R_{without}$: Sound reduction index of the basic element without lining, from 100 to 5000 Hz

The sound reduction index, R, for the one-third octave band from 100 Hz to 5 KHz is calculated according to UNE-EN ISO 10140-2:2011 using the following formula:

$$R=L_1-L_2+10*\text{Log } S/A$$

L_1: Average sound pressure level in the source room

L_2: Average sound pressure level in the receiving room

S: Test specimen area

A: Equivalent sound absorption area in the receiving room

The measurement of the average sound pressure levels L_1 and L_2 is performed by emitting an equalized white noise, from 100 Hz to 5 kHz, using a moving omnidirectional sound source. The sound field in the source and receiving rooms is sampled using a moving microphone with a sweep radius of 1 m and a traverse period of 16 s during 32 s of measure, for the basic element and through six fixed positions of the microphone path, for the basic element with lining. Background noise in the receiving room for the one-third-octave band from 100 Hz to 5 KHz, is measured according to the same measurement process of sound field in the receiving room.

The equivalent sound absorption area from 100 Hz to 5 kHz is evaluated from the reverberation time measured in the receiving room, using Sabine's formula:

$$A=0,16*V/T$$

A: Equivalent sound absorption area in the receiving room
T: Reverberation time in the receiving room
V: Receiving room volume

Reverberation time in the receiving room is determined by using two positions of the sound source and three fixed microphone positions for each source position distributed at 120º in the microphone path.

Measuring chain is verified just before and after the execution of the test.

The guidelines indicated in the applicable internal procedures have been followed:

- PE.CM-AA-61-E: "Procedure for the determination of the airborne sound insulation into the horizontal and vertical transmission rooms".
- PE.MC-AA-06-M: "Procedure to manage the test specimens for acoustic tests in laboratory".

Standard UNE-EN ISO 10140-2:2011, together with the other UNE-EN ISO 10140-1:2016, UNE-EN ISO 10140-4:2011 and UNE-EN ISO 10140-5:2011, cancels and replaces UNE-EN ISO 140-3:1995. The measurement and evaluation process applied to the test specimen described in this report is according to the standard UNE-EN ISO 10140-2:2011, and complies with cancelled UNE-EN ISO 140-3:1995.

4.2 Improvement of impact sound insulation

The improvement of impact sound insulation of a floor covering is defined by the Reduction of impact sound pressure level (ΔL).

The determination of the improvement requires the impact sound insulation test of the heavyweight reference floor without and with the floor covering, according to standard UNE-EN ISO 10140-3:2011+A1:2015.

The reduction of impact sound pressure level, ΔL, in decibels, of the floor covering at one-third octave frequency band is obtained from the difference between normalized impact sound pressure levels of the heavyweight reference floor without and with the floor covering:

$$\Delta L = L_{n,0} - L_n$$

$L_{n,0}$: Normalized impact sound pressure level of the heavyweight reference floor without floor covering, between 100 and 5000 Hz.

L_n: Normalized impact sound pressure level of the heavyweight reference floor with floor covering, between 100 and 5000 Hz.

Both normalized impact sound pressure levels ($L_{n,0}$ and L_n) at each one-third octave frequency band between 100 Hz and 5 KHz, are obtained according to the following formula:

$$L_{n,0} / L_n = L_i + 10 * \text{Log } A/A_0$$

L_i: Impact sound pressure level

A: Equivalent absorption area in the receiving room

A_0: Reference equivalent absorption area (10 m^2)

The measurement of the impact sound pressure level, Li, in a one-third-octave band in the receiving room is performed by exciting the sample using a standard tapping machine, placed at six positions randomly distributed on the test specimen. For each position, the sound field in the receiving room is sampled using a moving microphone with a sweep radius of 1 m and a traverse period of 16 s/ciclo during 32 s of measure. The impact sound pressure level for the test specimen is obtained as the average of the measured six impact sound pressure levels. To determinate L_n and $L_{n,0}$, the same positions of the standard tapping machine are used. The standard tapping machine has five metallic hammers of 30 mm of nominal diameter and meets the specifications of UNE-EN ISO 10140-5:2011, Annex E.

The background noise is measured in the receiving room in the one-third-octave band 100 Hz to 5 kHz, according to the same measurement process of sound field in the receiving room.

The equivalent sound absorption area between 100 Hz and 5 kHz, is evaluated from the reverberation time measured in the receiving room, using Sabine's formula:

$$A=0{,}16*V/T$$

A: Equivalent sound absorption area in the receiving room

T: Reverberation time in the receiving room

V: Receiving room volume

The reverberation time in the receiving room is determined using two positions of the sound source and three fixed microphone positions for each source position, at 120º in the microphone path.

Measuring chain is verified just before and after the execution of the test.

The guidelines indicated in the applicable internal procedures have been followed:

- PE.CM-AA-62-E: "Procedure to determinate the impact sound insulation and the improvement of impact sound insulation in the vertical transmission room".
- PE.MC-AA-06-M: "Procedure to manage the test specimens for acoustic tests in laboratory".

Standard UNE-EN ISO 10140-3:2011+A1:2015, together with the other UNE-EN ISO 10140-1:2016, UNE-EN ISO 10140-4:2011 and UNE-EN ISO 10140-5:2011, cancels and replaces UNE-EN ISO 140-6:1998. The measurement and evaluation process applied to the test specimen described in this report is according to the standard UNE-EN ISO 10140-3:2011+A1:2015 and also complies with cancelled UNE-EN ISO 140-6:1998.

5. RESULTS

5.1. Improvement of airborne sound insulation

The following results are presented:

- Sound reduction improvement index, ΔR, in decibels, for the one-third-octave band from 100 Hz to 5000 Hz, in table and graph.
- Weighted sound reduction improvement index, $\Delta R_{w,heavy}$, calculated according to UNE-EN ISO 10140-1:2016, Annex G, on the standard heavy wall.

$$\Delta R_{w,heavy} = R_{w,ref,with} - R_{w,ref,without}$$

$R_{ref,with} = R_{ref,without} + \Delta R$

$R_{ref,without}$ given in UNE-EN ISO 10140-5:2011, Annex B.

- A-weighted improvement of sound reduction indices $\Delta(R_w+C)_{heavy}$ and $\Delta(R_w+C_{tr})_{heavy}$, calculated in an equivalent way.
- A-weighted improvement of sound reduction indices $\Delta(R_w+C_{100\text{-}5000})_{heavy}$ and $\Delta(R_w+C_{tr,100\text{-}5000})_{heavy}$, calculated in an equivalent way.

Additionally, are presented:

- Sound reduction index of the standard wall with lining, $R_{with,}$ for the one-third-octave band from 100 Hz to 5000 Hz.
- Sound reduction index of the standard wall without lining, $R_{without}$, for the one-third-octave band from 100 Hz to 5000 Hz.
- Global indices R_w (C; C_{tr}), R_A and $R_{A,tr}$ for the both elements mentioned above, calculated as follows:
  - R_w: Weighted sound reduction index, calculated according to UNE-EN ISO 717-1:2021, from the sound reduction index, R.
  - C and C_{tr}: Spectrum adaptation terms from 100 to 3150 Hz, calculated according to UNE-EN ISO 717-1:2021, which are the values, expressed in decibels, to be added to the global magnitude value R_w to consider the characteristics of the pink noise spectrum (C) and traffic noise spectrum (C_{tr}), respectively.
  - R_A and $R_{A,tr}$: Global indices calculated according to the expression of *Documento Básico "DB-HR Protección frente al ruido" - Código Técnico de la Edificación (CTE)*, from the sound reduction index, R, obtained by laboratory measurement:
    - R_A: A-weighted sound reduction index, from 100 to 5000 Hz, expressed to one decimal place.
    - $R_{A,tr}$: A-weighted sound reduction index for exterior traffic noise, from 100 to 5000 Hz, expressed to one decimal place.

The R value marked with $_*$ means that is greater than or equal to the indicated value, due to the approximation in less than 15 dB for the R'_{max} of the test facilities. The R value marked with $_\#$ means that is greater than or equal to the indicated value, due to the approximation in less than 15 dB for the R'_{max} of the test rooms and due to the approximation of the measured receiving level for the background noise in less than 6 dB (1,3 dB has been made for background correction). The ΔR value marked with $_*$ means that is greater than or equal to the indicated value, due to the measurement limit of the R value marked with $_*$ or $_\#$ on the same frequency. The global index marked with $_{**}$ means that is greater than or equal to the indicated value, due to the limit values in frequencies marked with $_*$ or $_\#$.

F(Hz)	100	125	160	200	250	315	400	500	630
R'_{max} (dB)	61,2	63,7	72,6	67,6	76,3	79,5	84,9	89,2	93,4
F(Hz)	800	1000	1250	1600	2000	2500	3150	4000	5000
R'_{max} (dB)	95,3	97,4	97,7	99,0	99,6	96,4	92,3	84,8	81,5

5.2. Improvement of impact sound reduction

The following results are presented for the test specimen:

- The reduction of impact sound pressure level (ΔL) at one-third octave frequency band between 100 and 5000 Hz, in table and graph.
- The weighted reduction of impact sound pressure level (ΔL_w), of the floor covering, according to UNE-EN ISO 717-2:2021, obtained using the following formula:

$$\Delta L_w = L_{n,r,0,w} - L_{n,r,w} = 78\ dB - L_{n,r,w}$$

$L_{n,r,0,w}$: Weighted normalized impact sound pressure level calculated from $L_{n,r,0}$.

$L_{n,r,w}$: Weighted normalized impact sound pressure level calculated from $L_{n,r}$.

$L_{n,r,0}$: Normalized impact sound pressure level of a reference floor defined in the standard UNE-EN ISO 717-2:2021

$L_{n,r}$: Normalized impact sound pressure level calculated by $L_{n,r} = L_{n,r,0} - \Delta L$.

- The spectrum adaptation term ($C_{I,\Delta}$), according to UNE-EN ISO 717-2:2021, obtained using the following formula:

$$C_{I,\Delta} = C_{I,r,0} - C_{I,r} = -11\ dB - C_{I,r}$$

$C_{I,r,0}$: Spectrum adaptation term calculated from $L_{n,r,0}$.

$C_{I,r}$: Spectrum adaptation term calculated from $L_{n,r}$.

Additionally, is presented the following information:

- Normalized impact sound pressure level of the floor covering on the heavyweight reference floor (L_n) between 100 and 5000 Hz.
- Normalized Impact sound pressure level of the heavyweight reference floor ($L_{n,0}$) between 100 and 5000 Hz.
- Single-number quantities ($L_{n,w}$ and $L_{n,0,w}$) of the heavyweight reference floor with and without the floor covering and Single-number quantity ($L_{n,r,w}$) and spectrum adaptation term ($C_{I,r}$).

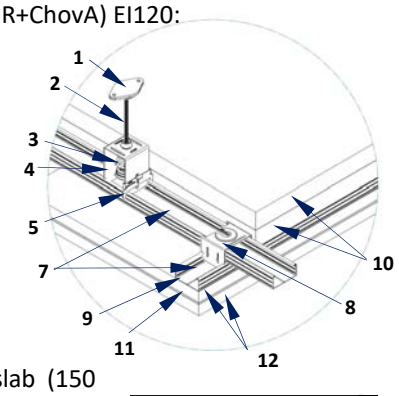
Sound reduction improvement index of a lining on heavyweight reference floor according to UNE-EN ISO 10140-1:2016 Annex G
Laboratory measurements according to UNE-EN ISO 10140-2:2011

Result No.: B2021-160-M865 MRA **Test date:** 25th November 2021

Applicant: SUSPENSIONES ELÁSTICAS DEL NORTE, S.L. (SENOR)

Test specimen: ACOUSTIC SUSPENDED CEILING (SENOR+ChovA) EI120:

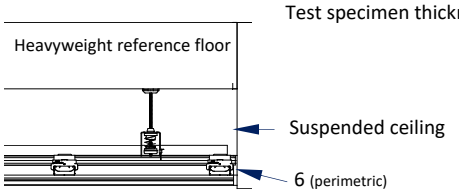
- SE- SRC (SENOR)
- SE-60M/DS (HYBRID) (SENOR)
- SE-CN (SENOR)
- SE-BEC-10X80 (SENOR)
- 60 mm PROFILES
- SE-F/RAPID 60 DS2 (SENOR)
- SE-MONT-BICAPA-40 (SENOR)
- ChovANAPA 4cm PANEL 600 (ChovA)
- ViscoLAM AUTOADHESIVA (ChovA)
- 25 mm plasterboards



1. SE-SRC
2. Threaded rod
3. SE-60M/DS (HYBRID)
4. SE-CN
5. LOCKING DIVICE
6. SE-BEC-10x80
7. 60 mm PROFILES (CD 60/27 Z1)
8. SE-F/RAPID 60 DS2
9. SE-MONT-BICAPA-40
10. ChovANAPA 4cm PANEL 600 (2 units)
11. ViscoLAM AUTOADHESIVA
12. 25 mm plasterboards

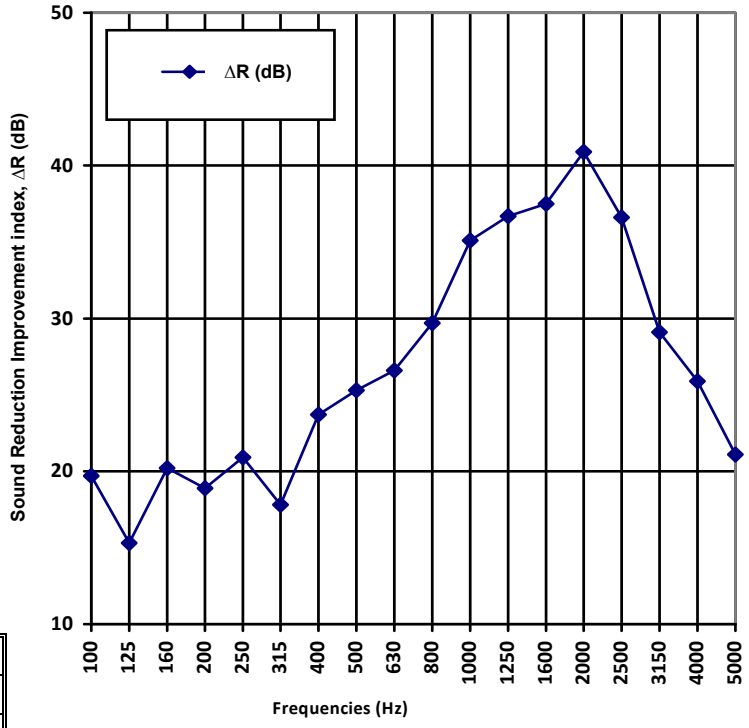
Chamber floor - interior layer plasterboards: 240 mm
Test specimen thickness: 299,5 mm

<u>Heavyweight reference floor</u>: Reinforced concrete slab (150 mm & 375 kg/m²), tested on 22nd November 2021 (R_{with}).



Test specimen estimated superficial mass: 48 kg/m²
Test specimen area, S: 13,86 m² (3,3x4,2m) T_{rooms}: 18,3 ºC
Receiving room volume: 60,6 m³ HR_{rooms}: 43 %
Source room volume: 56,4 m³ P_{rooms}: 951 mbar

f (Hz)	R_{with} (dB)	$R_{without}$ (dB)	ΔR (dB)
100	58,0 *	38,3	19,7 *
125	59,2 *	43,9	15,3 *
160	60,2 *	40,0	20,2 *
200	62,7 *	43,8	18,9 *
250	67,4 *	46,5	20,9 *
315	65,9 *	48,1	17,8 *
400	76,4 *	52,7	23,7 *
500	80,5 *	55,2	25,3 *
630	83,1 *	56,5	26,6 *
800	87,9 *	58,2	29,7 *
1000	95,3 *	60,2	35,1 *
1250	98,7 *	62,0	36,7 *
1600	101,6 *	64,1	37,5 *
2000	108,2 *	67,3	40,9 *
2500	107,4 #	70,8	36,6 *
3150	103,0 #	73,9	29,1 *
4000	101,1 #	75,2 *	25,9 *
5000	98,6 #	77,5 *	21,1 *



$R_w(C; C_{tr})_{with}$: 78(-2;-7) dB **		$R_w(C; C_{tr})_{without}$: 57(-1; -5) dB	
$R_{A,with}$:	77,3 dBA **	$R_{A,without}$:	56,9 dBA
$R_{A,tr,with}$:	71,3 dBA **	$R_{A,tr,without}$:	51,6 dBA

Weighted indices according to UNE-EN ISO 10140-1:2016 Annex G:

$\Delta R_{w,heavy}$ = 22 dB ** / $\Delta(R_w+C)_{heavy}$ = 21 dBA ** / $\Delta(R_w+C_{tr})_{heavy}$ = 21 dBA **

$\Delta(R_w+C_{100-5000})_{heavy}$ = 21 dBA ** / $\Delta(R_w+C_{tr,100-5000})_{heavy}$ = 21 dBA **

Evaluation based on laboratory measurement results obtained by an engineering method

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** R' ≥ indicated value (measurement limit by approx. R'_{max}). # R' ≥ indicated value (measurement limit by approx. background and R'_{max}). * ΔR ≥ indicated value.*
*** Global Index ≥ indicated value.*

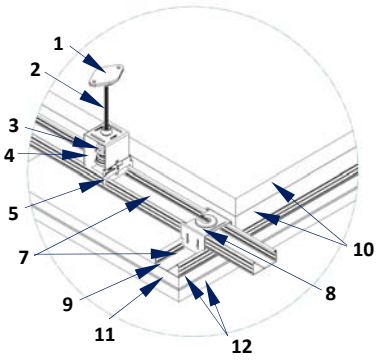
Reduction of Impact Sound Pressure Level according to UNE-EN ISO 10140-1:2016, Annex H
Laboratory measurements

Result No.: B2021-160-M865 MRI **Test date:** 25th November 2021

Applicant: SUSPENSIONES ELÁSTICAS DEL NORTE, S.L. (SENOR)

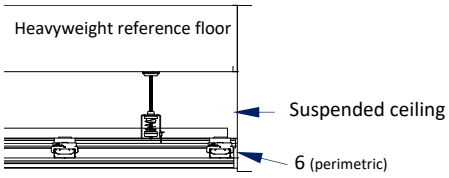
Test specimen: ACOUSTIC SUSPENDED CEILING (SENOR+ChovA) EI120:

- SE- SRC (SENOR)
- SE-60M/DS (HYBRID) (SENOR)
- SE-CN (SENOR)
- SE-BEC-10X80 (SENOR)
- 60 mm PROFILES
- SE-F/RAPID 60 DS2 (SENOR)
- SE-MONT-BICAPA-40 (SENOR)
- ChovANAPA (ChovA) 4cm PANEL 600 (ChovA)
- ViscoLAM (ChovA) AUTOADHESIVA (ChovA)
- 25 mm plasterboards



1. SE-SRC
2. Threaded rod
3. SE-60M/DS (HYBRID)
4. SE-CN
5. LOCKING DEVICE
6. SE-BEC-10x80
7. 60 mm PROFILES (CD 60/27 Z1)
8. SE-F/RAPID 60 DS2
9. SE-MONT-BICAPA-40
10. ChovANAPA 4cm PANEL 600 (2 units)
11. ViscoLAM
12. 25 mm plasterboards

Chamber floor - interior layer plasterboards: 240 mm
Test specimen thickness: 299,5 mm

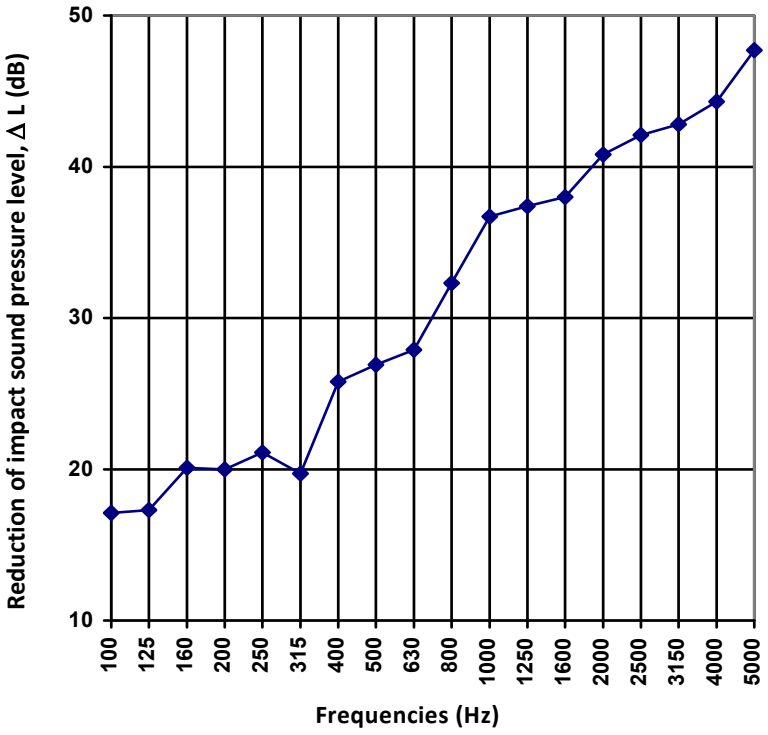


Heavyweight reference floor: Reinforced concrete slab (150 mm & 375 kg/m^2), tested on 22nd November 2021 ($L_{n,0}$).

Test specimen estimated superficial mass: 48 kg/m^2
Test specimen area, S: 13,86 m^2 (3,3x4,2m)

Receiving room volume: 60,6 m^3
Source room volume: 56,4 m^3
$T_{upper\ floor\ surface\ centre}$: 18,5 ºC
T_{rooms}: 18,3 ºC
HR_{rooms}: 43 %
P_{rooms}: 951 mbar

f (Hz)	$L_{n,0}$ (dB)	L_n (dB)	ΔL (dB)
100	68,9	51,8	17,1
125	62,4	45,1	17,3
160	67,6	47,5	20,1
200	68,0	48,0	20,0
250	66,0	44,9	21,1
315	68,7	49,0	19,7
400	67,6	41,8	25,8
500	67,8	40,9	26,9
630	69,0	41,1	27,9
800	70,3	38,0	32,3
1000	71,3	34,6	36,7
1250	71,5	34,1	37,4
1600	71,8	33,8	38,0
2000	71,1	30,3	40,8
2500	70,3	28,2	42,1
3150	69,9	27,1	42,8
4000	69,8	25,5	44,3
5000	68,7	21,0	47,7



Rating according to UNE-EN ISO 717-2:2021: **ΔL_w ($C_{I,\Delta}$): 34 (-10) dB**

$L_{n,0,w}$: 77 dB; $L_{n,w}$: 42 dB; $L_{n,r,w}$: 44 dB; $C_{I,r}$: -1 dB.

These results are based on test made with an artificial source under laboratory conditions (engineering method)

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