

Test Report
8-108E/05

JOCAVI – Consultadoria e Design em Acústica, Lda.

Sintra, Portugal

DETERMINATION OF SOUND ABSORPTION COEFFICIENTS

Woodiffusor

March 2005

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1 - DESCRIPTION

As requested by the company *JOCAVI – Consultadoria e Design em Acústica, Lda.* (Centro Empresarial LusoWorld edif. 22, Rua Pé de Mouro, Capa Rota, P-2710 Sintra, Portugal) this Laboratory of Acoustics has proceeded to a series of measurements to determine the sound absorption coefficients (α_s) of the system/material commercially known as **Wooddiffusor**.

2 - METHOD

2.1 - Sample

The measured sample was tested on March 4, 2005 using panels of various dimensions (120x60 cm e 60x60 cm). The sample, with a total area of 13.12 m², was placed on the floor of the reverberation room (see Fig 1 and 2).



Fig. 1 and 2 – Sample (with sobreposition of a 40 cm ruler) and test assembly on the reverberant chamber floor.

2.2 - Parameters

The determination of the sound absorption coefficients (α_s) was done by measuring the reverberation time of the reverberant room R1 of the Laboratory of Acoustics of the Institute of Construction of the Faculty of Engineering of the University of Porto with and without the studying sample (in accordance with EN 20354 / ASTM C423). The 95% confidence limits for the uncertainty of the sound absorption coefficients limits were also determined.

2.3 - Measurement Positions

Twenty-seven (27) measurements were used as followed:

- Three positions of the sound source;
- Three positions for the microphone;
- Three measurements for each microphone position.

2.4 - Characteristics of the reverberant room

The receiving reverberant room (R1), has the following dimensions:

Average length = 7.25 m; Average width = 5.88 m; Height = 4.65 m; Volume = 217.7 m³

The atmospheric conditions in the receiving room during the measurements were the following:

Air temperature = 13 °C Air humidity = 70%

During the measurements the room was empty of persons or any extra objects.

2.5 - Equipment

The equipment and the measurement procedure used were in accordance with the applicable standards: Sound level meter B&K 2260 n° 2168642 (verif. in ISQ - Certified n° 25310/04 of 03/09/2004); Calibrator B&K 4231 n° 2176164 (verif. in ISQ - Cert. n° 25310/04 of 03/09/2004); ½ inch microphone, Brüel & Kjaer, model 4189; Sound source, Brüel & Kjaer Type 4224; Termo-Higrometer Wm HTA 4200.

3 - RESULTS

Table 1 presents a global analysis of the obtained values for the sound absorption coefficients (α_s) and the average reverberation times (RT) of the room with and without the sample in study, for all the normative frequencies (one third octave bands). Table 2 presents the values for the global parameters NRC (Noise Reduction Coefficient) and α_w (Weighted Sound Absorption Coefficient, as in EN 11654). Table 3 presents the values for the uncertainty of the sound absorption coefficients using 95% confidence limits, as in ASTM C423. By special request of the client, Table 4 shows some results for non-normative frequencies.

Table 1 – Summary of results.

Wooddiffusor																		
Freq. (Hz)	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k
RTref ^{average}	14.52	14.12	13.17	12.98	12.92	13.76	14.41	13.30	11.77	10.11	8.35	7.64	6.50	5.21	4.28	3.33	2.36	1.81
RTsample ^{average}	11.51	10.81	7.47	7.57	7.65	9.20	8.52	7.74	6.95	6.06	4.95	4.29	4.10	3.56	3.16	2.66	1.94	1.54
α_s	0.05	0.06	0.16	0.15	0.14	0.10	0.13	0.15	0.16	0.18	0.22	0.28	0.24	0.24	0.22	0.21	0.25	0.26

Table 2 – NRC and α_w global parameters.

	NRC	α_w
Wooddiffusor	0.20	0.20

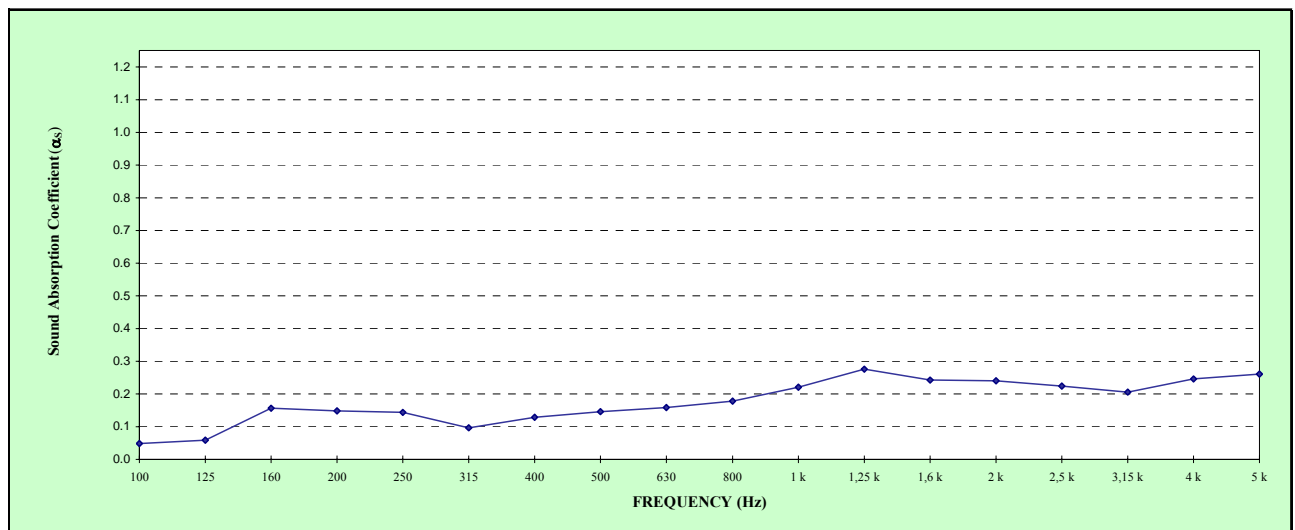
Table 3 – Values for the uncertainty of the sound absorption coefficients using 95% confidence limits ($\alpha_s = \alpha_{s, average} \pm \Delta\alpha_s$).

	Frequency (Hz)	63	80	100	125	160	200	250	315	400	500	
Wooddiffusor	$\Delta\alpha_s$	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	
	Frequency (Hz)	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k
Wooddiffusor	$\Delta\alpha_s$	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03	0.03	0.03

Table 4 – Sound absorption coefficients at frequencies other than the normative.

Wooddiffusor			
Freq. (Hz)	63	80	6,3k
α_s	0.01	0.02	0.28

Table 5 – Sound absorption coefficients (α_s) for *Wooddiffusor* presented in the form of a graph at the normative 1/3 octave frequency bands.



Porto and F.E.U.P., March 31, 2005.

Made by: Paulo Marques
Civil Engineer

The Director of the Laboratory
António P. O. Carvalho, Ph.D.