

Test Report
8-114E/05

JOCAVI – Consultadoria e Design em Acústica, Lda.

Sintra, Portugal

DETERMINATION OF SOUND ABSORPTION

Tubabsorber

May 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 per unit (A_U) of the system/material commercially known as *Tubabsorber*.

2 - METHOD

2.1 – Sample and date

The sample (six elements each with the dimensions specified on Fig. 2 - according to the manufacturer's online catalogue: www.jocavi.net), with a visible area for sound absorption of $6 \times 1.570 = 9.420 \text{ m}^2$, was placed on the reverberation room and tested on May 5, 2005.

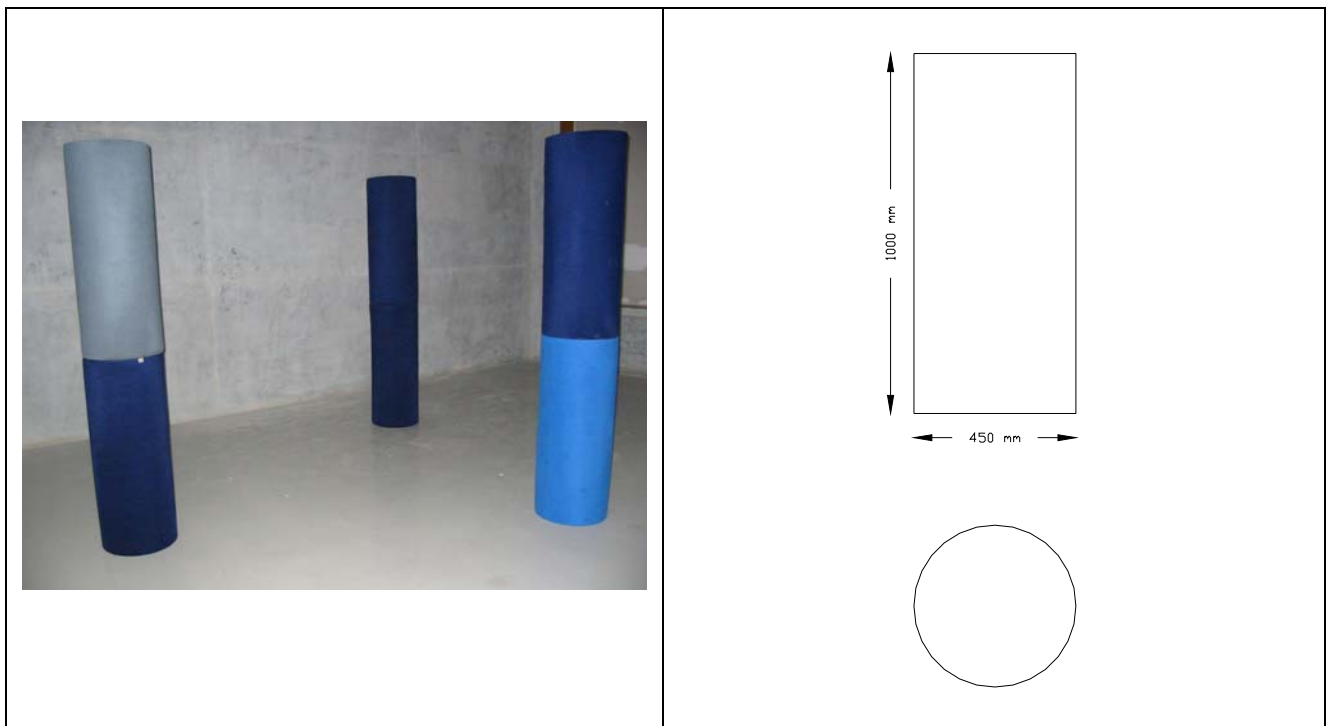


Fig. 1 (left) – Sample and test assembly on the reverberant room; Fig. 2 (right) – Panel's dimensions (according to the manufacturer's online catalogue: www.jocavi.net).

2.2 - Parameters

The determination of the sound absorption per unit (A_U) was done by measuring the reverberation time of the reverberant room *RI* 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 per unit 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 (*RI*) has the following dimensions:

Average length = 7.25 m; Average width = 5.88 m; Height = 4.65 m; Volume = 216 m³

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

Air temperature = 20 °C Relative air humidity = 69,5%

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 per unit ($A_{U,average}$) 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). The table also presents the values for the uncertainty of the sound absorption coefficients using 95% confidence limits, as in *ASTM C423*.

Table 1 – Summary of results (*RT*, $A_{U,average}$ and ΔA_U)

$$(A_U = A_{U,average} \pm \Delta A_U)$$

Tubabsorber																		
Freq. (Hz)	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k
$RT_{ref}^{average}$ (s)	11.51	12.62	12.42	11.05	11.40	12.78	12.53	12.11	11.20	10.47	9.21	8.25	7.42	6.62	5.93	5.04	4.03	3.22
$RT_{sample}^{average}$ (s)	6.12	6.16	5.56	4.91	4.67	4.19	3.62	3.45	3.39	3.30	3.15	3.04	2.91	2.83	2.65	2.42	2.16	1.88
$A_{U,average}$ (m ² /unit)	0.33	0.36	0.43	0.49	0.55	0.70	0.86	0.90	0.90	0.91	0.91	0.91	0.91	0.88	0.91	0.94	0.94	0.96
ΔA_U (m ² /unit)	0.04	0.04	0.03	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.05	0.04	0.04

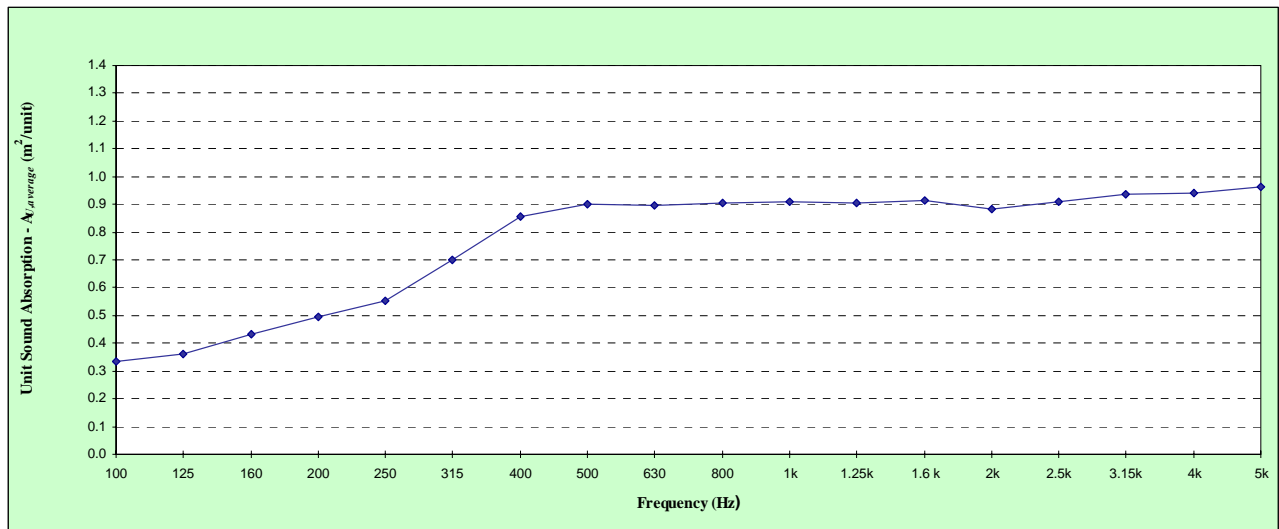
By special request of the client, Table 2 shows the obtained values for the sound absorption coefficients ($A_{U,average}$) and the uncertainty (ΔA_U) using 95% confidence limits, as in *ASTM C423*, for non-normative frequencies. The Fig. 3 shows the measured $A_{U,average}$ in graph form.

Table 2 – Summary of results ($A_{U,average}$ and ΔA_U) at frequencies other than the normative.

$$(A_U = A_{U,average} \pm \Delta A_U)$$

<i>Basscorner</i>						
Freq. (Hz)	50	63	80	6,3k	8k	10k
$A_{U,average}$ (m ² /unit)	0.14	0.25	0.18	1.02	1.14	1.26
ΔA_U (m ² /unit)	0.04	0.03	0.05	0.05	0.07	0.08

Fig. 3 – Sound absorption coefficients ($A_{U,average}$) for *Basscorner* presented in the form of a graph at the normative 1/3 octave frequency bands.



Porto and F.E.U.P., May 24, 2005.

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