



UPC

UNIVERSITAT POLITÈCNICA DE CATALUNYA

**Departament de
Teoria del Senyal
i Comunicacions**

Escola Tècnica Superior
d'Enginyers de Telecomunicació
Direcció: Campus Nord UPC Edifici D-5
Sor Eulàlia de Anzizu, s/n

Direcció postal:
Apdo. 30.002, 08080 Barcelona
Tel. (93) 401 64 40, Fax (93) 401 64 47
Télex 52821 UPC-E

**MEASUREMENT OF THE ACOUSTIC
ABSORPTION COEFFICIENT OF THE SEATS
MANUFACTURED BY EURO-SEATING.
MODEL: MILLENIUM SERIES – BOGART**

March 1999

At the request of the Euro-Seating company, a measurement has been performed of the acoustic absorption coefficient of the seats of the MILLENIUM SERIES – BOGART model. The measurements taken refer to two situations: empty seats and occupied seats.

The measurements were taken on the 26th and 26th February 1999 in the reverberation room of the acoustics laboratory of the Higher Technical School of Telecommunication Engineering (*Escuela Técnica Superior de Ingeniería de Telecomunicación*) of the Polytechnic University of Catalonia.

The sample for the measurement consisted of 16 seats assembled in 4 rows of 4 seats each, arranged in the centre of the reverberation room and following the normal assembly conditions.

The perimeter of the seats was surrounded by wooden sheets adapted to the height of the sample, with the aim of avoiding lateral absorption. In this way, the measured absorption is representative of an equivalent area of seats or audience in an audition room.

The reverberation room, the instruments used and the measurement procedures all comply with the ISO 354 and UNE-EN 20354 standards.

The following pages describe:

- A – the sample subjected to the test and its assembly
- B – the reverberation room and the measurement conditions
- C – the results of the measurement

The results of the measurements are expressed in terms of the absorption coefficient per square metre.

- A – the sample subjected to the test and its assembly

Customer:	EURO-SEATING
Sample:	MILLENIUM SERIES – BOGART model seats
Number of units:	16 seats
Sample area:	7.92 m ²
Separation between rows:	90 cm

The sample to be tested was arranged in the centre of the test room (reverberation room), forming a rectangle of about 2.23 x 3.55 metres. The perimeter of this rectangle was surrounded by wooden sheets adapted to the height of the sample, with the aim of avoiding lateral absorption.

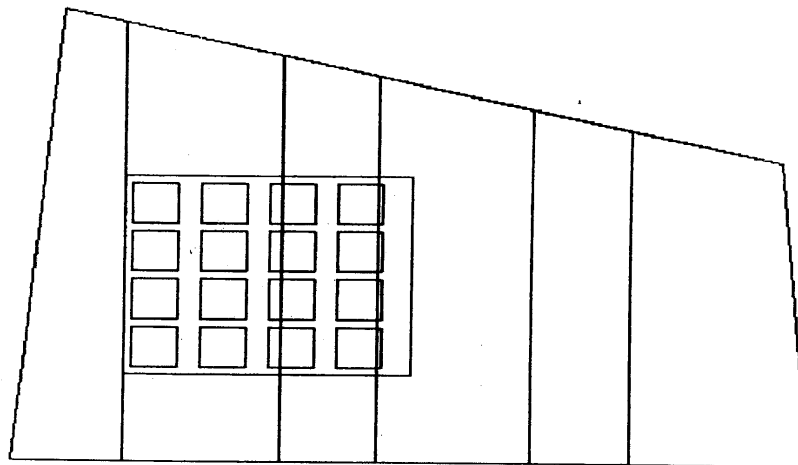


Figure 1. Plan of the reverberation room with the seats arranged in the centre of the room with their perimeter surrounded to avoid lateral absorption.

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Télex 52821 UPC-E**B – Description of the reverberation room and the measurement conditions**

Volume: 189 m³
Area: 214 m²
Diffusers: 12 diffusers of 1.5 x 1 metres
N. of microphone positions: 4

Measuring conditions:

Type of noise: White noise filtered by means of third octave frequency ranges.
Temperature: 20° C
Relative humidity: 35 %

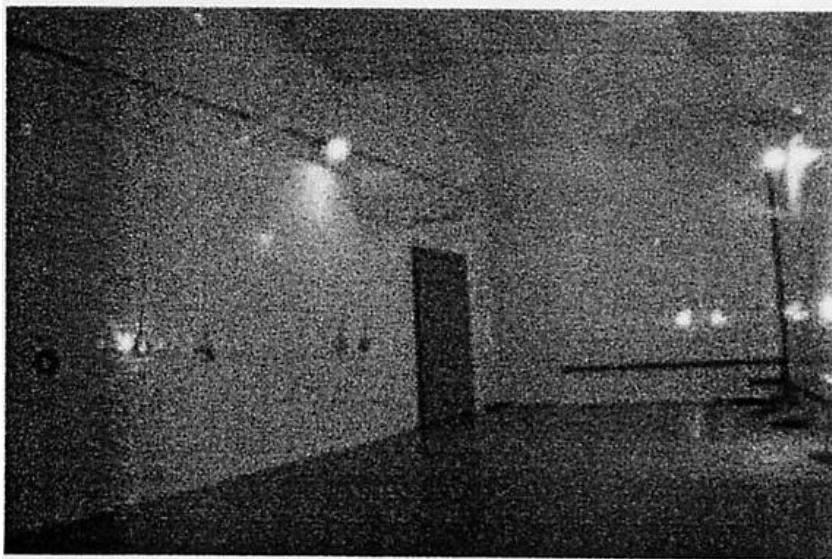


Figure 2. Perspective view of the reverberation room

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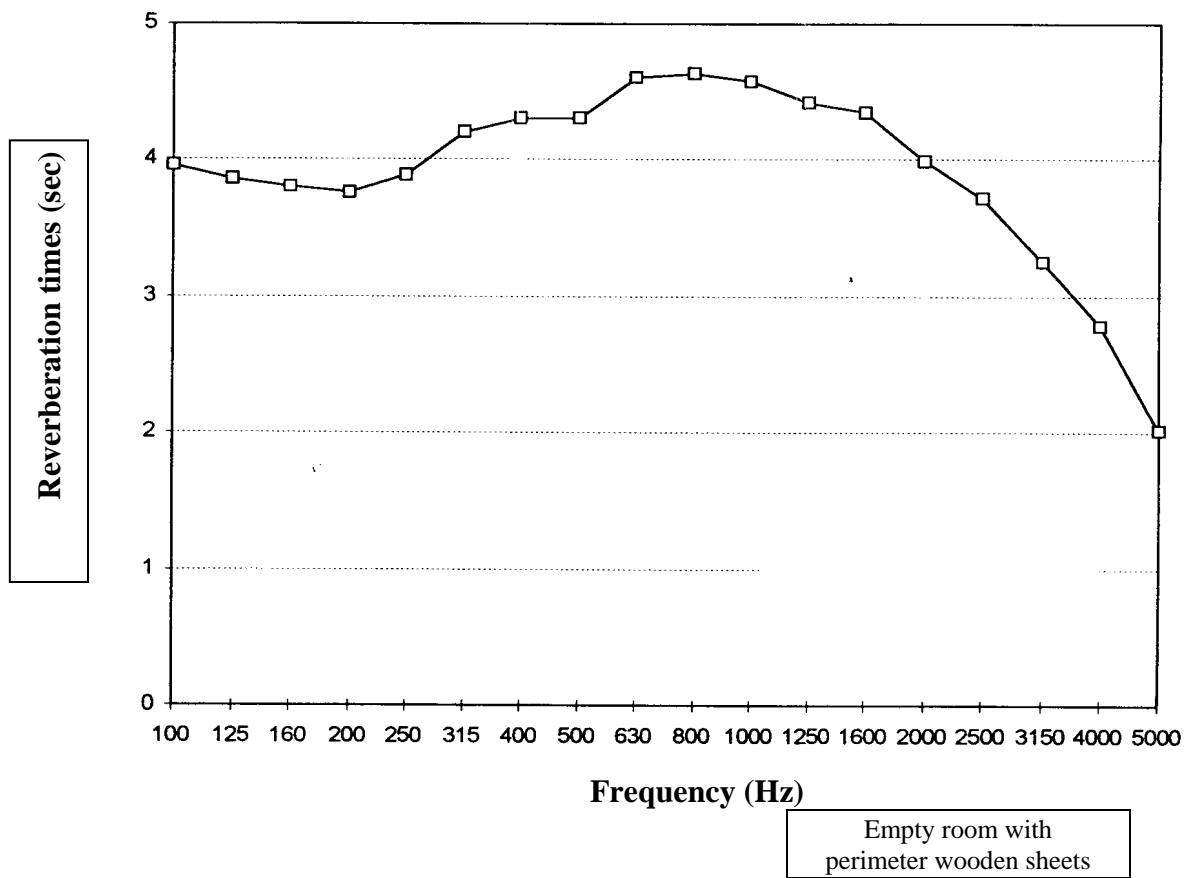
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C – Results of the measurements:

Reverberation times (in sec.) of the empty room with the perimeter wooden sheets:

Frequency (Hz)
Reverberation times (sec)

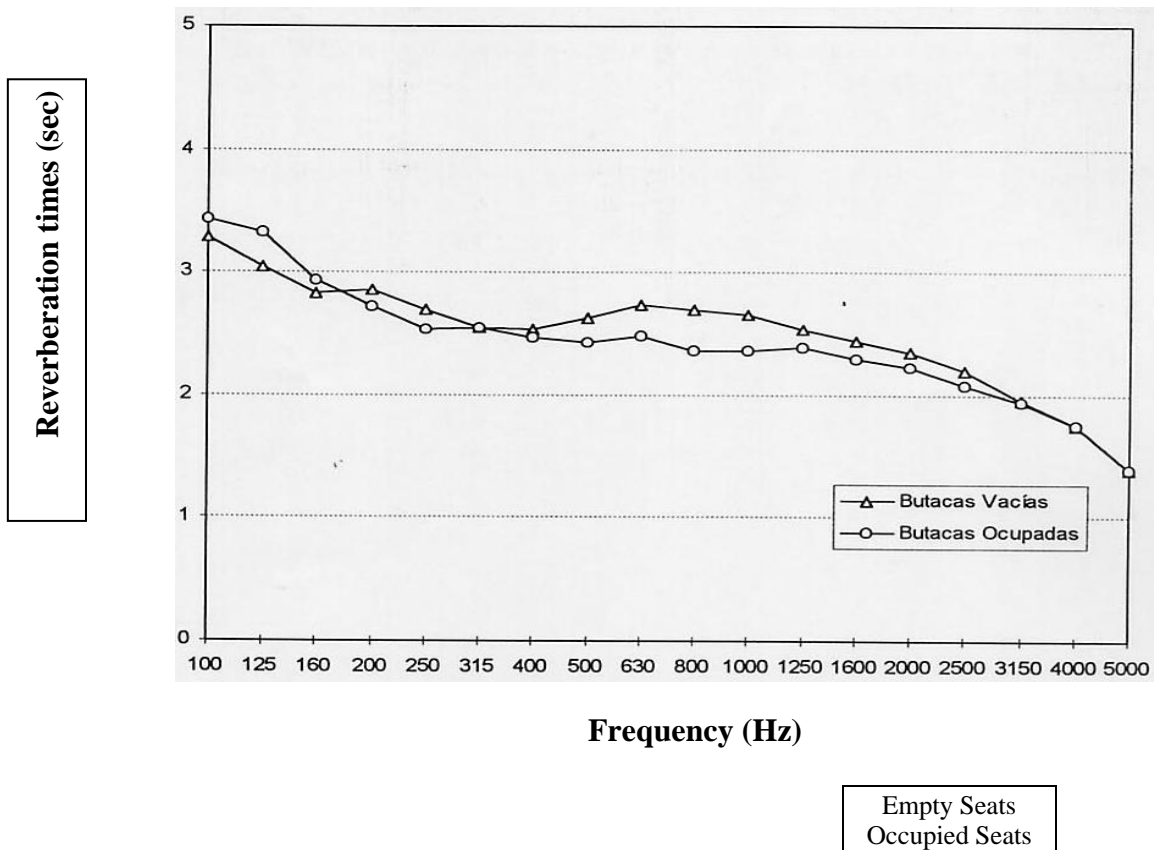
Frequency (Hz)
Reverberation times (sec)



Reverberation times (in sec.) of the room with the empty and occupied seats of the MILLENNIUM SERIES – BOGART model made by the EURO-SEATING company:

Frequency (Hz)
Empty Seats
Occupied Seats

Frequency (Hz)
Empty Seats
Occupied Seats



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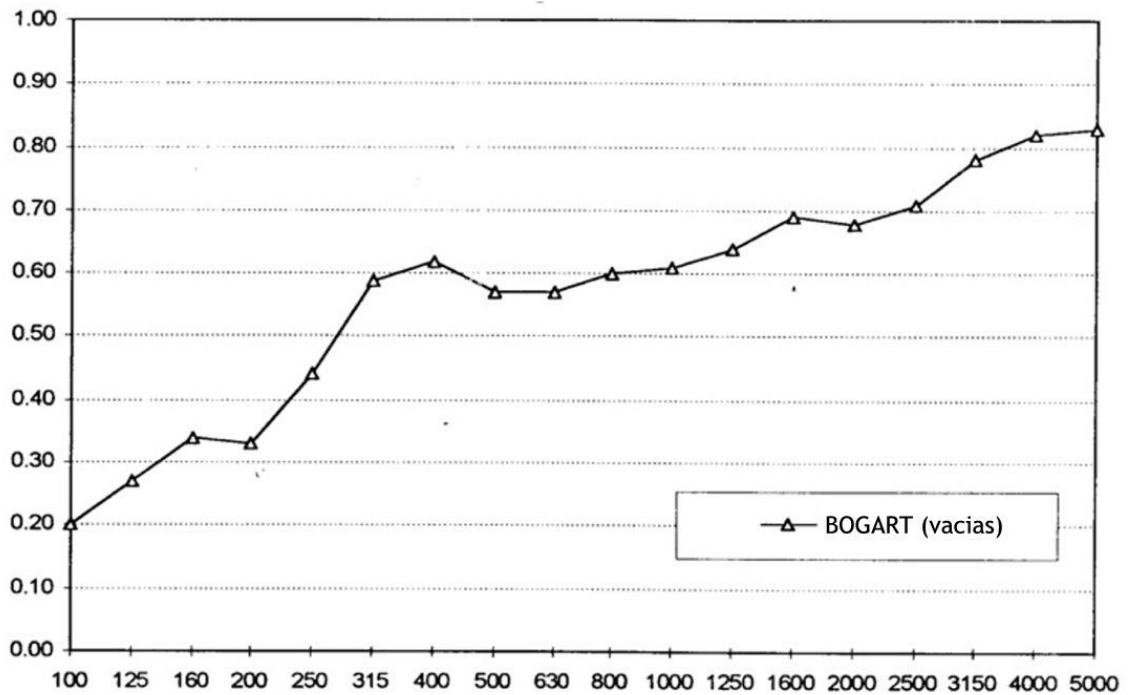
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Third octave absorption coefficient of empty seats of the MILLENIUM SERIES – BOGART model of the EURO-SEATING company:

Frequency (Hz)
Absorption coefficient α

Frequency (Hz)
Absorption coefficient α

Absorption coefficient α according to ISO 354 / UNE-EN 20354 STANDARD



Frequency (Hz)

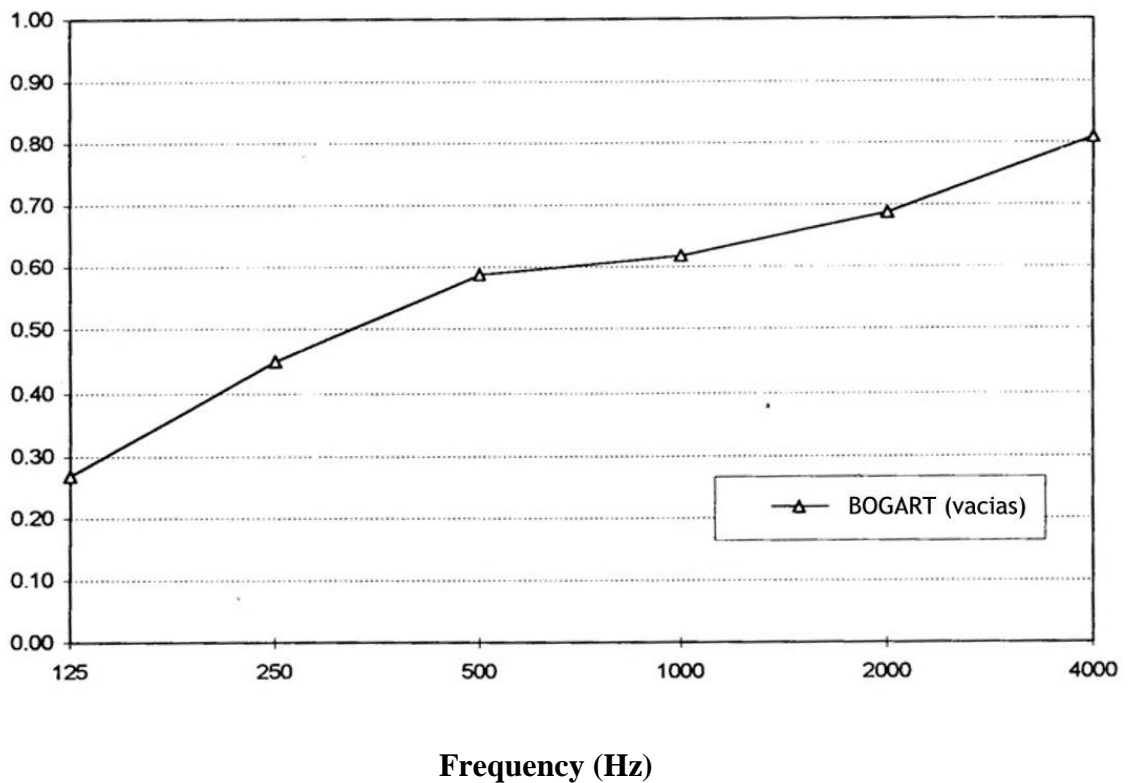
BOGART Empty
Seats

Average absorption coefficients in one octave frequency range of empty seats
MILLENIUM SERIES – BOGART model of the company EURO-SEATING:

Frequency (Hz)

Absorption coefficient α

Absorption coefficient α according to ISO 354 / UNE-EN 20354 STANDARD



BOGART Empty
Seats

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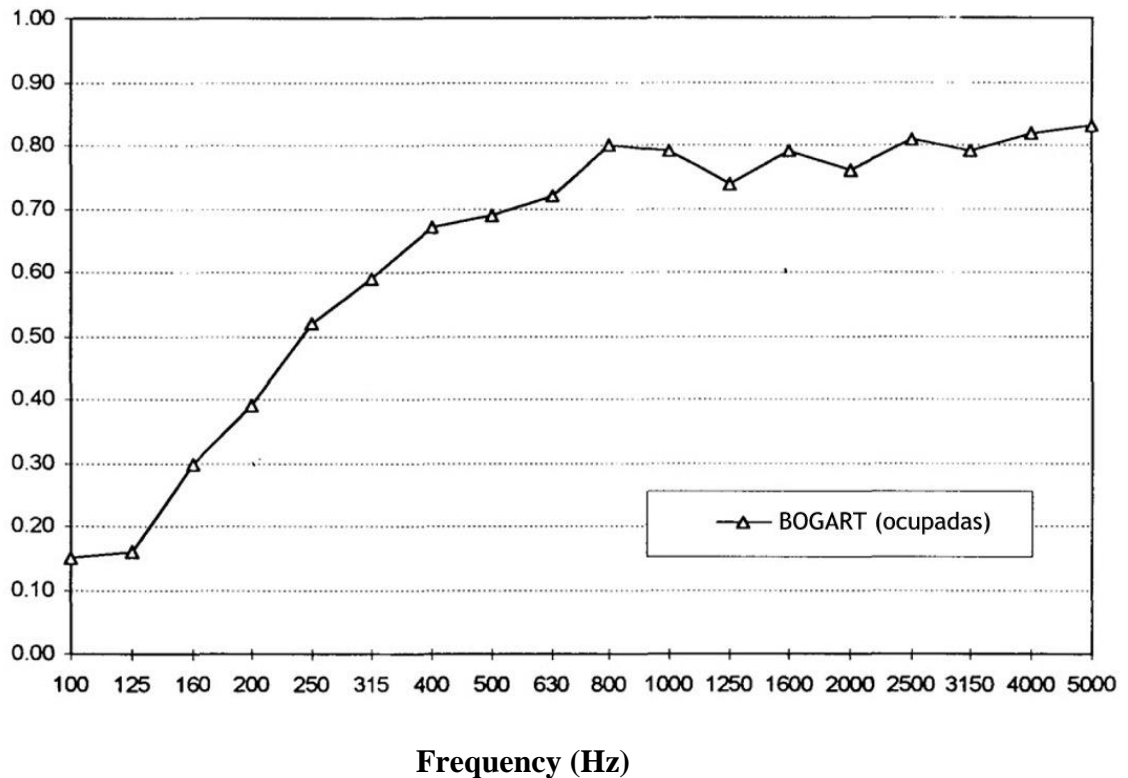
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Third octave absorption coefficient of occupied seats of the MILLENIUM SERIES – BOGART model made by the EURO-SEATING company:

Frequency (Hz)
Absorption coefficient α

Frequency (Hz)
Absorption coefficient α

Absorption coefficient α according to ISO 354 / UNE-EN 20354 STANDARD



BOGART Occupied Seats

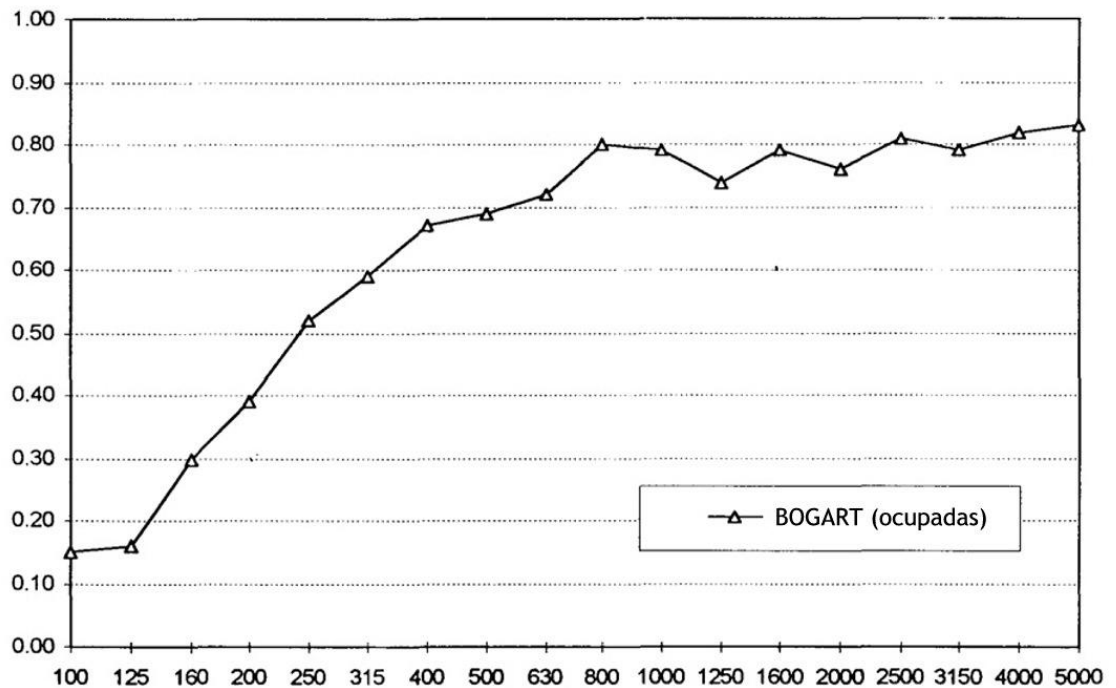
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Average absorption coefficients in one octave frequency range of occupied seats of the MILLENIUM SERIES – BOGART model of the EURO-SEATING company:

Frequency (Hz)
Absorption coefficient α

Absorption coefficient α according to ISO 354 / UNE-EN 20354 STANDARD



Frequency (Hz)

BOGART Occupied Seats

Head of the Acoustics Lab

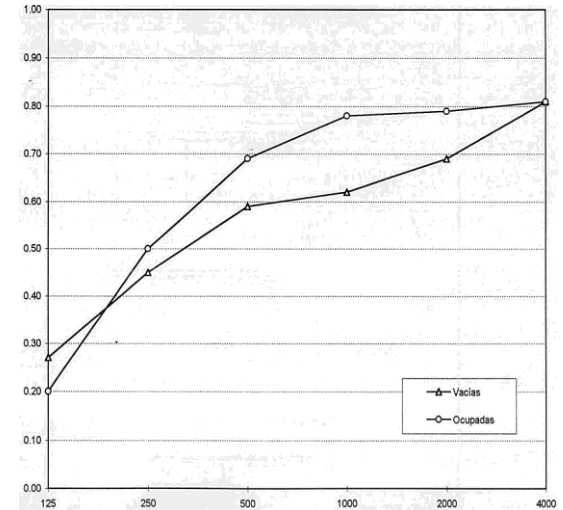
Víctor Polo

Acoustics Full Professor

Antoni Carrión

Sample	MILLENIUUM SERIES – BOGART model seats of the EURO-SEATING company			
Testing place:	Reverberation room of the acoustics laboratory of the Higher Technical School of Telecommunication Engineering of the Polytechnic University of Catalonia			
Testing area:	7.92 m² (4 rows with 4 sets each. 90 cm separation between rows)			
Unit Sample length:				
Unit Sample width:				
Unit Sample height:				
Reverberation room volume:				
Temperature:				
Relative Humidity:				
Date:				
Standards				
Frequency	Absorption coefficient α			
(Hz)	Empty	Occupied		
	Average values in a one octave frequency range			

Absorption coefficient α of the seats model MILLENIUUM SERIES – BOGART of the company EURO-SEATING:



Frequency (Hz)