ODEON
Auralization of sound transmission

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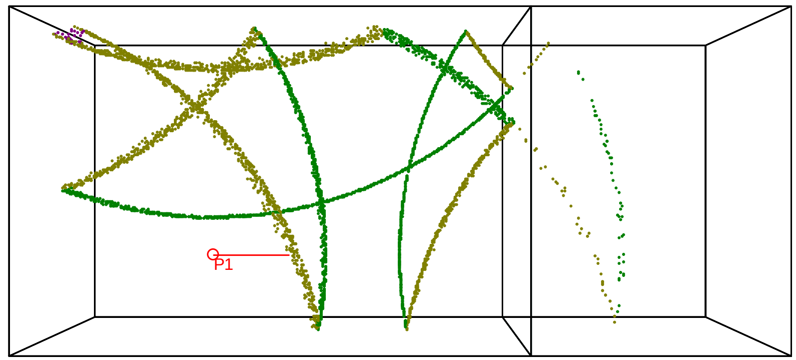
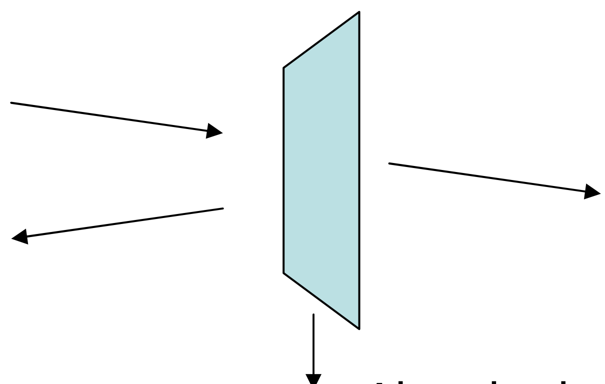
Transparency in ODEON



Incident: 1



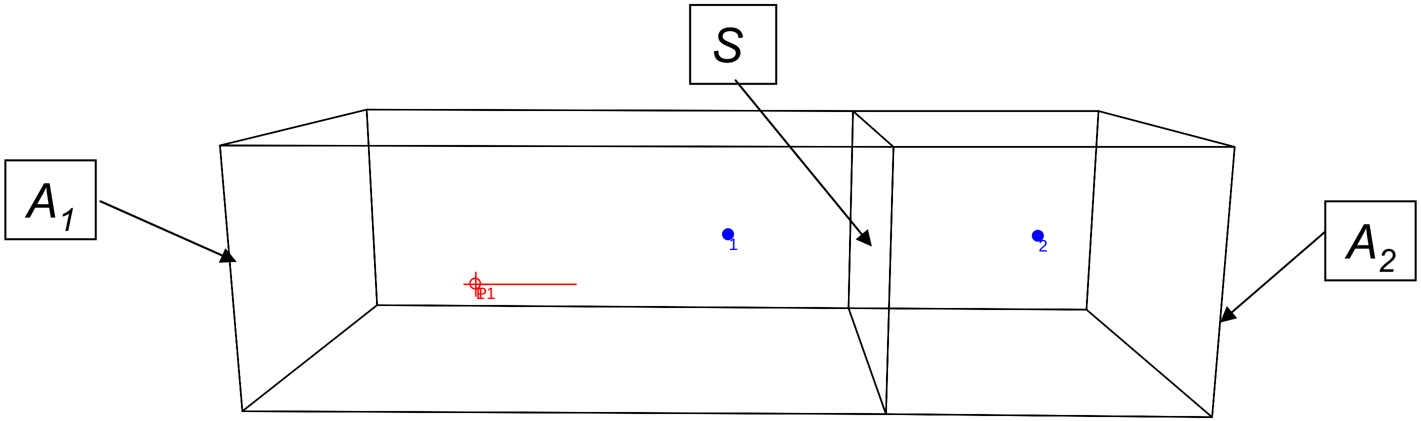
Transmitted: τ

Reflected: $(1-\alpha)(1-\tau)$

Absorbed: $\alpha\,(1-\tau)$

Apparent absorption (seen from source room): $\tau + \alpha\,(1-\tau) = \alpha + \tau\,(1-\alpha)$

Sound transmission



Source, sound power level: *LW*

Receiver 1 and 2: sound pressure level, L_1 and L_2

$$L_1 = L_W + 10\log\frac{4}{A_1}$$

$$R = L_1 - L_2 + 10\log\frac{S}{A_2}$$

$$L_2 = L_W - R + 10\log\frac{4S}{A_1 A_2}$$

Auralization in the receiving room

The frequency dependent insulation of the wall can be simulated by a frequency dependent attenuation of the source sound power

A transparency of $\tau = 0.1$ is equivalent to

10 dB sound reduction index, or

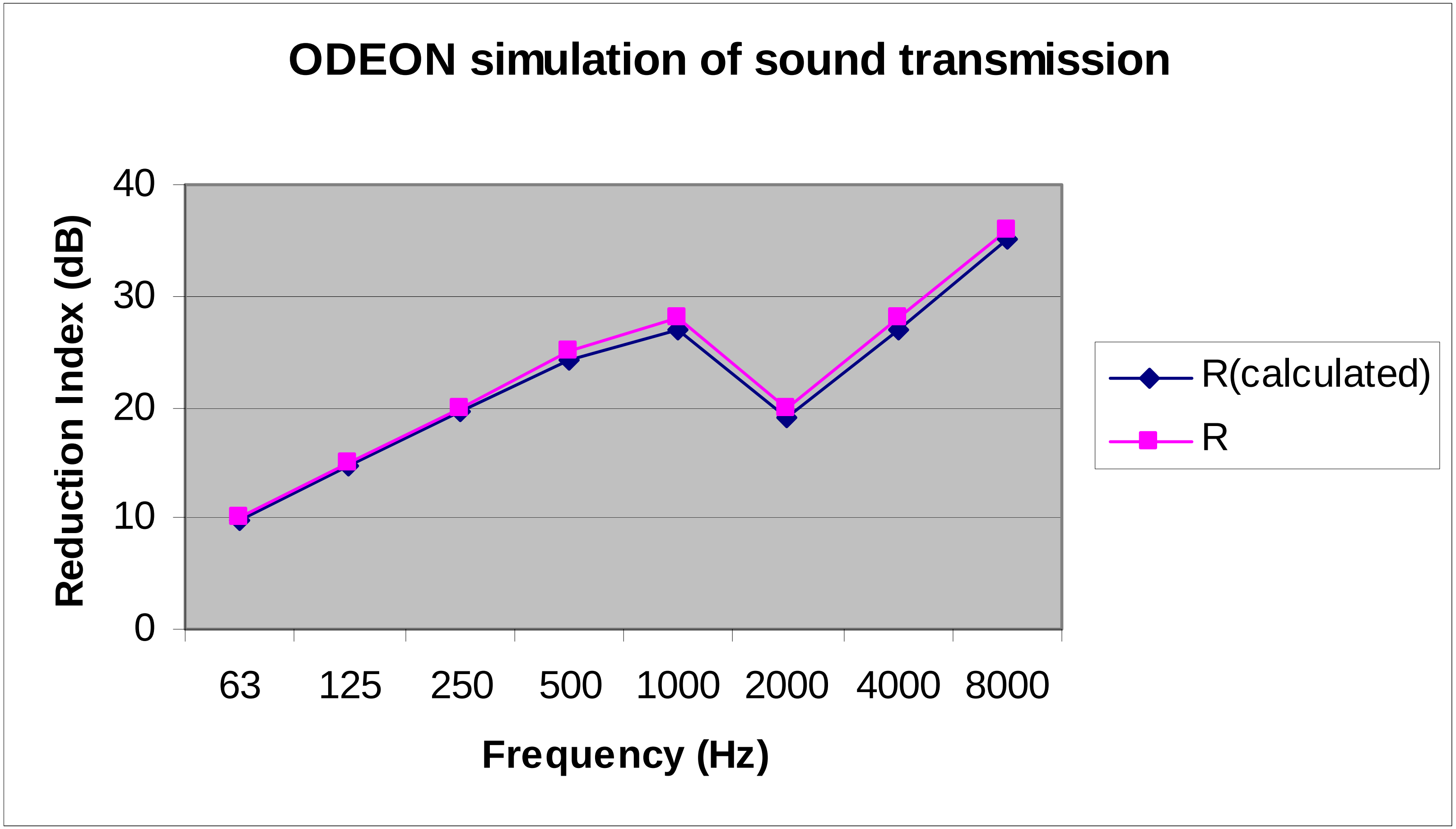
10 dB reduced sound power level of the source

This means a small increase of the sound absorption in the two rooms (less than 0.1 for the transmitting surface, which is normally not significant)

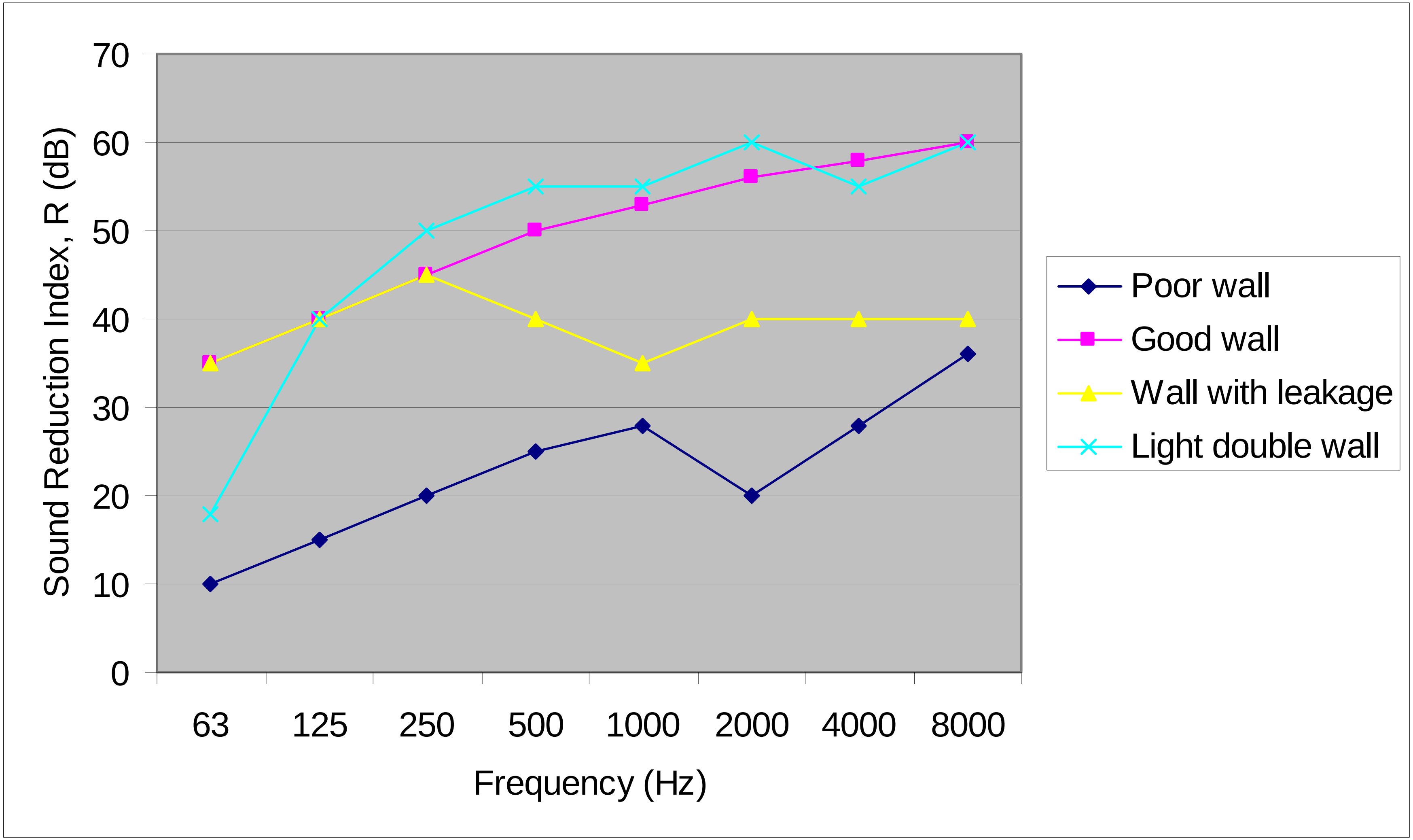
Simulated measurement in ODEON

	S=	10	m2	V2 =	30	m3		
Frequency	63	125	250	500	1000	2000	4000	8000
L1	72,4	72,4	72,4	71	69,5	68,8	68,3	67,5
L2	62,8	57,8	52,8	46,1	41,5	48,8	40,2	30,6
T2	0,49	0,49	0,49	0,41	0,38	0,38	0,36	0,31
Area correction	0,1	0,1	0,1	-0,7	-1,0	-1,0	-1,2	-1,9
R(calculated)	9,7	14,7	19,7	24,2	27,0	19,0	26,9	35,0
R	10	15	20	25	28	20	28	36
Deviation	0,3	0,3	0,3	0,8	1,0	1,0	1,1	1,0

Simulated measurement in ODEON

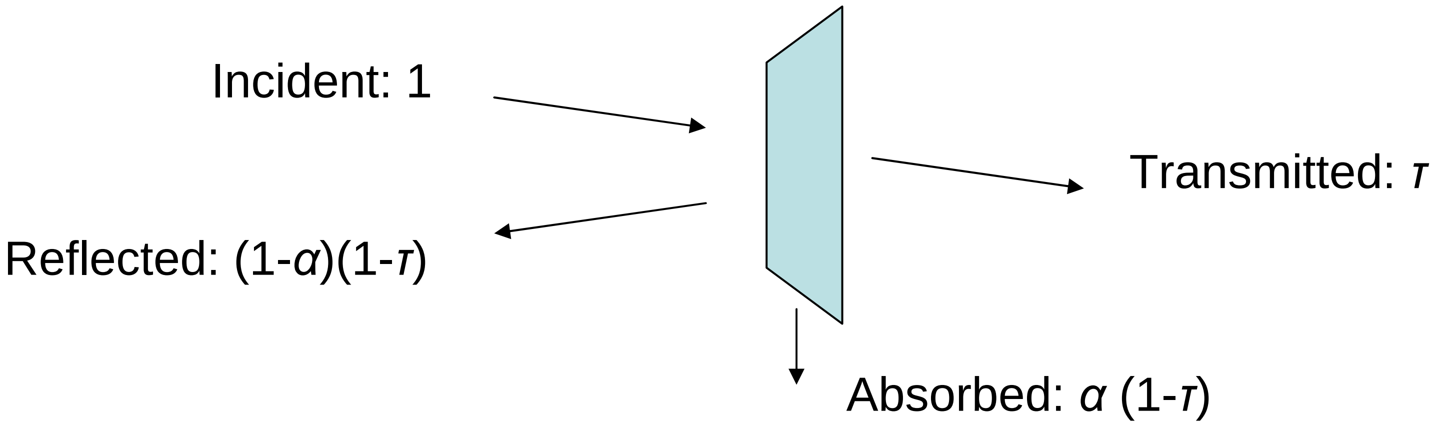


Examples



Sound Reduction Index, R (dB)
70
60
50
40
30
20
10
0
63
125
250
500
1000
2000
4000
8000
Frequency (Hz)
Poor wall
Good wall
Wall with leakage
Light double wall

Freely suspended surface



Transmitted sound remains in the room

Sound is incident from both sides

Apparent absorption : $2\ \alpha\ (1-\tau)$

If α is measured in lab. e.g. 20 cm in front of a wall,
the absorption of freely suspended material can be modelled
using the same α and $\tau = 0.4 – 0.6$ depending on the density