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Renovating Teatro alla Scala Milano for the 21st century, Part I

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Teatro alla Scala of Milan, known simply as La Scala throughout the world, is an old but venerable opera house that achieved legendary status in the world of music. A great number of singers of Olympian status have sung there; and major operas, among them Verdi's Falstaff and Otello and Puccini's Turandot, premiered there. The 227 - year - old theater is beloved with a passion by the Milanese and the Italians, but it has suffered the ravages of time. It needed to be renovated in order to reverse material decay, meet current fire codes and security requirements, incorporate a new HVAC system, and to accommodate badly needed modern stage machinery. This renovation project took 3 years during which the theater was closed, and it included the construction of an elliptical 17 - floor fly tower, designed by architect Mario Botta, for housing rehearsal rooms and serving as a scenery changing facility. The renovation proposal originally aroused a strong sense of melodrama among the extremely excitable Italian opera buffs who feared the desecration of their beloved edifice, but the acoustics and the beauty (carried out by Elisabetta Fabbri Architect) of the auditorium were preserved (and even enhanced). In this paper we explain how this project was achieved.

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Renovating Teatro alla Scala Milano for the 21st century, Part II

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- **Abstract**
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The acoustic phase of La Scala renovation began in September 2002, after the main stalls and other sections of the theater were demolished. This assignment was twofold: (a) design of the auxiliary building with architect Mario Botta, and more importantly, (b) collaboration with architect Elisabetta Fabbri in restoration of the auditorium through acoustic analyses of proposed solutions. Only one set of acoustical measurements was known to be taken before demolition; and reliance had to be placed on hearsay from audience members. The author used his own computer program that included some of the salient features of other programs such as Odeon, Epidaure, Raynoise, etc. but avoided their pitfalls. This program was the only one that correctly predicted the known RT of the auditorium through the use of H. Arau Purchades formula [Arau, H., 1988. Acustica. Hirzel Verlag **65**(4), 163–180] and the authors dimension theory [Arau, H. 1997. Variation of the reverberation time of places of public assembly. Building Acoustics **4**(2).]. A new floor was designed to provide sufficient vibration transmission to the audience, actuating as a radiation box installed to direct sound vertically. Music Director Ricardo Muti pronounced the acoustical results as being excellent.

PACS

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Auditorium and enclosure design

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Renovating Teatro Alla Scala Milano for the 21st Century, Part I

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1. History

- In the late 1770s, Maria Theresa, the Empress of Austria, ordered an opera house be built in Milan.
- When it opened in 1778, it was called Teatro alla **Scala** - La **Scala** for short; and the first performance was an opera ballet called *Europa Riconoscuita* (*Europe Revealed*), written by Salieri, a rival of Mozart.
- The theatre had the largest stage in Europe and for the last two centuries, was home to nearly every notable composer, opera star and orchestral conductor.
- The horseshoe-shaped auditorium of gold and red boxes was originally built to simulate a musical instrument.
- It was 'modernized' in 1921 and restored in 1946 after having been bombed in World War II.

The old opera house 1778

bombed in World War II

D-day

- Enter Ricardo Muti, the talented, magisterial and abrasive conductor who never takes 'no' for an answer. He succeeded in shutting the Opera House down for a three-year renovation process started in 2001

The old La Scala

- After so many years of use - and some abuse - the carpet became stained and frayed,
- the cream-colored and gilt paint chipped,
- the velvet surfaces of the seats were smudged.
- The plumbing proved to be grossly inefficient.
- The backstage storage space was totally inadequate.
- The building itself came close to being declared fire hazard!!!.

RESTORATION

- . This renovation project, took three-years during which the theater was closed, and it included the construction of a adjacent elliptical building and fly tower, designed by architect Mario Botta for housing rehearsal rooms and serving as a scenery changing facility.
- The renovation proposal originally aroused a strong sense of melodrama among the extremely excitable Italian opera buffs who feared the desecration of their beloved opera house, but the acoustics and the elegance of the auditorium (whose interior was executed by architect Elisabetta Fabbri) were preserved (and even enhanced).
- In this paper we explain how this project was achieved.

INITIAL DATA

In December 2002, I was called by Ricardo Muti of La Scala who engaged me to provide acoustical consultation.

The first day of assignment they gave me the plans, a report of measurements that were carried out before the disassembling of the auditorium, and they showed me the enclosure in destroyed state.

I got to see the auditorium in its cadaverous state.

RT measured, mean value, December 20,.2000 by Andreas Hoischen MLS System. N seats = 2289

f(Hz)	125	250	500	1000	2000	4000
RT s unoccupied	1.40	1.30	1.20	1.10	1.10	0.90

$T_{low} = 1.35$ $T_{mid} = 1.15$ $T_{high} = 1.00$

f(Hz)	125	250	500	1000	2000	4000
RT s occupied	1.23	1.19	1.10	1.02	0.99	0.80

$T_{low} = 1.22$ $T_{mid} = 1.06$ $T_{high} = 0.90$

PREVIOUS ACOUSTIC RESULTS AND OPINIONS

Beranek (1962), (1997)

f(Hz)	125	250	500	1000	2000	4000
RT s occupied	1.5	1.4	1.25	1.15	1.1	1.0

TLow = 1.45 Tmid = 1.2 Thigh = 1.05

f(Hz)	125	250	500	1000	2000	4000
RT s Unoccupied Paolini (1947)	1.35	1.5	1.35	1.35	1.20	1.15

$T_{Low} = 1.425$ $T_{mid} = 1.35$ $T_{high} = 1.175$

BERANEK OPINION (1962): The acoustics are excellent for those lucky enough to sit either at the front of the boxes, on the main floor, or in the galleries, For those at the rear of boxes, particularly in the side boxes, a radio broadcast would present the sound more faithfully. ... The sound is clear, warm and brilliant........

ACTUAL OTHER OPINIONS

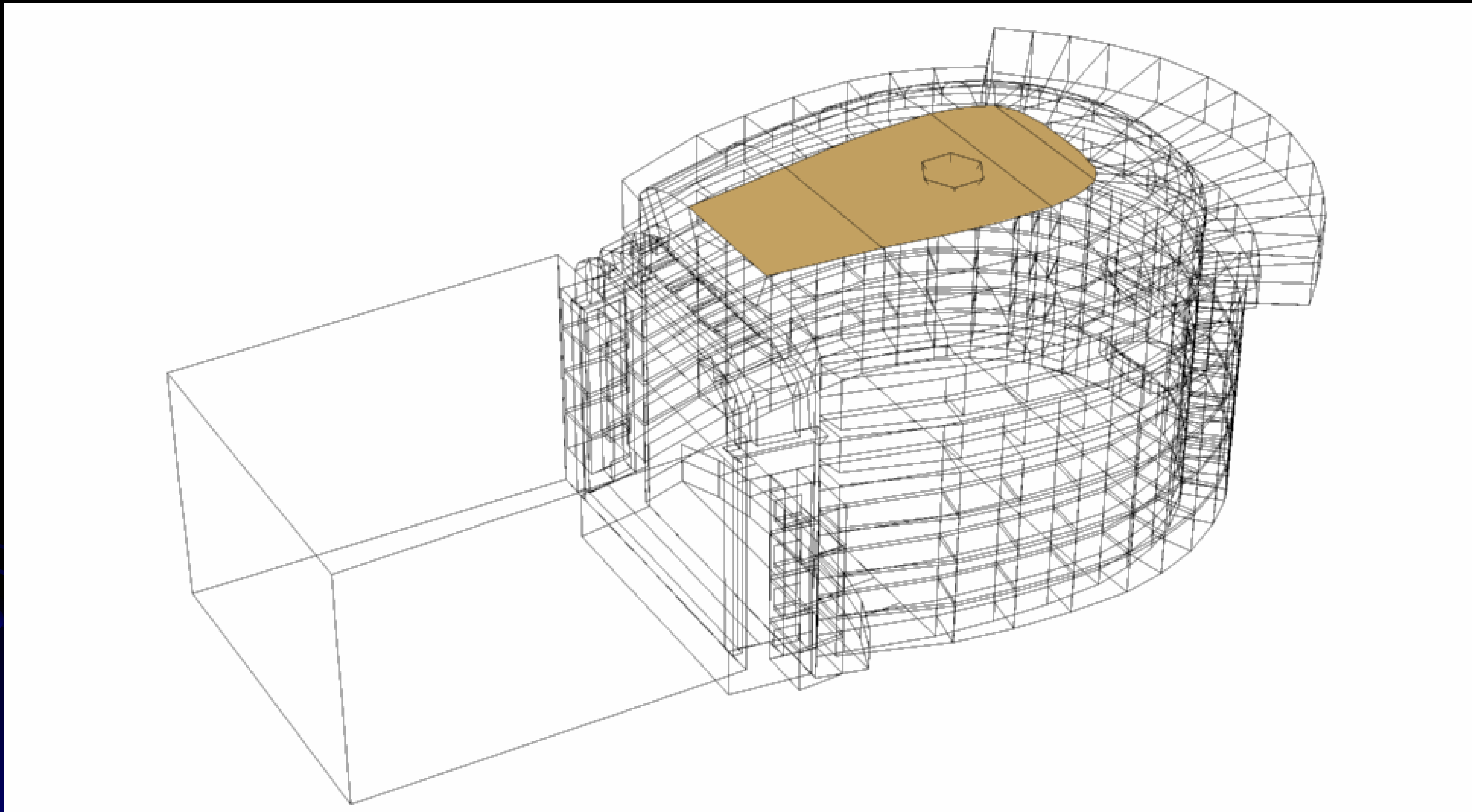
Before studying the room in depth, I talked with several people in Milan and I found many other comments in Google groups regarding earlier problems with bad acoustics.

PLAN OF ACOUSTIC PERFORMANCE IN THE MONUMENTAL PART

I concentrated on the following problems:

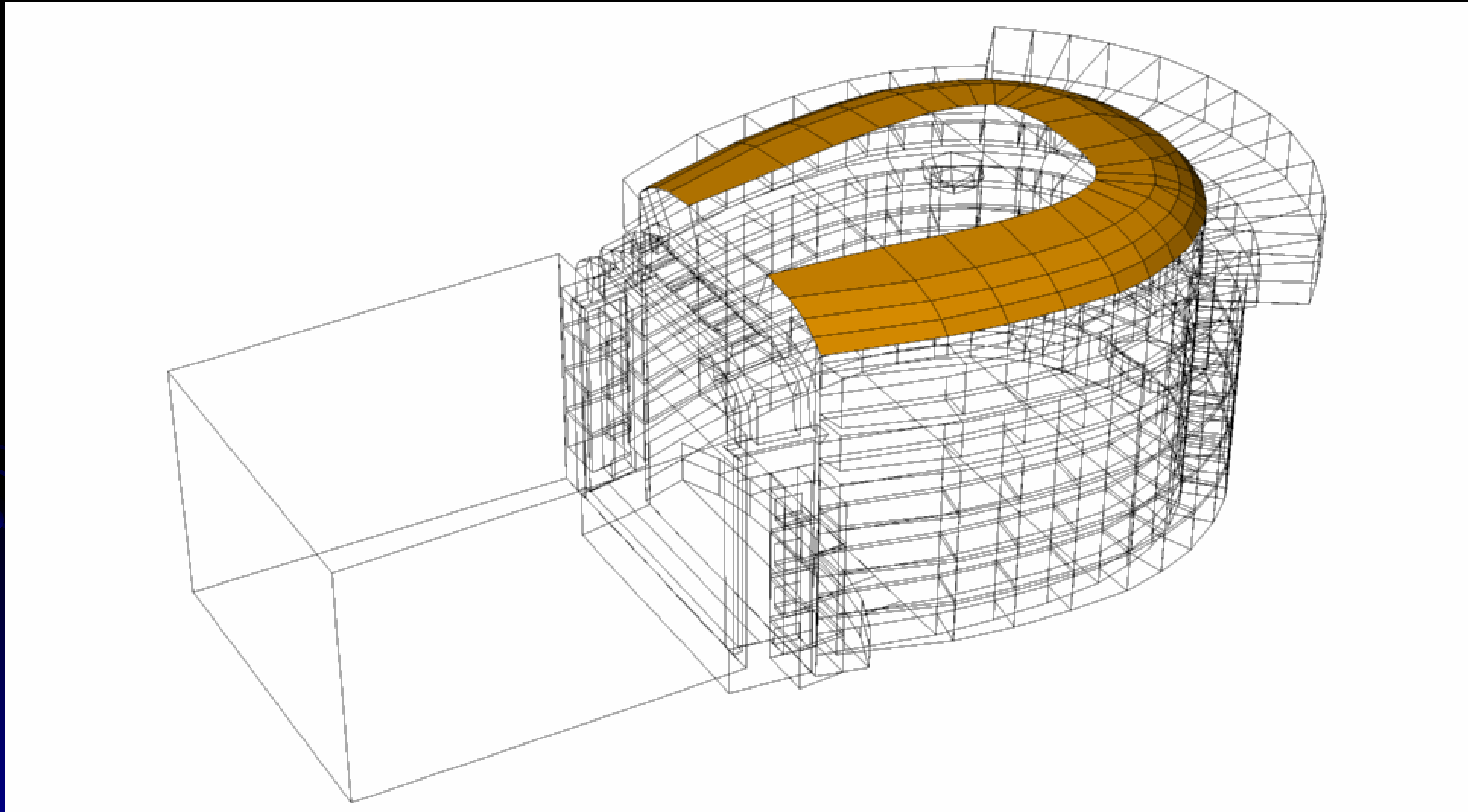
- The deplorable state of main stalls floor and its flat slope.
- The boxes' walls that contain excessively light membrane resonance elements and very absorbent fabric.
- The boxes' ceiling with their likewise unsatisfactory membrane resonance material.
- The acoustic design of the old chairs.
- Redesign and reconstruction of the destroyed musician's pit.
- Acoustical shell design
- Upgrading of the theatre annexes by improving the acoustics of some pavements and beefing up the acoustic insulation of some areas.
- Advising installation engineers on the reduction of machinery noises and vibrations.

3D-SCALA view 1, (ceiling)

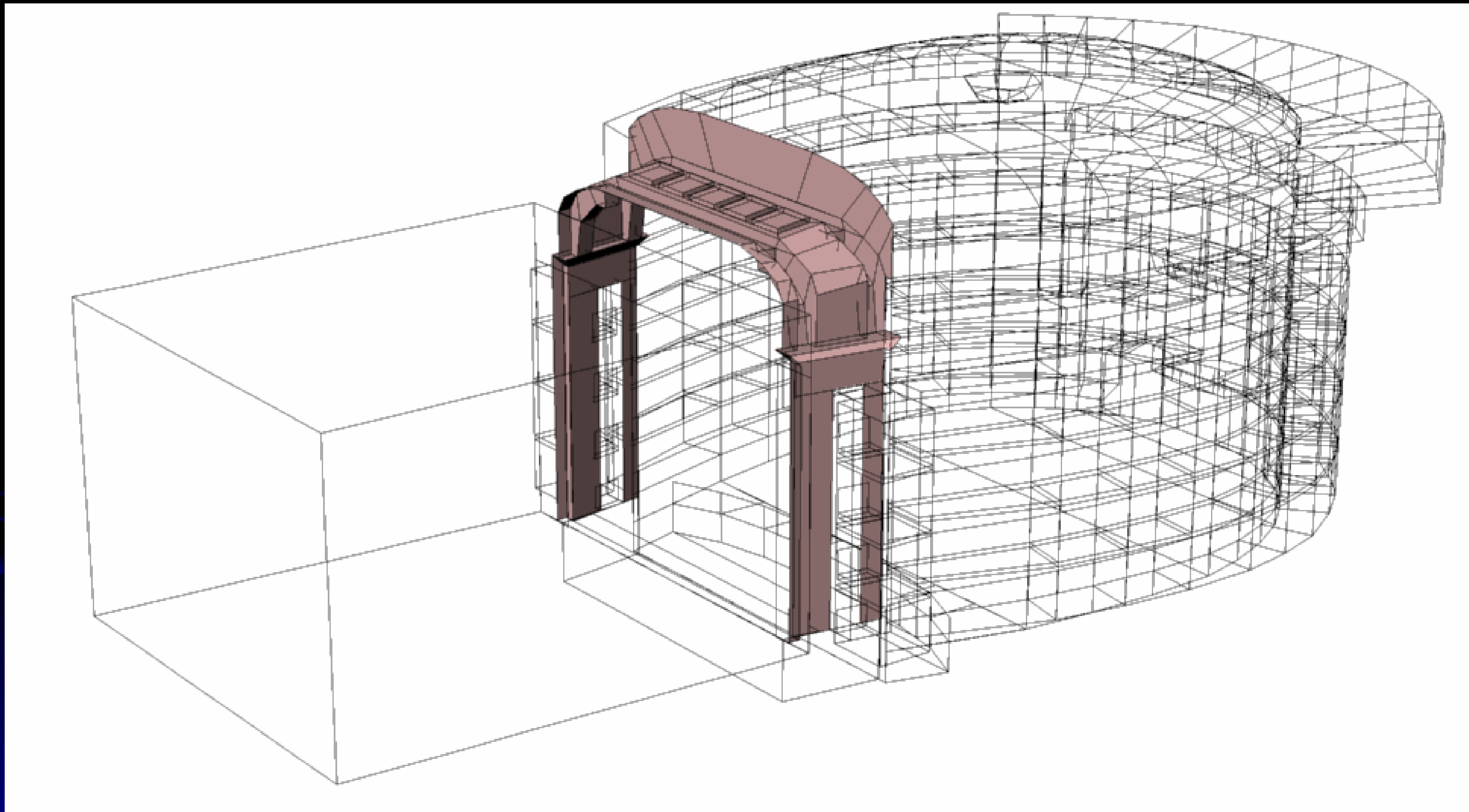


Ceiling: Reliefs of gypsum on acumen plywood 12 mm

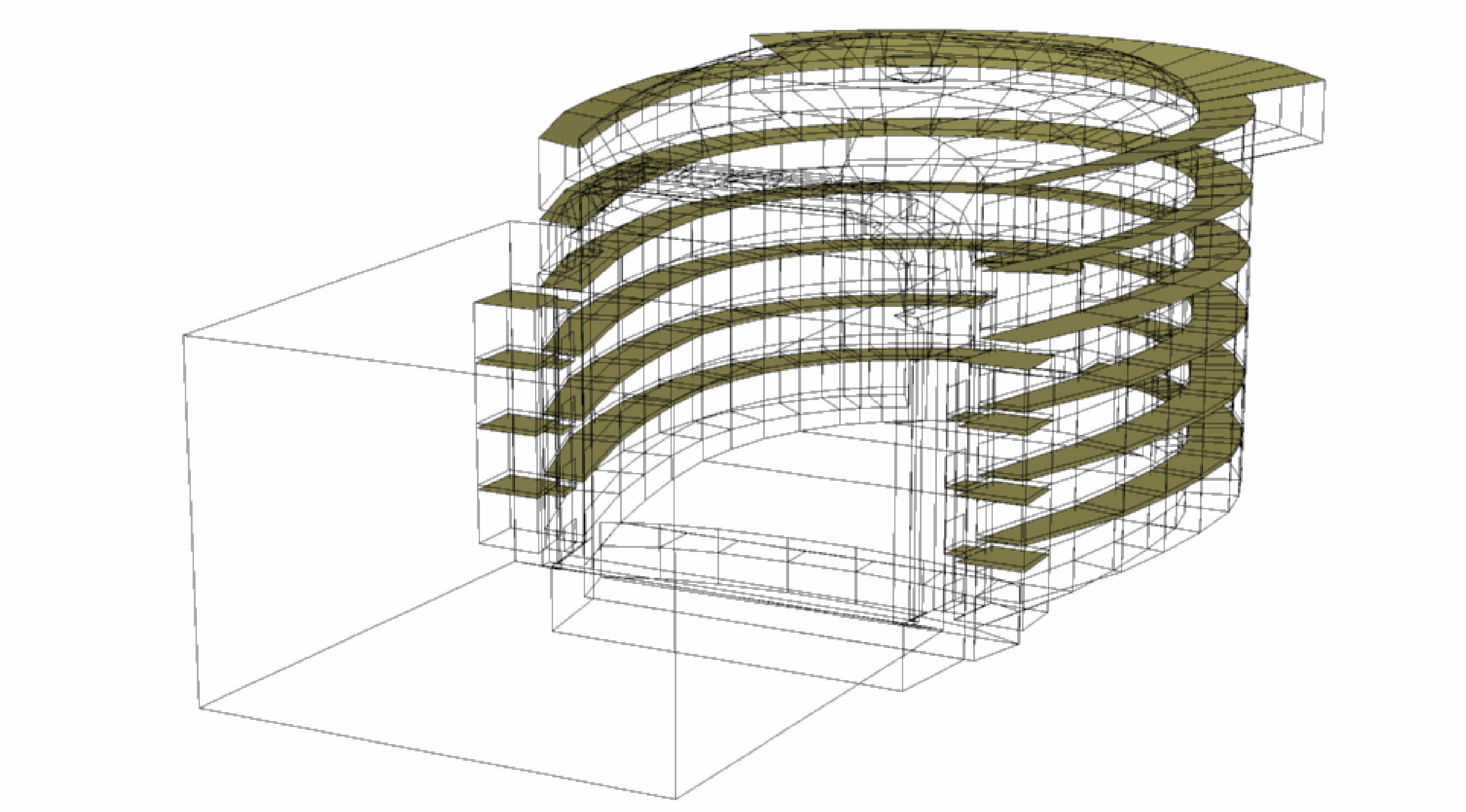
3D-SCALA view 2, (ceiling)



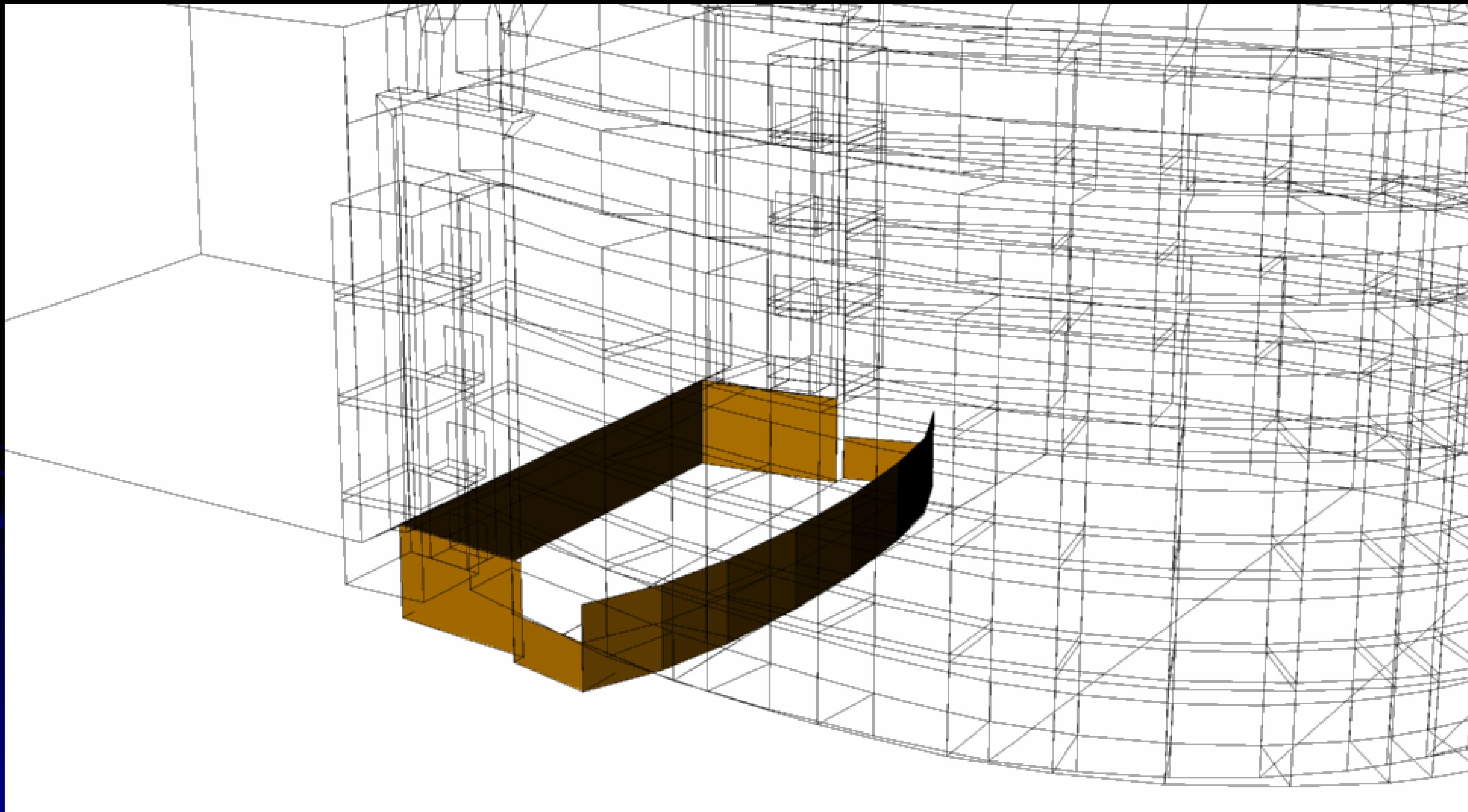
3D-SCALA view 3, Proscenium



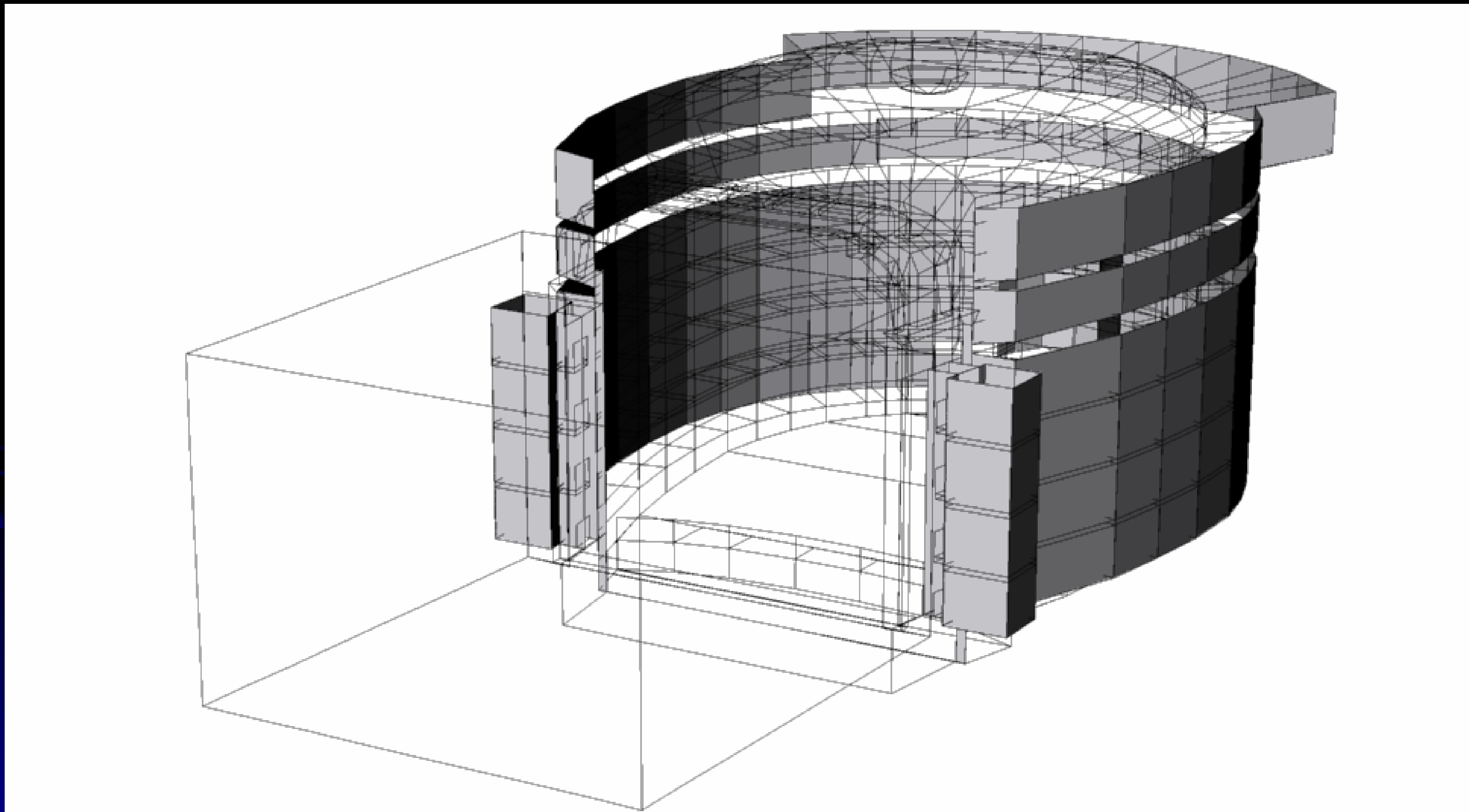
3D-SCALA view 4, (floor boxes)



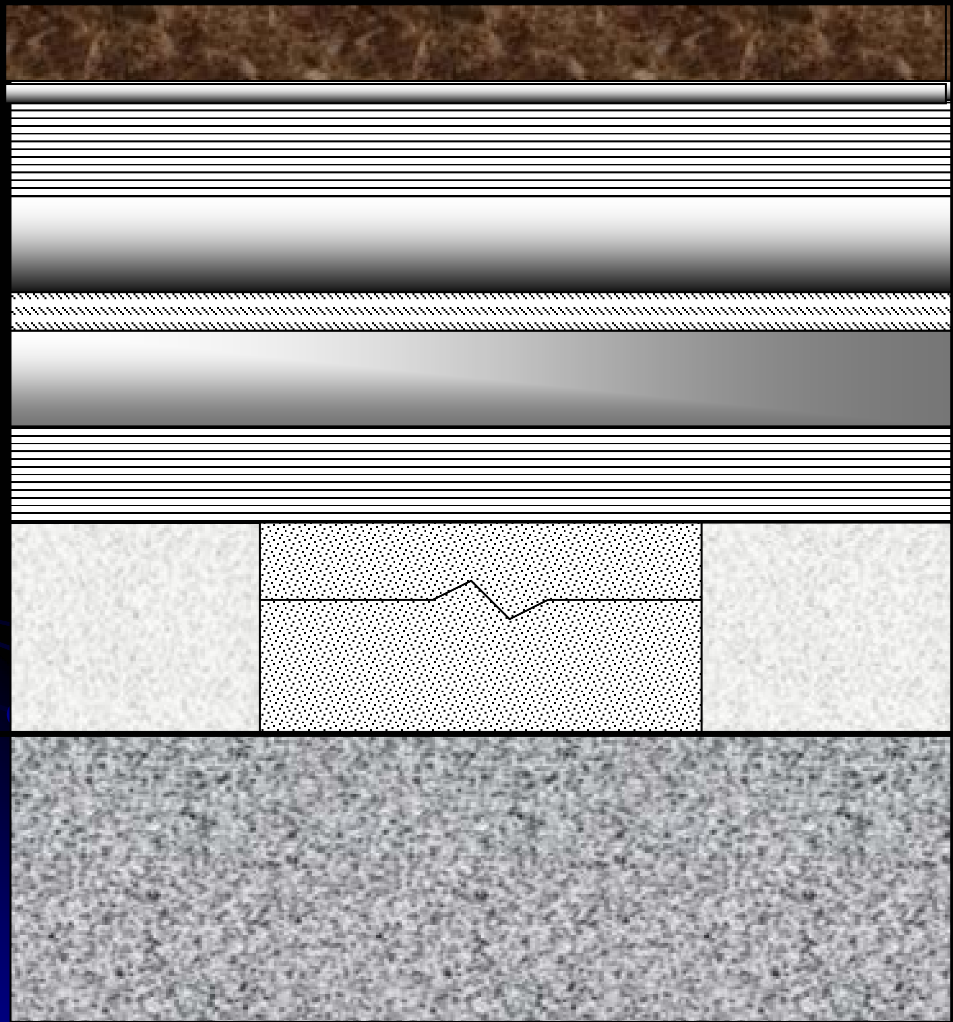
3D-SCALA view 5, (pit)



3D-SCALA view 6, (walls)



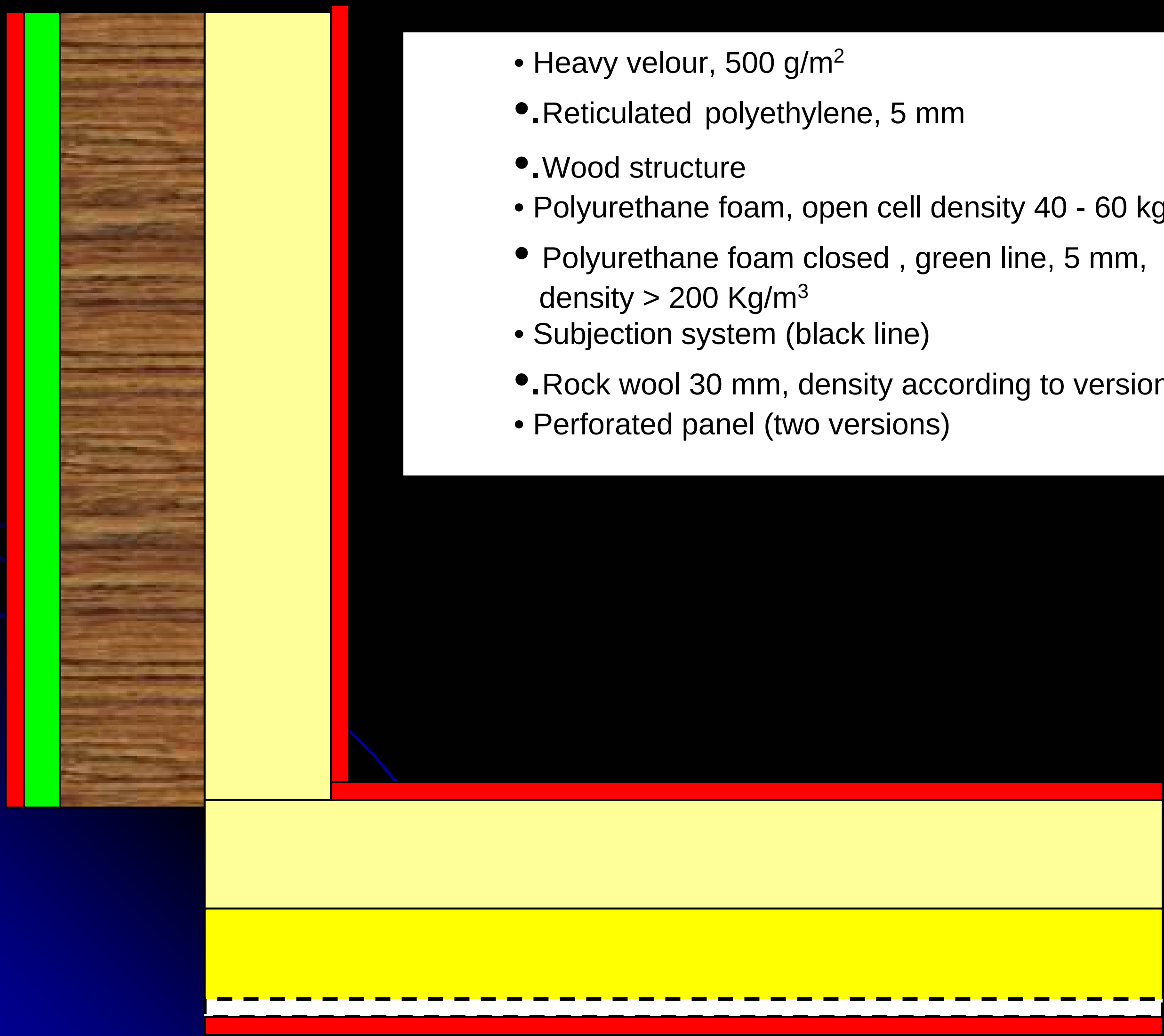
Floor solution (main stalls)



1. Oak parquet 22 mm
2. Sheet of grained of rubber mixed wth cork, 6 mm thick and 250 Kg/m3
3. Plywood panel (compensato marino) of 25 mm
4. Panel of chip of plaster 15 mm
5. Sheet of reticulated polyethylene, 10 mm
6. Panel of chip of plaster .18 mm
7. Plywood panel (compensato marino) of 16 mm
8. Fixed wood studs 100 x 100 mm with gap of 400 mm, filled wit dry sand.
9. Sheet of very fine PVC, 0.2 mm
10. Layer of poured concrete
11. Soil

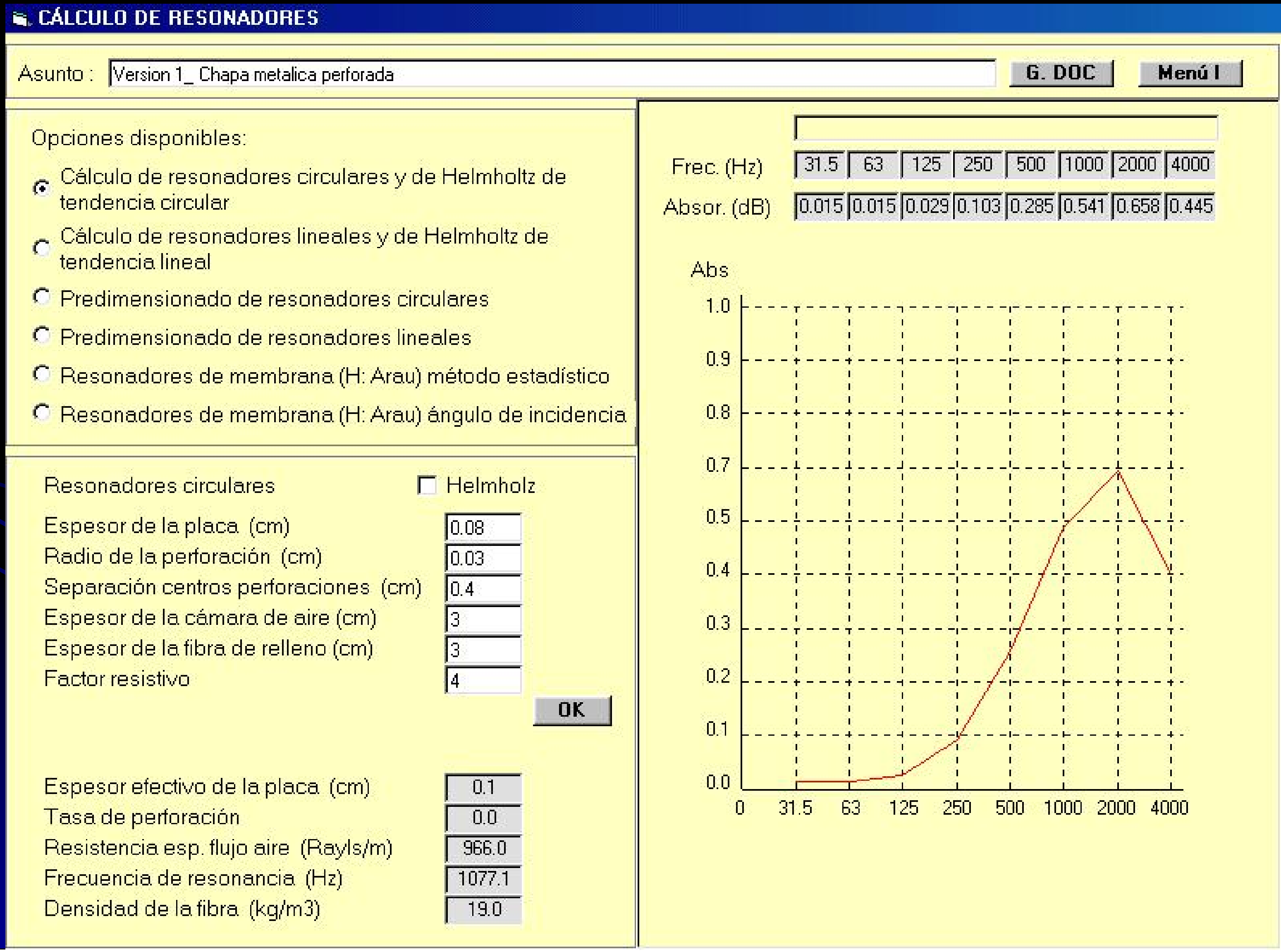
Floor (main stalls)

Seat acoustic design underseats and backseat

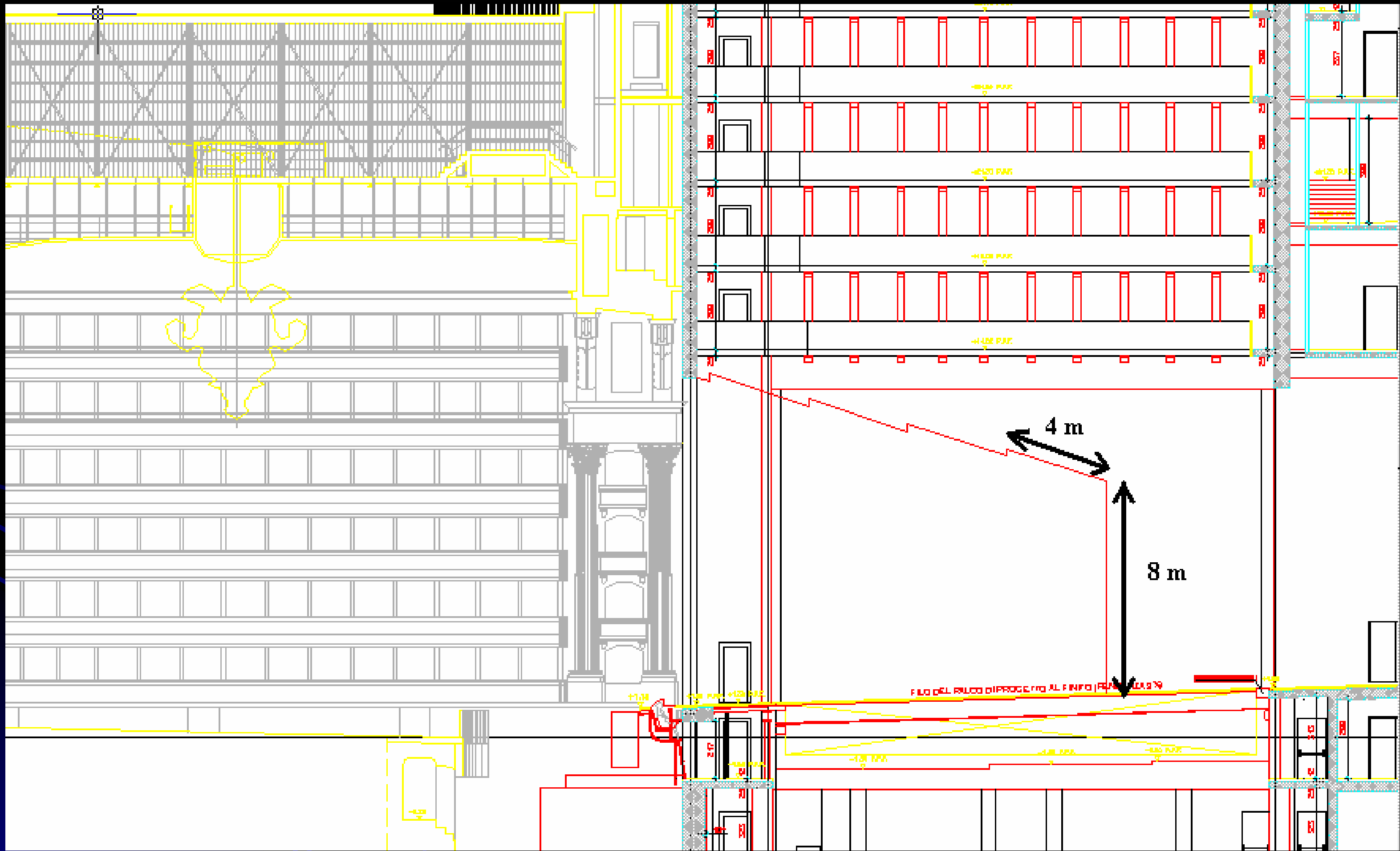


- Heavy velour, 500 g/m^2
- .Reticulated polyethylene, 5 mm
- .Wood structure
- Polyurethane foam, open cell density 40 - 60 kg/m3
- Polyurethane foam closed , green line, 5 mm, density > 200 Kg/m^3
- Subjection system (black line)
- .Rock wool 30 mm, density according to version 1 or 2.
- Perforated panel (two versions)

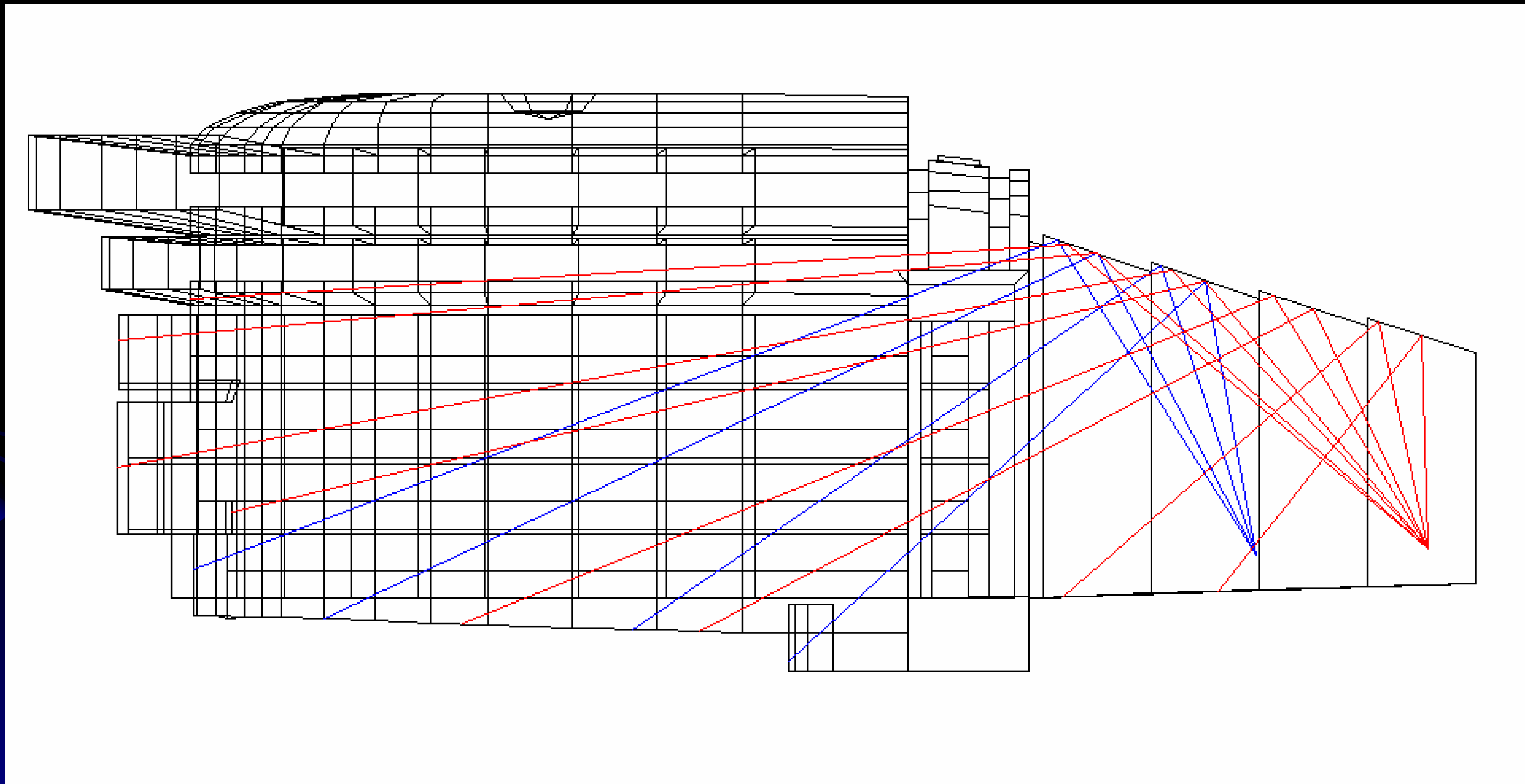
Seat acoustic design (absorption resonator)



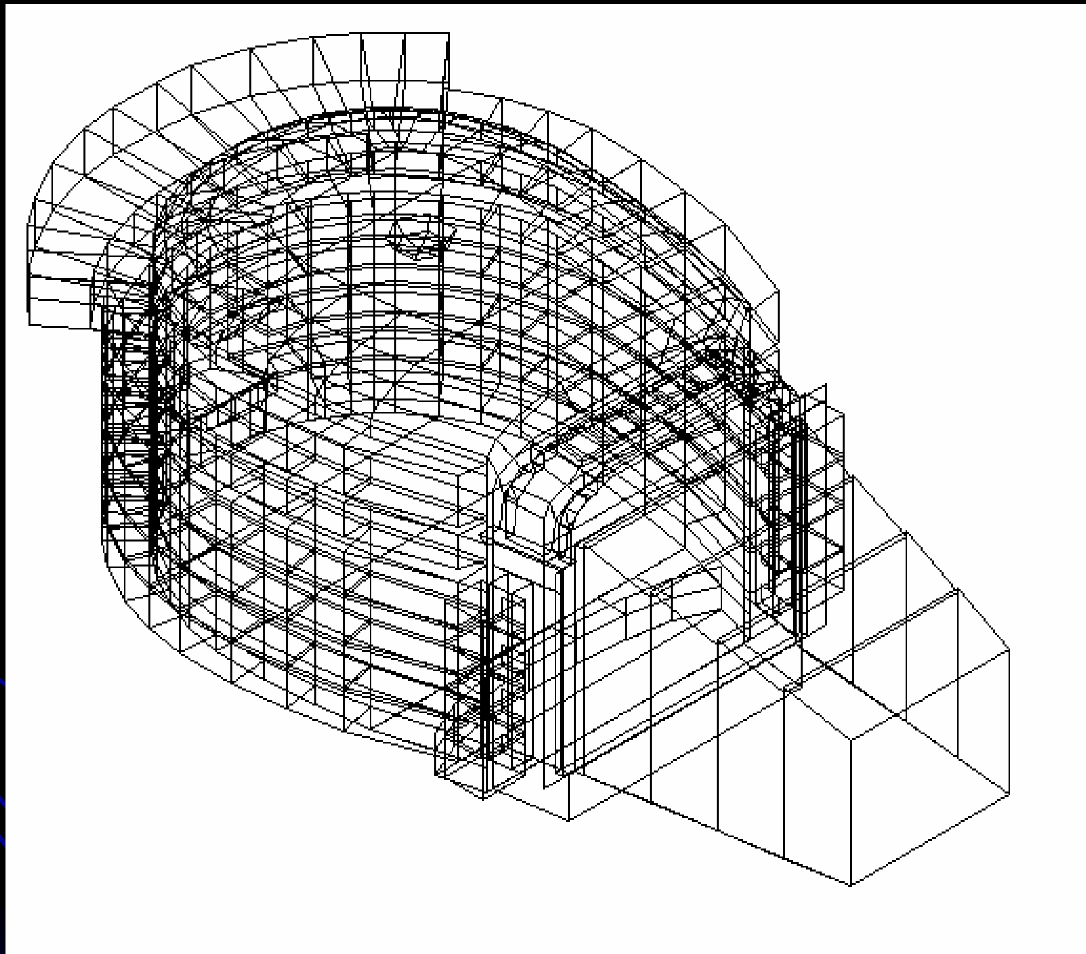
acoustic shell design



acoustic shell design



acoustic shell design

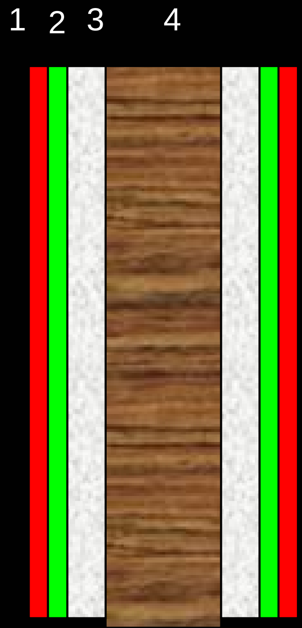


New Scala (2004)

New Scala (2004)

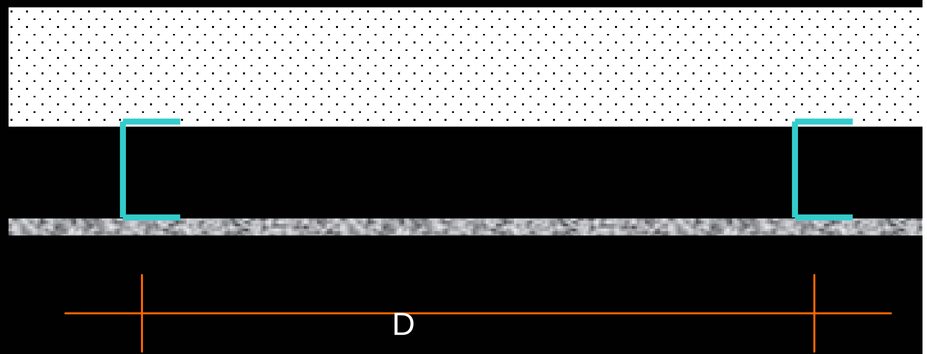
New Scala (2004)

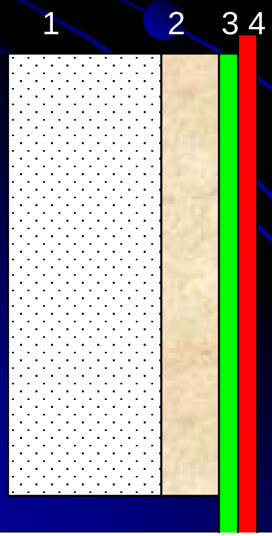
The boxes have been refurbished with crimson silk over a sheet of 5 mm reticulated polyethylene



WALLS AMONG BOXES
1.- Fabric Decorative
2._ Sheet of 5 mm reticulated polyethylene
3._Gypsum board, 12 mm
4._Legno ,25 mm

CEILING BOXES





REAR WALLS
1.-Brick wall (matoni)
2._Gypsum board, 12 mm
3._ Sheet of 5 mm reticulated polyethylene
4._ Fabric Decorative

1. Floor
2.Air chamber extending 50 = 100 mm,
3.Gypsum board, 15 mm.
D is length between interacting layers
In the first and second ceiling boxes D = 600 mm
In the third and fourth ceiling boxes D = 500 mm
In the fifth and sixth ceiling boxes D = 400 mm

New Scala (2004)

New Scala (2004)

New Scala (2004)

- The theatre has literally been powered into the 21st century. **The most obvious change, apparently, is in the acoustics.** Before, singers had to stand in particular places on the stage to be heard. In fact, there was a 'Maria Callas' spot!! Carpets that absorb sound have been replaced with layers of resonant material and a noise-reflecting oak floor (I.e., vibrating floor or harmonic box).
- A new set of stage machinery and an extra stage that can contain scenery for three operas at a time, brings **La Scala** up to the standard of New York's Metropolitan Opera House or London's Covent Garden.
- **La Scala** has the only machinery in the world that moves horizontally and vertically, according to engineer Luigi Bert. "It is fantastic.

Renovating Teatro Alla Scala Milano, Part 2

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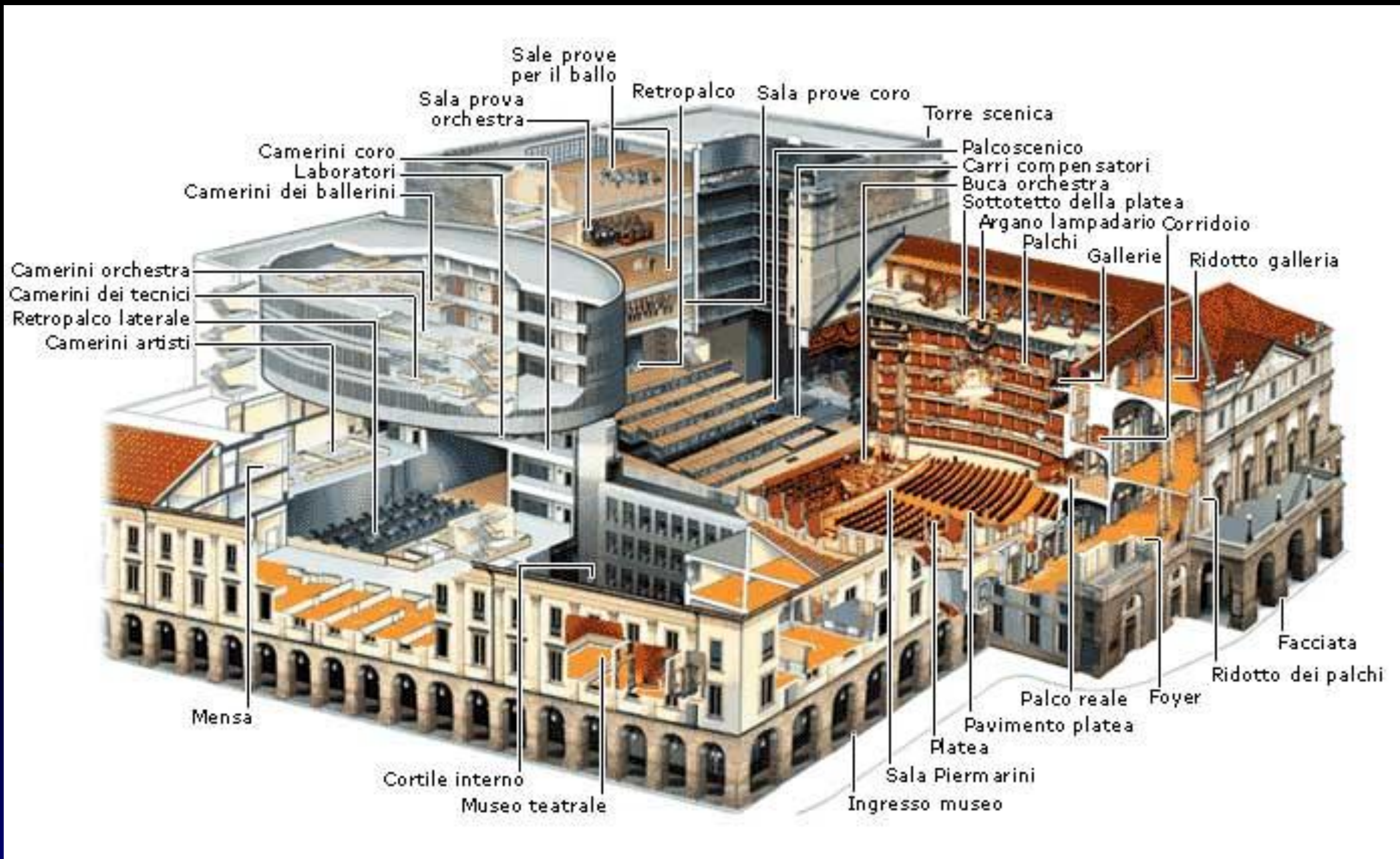
SCALA MODEL



Sale prove per il ballo
Sala prova orchestra
Retropalco
Sala prove coro
Torre scenica
Camerini coro
Laboratori
Camerini dei ballerini
Palcoscenico
Carri compensatori
Buca orchestra
Sottotetto della platea
Argano lampadario
Corridoio
Palchi
Gallerie
Ridotto galleria
Camerini orchestra
Camerini dei tecnici
Retropalco laterale
Camerini artisti
Facciata
Ridotto dei palchi
Palco reale
Foyer
Pavimento platea
Platea
Mensa
Sala Piermarini
Cortile interno
Museo teatrale
Ingresso museo

RT measured, mean value, 20.12.2000 by Andreas Hoischen MLS System. (N_{seats}: 2289).

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RT s occupied	1.23	1.19	1.10	1.02	0.99	0.80

$T_{low} = 1.22$ $T_{mid} = 1.06$ $T_{high} = 0.90$

PREVIOUS ACOUSTIC RESULTS AND OPINIONS

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RT s Unoccupied Paolini (1947)	1.35	1.5	1.35	1.35	1.20	1.15

T_{Low} = 1.425 T_{mid} = 1.35 T_{high} = 1.175

REVERBERATION TIME PREDICTION BY DIMENSIONED THEORY

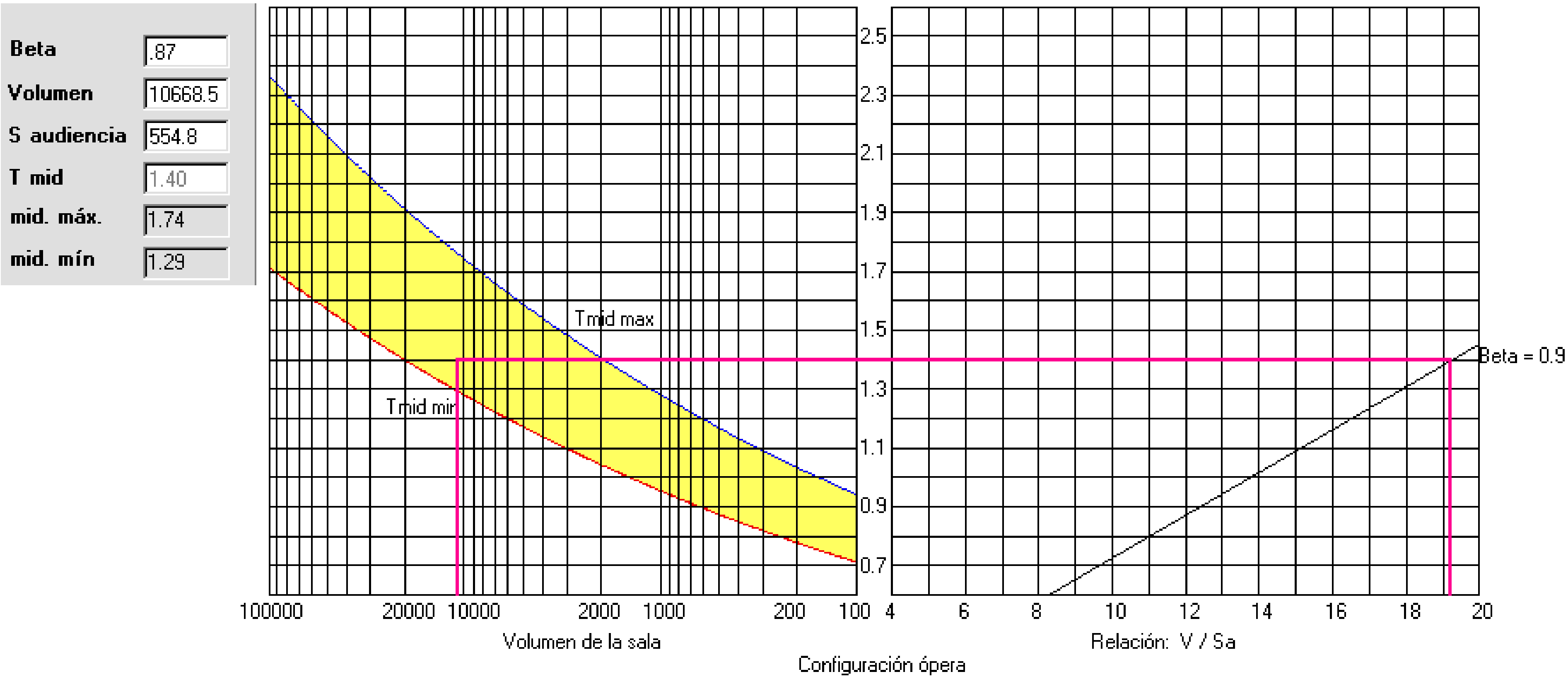


Figure 1: Dimensioned theory of H.Arau ([1],[2]). in the left graphic are exposed the limits of acceptation of the Reverberation Time versus volume for opera use (to see yellow shadow). In the right graphic is indicated the prediction of T_{MID} in basis to dimensioned law . (T_{MID} is the mean value of the Reverberation Time of the frequencies of 500 y 1000 Hz for occupied hall).

[1] H.Arau. Variation of the Reverberation Time of places of public assembly with audience size (1997). Building Acoustics, Volume 4 nº 2.

[2] H.Arau. (1999) ABC de la Acústica Arquitectónica. Editorial CEAC (Now is belonging to Planeta)

FOLLOWING OF PREVIOUS SLIDE

- **GEOMETRY AND SEATING CAPACITY::**

  Volume hall: $V = 10668.5\ m^3$ (this volume do not include the volume of the actuation box placed on stage)

  Seating capacity: N = 2289 seats

  Relation V/N = 4.66 m3/seat.

  Relation $V/S_A = 554.8$ (S_A is the audience area seated in main stalls)

  Fraction of audience area placed in boxes with relation main stalls area S_T: $\beta = 0.87$

  Using: opera.

- **RT PREDICTION BY DIMENSIONED**

  Applying of dimensioned theory is possible to realize a very approximated prediction of the T_{MID}, for occupied hall, having account that the absorption in the enclosure only is due to the audience.

  In this case has been obtained $T_{MID} = 1.4$ s. This it would be the maximum time of possible reverberation in the room.

- **RT PREDICTION ADDING OTHER ABSORPTION**

  Applying the Sabine formula [3] we obtain that the equivalent units of absorption at this time of reverberation, are: $A_0 = 1234\ m^2$.

  Adding to A_0 the absorption units due to a historical velvets in up part on the front of the boxes (A1 = 145.7 m2), we using Sabine we have that Tmid = 1.25 s

REVERBERATION TIME CALCULATED BY OTHER METHODS

- The reverberation Time has been calculated using several statistical theories as: W.C. Sabine [3] and H.Arau [4], of very different conception, and others of Ray Tracing method J.P.Vian (Epidaure) [5], and ODEON [6].

- Now we consider that Volume is Volume hall + Volume box actuation = 15836.1 m^3

- **TABLE 1: RT calculated for occupied audience and bottom wall of actuation box with decorated in bottom box actuation scenery and other sides walls and ceiling of stage with curtains with absorption type Knudsen.**

Frecuencia (Hz)	**125**	**250**	**500**	**1000**	**2000**	**4000**	**T_{MID}**	**T_{LOW}**	**T_{HIGH}**
RT Sabine	**1.52**	**1.44**	**1.28**	**1.14**	**1.14**	**1.13**	**1.21**	**1.48**	**1.14**
RT Arau [4]	**1.46**	**1.42**	**1.31**	**1.14**	**1.14**	**1.14**	**1.22**	**1.44**	**1.14**
RT Vian [5]	**1.88**	**1.68**	**1.46**	**1.27**	**1.26**	**1.25**	**1.37**	**1.78**	**1.26**

[3] W.C. Sabine (1900) Collected Papers on acoustics. Dover Publications (1922)

[4] H. Arau (1988). An improved Reverberation Formula. Acustica (Hirzel Verlag).Vol 65 nº4, p:163-180.

[5] J.P.Vian-J.Martin-Van Maercke (1993). Binaural simulation of concert halls: New approach for the binaural reverberation process. JASA 94(6). (EPIDAURE RT stadistic)

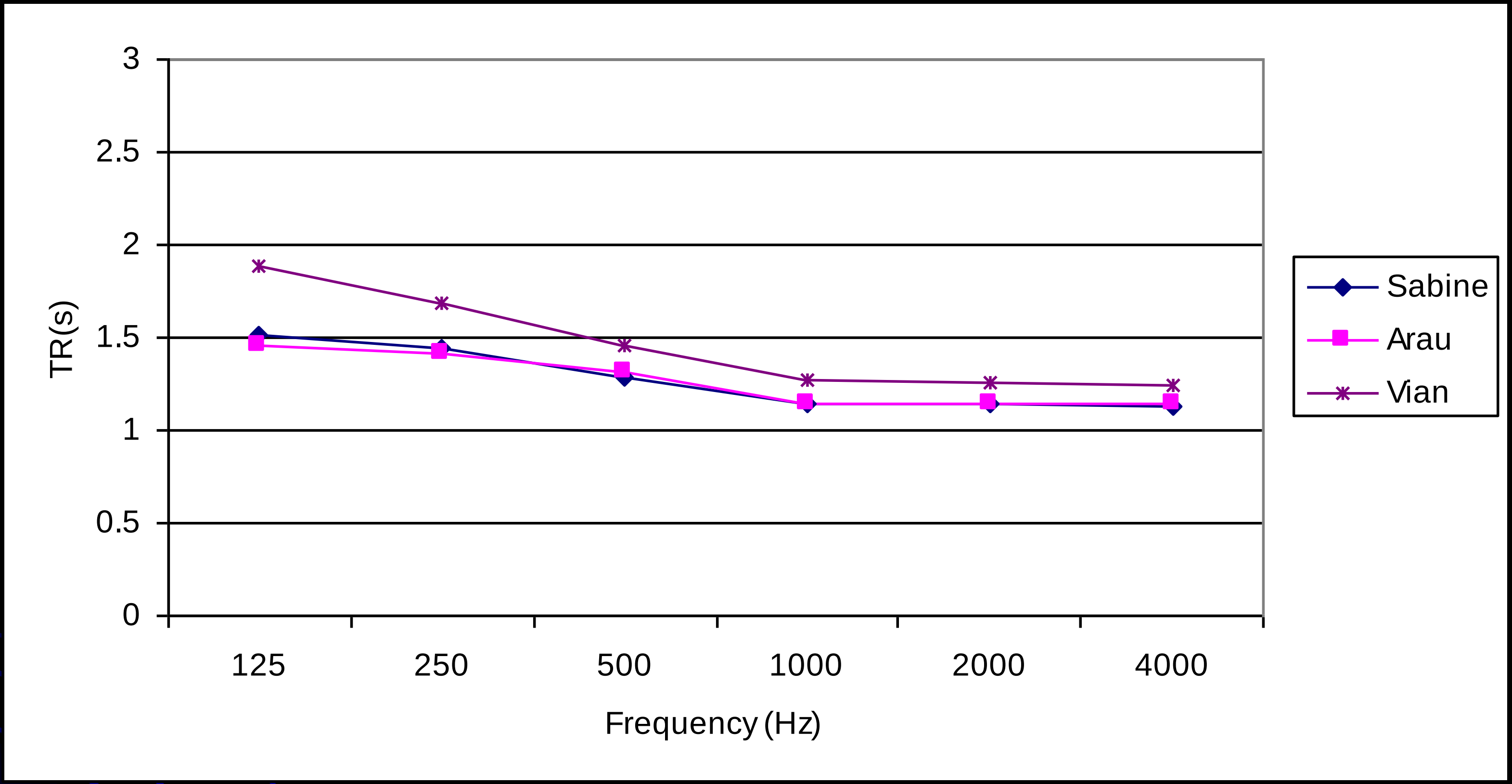
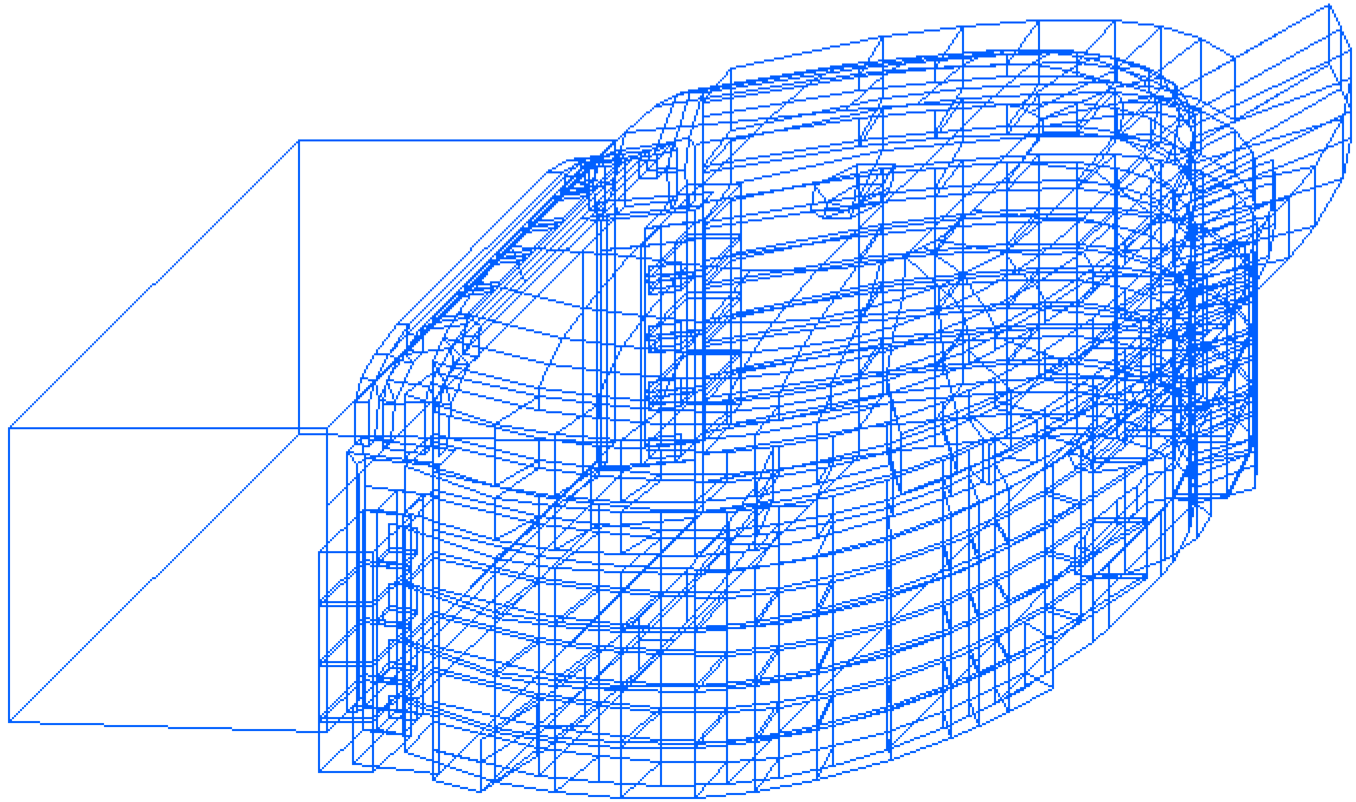


Figure: Graphic Table 1



mat. real | Sumat. proy. | ¿?

	Area	corr A	+M	-M	Total
er.	1005.3				
q.	1005.4				2010.7
tal	534.6				
lo	846.6				1381.2
no	1940.1				
o	1831.3				3771.4
TOTAL					7163.3

umen (m3) 15836.13

ctor de difusión (-5/+1) 0

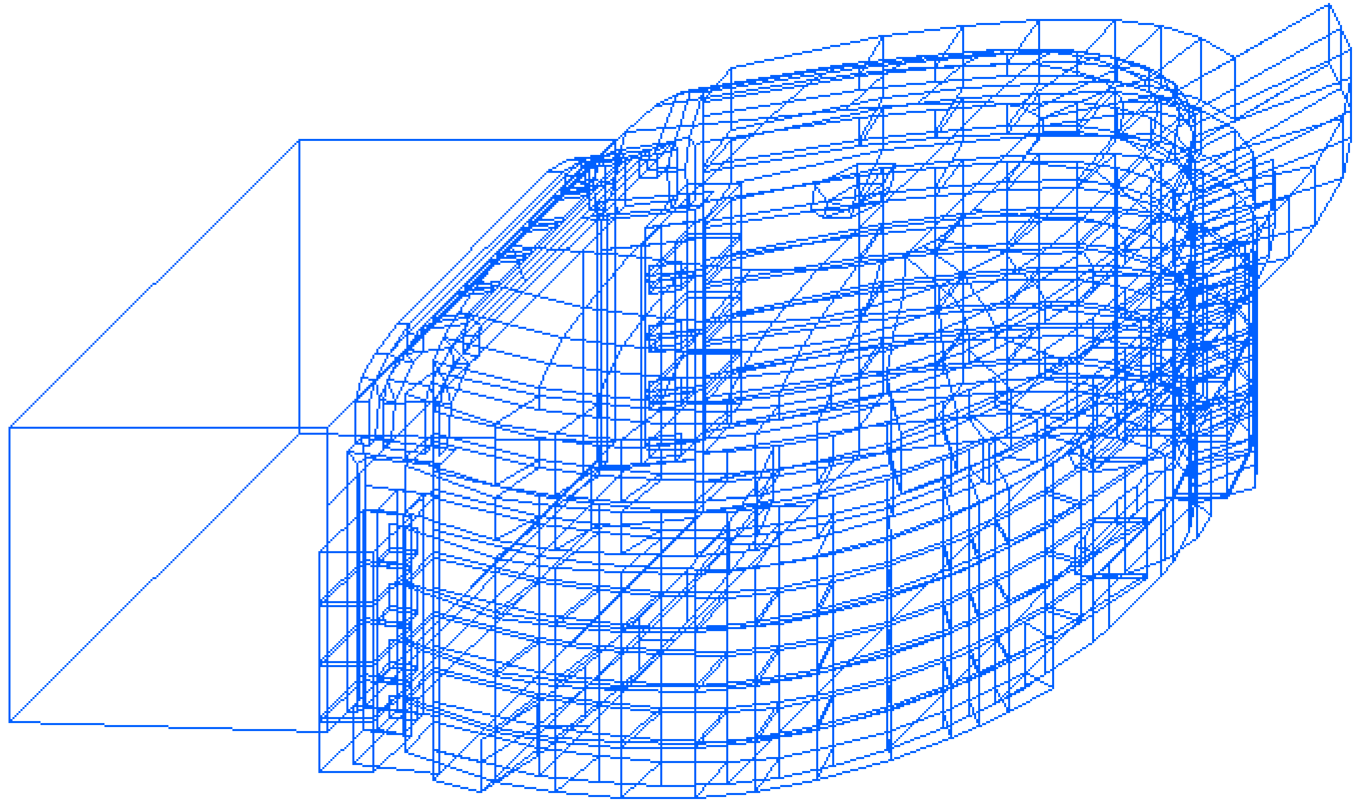
OK

TR	Sabine	Eyring	Arau	EDT
125	1.52	1.33	1.46	1.36
250	1.40	1.21	1.33	1.23
500	1.23	1.04	1.17	1.08
1000	1.08	0.90	1.01	0.92
2000	1.08	0.91	1.01	0.92
4000	1.08	0.95	1.04	0.94

	Sabine	Eyring	Arau
T. low	1.46	1.27	1.39
T. mid	1.15	0.97	1.09
T. high	1.08	0.93	1.02
Calidez	1.26	1.31	1.28
Brillo	0.94	0.96	0.94

REVERBERACIÓN SALA LLENA CON CÁMARA NEGRA

The calculations were carried out with absorption curtains, type Knudsen, on scenery box actuation and occupied hall.



umat. real | Sumat. proy. | ¿?

	Area	corr A	+M	-M	Total
er.	1005.3				
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ho	1940.1				
lo	1831.3				3771.5
TOTAL					7163.4

lumen (m3) 15836.13

ctor de difusión (-5/+1) 0

OK

TR	Sabine	Eyring	Arau	EDT
125	1.69	1.50	1.60	1.51
250	1.50	1.31	1.42	1.32
500	1.30	1.12	1.24	1.15
1000	1.15	0.97	1.07	0.98
2000	1.17	1.00	1.09	1.00
4000	1.20	1.07	1.14	1.06

	Sabine	Eyring	Arau
T. low	1.59	1.41	1.51
T. mid	1.23	1.04	1.15
T. high	1.18	1.03	1.11
Calidez	1.30	1.35	1.31
Brillo	0.96	0.99	0.97

REVERBERACIÓN SALA VACÍA CON CÁMARA NEGRA

The calculations were carried out with absorption curtains, type Knudsen, on scenery box actuation and unoccupied hall.

a) Maximum scattering (audience 0.7, remainder walls 0.95) ODEON, [6] Version 6.5

Frequency (Hz)	125	250	500	1000	2000	4000	T_{MID}	T_{LOW}	T_{HIGH}
RT 20	2.10	1.68	1.35	1.17	1.17	1.17	1.26	1.89	1.17
RT 30	2.08	1.68	1.38	1.20	1.20	1.18	1.29	1.88	1.19

b) Medium scattering (audience 0.7, remainder walls 0) ODEON

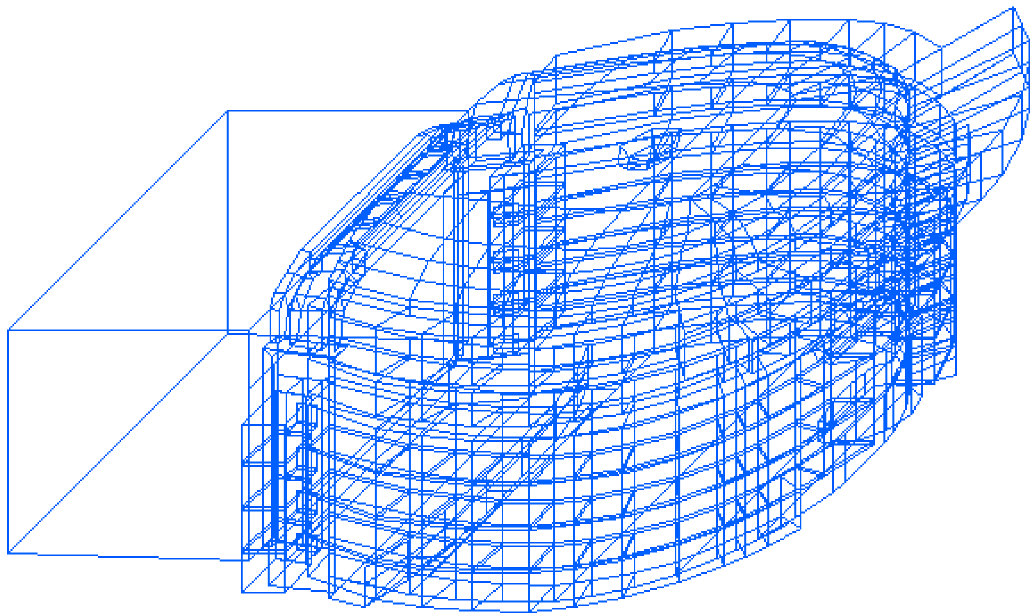
Frequency (Hz)	125	250	500	1000	2000	4000	T_{MID}	T_{LOW}	T_{HIGH}
RT 20	2.19	2.01	1.89	1.68	1.62	1.44	1.79	2.10	1.53
RT 30	2.52	2.50	2.48	2.24	2.10	2.10	2.36	2.51	2.11

c) Minimum scattering (audience 0, remainder walls 0) ODEON

Frequency (Hz)	**125**	**250**	**500**	**1000**	**2000**	**4000**	$\mathbf{T_{MID}}$	$\mathbf{T_{LOW}}$	$\mathbf{T_{HIGH}}$
RT20	2.43	2.28	2.13	1.86	1.92	1.71	2.00	2.36	1.82
RT30	2.80	2.80	2.78	2.48	2.44	2.02	2.63	2.80	2.23

d) Same case with Classical Theories:

Frequency (Hz)	**125**	**250**	**500**	**1000**	**2000**	**4000**	$\mathbf{T_{MID}}$	$\mathbf{T_{LOW}}$	$\mathbf{T_{HIGH}}$
RT Sabine	1.52	1.44	1.28	1.14	1.14	1.13	1.21	1.48	1.14
RT Arau	1.46	1.42	1.31	1.14	1.14	1.14	1.22	1.44	1.14



Sumat. real | Sumat. proy. | ¿?

	Area	corr A	+M	-M	Total
L. der.	1005.3				
L. izq.	1005.4				2010.7
Frontal	534.6				
Fondo	846.6				1381.2
Techo	1940.1				
Suelo	1831.3				3771.4
TOTAL					7163.3

Volumen (m3) 15836.13

Factor de difusión (-5/+1) 0

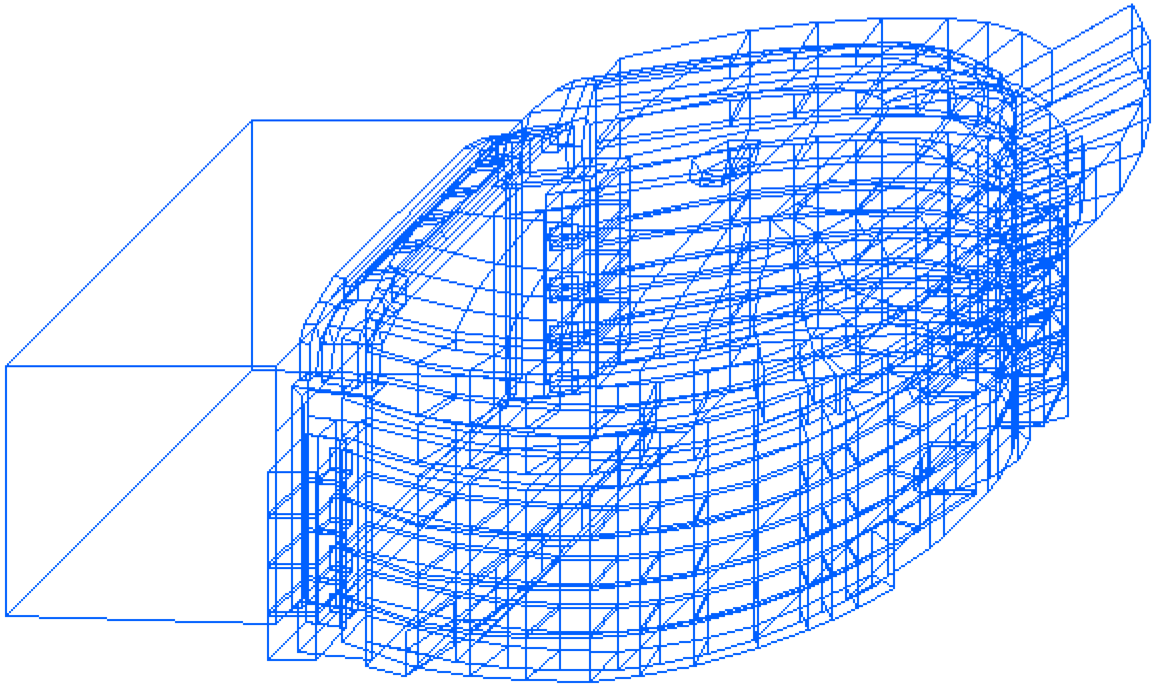
OK

TR	Sabine	Eyring	Arau	EDT
125	1.52	1.33	1.46	1.36
250	1.44	1.25	1.42	1.30
500	1.28	1.10	1.31	1.18
1000	1.14	0.96	1.14	1.02
2000	1.14	0.97	1.14	1.02
4000	1.13	1.00	1.14	1.01

	Sabine	Eyring	Arau
T. low	1.48	1.29	1.44
T. mid	1.21	1.03	1.22
T. high	1.14	0.99	1.14
Calidez	1.22	1.26	1.18
Brillo	0.94	0.96	0.93

REVERBERACION SALA LLENA CON DECORADOS EN PARED FONDO DE CAJA DE ACTUACIÓN

The calculations were carried out with decorated in bottom box actuation scenery and the other sides walls and ceiling of actuation box with curtains absorption type Knudsen and occupied hall.



REVERBERACION SALA VACIA CON
DECORADO EN CAJA DE ACTUACION

real | Sumat. proy. | ¿?

rea	corr A	+M	-M	Total
05.3				
05.4				2010.7
4.6				
6.6				1381.3
40.1				
31.3				3771.5
TOTAL				7163.4

(m3) 15836.13

e difusión (-5/+1) 0

OK

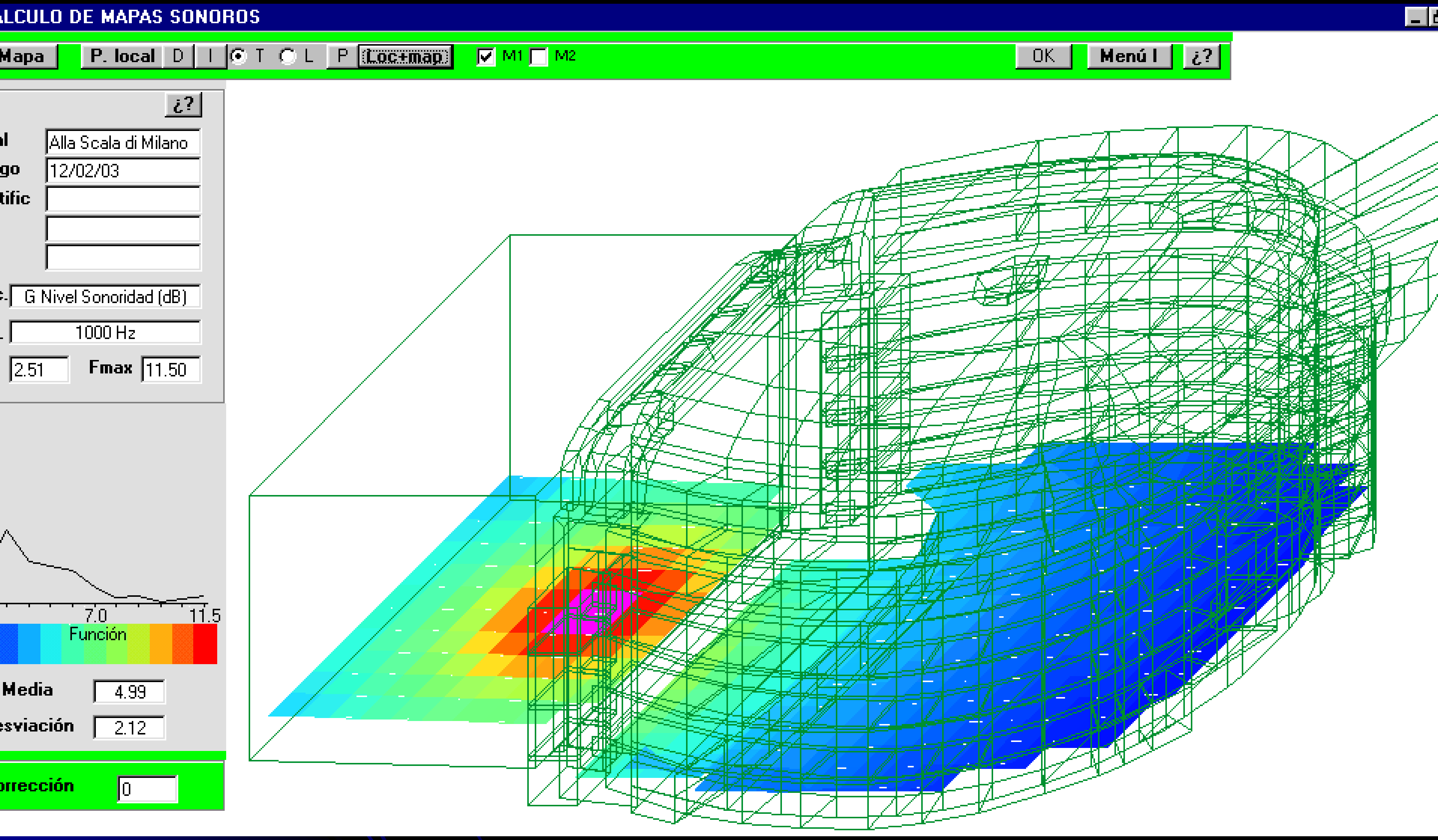
TR	Sabine	Eyring	Arau	EDT
125	1.69	1.50	1.60	1.51
250	1.55	1.36	1.51	1.40
500	1.37	1.18	1.38	1.25
1000	1.22	1.04	1.21	1.09
2000	1.24	1.07	1.22	1.11
4000	1.26	1.13	1.26	1.14

	Sabine	Eyring	Arau
T. low	1.62	1.43	1.56
T. mid	1.29	1.11	1.29
T. high	1.25	1.10	1.24
Calidez	1.25	1.29	1.20
Brillo	0.97	0.99	0.96

The calculations were carried out with decorated in bottom box actuation scenery and the other sides walls and ceiling of actuation box with curtains absorption type Knudsen and unoccupied hall.

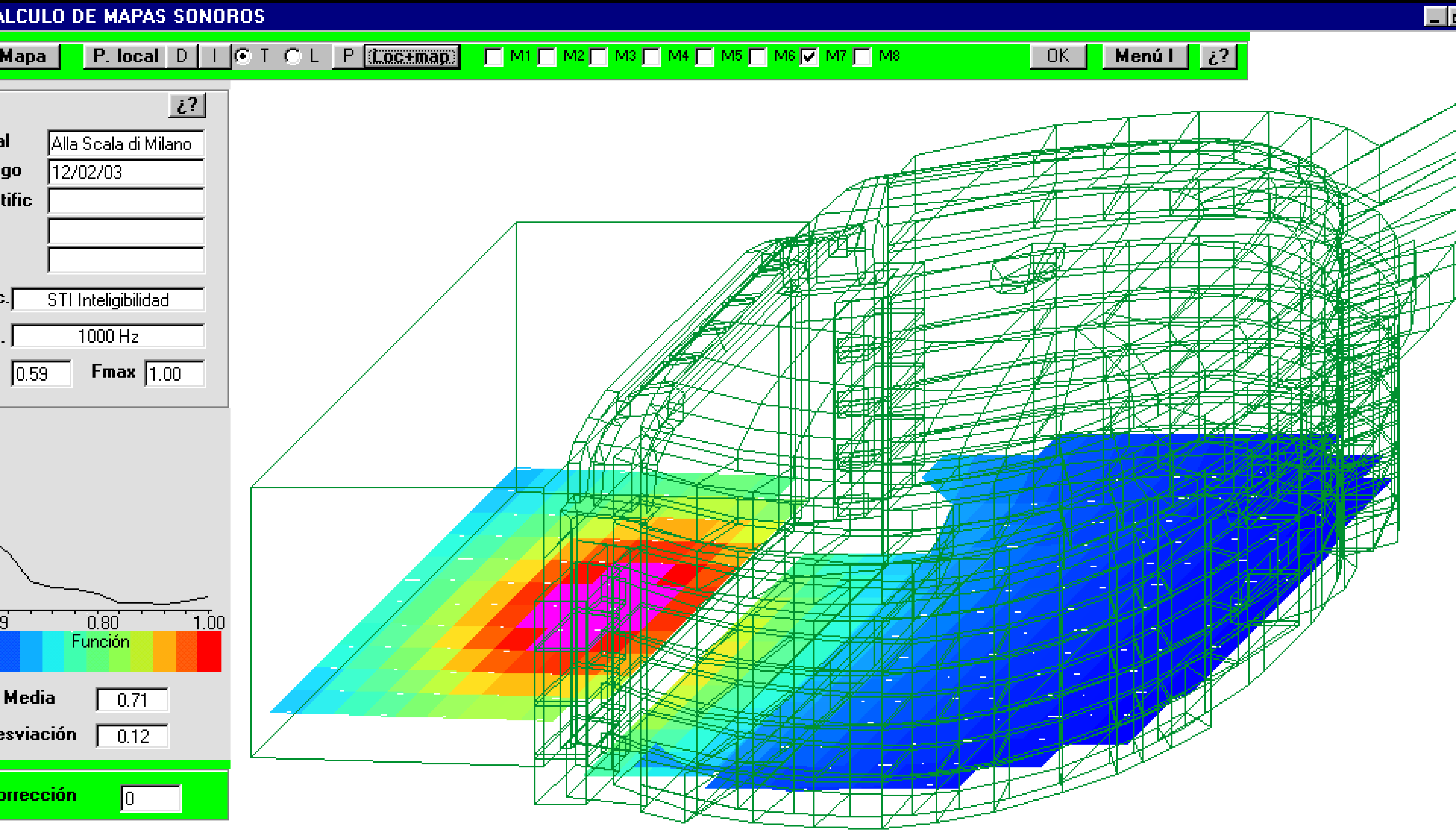
ARAU METHOD (Acustic_Salas)

STRENGTH G dB



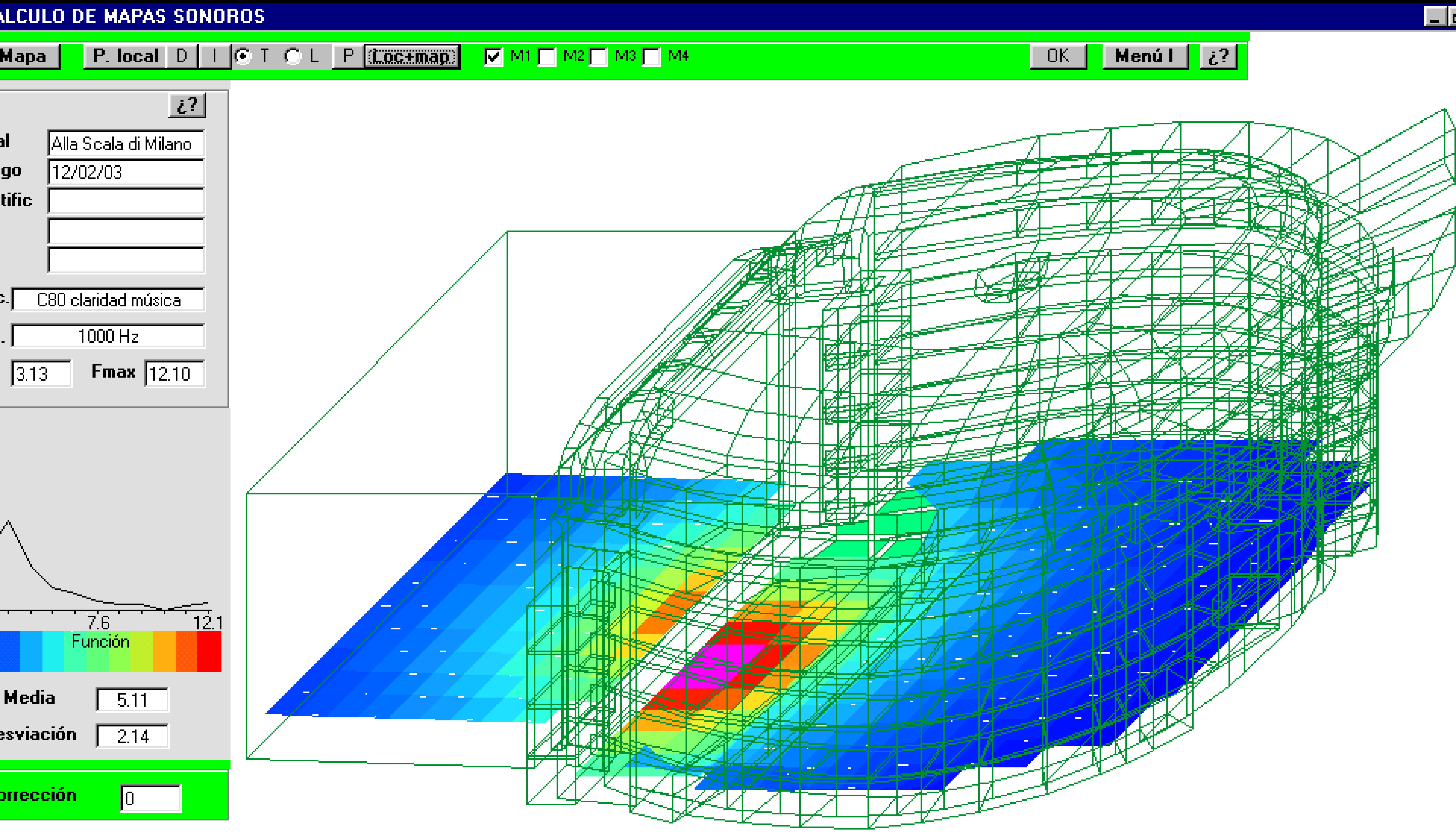
ARAU METHOD (Acustic_Salas)

INTELIGIBILITY STI



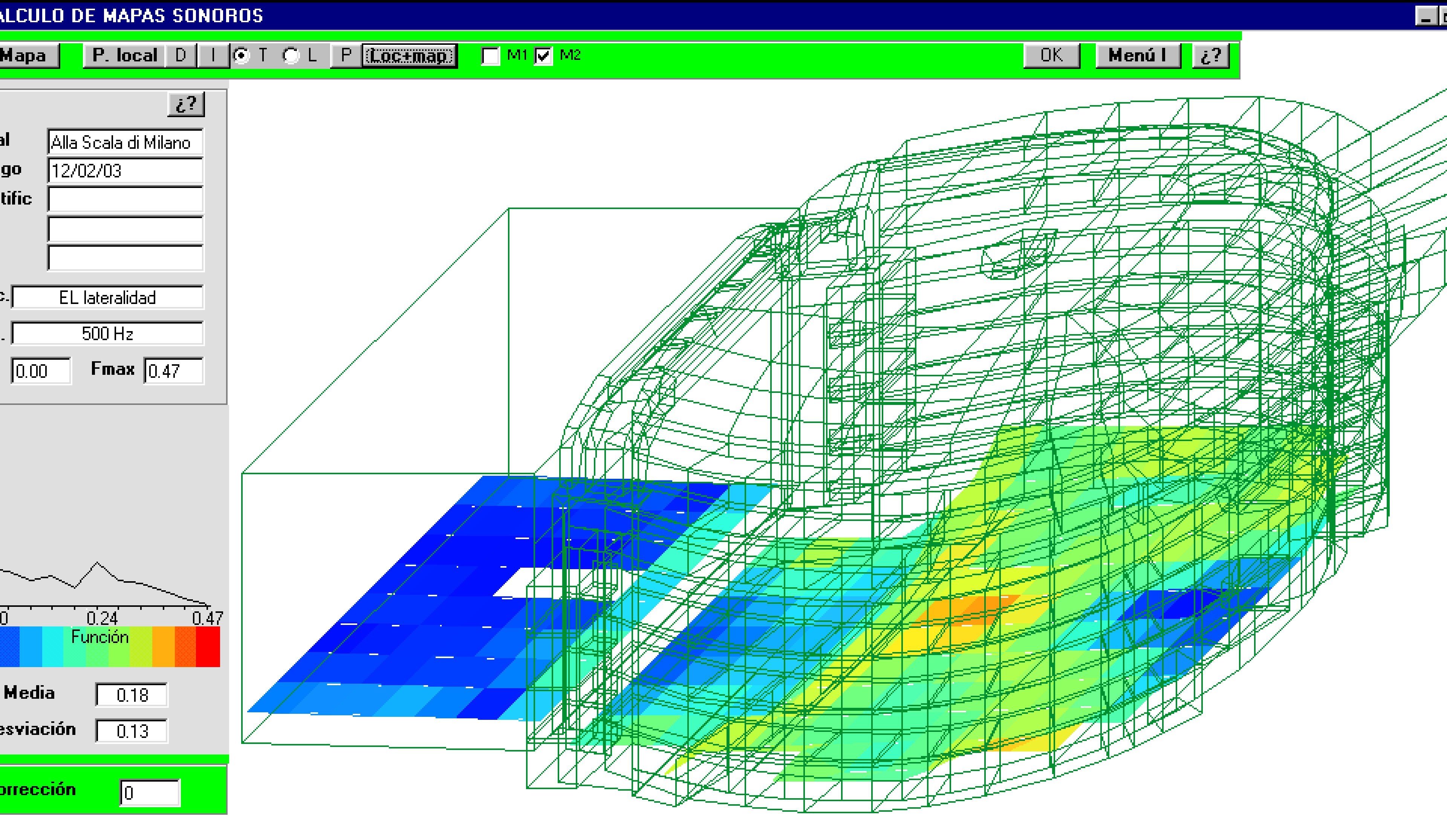
ARAU METHOD (Acustic_Salas)

CLARITY INDEX C_{80}



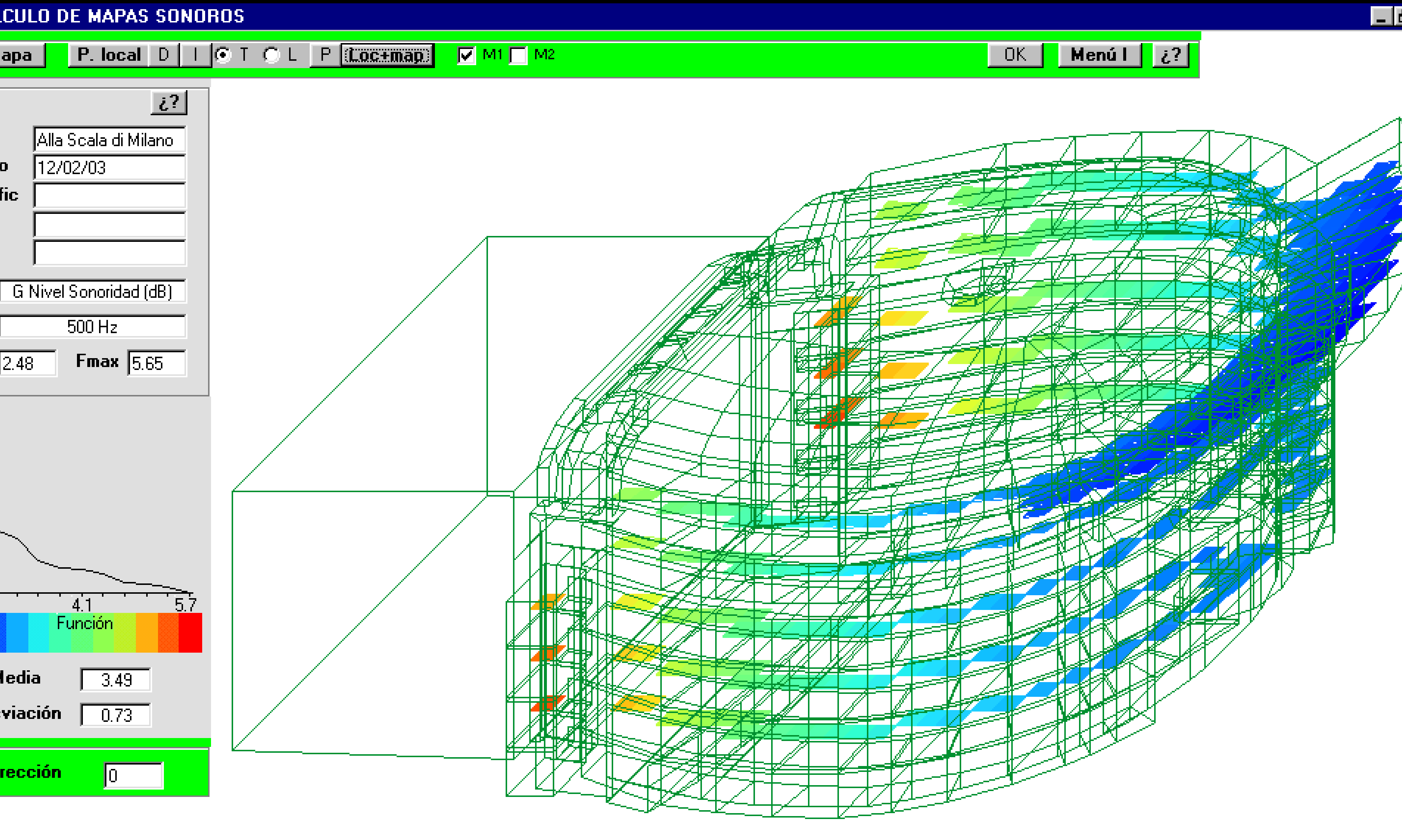
ARAU METHOD (Acustic_Salas)

LATERAL ENERGY



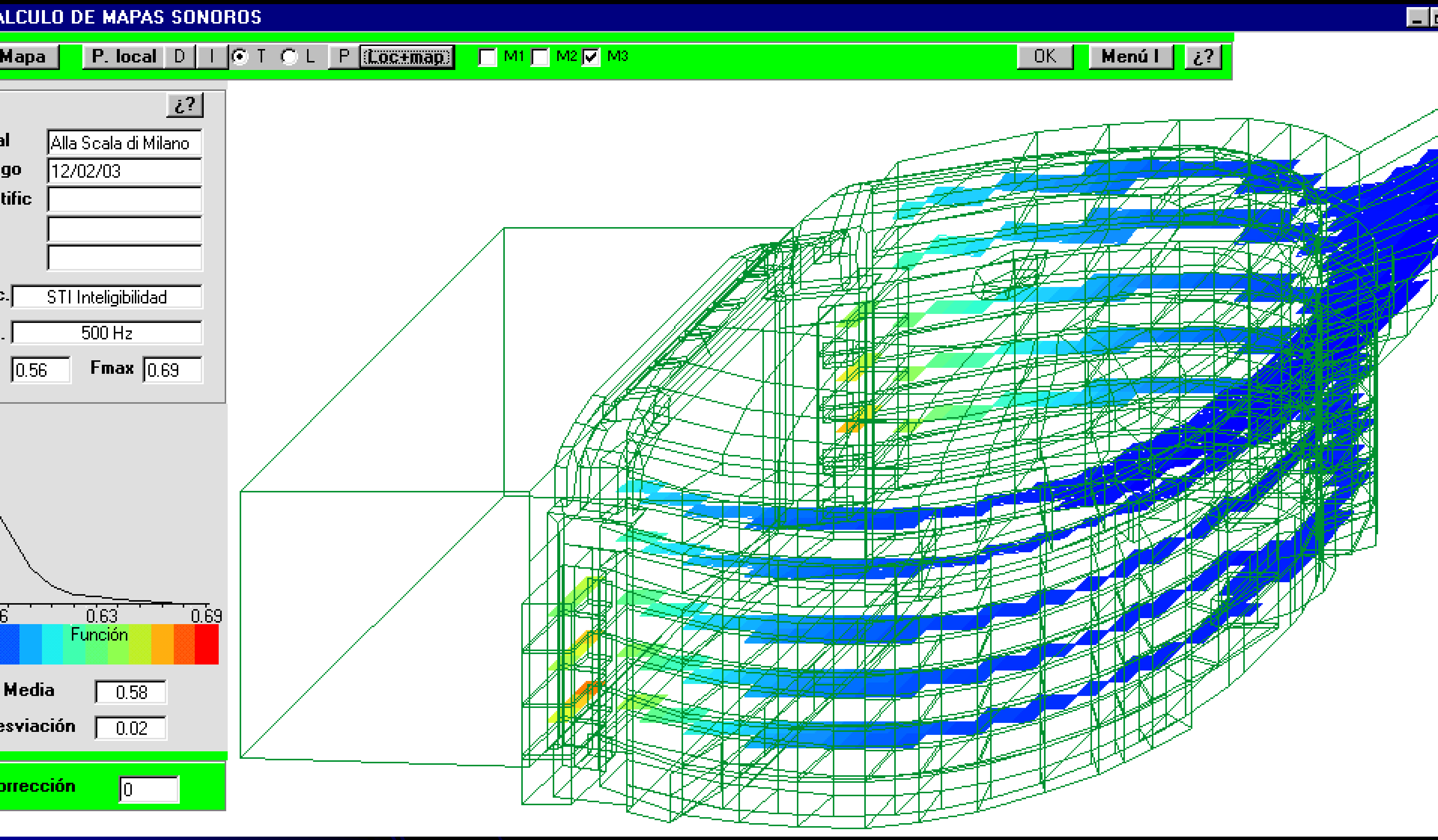
ARAU METHOD (Acustic_Salas)

STRENGTH G dB

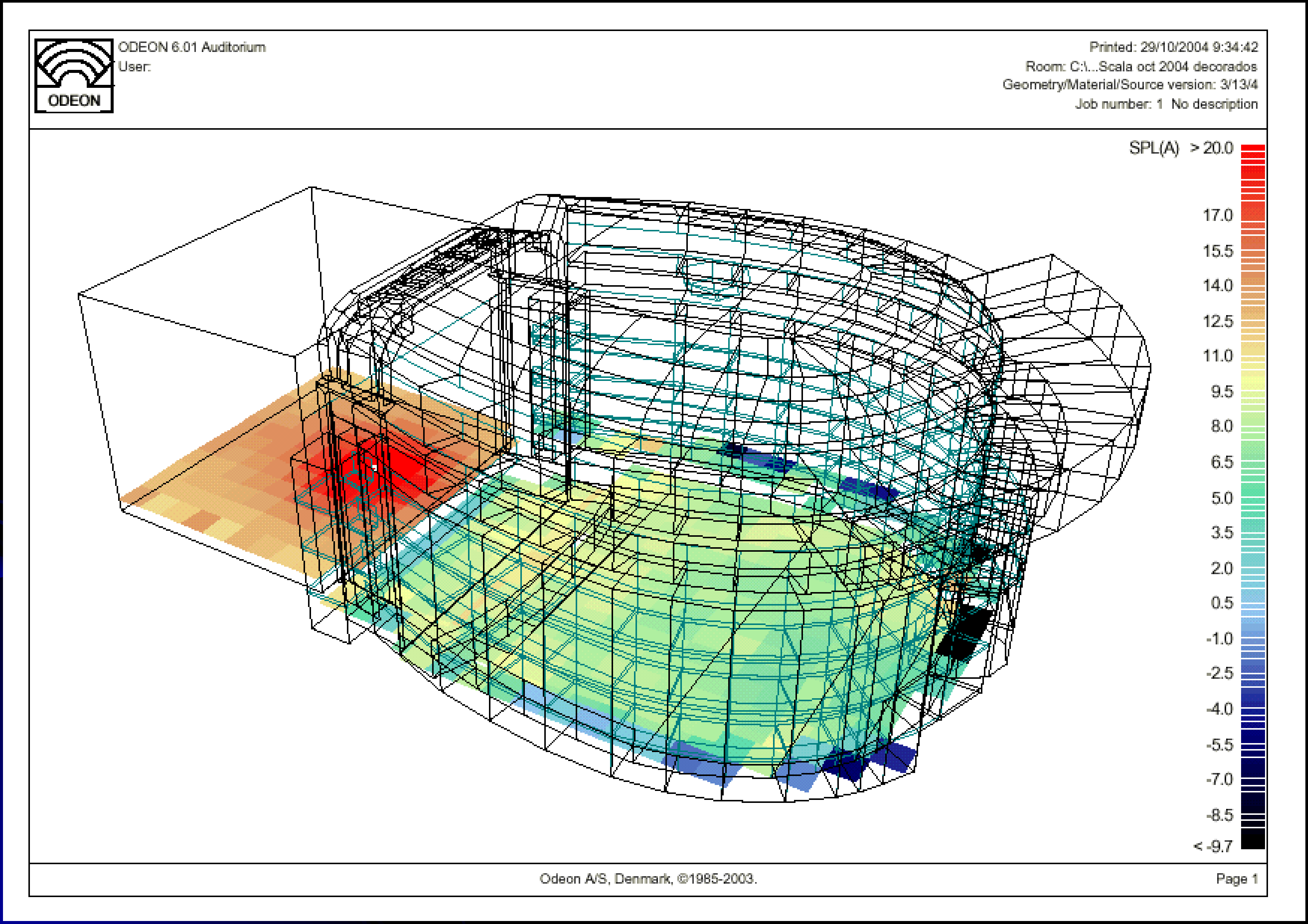


ARAU METHOD (Acustic_Salas)

INTELIGIBILITY STI



STRENGTH dB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-1.0
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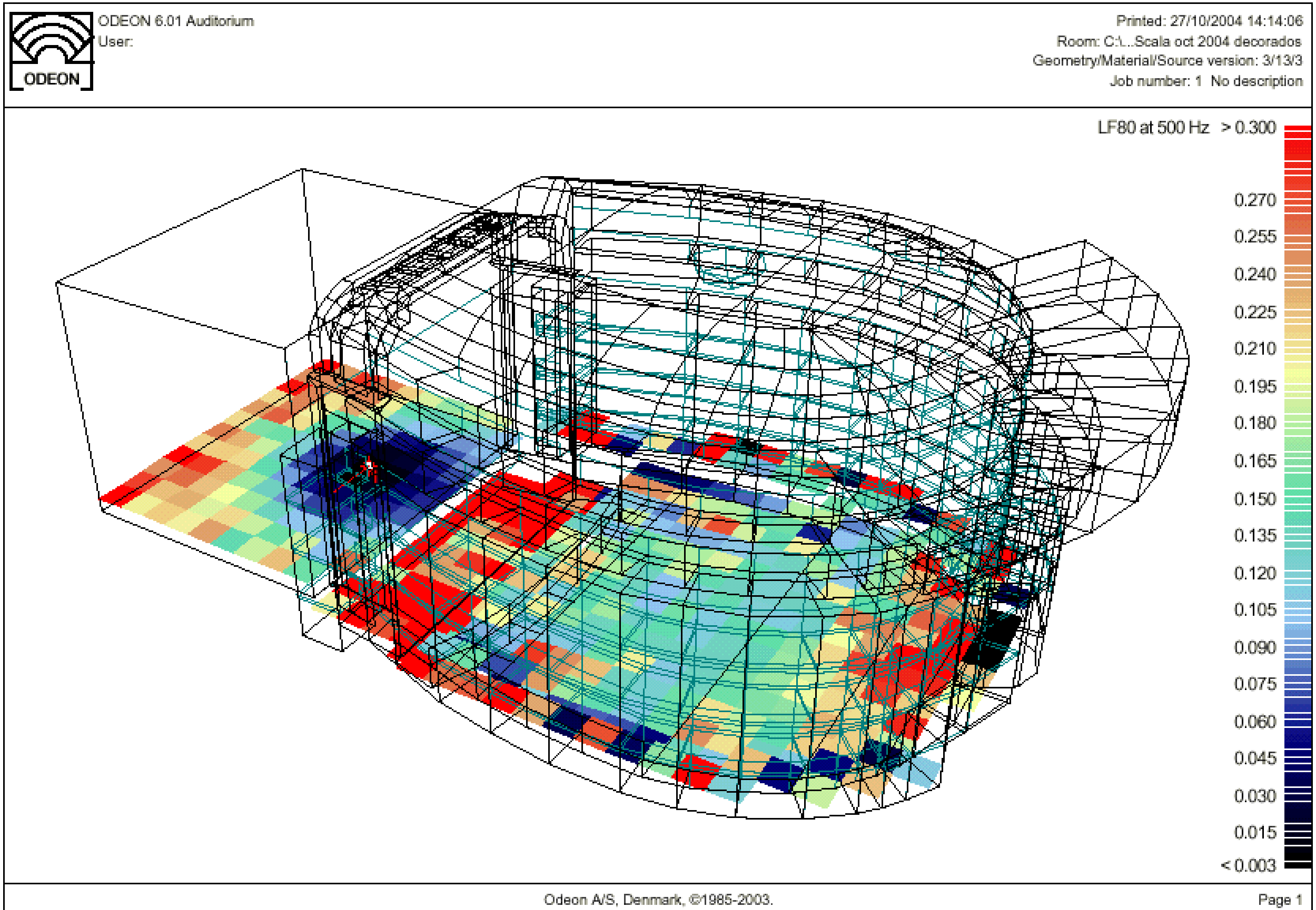
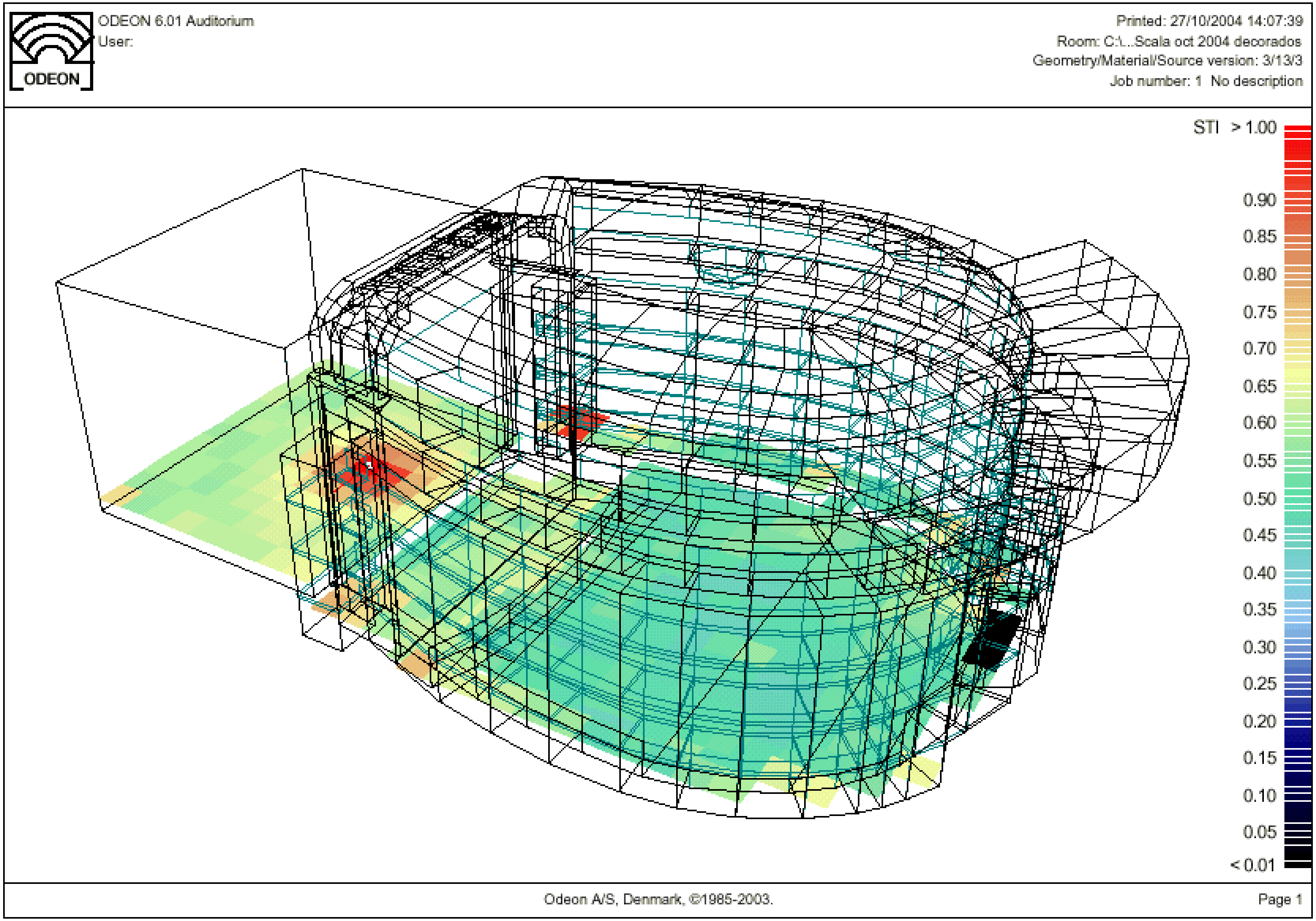
< -9.7
Odeon A/S, Denmark, ©1985-2003.
Page 1

LATERAL ENERGY



INTELIGIBILITY STI



Floating pavement.
NEW EFFECT: “Lifting Sound Radiated from the Floor”.

- We designed a elastically floating floor that it picks up the sound by direct and structural way. Then the superior plate puts on vibration being created a flexion wave that is transmitted to the whole audience area, placed on main stalls, in very brief time.

This vibration brings sound directly near to audience, by means of re-irradiation from the floor.

This phenomenon occurs because the longitudinal sound speed in the top wood layer is approximately ten times faster that of the sound in the air. As unexpected, and additional result, we get that a vertically radiated sound produced by a multitude of plane waves that arrive virtually at the same time from floor to everyone sitting in the main stalls. As a overall result, the rising sound reaches the audience almost at the same time, as in a harmonically resonant box being the spring a non porous and elastic substance. In many old theatres have under floor an air chamber acting like spring but then is produced a very important sound absorption in the low frequency normally not wished, and in our case is not generated.

(This is similar to the air climate of a hall by impelling air from the floor to the ceiling).
As far as I know, this vertical sound radiation is a new effect in acoustics not known.
It may very well be that this **new effect** may be considered in the future as a new acoustic concept such desirable as the lateral sound energy, which only a few years ago became an important acoustic concept.
I propose a name for this new effect of instantaneously perceiving the sound emanati our ng from the floor: **“Lifting Sound Radiated from the Floor”.**
Something of it were known by Alessandro Cocchy, Paper 2aAAb3 ASA New York Congress 2004, through us, when we were designing the floating floor in the Scala.

- In reality only we were trying to transmit a little vibration to seated people so that they listened the sound via corporal, as the deaf ones they listen.

BOTH EFFECTS WERE GET¡

MUSICAL TEST

Milano - **" Acustica eccellente ": parola di Riccardo Muti. Il primo esame, quale e' la prova musicale fatto stamani del maestro Muti con l'orchestra all'abito, e' è superato dunque con eccellente. E fu un esam fondamentale, quello dell'acustica, per un teatro, come lo Scala, nato per produrre musica che e' è sommesso ad una lunga e minuziosa opera di ristrutturazione e restaurazione. L'acustica segue le sue leggi, ben codificati nella fisica, ma modificarla come in un 'strumento musicale' gigantesco può considerarsi un teatro quale lo Scala non e' cosa semplice......**
Ma subito ogni apprensione e' è cancellata, del suono di una nota sola del violoncello nel Guglielmo Tell, a quello pieno dell' insieme degli strumenti nella 'Forza della fortuna**'. Tutte le variazioni sonore e timbriche dell'orchestra si sono espressi in questo esordio prova. " Muti entusiasta ", dopo Antonio Acerbo ha riferito, il direttore dei lavori. " Acustica eccellente ", ha detto, riferendo le parole del maestro,**

Ma l'acustica come e'? " Per me il giudizio più importante - dice nella nota scaligera il maestro - fu quello dei musicisti; sono voi che producono i suoni, sono voi che li hanno diffusi del buco della Scala per decadi. **Nessun migliore di essi potè stimare l'acustica della sala dopo l'intervento di restaurazione. Il lavoro dell'ingegner Arau e' stato perfetto. L'ho letto subito sul viso di tutti i musicisti e nella sua esplosione di si congratula' alla fine dell'esecuzione ". è stato, in effetti, un molto, caldo, commosso applauso dei musicisti a tritare nella sala. " Un applauso liberatorio continua il Maestro Muti ed anche di gratitudine per chi ha contribuito a questa straordinaria impresa**.....

MUSICAL TEST (Following)

Ma quello di Muti segue perfettamente il giudizio dei suoi professori di orchestra. Vale la pena di citare, uno per tutto, quello di Ernesto Schiavo, primo violino: " Sono emozionato ed accontento. E' una sensazione come quello di chi trova un amore, una fidanzata. Un'emozione profonda: ritornare in un posto dove senti che lì e' qualcosa ". Ancora: " La sensazione dominante, a quello di quello' dell'acustica, il più importante e' quella che ho girato a guardare la Scala di dove l'ho vista per 30 anni. Anche l'allegria di ritornare in centro a Milano: sara' un placebo, ma si respira un'altra aria, la storia, le note di quello Taci che vagano per la sala....

I suoni non scapparono fuori: furono gli stessi di 200 anni fa, non sono andati fuori coi lavori.... l'ho trovata intatta ". Il suono? " Un bell' acustico. Tra suoli di velluto e suoli di legno – aggiunge Schiavi - fa già' un po' di differenza. E' un suono onesto e bollato, e' molto suono ". Significa che il lavoro del fisico catalano Higini Arau, lo stesso che ha curato l'acustica del nuovo Teatro Liceu di Barcellona, dopo l'incendio, " e' stato - come ha sottolineato Muti - perfetto ". Arau ha eliminato il vecchio suolo realizzato compattando le macerie nella ricostruzione del dopoguerra, infine ricoperto di moquette di velluto rosso, e l'ha rimpiazzat con un suolo multistrato, legno e materiali sintetici, capace di riflettere il suono, finito con asticelle di rovere chiaro non attaccati, ma appoggiati solamente in modo che ampliare e riflettere meglio il suono dell'orchestra.

HAPPY DAY St. AMBROSIO MIRACLE 7 December 2004