AHLV100 - Guide of wave at anechoic exit

Summary:

A rectilinear guide of wave at anechoic exit, with rigid walls, whose propagation medium is “normal” air, is excited by a harmonically vibrating piston.

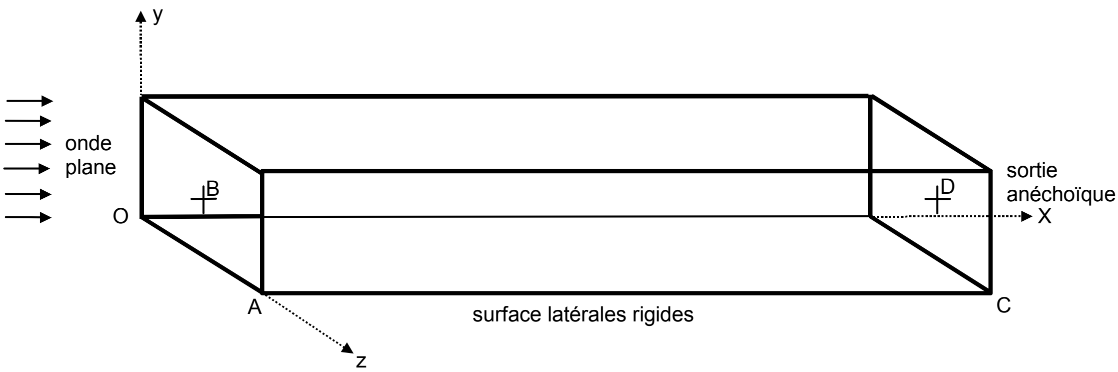
One calculates by an acoustic formulation the acoustic field of pressure of the harmonic answer for 13 different modelings. The results are tested in 2 points at the entry and 2 points at the exit.

They make it possible to validate the matrices of rigidity, mass, damping (impedance), the vector source (imposed normal speed) as well as the operators of postprocessings.

The results of reference come from an analytical calculation.

1 Problem of reference

1.1 Geometry



Tube with rectangular section:

length: $L = l_x = 1.0\,m$
height: $h = l_y = 0.1\,m$
width: $l = l_z = 0.2\,m$

Coordinates of the points (in m):

	A	B	C	D
x	0.	0.	1.00	1.00
y	0.	0.05	0.	0.05
z	0.20	0.10	0.20	0.10

1.2 Properties of materials

Air:

$$\rho_c = 1.3\,kg.m^{-3}$$
$$c_0 = 343.\,m.s^{-1}$$

1.3 Boundary conditions and loading

Normal speed at the entry $V = V_n \times \exp(i\omega t)$ with $V_n = 0.014\,m.s^{-1}$
$f = 500\,Hz$

Impedance at the end CD $Z = \rho_0 . c_0 = 445.9\,kg.m^{-2}\,s^{-1}$

2 Reference solution

2.1 Method of calculating used for the reference solution

The general analytical solution for a guide of wave is written:

$(\mathbf{e}_x, \mathbf{e}_y, \mathbf{e}_z)$ being the orthonormal reference mark associated with the Cartesian coordinates (x, y, z)

- for the pressure:

$$p(x,y,z) = A \exp(ikx) + B \exp(-ikx)$$

- for vibratory speed:

$$\mathbf{V}(x,y,z) = -\frac{1}{\rho_0 . c_0}\left[A \exp(ikx) - B \exp(-ikx)\right]\mathbf{e}_x$$

- With and B are determined by the boundary conditions:

en x = 0 $\quad V_n = V_{n0}$

en x = L $\quad p(L,y,z) = Z.\mathbf{V}(L,y,z).\mathbf{n}_L$

$$A = B\left(\frac{Z - \rho_0.c_0}{Z + \rho_0.c_0}\right)\exp(-2ikL) \text{ et } B = \frac{\rho_0.c_0.V_n}{\left(\frac{Z - \rho_0.c_0}{Z + \rho_0.c_0}\right)\exp(-2ikL) - 1} \text{ avec } k = \frac{\omega}{c_0}$$

In the studied case, the exit of the guide is anechoic: $Z = \rho_0 c_0$. One thus has:

- for the pressure:

$$p(x,y,z) = \rho_0 c_0 V_n \exp(-ikx)$$

- for speed:

$$\mathbf{V}(x,y,z) = -V_n \exp(-ikx).\mathbf{e}_x$$

- and for the acoustic intensity:

$$\mathbf{I} = \frac{1}{2} p \mathbf{V}^* = \frac{1}{2}\rho_0 c_0 V_n^2.\mathbf{e}_x$$

I.e. acoustic Intensity activates uniform in all the guide and parallel with the axis.

The Eigen frequencies are given for the guide closed at the two ends by:

$$f_{m,n,p} = \frac{c_0}{2}\left(\frac{m^2}{1_x^2} + \frac{n^2}{1_y^2} + \frac{p^2}{1_z^2}\right)^{1/2}$$ where m, n, p are positive entireties.

2.2 Results of reference

Pressure at the points A, B, C, D (for modelings A, B, C, D, E).
Acoustic intensity at the points A, B, C, D (for modelings A and C).
Eigen frequencies n°2 with n°9.

2.3 Uncertainty on the solution

Analytical solution

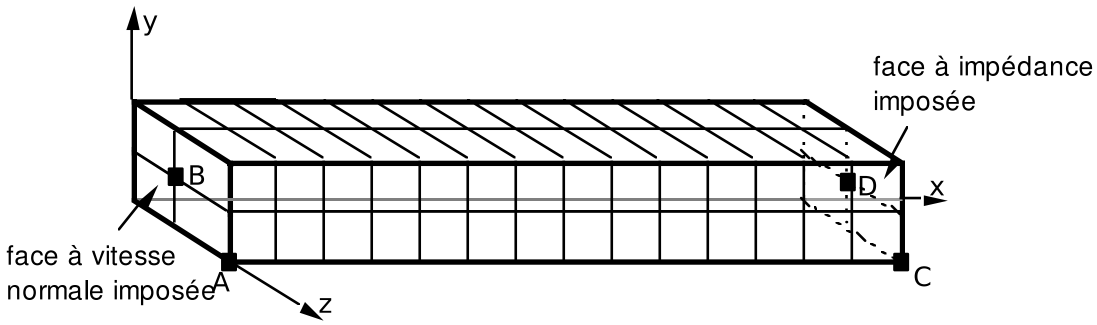
2.4 Bibliographical references

1) BOUIZI A. Résolution of the equations of linear acoustics by a method finite elements mixed - Thesis (1989).

3 Modeling A

3.1 Characteristics of modeling

Formulation pressure elements 'ACOUSTIC' 3D (ACOU_HEXA20 and ACOU_FACE8)



Cutting =	15	meshs HEXA20 according to the axis of	x
	2	meshs HEXA20 according to the axis of	y
	2	meshs HEXA20 according to the axis of	z

Limiting conditions:

```
VITE_FACE:     (Group_ma: Entry    Vnor: IH  0,014  0.)
IMPE_FACE:     (Group_ma: Exit     Impe: IH  445.9  0.)
```

Name of the nodes $A=No1$ $B=No780$ $C=No751$ $D=No763$

3.2 Characteristics of the grid

Many nodes: 471
Many meshs and types: 60 HEXA20 8 QUAD8

4 Results of modeling A

4.1 Values tested

Localization	Sizes	Reference	tolerance
A	$p(réel)$	– 6.2426	0.1%
	$p(imag)$	0.0000	0.1%
	$p(dB)$	109.9	0.1%
	Acoustic intensity (reality)	0.0437	3%
	Acoustic intensity (imag)	0	3.5E-4
B	$p(réel)$	– 6.2426	0.1%
	$p(imag)$	0.0000	0.1%
	$p(dB)$	109.9	0.1%
	Acoustic intensity (reality)	0.0437	3%
	Acoustic intensity (imag)	0	3.5E-4
C	$p(réel)$	6.0237	0.1%
	$p(imag)$	1.6387	0.1%
	$p(dB)$	109.9	0.1%
	Acoustic intensity (reality)	0.04037	3%
	Acoustic intensity (imag)	0	3.5E-4
D	$p(réel)$	6.0237	0.1%
	$p(imag)$	1.6387	0.1%
	$p(dB)$	109.9	0.1%
	Acoustic intensity (reality)	0.0437	3%

Acoustic intensity (imag) 0 3.5E-4

Order of the clean mode i	m	n	p	Frequency Reference	tolerance
2	1	0	0	171.5	0.01%
3	2	0	0	343.0	0.01%
4	3	0	0	514.5	0.1%
5	4	0	0	686.0	1%
6	5	0	0	857.5	0.1%
7	0	0	1	857.5	0.5%
8	1	0	1	874,482	0.5%
9	2	0	1	923,556	0.5%

4.2 Notice

One tests the results in two different ways:

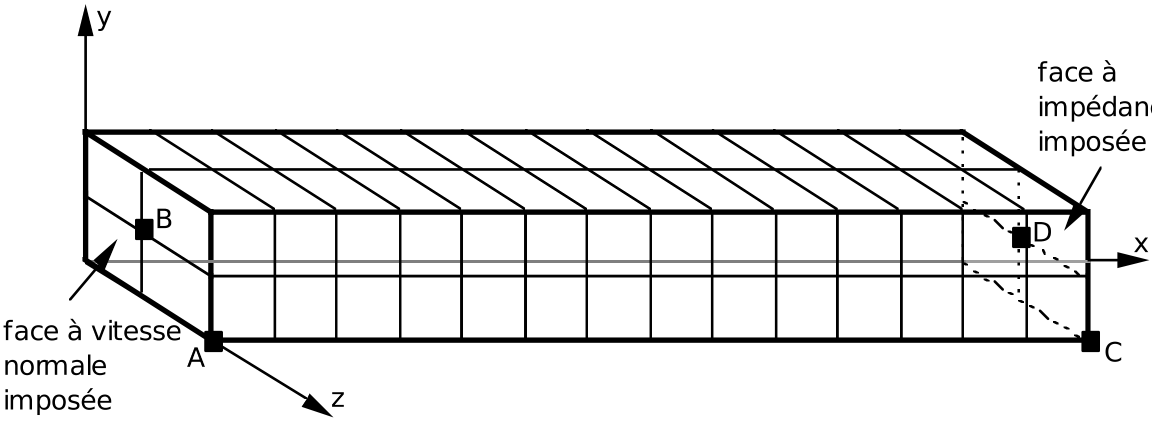
- by the usual procedure while using DYNA_LINE_HARM ;
- by a calculation broken up into orders of linear algebra COMB_MATR_ASSE, CREA_CHAMP, TO FACTORIZE, TO SOLVE.

The tests are thus duplicated and it is checked that the results are coherent.

5 Modeling B

5.1 Characteristics of modeling

Formulation pressure potential of elements displacements '3D_FLUIDE' (MEFL_HEXA20 and MEFL_FACE8)



Cutting =	15	meshs HEXA20 according to the axis of	x
	2	meshs HEXA20 according to the axis of	y
	2	meshs HEXA20 according to the axis of	z

Limiting conditions:

```
VITE_FACE:     (GROUP_MA: Entry    VNOR: 0,014)
IMPE_FACE:     (GROUP_MA: Exit     IMPE: 445.9)
```

Name of the nodes $A=No1$ $B=No780$ $C=No751$ $D=No763$

5.2 Characteristics of the grid

Many nodes: 471
Many meshs and types: 60 HEXA20 8 QUAD8

6 Results of modeling B

6.1 Values tested

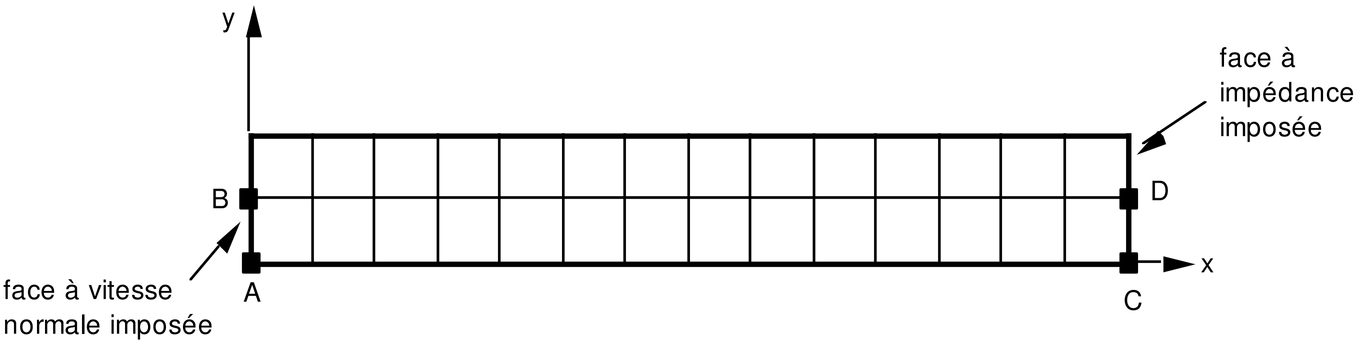
Localization	Reference	Reference	tolerance
A	$p(réel)$	– 6.2426	0.1%
	$p(imag)$	0.0	0.1%
	$p(dB)$	109.8867	0.1%
B	$\|p\|$	6.2426	0.1%
	$p(angle)$	180.0°	0.1%
	$p(dB)$	109.8867	0.1%
C	$\|p\|$	6.2426	0.1%
	$p(angle)$	15.2186°	0.1%
	$p(dB)$		0.1%

D	$\|p\|$	6.2426	0.1%
	$p(angle)$	15.2186°	0.1%
	$p(dB)$	109.8867	0.1%

7 Modeling D

7.1 Characteristics of modeling

Formulation pressure potential of elements displacements `'2D_FLUIDE'` (`MEFLSE3` and `MEFLQU8`)



Cutting = 15 meshs `QUAD8` according to the axis of x
2 meshs `QUAD8` according to the axis of y

Limiting conditions:

```
VITE_FACE:     (GROUP_MA: Entry    VNOR: 0,014)
IMPE_FACE:     (GROUP_MA: Exit     IMPE: 445.9)
```

Name of the nodes $A=No1$ $B=No780$ $C=No151$ $D=No153$

7.2 Characteristics of the grid

Many nodes: 125
Many meshs and types: 30 `QUAD8` 4 `SEG3`

8 Results of modeling D

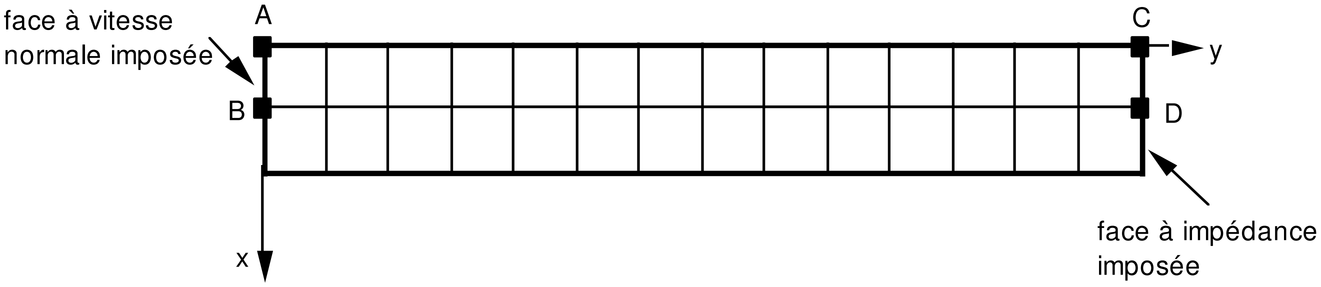
8.1 Values tested

Localization	Sizes	Reference	% difference
A	$p(réel)$	– 6.2426	0.1%
	$p(imag)$	0.0	0.1%
	$p(dB)$	109.8867	0.1%
B	$p(réel)$	– 6.2426	0.1%
	$p(imag)$	0.0	0.1%
	$p(dB)$	109.8867	0.1%
C	$p(réel)$	6.0237	0.1%
	$p(imag)$	1.6387	0.1%
	$p(dB)$	109.8867	0.1%
D	$p(réel)$	6.0237	0.1%
	$p(imag)$	1.6387	0.1%
	$p(dB)$	109.8867	0.1%

9 Modeling E

9.1 Characteristics of modeling

Formulation pressure potential of elements displacements `'AXIS_FLUIDE'` (`MEAXFLS3` and `MEAXFLQ8`)



Cutting = 15 meshs `QUAD8` according to the axis of x
2 meshs `QUAD8` according to the axis of y

Limiting conditions:

```
VITE_FACE:     (GROUP_MA: Entry    VNOR: 0,014)
IMPE_FACE:     (GROUP_MA: Exit     IMPE: 445.9)
```

Name of the nodes $A=No1$ $B=No780$ $C=No151$ $D=No153$

9.2 Characteristics of the grid

Many nodes: 125
Many meshs and types: 30 `QUAD8` 4 `SEG3`

10 Results of modeling E

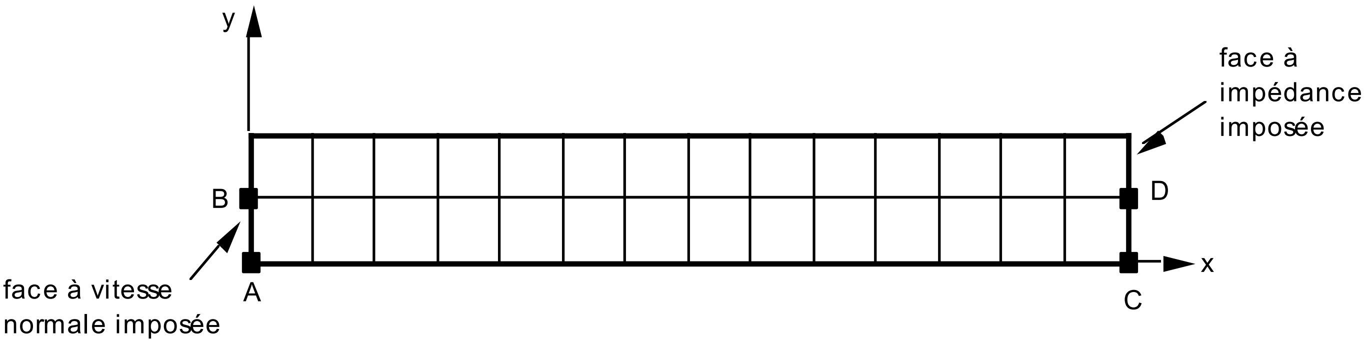
10.1 Values tested

Localization	Sizes	Reference	% difference
A	$p(réel)$	– 6.2426	0.1%
	$p(imag)$	0.0	0.1%
	$p(dB)$	109.8867	0.1%
B	$p(réel)$	– 6.2426	0.1%
	$p(imag)$	0.0	0.1%
	$p(dB)$	109.8867	0.1%
C	$p(réel)$	6.0237	0.1%
	$p(imag)$	1.6387	0.1%
	$p(dB)$	109.8867	0.1%
D	$p(réel)$	6.0237	0.1%
	$p(imag)$	1.6387	0.1%
	$p(dB)$	109.8867	0.1%

11 Modeling F

11.1 Characteristics of modeling

Formulation pressure elements `'ACOUSTIC' PLAN` (`SEG3` and `QUAD8`)



Cutting = 15 meshs `QUAD8` according to the axis of x
2 meshs `QUAD8` according to the axis of y

Limiting conditions:

```
VITE_FACE:     (Group_ma: Entry    Vnor: 0,014)
IMPE_FACE:     (Group_ma: Exit     Impe: 445.9)
```

Name of the nodes $A=No1$ $B=No33$ $C=No2$ $D=No34$

11.2 Characteristics of the grid

Many nodes: 125
Many meshs and types: 30 `QUAD8` 4 `SEG3`

12 Results of modeling F

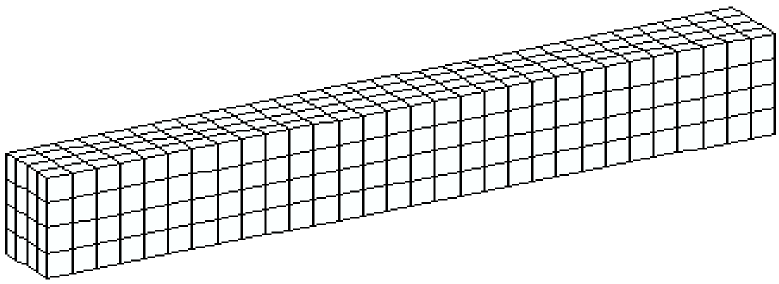
12.1 Values tested

Localization	Sizes	Reference	tolerance
A	$p(réel)$	– 6.2426	0.1%
	$p(imag)$	0.0000	0.1%
	Acoustic intensity (reality)	0.0437	3%
	Acoustic intensity (imag)	0	3.5E-4
B	$p(réel)$	– 6.2426	0.1%
	$p(imag)$	0.0000	0.1%
	Acoustic intensity (reality)	0.0437	3%
	Acoustic intensity (imag)	0	3.5E-4
C	$p(réel)$	6.0237	0.1%
	$p(imag)$	1.6387	0.1%
	Acoustic intensity (reality)	0.04037	3%
	Acoustic intensity (imag)	0	3.5E-4
D	$p(réel)$	6.0237	0.1%
	$p(imag)$	1.6387	0.1%
	Acoustic intensity (reality)	0.0437	3%
	Acoustic intensity (imag)	0	3.5E-4

13 Modeling G

13.1 Characteristics of modeling

Formulation pressure elements `'ACOUSTIC' 3D` (`ACOU_HEXA8` and `ACOU_FACE4`)



Cutting = 30 meshs `HEXA8` according to the axis of x
4 meshs `HEXA8` according to the axis of y
4 meshs `HEXA8` according to the axis of z

Limiting conditions:

```
VITE_FACE:     (Group_ma: bicycle  Vnor: IH  0,014  0.)
IMPE_FACE:     (Group_ma: impe     Impe: IH  445.9  0.)
```

Name of the nodes $A=No69$ $B=No95$ $C=No65$ $D=No876$

13.2 Characteristics of the grid

Many nodes: 775
Many meshs and types: 480 `HEXA8` 32 `QUAD4`

14 Results of modeling G

14.1 Values tested

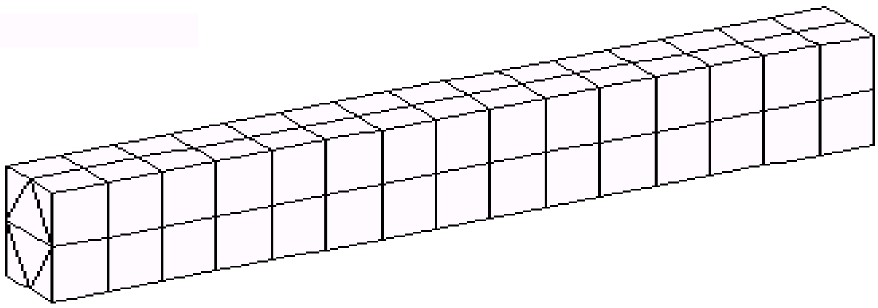
Localization	Sizes	Reference	tolerance
A	$p(réel, imag)$ Intensité_Acou	(– 6.2426, 0.0000) 0.0437	0.3% 3%
B	$p(réel, imag)$ Intensité_Acou	(– 6.2426, 0.0000) 0.0437	0.3% 3%
C	$p(réel, imag)$ Intensité_Acou	(6.0237, 1.6387) 0.0437	4% 3%
D	$p(réel, imag)$ Intensité_Acou	(6.0237, 1.6387) 0.0437	4% 3%

				Frequency	
Order of the clean mode i	m	n	p	**Reference**	**tolerance**
2	1	0	0	171.5	0.1%
3	2	0	0	343.0	0.2%
4	3	0	0	514.5	0.5%
5	4	0	0	686.0	1%
6	5	0	0	857.5	2%
7	0	0	1	857.5	3%
8	1	0	1	874,482	3%
9	2	0	1	923,556	3%

15 Modeling H

15.1 Characteristics of modeling

Formulation pressure elements `'ACOUSTIC' 3D` (`ACOU_PENTA15` and `ACOU_FACE6`)



Cutting = 15 meshs `PENTA15` according to the axis of x
2 meshs `PENTA15` according to the axis of y
2 meshs `PENTA15` according to the axis of z

Limiting conditions:

```
VITE_FACE:     (Group_ma: bicycle  Vnor: IH  0,014  0.)
IMPE_FACE:     (Group_ma: impe     Impe: IH  445.9  0.)
```

Name of the nodes $A=No28$ $B=No64$ $C=No24$ $D=No720$

15.2 Characteristics of the grid

Many nodes: 456
Many meshs and types: 90 `PENTA15` 12 `TRIA6`

16 Results of modeling H

16.1 Values tested

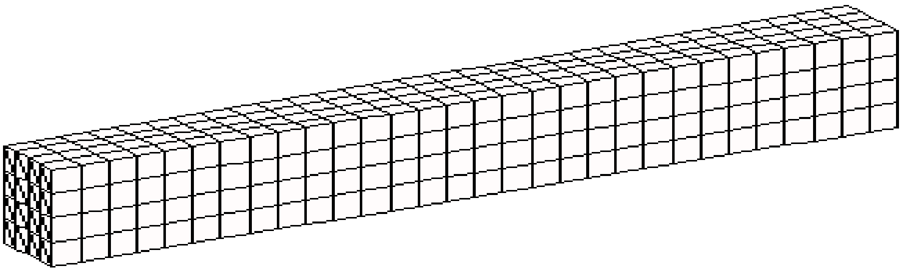
Localization	Sizes	Reference	tolerance
A	$p(réel, imag)$	(– 6.2426, 0.0000)	0.1%
	Intensité_Acou	0.0437	3%
B	$p(réel, imag)$	(– 6.2426, 0.0000)	0.1%
	Intensité_Acou	0.0437	3%
C	$p(réel, imag)$	(6.0237, 1.6387)	0.1%
	Intensité_Acou	0.0437	3%
D	$p(réel, imag)$	(6.0237, 1.6387)	0.1%
	Intensité_Acou	0.0437	3%

Order of the clean mode i	m	n	p	Frequency Reference	tolerance
2	1	0	0	171.5	0.01%
3	2	0	0	343.0	0.01%
4	3	0	0	514.5	0.1%
5	4	0	0	686.0	0.1%
6	5	0	0	857.5	0.1%
7	0	0	1	857.5	0.5%
8	1	0	1	874,482	0.5%
9	2	0	1	923,556	0.5%

17 Modeling I

17.1 Characteristics of modeling

Formulation pressure elements `'ACOUSTIC' 3D` (`ACOU_PENTA6` and `ACOU_FACE3`)



Cutting = 30 meshs `PENTA6` according to the axis of x
4 meshs `PENTA6` according to the axis of y
4 meshs `PENTA6` according to the axis of z

Limiting conditions:

```
VITE_FACE:     (Group_ma: bicycle  Vnor: IH  0,014  0.)
IMPE_FACE:     (Group_ma: impe     Impe: IH  445.9  0.)
```

Name of the nodes $A = No110$ $B = No156$ $C = No106$ $D = No939$

17.2 Characteristics of the grid

Many nodes: 775
Many meshs and types: 960 `PENTA6` 64 `TRIA3`

18 Results of modeling I

18.1 Values tested

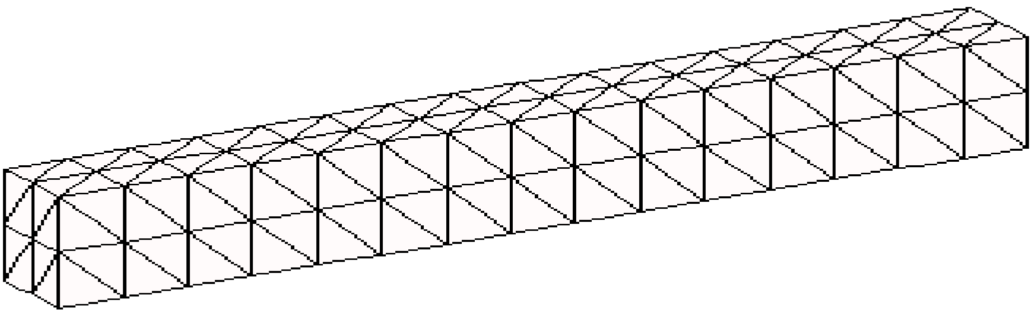
Localization	Sizes	Reference	tolerance
A	$p(réel, imag)$	(– 6.2426, 0.0000)	0.3%
	Intensité_Acou	0.0437	2%
B	$p(réel, imag)$	(– 6.2426, 0.0000)	0.3%
	Intensité_Acou	0.0437	2%
C	$p(réel, imag)$	(6.0237, 1.6387)	4%
	Intensité_Acou	0.0437	2%
D	$p(réel, imag)$	(6.0237, 1.6387)	4%
	Intensité_Acou	0.0437	2%

Order of the clean mode i	m	n	p	Frequency Reference	tolerance
2	1	0	0	171.5	0.1%
3	2	0	0	343.0	0.2%
4	3	0	0	514.5	0.5%
5	4	0	0	686.0	1%
6	5	0	0	857.5	2%
7	0	0	1	857.5	3%
8	1	0	1	874,482	3%
9	2	0	1	923,556	3%

19 Modeling J

19.1 Characteristics of modeling

Formulation pressure elements `'ACOUSTIC' 3D` (`ACOU_TETRA10` and `ACOU_FACE6`)



Cutting = 15 meshs `TETRA10` according to the axis of x
2 meshs `TETRA10` according to the axis of y
2 meshs `TETRA10` according to the axis of z

Limiting conditions:

```
VITE_FACE:     (Group_ma: bicycle  Vnor: IH  0,014  0.)
IMPE_FACE:     (Group_ma: impe     Impe: IH  445.9  0.)
```

Name of the nodes $A=No4$ $B=No76$ $C=No7$ $D=No73$

19.2 Characteristics of the grid

Many nodes: 870
Many meshs and types: 421 `TETRA10` 16 `TRIA6`

20 Results of modeling J

20.1 Values tested

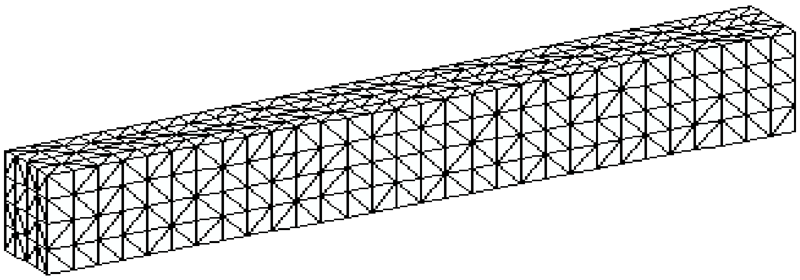
Localization	Sizes	Reference	tolerance
A	$p(réel, imag)$ Intensité_Acou	(– 6.2426, 0.0000) 0.0437	0.3% 3%
B	$p(réel, imag)$ Intensité_Acou	(– 6.2426, 0.0000) 0.0437	0.3% 4%
C	$p(réel, imag)$ Intensité_Acou	(6.0237, 1.6387) 0.0437	0.2% 2%
D	$p(réel, imag)$ Intensité_Acou	(6.0237, 1.6387) 0.0437	0.2% 3%

				Frequency	
Order of the clean mode i	m	n	p	Reference	tolerance
2	1	0	0	171.5	0.01%
3	2	0	0	343.0	0.01%
4	3	0	0	514.5	0.01%
5	4	0	0	686.0	0.1%
6	5	0	0	857.5	0.1%
7	0	0	1	857.5	0.5%
8	1	0	1	874,482	0.5%
9	2	0	1	923,556	0.5%

21 Modeling K

21.1 Characteristics of modeling

Formulation pressure elements `'ACOUSTIC' 3D` (`ACOU_TETRA4` and `ACOU_FACE`3)



Cutting =	30	meshs TETRA4 according to the axis of x
	4	meshs TETRA4 according to the axis of y
	4	meshs TETRA4 according to the axis of z

Limiting conditions:

```
VITE_FACE:     (Group_ma: bicycle  Vnor: IH  0,014  0.)
IMPE_FACE:     (Group_ma: impe     Impe: IH  445.9  0.)
```

Name of the nodes $A=No18$ $B=No521$ $C=No15$ $D=No1028$

21.2 Characteristics of the grid

Many nodes:	685
Many meshs and types:	2180 TETRA4 64 TRIA6

22 Results of modeling K

22.1 Values tested

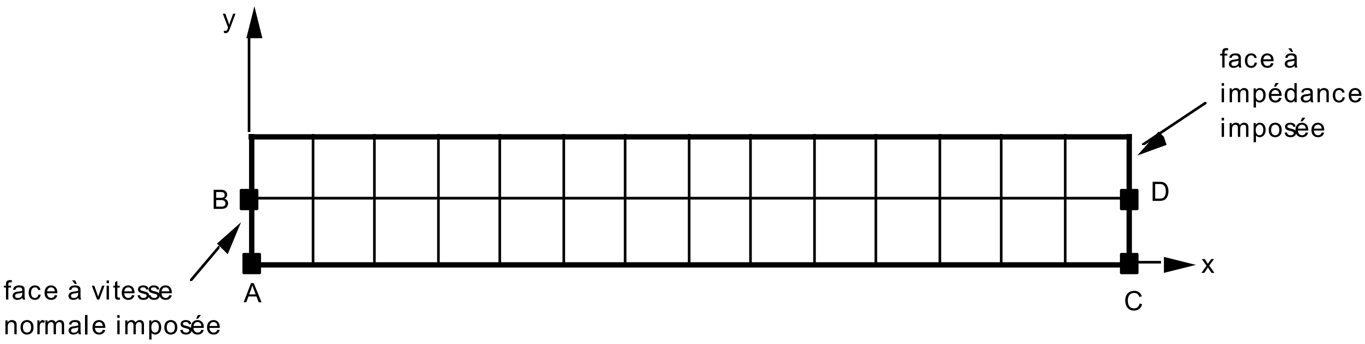
Localization	Sizes	Reference	tolerance
A	$p(réel, imag)$	(– 6.2426, 0.0000)	1%
	Intensité_Acou	0.0437	3%
B	$p(réel, imag)$	(– 6.2426, 0.0000)	2%
	Intensité_Acou	0.0437	3%
C	$p(réel, imag)$	(6.0237, 1.6387)	5%
	Intensité_Acou	0.0437	3%
D	$p(réel, imag)$	(6.0237, 1.6387)	5%
	Intensité_Acou	0.0437	3%

				Frequency	
Order of the clean mode i	m	n	p	Reference	tolerance
2	1	0	0	171.5	0.2%
3	2	0	0	343.0	0.3%
4	3	0	0	514.5	0.6%
5	4	0	0	686.0	1%
6	5	0	0	857.5	2%
7	0	0	1	857.5	3%
8	1	0	1	874,482	3%
9	2	0	1	923,556	4%

23 Modeling M

23.1 Characteristics of modeling

Formulation pressure elements `'ACOUSTIC' PLAN` (`SEG3` and `QUAD8`)



Cutting = 15 meshs `QUAD8` according to the axis of x
2 meshs `QUAD8` according to the axis of y

Limiting conditions:

```
VITE_FACE:    (Group_ma: Entry    Vnor: 0,014)
IMPE_FACE:    (Group_ma: Exit     Impe: 445.9)
```

Name of the nodes $A=No1$ $B=No33$ $C=No2$ $D=No34$

23.2 Characteristics of the grid

Many nodes: 125
Many meshs and types: 30 `QUAD8` 4 `SEG3`

24 Results of modeling M

24.1 Values tested

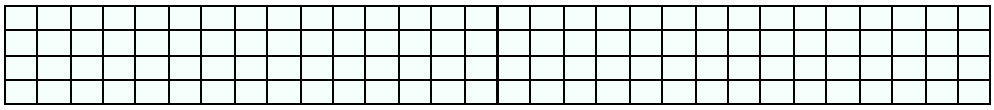
Localization	Sizes	Reference	tolerance
A	$p(réel)$	– 6.2426	0.1%
	$p(imag)$	0.0000	0.1%
	Acoustic intensity (reality)	0.0437	3%
	Acoustic intensity (imag)	0	3.5E-4
B	$p(réel)$	– 6.2426	0.1%

	$p(imag)$	0.0000	0.1%
	Acoustic intensity (reality)	0.0437	3%
	Acoustic intensity (imag)	0	3.5E-4
C	$p(réel)$	6.0237	0.1%
	$p(imag)$	1.6387	0.1%
	Acoustic intensity (reality)	0.04037	3%
	Acoustic intensity (imag)	0	3.5E-4
D	$p(réel)$	6.0237	0.1%
	$p(imag)$	1.6387	0.1%
	Acoustic intensity (reality)	0.0437	3%
	Acoustic intensity (imag)	0	3.5E-4

25 Modeling Q

25.1 Characteristics of modeling

Formulation pressure elements `'ACOUSTIC' PLAN` (`SEG2` and `QUAD4`)



Cutting = 30 meshs `QUAD4` according to the axis of x
4 meshs `QUAD4` according to the axis of y

Limiting conditions:

```
VITE_FACE:     (Group_ma: Entry   Vnor: 0,014)
IMPE_FACE:     (Group_ma: Exit    Impe: 445.9)
```

Name of the nodes $A=No1$ $B=No237$ $C=No2$ $D=No205$

25.2 Characteristics of the grid

Many nodes: 155
Many meshs and types: 120 `QUAD8` 8 `SEG2`

26 Results of modeling Q

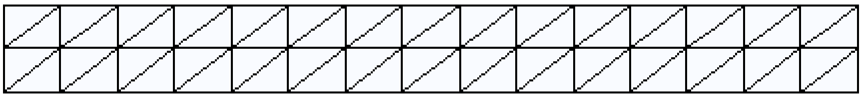
26.1 Values tested

Localization	Sizes	Reference	tolerance
A	$p(réel)$	– 6.2426	0.3%
	$p(imag)$	0.0000	0.3%
	Acoustic intensity (reality)	0.0437	1.5%
	Acoustic intensity (imag)	0	6.5E-3
B	$p(réel)$	– 6.2426	0.3%
	$p(imag)$	0.0000	0.3%
	Acoustic intensity (reality)	0.0437	1.5%
	Acoustic intensity (imag)	0	6.5E-3
C	$p(réel)$	6.0237	4%
	$p(imag)$	1.6387	4%
	Acoustic intensity (reality)	0.04037	1.5%
	Acoustic intensity (imag)	0	6.6E-4
D	$p(réel)$	6.0237	4%
	$p(imag)$	1.6387	4%
	Acoustic intensity (reality)	0.0437	1.5%
	Acoustic intensity (imag)	0	6.6E-3

27 Modeling R

27.1 Characteristics of modeling

Formulation pressure elements `'ACOUSTIC' PLAN` (`SEG3` and `TRIA6`)



Cutting = 15 meshs `TRIA6` according to the axis of x
2 meshs `TRIA6` according to the axis of y

Limiting conditions:

```
VITE_FACE:     (Group_ma: Entry    Vnor: 0,014)
IMPE_FACE:     (Group_ma: Exit     Impe: 445.9)
```

Name of the nodes $A=No1$ $B=No5$ $C=No2$ $D=No6$

27.2 Characteristics of the grid

Many nodes: 155
Many meshs and types: 60 `TRIA6` 4 `SEG3`

28 Results of modeling R

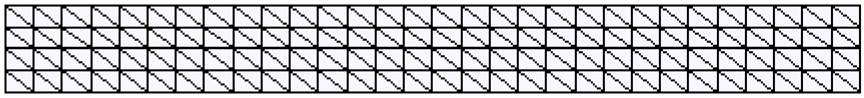
28.1 Values tested

Localization	Sizes	Reference	tolerance
A	$p(réel)$	– 6.2426	0.2%
	$p(imag)$	0.0000	0.2%
	Acoustic intensity (reality)	0.0437	3.5%
	Acoustic intensity (imag)	0	5.0E-3
B	$p(réel)$	– 6.2426	0.1%
	$p(imag)$	0.0000	0.1%
	Acoustic intensity (reality)	0.0437	3.5%
	Acoustic intensity (imag)	0	4.5E-3
C	$p(réel)$	6.0237	0.3%
	$p(imag)$	1.6387	0.3%
	Acoustic intensity (reality)	0.04037	2.0%
	Acoustic intensity (imag)	0	2.5E-4
D	$p(réel)$	6.0237	0.1%
	$p(imag)$	1.6387	0.1%
	Acoustic intensity (reality)	0.0437	2.5%
	Acoustic intensity (imag)	0	3.5E-4

29 Modeling S

29.1 Characteristics of modeling

Formulation pressure elements `'ACOUSTIC' PLAN` (`SEG2` and `TRIA3`)



Cutting = 30 meshs `TRIA3` according to the axis of x
4 meshs `TRIA3` according to the axis of y

Limiting conditions:

```
VITE_FACE:    (Group_ma: Entry   Vnor: 0,014)
IMPE_FACE:    (Group_ma: Exit    Impe: 445.9)
```

Name of the nodes $A=No1$ $B=No237$ $C=No2$ $D=No205$

29.2 Characteristics of the grid

Many nodes: 155
Many meshs and types: 240 `TRIA3` 8 `SEG2`

30 Results of modeling S

30.1 Values tested

Localization	Sizes	Reference	tolerance
A	$p(réel)$	– 6.2426	1.0%
	$p(imag)$	0.0000	1.0%
	Acoustic intensity (reality)	0.0437	3.0%
	Acoustic intensity (imag)	0	6.0E-3
B	$p(réel)$	– 6.2426	0.1%
	$p(imag)$	0.0000	0.1%
	Acoustic intensity (reality)	0.0437	2.5%
	Acoustic intensity (imag)	0	6.5E-3
C	$p(réel)$	6.0237	7%
	$p(imag)$	1.6387	7%
	Acoustic intensity (reality)	0.04037	1.0%
	Acoustic intensity (imag)	0	7.0E-3
D	$p(réel)$	6.0237	6%
	$p(imag)$	1.6387	6%
	Acoustic intensity (reality)	0.0437	2.5%
	Acoustic intensity (imag)	0	7.0E-3

31 Modeling T

31.1 Characteristics of modeling

One takes again modeling A completely by modifying only celerity CELE_C material: its real part remains unchanged with $343\,m.s^{-1}$ whereas the imaginary part passes from 0 with $10\,m.s^{-1}$.

32 Results of modeling T

32.1 Values tested

One analyzes the same sizes as for modeling A, but only for tests of non- regression.

33 Summary of the results

Modelings give the expected results.

In modelings using of the tetrahedrons or the triangles, the distribution of the pressures is less uniform than in the other cases, consequence of the non-uniformity of the grid.