

## SDLS123 – Right beam with damping of Rayleigh (elastic behavior)

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### Summary:

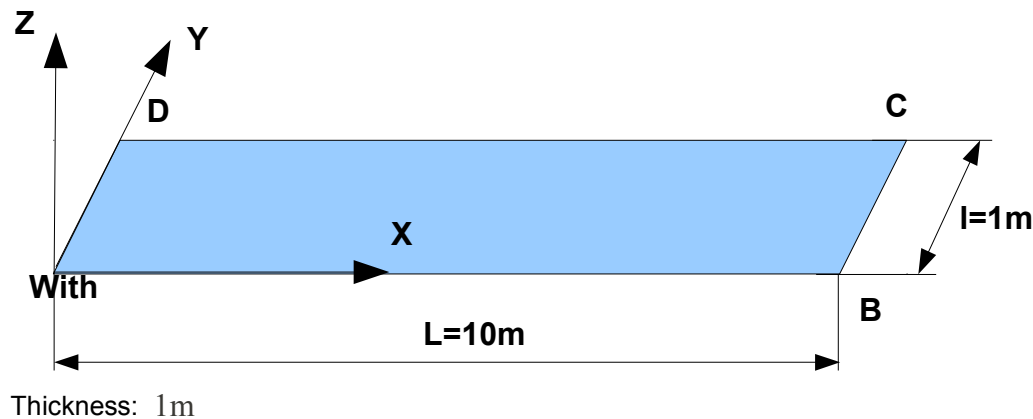
This test represents dynamic calculation with damping of Rayleigh of a right beam, embedded at the two ends and subjected to a constant pressure.

Two modelings are carried out:

- 1) Modeling `With` allows to test the model `Q4GG` with `QUAD4`,
- 2) Modeling `B` allows to test the model `Q4GG` with `TRIA3`.

## 1 Problem of reference

### 1.1 Geometry



### 1.2 Material properties

The mechanical properties are the following ones:

- Young modulus  $E = 3.5 \times 10^{10} Pa$
- Poisson's ratio  $\nu = 0,2$
- Density  $\rho = 2500 Kg/m^3$
- $\alpha = AMOR\_ALPHA = 6.69 \times 10^{-5}$
- $\beta = AMOR\_BETA = 20.06$

### 1.3 Boundary conditions and loadings

- Embedding on with dimensions ones  $AD$  and  $BC$  :  
 $DX = DY = DZ = DRX = DRY = DRZ = 0$  ;
- The pressure distributed uniformly on the beam grows linearly until  $0.1 ms$  then remains constant and equal to  $p = 10^5 Pa$  until the end of calculation (  $1.0 ms$  ).

### 1.4 Initial conditions

The beam is initially at rest in a virgin state.

## 2 Reference solution

### 2.1 Method of calculating used for the reference solution

The results of reference were got with Europlexus.

The grids used by Europlexus and Code\_Aster are the same ones.

### 2.2 Results of reference

The results of reference corresponds to following displacement  $Z$  node  $N9$  located at the center of the beam. They were obtained at the moment  $t=0.001s$ .

Size	Localization	Europlexus elements	
		Q4GS	T3GS
Following displacement $Z$	$X=5.m$	$-1.79497 \times 10^{-5} m$	$-1.79508 \times 10^{-5} m$
Speed according to $Z$	$X=5.m$	$-3.76207 \times 10^{-2} m/s$	$-3.76309 \times 10^{-2} m/s$
Acceleration according to $Z$	$X=5.m$	$-39.09299 m/s^2$	$-39.17340 m/s^2$

### 2.3 Uncertainty on the solution

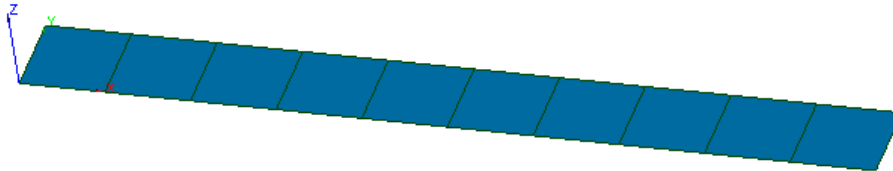
Digital solution.

### 2.4 Bibliographical references

- [1] MARKOVIC D., "Establishment of a new finite element of thick hull (T3GS) in Europlexus", Notes EDF/R & D /AMA H-T-62-2008-00080-FR.

## 3 Modeling A

### 3.1 Characteristics of modeling



### 3.2 Characteristics of the grid

Many nodes: 22  
Number of meshes and type: 10 QUAD4

### 3.3 Sizes tested and results

Moment (S)	Size	Component	Node	Type of Reference	Value of reference	Precision (%)
$t=0.001s$	DEPL	DZ	N9	'SOURCE EXTERNE'	$-1.79497 \times 10^{-5} m$	1.0
$t=0.001s$	QUICKLY	DZ	N9	'SOURCE EXTERNE'	$-3.76207 \times 10^{-2} m/s$	1.0
$t=0.001s$	ACCE	DZ	N9	'SOURCE EXTERNE'	$-39.09299 m/s^2$	2.5

### 3.4 Remarks

Calculations were carried out with a diagram of temporal integration explicit of differences type finished centered with a matrix masses diagonal (MASS\_DIAG=' OUI ' under DYNA\_NON\_LINE).

## 4 Modeling B

### 4.1 Characteristics of modeling



### 4.2 Characteristics of the grid

Many nodes: 22

Number of meshes and type: 20 TRIA3

### 4.3 Sizes tested and results

Moment (S)	Size	Component	Node	Type of Reference	Value of reference	Precision (%)
$t=0.001s$	DEPL	DZ	N9	'SOURCE EXTERNE'	$-1.79508 \times 10^{-5} m$	1.0
$t=0.001s$	QUICKLY	DZ	N9	'SOURCE EXTERNE'	$-3.76309 \times 10^{-2} m/s$	1.0
$t=0.001s$	ACCE	DZ	N9	'SOURCE EXTERNE'	$-39.17340 m/s^2$	1.0

### 4.4 Remarks

Calculations were carried out with a diagram of temporal integration explicit of differences type finished centered with a matrix masses diagonal (MASS\_DIAG=' OUI ' under DYNA\_NON\_LINE).

## 5 Summary of the results

The got results are satisfactory.

On the figures below, we traced the evolution of displacement, speed and the acceleration in the center of the beam according to time. This answer is compared with that obtained with Europlexus (EPX).

