

---

## MUMPS01 - Validation of solver MUMPS

---

### Summary:

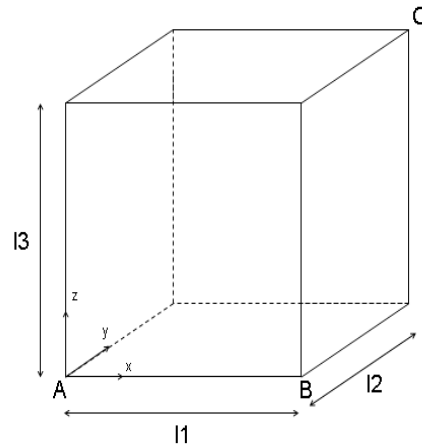
This CAS-test makes it possible to validate the solver MUMPS under various configurations:

- Taking into account or not of Dirichlets (AFFE\_CHAR\_CINE/MECA)
- Taking into account of the options of the type of problem of MUMPS (SYMDEF/SYMGEN/NONSYM)
- Modification of the value of the keyword PARALLELISM (CENTRALIZE, MAIL\_DISPERSER, SOUS\_DOMAINE).

## 1 Problem of reference

---

### 1.1 Geometry



Coordinates of the points ( $m$ ) :

$$\begin{aligned} A &: (0., 0., 0.) \\ B &: (10., 0., 0.) \\ C &: (10., 10., 10.) \end{aligned}$$

Geometry of the cube ( $m$ ) :

$$l1 = l2 = l3 = 10.$$

Group of meshes:

*base1* : lower surface of the cube (plan  $XOY$ )

### 1.2 Properties of material

- $E = 1.0 \text{ E}5 \text{ N/m}^2$
- $\nu = 0.3$
- $\rho = 9800. \text{ Kg/m}^{-3}$

### 1.3 Boundary conditions and loadings

- Imposed displacements:
  - *base1* :  $DX = 10. , DY = DZ = 0.$
- Loading imposed:
  - Gravity according to  $-z$   $g = 9.81 \text{ ms}^{-2}$

# Code\_Aster

Version  
default

Titre : MUMPS01 - Validation du solveur MUMPS  
Responsable : BOITEAU Olivier

Date : 26/01/2010 Page : 3/6  
Clé : V1.04.111 Révision :  
61703075eb59

## 2 Reference solution

---

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

The reference solution was obtained with the operator `MECA_STATIQUE` (`MULT_FRONT` and `MONGREL`).

### 2.2 Sizes and results of reference

The reference variable used is displacement according to the axis  $z$  with the node  $C$ .

Displacement at the point  $C$  :  $DZ = -41,6 E-3 \text{ m}$ .

### 2.3 Configurations of solver tested

- # 1 : calculation of reference (MONGREL)
- # 2.1: MUMPS (centralized) charges dualized + kinematic load + SYMGEN
- # 2.2: MUMPS (centralized) charges kinematic + SYMDEF
- # 2.3: MUMPS (centralized) charges dualized + kinematic load + NONSYM
- # 3.1: MUMPS (distributed by meshes) charges dualized + kinematic load + SYMGEN
- # 3.2: MUMPS (distributed by meshes) charges kinematic + SYMDEF
- # 3.3: MUMPS (distributed by meshes) charges dualized + kinematic load + NONSYM
- # 4.1: MUMPS (distributed by under-fields) charges dualized + kinematic load + SYMGEN
- # 4.2: MUMPS (distributed by under-fields) charges kinematic + SYMDEF
- # 4.3: MUMPS (distributed by under-fields) charges dualized + kinematic load + NONSYM

## 3 Modeling A

---

### 3.1 Characteristics of modeling A

Modeling 3D :

Many nodes	125	
Many meshes	84	That is to say:
		SEG2 4
		QUAD4 16
		HEXA8 64

### 3.2 Results

Points	Size	Reference (m)	Tolerance (%)
<i>C</i>	<i>DZ</i>	$-41.6 E-3$	$1.00 E-06$

## 4 Summary of the results

---

This CAS-test shows the good performance of the solver MUMPS in the various studied cases.