Operator AFFE_CHAR_MECA_C

1 Drank

To affect loadings and mechanical boundary conditions of complex **type**.

This operator supplements operators AFFE_CHAR_MECA and AFFE_CHAR_MECA_F [U4.44.01] which make it possible to affect loadings and mechanical boundary conditions of real **type**.

This operator must be used, during a harmonic study (operator DYNA_LINE_HARM [U4.53.11]), to impose of the different phase shifts, either between each element of the model, or between the various degrees of freedom within the same element.

2 General syntax

```
CH  [char_meca] = AFFE_CHAR_MECA_C

           (  ♦ MODELE=mo ,                                          [model]
                |  DDL_IMPO = _F        (see key word DDL_IMPO     [§ 3.4])
                |  LIAISON_DDL = _F     (see key word LIAISON_DDL  [§ 3.5])
                |  FORCE_POUTRE = _F    (see key word FORCE_POUTRE    [§
3.6])

             ◊INFO   =/1            ,
[DEFAULT]
                              /2 ,

           )
```

3 Operands

3.1 General information on the operands

3.1.1 Two categories of operands

the operands under a key word factor are of two forms:

- operands specifying the geometrical entities on which the loadings are affected (key words GROUP_NO, GROUP_MA, etc…),
- operands specifying the affected values (DX, DY, etc…). The arguments of these operands are all of the complex type.
  This is true near with an exception: the argument of COEF_MULT for the key word factor LIAISON_DDL is obligatorily of real type.

3.1.2 Designation of the topological entities of assignment of the loadings

In a general way, the entities on which values must be affected are defined:

- on all the mesh by the operand TOUT = "YES"
- by node and in this case:
  - either by operand GROUP_NO allowing to introduce a list of nodes groups,
  - or by the operand NOEUD allowing to introduce one nodes list.
- by mesh and in this case:
  - either by GROUP_MA allowing to introduce a list of mesh groups,
  - or by MESH allowing to introduce a list of meshes.

3.1.3 Regulate of overload

to define the field of assignment most simply possible, one uses **the rule of overload** defined in the document "Course of a study with *Aster*" :
it is the last assignment which precedes.

3.2 MODEL operand

♦MODELE =mo

Product concept by the operator AFFE_MODELE [U4.41.01] where definite affected ones on the mesh the are element types finished.

3.3 Operand INFO

◊INFO =

Level of the printings on the file "MESSAGE"

1 : nothing
2 : nothing

3.4 Key word DDL_IMPO

3.4.1 Drank

Key word factor usable to impose, with nodes or nodes groups or nodes of meshes or mesh groups, one or more values of displacement (or certain associated quantities).

3.4.2 Syntax

```
| DDL_IMPO = _F (                      ♦/TOUT=' OUI',
                       /   |  NOEUD=       lno,          [l_noeud]
                           |  GROUP_NO=    lgno,         [l_gr_noeud]
                           |  GROUP_MA=    lgma,         [l_gr_maille]
                           |  NET =     my,           [l_maille]
                     ♦     |  DX=ux           ,               [C]
                           |  DY=uy           ,               [C]
                           |  DZ=zu           ,               [C]
                           |  DRX=theta        _x,          [C]
                           |  DRY=theta        _y,          [C]
                           |  DRZ=theta        _z,          [C]
                           |  GRX=g        ,               [C]
                           |  PRES=p       ,               [C]
                           |  PHI=phi         ,             [C]
                           |  LIAISON=      `ENCASTRE'      [TXM]
                    )
```

3.4.3 Operands: choice of the degree of freedom

| DDL_IMPO

All the specified values are defined in **reference GLOBAL** of definition of the mesh.

DX = ux DY = uy DZ = uz	Valeur of the component of displacement in **translation** imposed on the Only specified

nodes if the specified nodes belong to discrete elements of translation - rotation and **beam:**

DRX = theta_x DRY = theta_y DRZ = theta_z	Value of the component of displacement in **rotation** imposed on the Only specified

nodes if the specified nodes belong to beam elements "POU_D_TG":

GRX = G	Value of the warping of the beam

Only if the specified nodes belong to elements fluid or fluid structure:

PRES= p	Pressure acoustic in the fluid (modelization "3D_FLUIDE")
PHI= Potential	phi of displacements of the fluid (modelizations "3D_FLUIDE" and "FLUI_STRU")

Only if the specified nodes belong to surface elements free:

DZ = uz	Déplacement imposed of the free face (modelization "2D_FLUI_PESA")
PHI = Potential	phi of displacements of the fluid (modelization "2D_FLUI_PESA")

If one wants to carry out a fixed support:

LIAISON= `ENCASTRE'	For the specified nodes, all the components of displacement in translation (and if necessary in rotation) will be null.

3.4.4 Checks and recommendations

It is checked that the specified degree of freedom exists in this node for the elements assigned in the model to meshes which contain the node.

However, if the same boundary condition is specified twice by two calls to AFFE_CHAR_MECA_C (for example, with two values of imposed displacement), that led to a matrix singular.

If it is specified twice (or more) in only one call to AFFE_CHAR_MECA_C, the rule of overload applies and an alarm message (indicating the overload) is transmitted.

3.5 Key word LIAISON_DDL

3.5.1 Drank

Key word factor usable to define a linear relation between degrees of freedom of two or several nodes.

3.5.2 Syntax

```
LIAISON_DDL = _F  (  ♦/NOEUD       =lno            ,       [l_noeud]
                        /GROUP_NO  =lgno       ,       [l_gr_noeud]
                     ♦   DDL=      |            "DX",
                                   |            "DY",
                                   |            "DZ",
                                   |            "DRX",
                                   |            "DRY",
                                   |            "DRZ",
                                   |            …
                     ♦COEF_MULT    =alphai            ,    [l_R]
                     ♦   COEF_IMPO =beta            ,      [C]
                  )
```

3.5.3 Operands

GROUP_NO or THE NODE IS OUTSIDE THE FIELD OF DEFINITION WITH A RIGHT PROFILE OF THE EXCLU TYPE NODE: list nodes $N_i(i=1,\dots,r)$ ordered in a natural way:

- in the order of the list of nodes groups, and for each nodes group, in the order of definition of the group by GROUP_NO,
- in the order of nodes list for NOEUD.

DDL : list degrees of freedom $U_i(i=1,\dots,r)$ of r texts taken among:

"DX", "DY", "DZ", "DRX", "DRY", "DRZ"

COEF_MULT : list $\alpha_i(i=1,\dots,r)$ coefficients of the real type.

COEF_IMPO : coefficient β of the complex type.

The following kinematical condition will be applied: $\sum_{i=1}^{r} \alpha_i U_i = \beta$

3.5.4 Component precautions of

3.5.4.1 use in rotation

the components of displacement in rotation DRX DRY, DRZ can intervene only in combinations only **assigned** to nodes which belong to discrete elements or of **beam** (see DDL_IMPO).

3.5.4.2 Relation linear between the degrees of freedom of the same node

In this cas particulier, one will repeat behind the key word NOEUD the name of the node as many times as there are degrees of freedom in the relation. Example: to impose $U_x = U_y$ on the node $N1$, one will write:

```
LIAISON_DDL = _F  ( NOEUD =        ("N1", "N1"),
                    DDL =          ("DX" "DY"),
                    COEF_MULT =    (1. , - 1.),
                    COEF_IMPO =    (RI0  .,   0.),
                  )
```

3.5.4.3 Relation linear between nodes groups

It is important to note that to an occurrence of the key word factor LIAISON_DDL corresponds one and only one linear relation.

If one wants to impose the same relation between 2 nodes groups GRN01 and GRN02 (even node U_x displacement with node for example) one cannot write:

```
LIAISON_DDL = _F ( GROUP_NO = ("GRNO1", "GRNO2"),
                   DDL =   ("DX", "DX"),
                   COEF_MULT =    (1. , -1.),
                   COEF_IMPO =    (RI0  .,   0.)   ,    )
```

This writing has meaning only if GRNO1 and GRNO2 contain each one one node. It will be necessary in the case to clarify each linear relation above, node by node.

3.6 Key word FORCE_POUTRE

3.6.1 Drank

Key word factor usable to apply linear **forces**, to elements of type beam (POU_D_T_, POU_D_E,...) defined on all the mesh or one or more meshes or of the mesh groups. The forces are definite component by component, either in reference GLOBAL, or in the local coordinate system of the element defined by the operator AFFE_CARA_ELEM [U4.42.01].

3.6.2 Syntax

```
FORCE_POUTRE =_F    (  ♦/TOUT           =          ' OUI',
                       /   |  NET =lma      ,          [l_maille]
                           |     GROUP_MA=lgma,          [l_gr_maille]
                     ♦/    |  FX=fx            ,            [C]
                           |  FY=fy            ,            [C]
                           |  FZ=fz            ,            [C]
                       /   |  N=n           ,             [C]
                           |  VY=vy            ,            [C]
                           |  VZ=vz            ,            [C]
                     ◊TYPE_CHARGE  =         "FORCE",     [DEFAULT]
                                         /   "VENT"
                  )
```

3.6.3 Operands: forces

♦/ | fx : Force according to x (total reference) [C]
| fy : Force according to y (total reference) [C]
| fz : Force according to z (total reference) [C]
/ | N : Force of traction and compression (local coordinate system) [C]
| vy : Following transverse force Y (local coordinate system) [C]
| vz : Following transverse force Z (local coordinate system) [C]

Let us note that one must remain homogeneous in each occurrence of the key word factor FORCE_POUTRE : either all the components are defined in reference GLOBAL or all the components are defined in the reference of definition of the beam.

3.6.4 Modelizations and meshes

This loading applies to the types of meshes and the following modelizations:

Net	Modelization
SEG2	POU_D_T, POU_C_T, POU_D_E

This loading is not currently available for modelization POU_D_TG.

3.6.5 Operand TYPE_CHARGE

```
◊TYPE_CHARGE   =      "FORCE",
                  /   "VENT",
```

If the excitation exerted on the beam element is due to the wind, it is then regarded as following.