Code_Aster

Titre : Opérateur PROJ_SPEC_BASE
Responsable : Hassan BERRO

Version default

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Operator `PROJ_SPEC_BASE`

1   Drank

To project one or more spectrums of turbulence on one (or several) bases (S) modal (S). The spectrums are defined by the operator `DEFI_SPEC_TURB` [U4.44.31]. (Or them) bases (S) modal (S) can or (can) to be defined by:

- a concept of the melasflu `type` produces CALC_FLUI_STRU [U4.66.02] by the operator,
- a concept of the mode_meca `type` by the operator produces MODE_ITER_INV [U4.52.04] or MODE_ITER_SIMULT [U4.52.03],
- a list of concepts of the cham_no_depl_r `type` corresponding to the deformed shapes.

Allows to calculate for each definite modal base an interspectral matrix of generalized excitations. An option makes it possible if necessary to calculate only the autospectrums.

The product concept is of standard `interspectrum`.

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2   Syntax

```
tinsp   [interspectrum] = PROJ_SPEC_BASE

    (  ♦SPEC_TURB=l_spec                        ,            [l_spectre]

       ♦/BASE_ELAS_FLUI=baseflui              ,        [melasflu]
            ♦VITE_FLUI=vitefl                         [R]
            ◊PRECISION=/            1.E-3             [DEFAULT]
                       /prec                 [R]
        /MODE_MECA          =basemeca      ,       [mode_meca]
        /CHAM_NO         =l_cham         ,
[l_cham_no_DEPL_R]

       ◊   MODELE_INTERFACE=modele              ,          [model]

       ♦   /GROUP_MA         =grma     ,          [gr_maille]
           /MAILLE           =ma                    [mesh]
           /TOUT             =      ' OUI',

       ◊   VECT_X=l_cmpx                   ,        [l_R]
       ◊   VECT_Y=l_cmpy                   ,        [l_R]
       ◊   ORIG_AXE=l_coor                ,        [l_R]

       ♦   FREQ_INIT=fi            ,           [R]
       ♦FREQ_FIN=ff               ,           [R]
       ♦   NB_POIN=np             ,           [I]

       ◊TOUT_CMP=/                  "YES"          [DEFAULT]
                 /   "NON",

       ◊OPTION=/                    "TOUT"         [DEFAULT]
               /   "DIAG",

       ◊TITER=titer                       ,          [TXM]

    )
```

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3 Operands

3.1 Operand SPEC_TURB

♦SPEC_TURB   = l_spec

List of concepts of type spectrum produced by the operator DEFI_SPEC_TURB [U4.44.31] defining several excitation spectrums turbulent.

Note:

1) *Operand SPEC_TURB allows the taking into account of several excitation spectrums turbulent. The interspectrums of generalized excitations are calculated for each provided physical spectrum then are added.*

2) *The spectrums of turbulence of type "correlation length" apply only to the tubes of steam generators. It is possible simultaneously to project several spectrums of turbulence of type "correlation length", but the excitation zones of each spectrum must be strictly disjoined from/ to each other. The zones to which these excitations apply are defined for each spectrum, with command DEFI_SPEC_TURB [U4.44.31].*

3) *The spectrums of turbulence of type "correlation length" cannot be combined with spectrums of another type.*

4) *In the case of a spectrum of the type SPEC_CORR_CONV_3, double projection is very consuming resources, because it is necessary to buckle on the directions, meshes, their points of gauss and the modes (double loop), and each time to evaluate the analytical function having defined the spectrum. One advises to use this kind of spectrum on the reduced meshes (less than 1000 degrees of freedom), while starting with a small number of points of frequential discretization to evaluate the computing time.*

3.2 Operand BASE_ELAS_FLUI

operand BASE_ELAS_FLUI is employed when one wishes to carry out the projection of a spectrum defined by one of the key words SPEC_LONG_COR_n factors, SPEC_FONC_FORME or SPEC_EXCI_POINT of operator DEFI_SPEC_TURB [U4.44.31]. In this case, one must inform the velocity of the fluid vitefl.

♦/BASE_ELAS_FLUI   = baseflui

Concept of the type melasflu produces by the operator CALC_FLUI_STRU [U4.66.02], which defines one or a set of modal bases on which or (which) the spectrums are projected, as well as the discretization of velocity.

The operator calculates a matrix of interspectrums of generalized excitations $S_{fifj}^{k}(\omega)$ corresponding at the speed of the fluid vitefl which one must inform.

The concept melasflu provides moreover the name of the concept type_flui_stru produces at the beginning of study by the command DEFI_FLUI_STRU [U4.25.01]. The concept type_flui_stru contains all information characteristic of the studied configuration: one finds there inter alia the data necessary to the dimensionnalisation of the projected excitation.

3.3 Key word VITE_FLUI

operand VITE_FLUI must be indicated if one uses a base of the melasflu type.

♦   VITE_FLUI = vitefl

Rate of flow of the fluid for the computation of response.

3.4 Key word accuracy

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◊ accuracy = prec

Accuracy on the rate of flow of the fluid (by default 1 E-3).

3.5 Operands MODE_MECA or CHAM_NO

operands MODE_MECA or CHAM_NO are employed when one wishes to carry out the projection of a spectrum of pressure defined by one of the key words SPEC_CORR_CONV_n factors of operator DEFI_SPEC_TURB [U4.44.31].

/MODE_MECA = basemeca

Concept of the mode_meca type by the operator produces MODE_ITER_INV [U4.52.04] or MODE_ITER_SIMULT [U4.52.03], which defines modal base on which the spectrums are projected. This modal base was possibly calculated by taking account of an effect of added mass fluid, by recourse to operator CALC_MATR_AJOU [U4.66.01] or MACRO_MATR_AJOU [U4.66.11].

/CHAM_NO = l_cham

List of concepts of the cham_no_depl_r type, which define the deformed shapes of modal base on which the spectrums are projected.

This way define modal base makes it possible to impose on structure a particular type of motion; a similar approach is adopted in operator CALC_MATR_AJOU [U4.66.01], where figure also operand CHAM_NO.

Note:

The operator determines the matrix of mutual acceptance on the structure connecting the acting spectrum of pressure to the interspectral matrix of generalized excitations:

$$S_{fifj}(\omega) = S_p(\omega) \times J_{Aij}(\omega)$$

where
- $S_p(\omega)$ *is the power spectral density of pressure,*
- $J_{Aij}(\omega)$ *is the matrix of mutual acceptance,*
- $S_{fifj}(\omega)$ *is the matrix of the interspectrums of generalized excitations.*

Note:

- *If modal base is defined by a list of the fields in the nodes (key word CHAM_NO), it is imperative to inform the model mechanical associated with the elements to which the projection of the spectrum must apply (by the key word MODELE_INTERFACE).*
- *If a modal base of the mode_meca type is given and if the structure is modelled in thin shells of type DKT , it is not compulsory to inform key word MODELE_INTERFACE .*

The theoretical precise details are given in internal report HP-51/97/027/B.

3.6 Operand MODELE_INTERFACE

operand MODELE_INTERFACE is employed when one wishes to carry out the projection of a spectrum of pressure defined by one of the key words SPEC_CORR_CONV_n factors of operator DEFI_SPEC_TURB [U4.44.31].

◊MODELE_INTERFACE = model

Concept of the model type produces AFFE_MODELE [U4.41.01] by the operator, defining:

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1.That is to say the model (thermal) of interface enters the structure and the fluid used beforehand for computation of the matrixes added by CALC_MATR_AJOU [U4.66.01] or MACRO_MATR_AJOU [U4.66.11].
2.That is to say the model mechanical of structure if this one is modelled by thin shell elements (DKT).

Note:

If a thermal model of interface is defined, the computation of the coefficients of acceptance is carried out using this model, which characterizes the wet surface of structure, by making the assumption of a homogeneous turbulence on all the interface fluid-structure.

If the model given is mechanical, the coefficients of acceptance can be calculated on the structure, provided that this one is modelled in thin shells of type DKT .

If key word MODELE_INTERFACE is not indicated, the model mechanical used is that which is associated with the stiffness matrix, referred in the modal base of projection.

Note:

If the spectrum were defined analytically with option SPEC_CORR_CONV_3 , the model of interface must obligatorily be indicated, because projection is by means of made the shape functions carried by the elements of the model.

3.7   Operand GROUP_MA/MAILLE/TOUT

operand GROUP_MA is employed when one wishes to carry out the projection of a spectrum of pressure defined by one of the key words SPEC_CORR_CONV_n factors of operator DEFI_SPEC_TURB [U4.44.31].

♦GROUP_MA/MAILLE/TOUT

Lists mesh groups, of meshes, or totality of the mesh, on which projection will be carried out. The mesh groups (or numbers of meshes) must be part of the mesh associated with the model (thermal or mechanical) used for computation with the coefficient with acceptance.

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3.8 Operand VECT_X

operand VECT_X is employed when one wishes to carry out the projection of a spectrum of pressure defined by one of the key words SPEC_CORR_CONV_n factors of operator DEFI_SPEC_TURB [U4.44.31], if the correlations of CORCOS or AU_YANG are used.

◊   VECT_X = l_cmpx

List of three components of an unit vector x defining:

- the direction of flow on the surface of structure planes, in the case of a correlation of CORCOS,
- the direction of the axis of revolution of cylindrical structure of circular section, in the case of a correlation of AU_YANG.
(see diagrams hereafter)

3.9 Operand VECT_Y

operand VECT_Y is employed when one wishes to carry out the projection of a spectrum of pressure defined by one of the key words SPEC_CORR_CONV_n factors of operator DEFI_SPEC_TURB [U4.44.31], if the correlation of CORCOS is used.
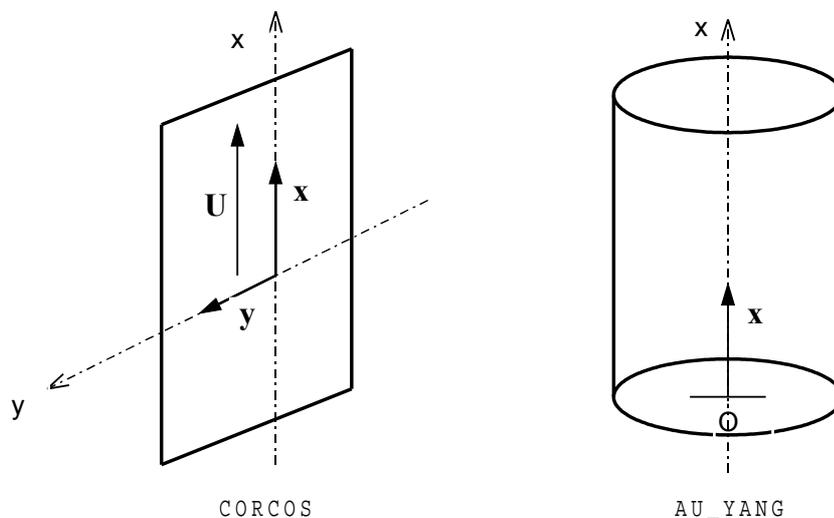
◊VECT_Y   = l_cmpy

List of the three components of an unit vector y defining the orthogonal direction in the direction of flow on the surface of plane structure (see diagrams hereafter).

3.10 Operand ORIG_AXE

operand ORIG_AXE is employed when one wishes to carry out the projection of a spectrum of pressure defined by one of the key words SPEC_CORR_CONV_n factors of operator DEFI_SPEC_TURB [U4.44.31], if the correlation of AU_YANG is used.

◊ORIG_AXE = l_coor

List of the three coordinates defining the position of an origin O on the axis of revolution of cylindrical structure of circular section (see diagrams hereafter).

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3.11 Operands `FREQ_INIT`, `FREQ_FIN` and `NB_POIN`

♦FREQ_INIT   = fi
♦FREQ_FIN = FF
♦NB_POIN   = Np

These operands define the bande de fréquence and the number of points of frequential discretization of the interspectrums in calculating. The number of points of discretization must be equal to a power of 2, in order to allow postprocessings of type FFT (Fast Fourier Transform). It is recommended to calculate these three elements according to the following method.

If $\left(f_1^k, \dots, f_N^k \right)$ indicate the frequencies of the modes of k the ème bases structure then:

$$\text{FREQ\_INIT} = \min_k \left(\frac{f_1^k}{2} \right) \quad \text{FREQ\_FIN} = \max_k \left(f_N^k + \frac{f_1^k}{2} \right)$$

The number of points of discretization can then be deduced from the minimum step in frequency defined by:

$$df = \min_{i,k} \left(2 \times \pi \times \mu_i^k \times f_i^k \right)$$

where μ_i^k indicates the reduced damping of i the ème mode of k the ème modal base.

3.12 Operand `TOUT_CMP`

◊TOUT_CMP = "YES" or "NON"

Indicator of the components of the modal deformed shapes which one to compute: adopts them inter - excitation spectrums on modal base:

- "YES"   one uses the three components in translation,
- "NON"   one uses only the component in translation which was defined prior to the assistance of operator `DEFI_FLUI_STRU`.

3.13 Operand `OPTION`

◊OPTION   = "TOUT" or "DIAG"

Indicator of the choice of computation to be realized:

- "TOUT"   if one wishes to calculate all the interspectrums of generalized excitations (default option),
- "DIAG"   if one wishes to calculate only the autospectrums of generalized excitations.

3.14 Operand `TITER`

◊TITER = title

Argument of type text defining the title attached to the concept `interspectrum` in output.