Macro-order CALC_ESSAI

1 Goal

Launching of the macro-order CALC_ESSAI, which allows, through a graphic interface, of launching calculations of identification and expansion on telegraphic telegraphic structures and of launching calculations of structural modification:

- expansion of experimental data on basis of digital deformations, by using the macro-order MACRO_EXPANS (which carries out the elementary operations EXTR_MODE, PROJ_MESU_MODAL, REST_GENE_PHYS and PROJ_CHAMP),
- identification of efforts on an unspecified structure, with decomposition of the movement on modal base and localization *a priori* loadings,
- structural modification: to evaluate the effect of a modification knowing the experimental modal model of the initial structure and the model with the finite elements of the made modification,
- treatment of the signal: to control the operator CALC_SPEC to calculate inter-spectra, auto-- spectra and FRF starting from temporal signals,
- visualization of the modal deformations, generation of FRF “blow of hammer”, visualization of spectra and matrices of MAC (via Salomé or GMSH/Xmgrace/Tk).

Contents

2 Syntax

```
CALC_ESSAI (

      ◊ INTERACTIVE =/'YES',                                    [DEFECT]
                     /'NOT',
```

1. Expansion of an experimental model on digital basis (MACRO_EXPANS)

```
      ◊ EXPANSION = _F (♦ CALCULATION = calculation,
      [mode_meca]

                       ♦ MEASUREMENT = measurement,          [mode_meca,
      dyna_harmo]

                       ♦ NUME_MODE_CALCUL = L_I,                  [L_I]

                       ♦ NUME_MODE_MESURE = L_I,                  [L_I]

                       ◊   RESOLUTION =/'SVD',                [DEFECT]
                                       /'LU',

                       # If RESOLUTION = 'SVD',
                              ◊ EPS = /0. ,
      [DEFECT]
                                      /epsilon,                    [R]
                     ),
```

2. Structural modification

```
      ◊ MODIFSTRUCT  = _F (♦ MEASUREMENT = measurement,
      [mode_meca]

                          ♦ MODELE_SUP = model,                [model]

                          ♦ MODELE_MODIF = model,              [model]

                          ♦ NUME_MODE_CALCUL = L_I,                [L_I]

                          ♦ NUME_MODE_MESU = L_I,                  [L_I]

                          ♦ MATR_RIGI = matrix,              [matr_asse]

                          ◊ RESOLUTION =/'ES',                 [DEFECT]
                                        /'LMME',

                          If RESOLUTION = 'LMME',

                          ♦ MATR_MASS = matrix,              [matr_asse]

                         ),
```

If MODIFSTRUCT:

```
      ◊ GROUP_NO_CAPTEURS = _F (♦ GROUP_NO = gr_no,           [mode_meca]
```

```
                              ♦ . NOM_CMP = nom_cmp,
[matr_asse]
                            ),

◊ GROUP_NO_EXTERIEUR = _F (♦ GROUP_NO = gr_no,              [mode_meca]

                             ♦ NOM_CMP = nom_cmp,           [matr_asse]
                            ),

◊ RESU_MODIFSTRU = _F ( ◊ MODE_MECA = mode,
[mode_meca]

                         ◊ MODEL = model,                    [model]

                         ◊ GRID = grid,               [grid]

                         ◊ Digital NUME_DDL=,
[nume_ddl]

                         ◊ MASS_MECA = mass,               [matr_asse]

                         ◊ RIGI_MECA = raid,               [matr_asse]

                         ◊ AMOR_MECA = amor,               [matr_asse]

                         ◊ MACR_ELEM = water caltrop,
[macr_elem_stat]

                         ◊ PROJ_MESU = proj,               [mode_gene]

                        | ◊ BASE_LMME = ba_lmme,            [mode_meca]
                        | ◊ BASE_ES = ba_es,                [mode_meca]

                         ◊ MODE_STA = modesta          [mode_stat_force]
                       ),
```

5. Identification of efforts with localization a priori

```
◊ IDENTIFICATION = _F (♦ BASE = bases,
[mode_meca]

                         ♦ INTE_SPEC = intsp,           [interspectre]

                         ♦ OBSERVABILITY = mode_obs,       [mode_meca]

                         ♦ COMMANDABILITE = mode_com,      [mode_meca]

                         ♦ RESU_EXPANSION = 'YES',
                                          /'NOT' .............
[defect]

                         ◊   EPS = /0. ,
[defect]
                                 /epsilon,                      [R]
                         ◊   ALPHA = /0. ,
[defect]
                                   /alpha,                      [R]

◊  RESU_IDENTIFICATION = _F (♦ TABLE = table,              [function]
```

```
                                    ),
```

6. Treatment of the signal with the operator CALC_SPEC

There is no specific keyword associated with this functionality:
this order cannot be used in noninteractive mode (it
is better to use the operator directly CALC_SPEC), and names
outgoing concepts are currently given by default:

- FRF for the functions of frequency response,
- Spec for the inter-spectra,
- Coh for coherences.

```
                                ),
)
```

3 Introduction

3.1 Objectives of the order

The macro-order CALC_ESSAI allows to carry out calculations of identification starting from measured data: expansion of experimental data on digital model, identification of efforts, and structural modification. It can function in not-interactive mode, but it is not the most relevant manner. In interactive, it uses a IHM (coded in python/Tk) which makes it possible to carry out several classification tests after by checking quality the results immediately. This use makes it possible to the user as well as possible to choose the parameters of calculation to arrive at a suitable result:

1) Choice of the modes of the base of expansion,
2) Choice of the points of localization a priori (for the efforts, turbulent mitre),
3) Choice of the parameters of regularization,
4) …

3.2 Parameters of visualization

The macro-order used in interactive has tools making it possible to observe interesting results:

- Visualization of deformations,
- Visualization of curves,
- Visualization of MAC (operator MAC_MODES, Tk visualization).

In the IHM, visualization can control with the mitre “parameters of visualization” which makes it possible to choose:

1) GMSH for the deformations and XMGrace for the curves,
2) Salomé.

If the user launched Salomé before the macro-order, the posting of the results is made by default according to the second option. It is also possible, if one launched Salomé on a distant machine with a posting locally, to return the results towards this session of Salomé, by giving the parameters of the distant machine.

3.3 Outgoing concepts

In the mitre EXPANSION macro-order, it is possible to name the outgoing concept interactivement, and to create as many outgoing concepts thus one wishes. With each new calculation, one brings up to date the pull-down menus by adding the new concepts. On the other hand, since these concepts pre-were not declared, it cannot be used in the continuation of calculation, except in continuation. In the mitre of treatment of the signal, the concepts are named interactivement at the time of their creation. On the other hand, it is not possible to choose their name: the inter-spectra are named Spec, transfer transfer functions FRF and functions of coherence Coh.
In the mitre of identification of efforts, it is necessary pre-to declare the concepts outgoing with the call of the macro-order. In this case, a keyword factor is added RESU_IDENTIFICATION. The concepts can then be used in the continuation of calculation, without having to pass by a continuation.

4 Use of the modal expansion (EXPANSION)

4.1 Keywords in not-interactive mode

The mode of not-interactive use of this option is not very relevant, it is especially useful for the validation. It is preferable, if one wishes to carry out a modal expansion, to use the order directly MACRO_EXPANS, or the sequence PROJ_MESU_MODAL, REST_GENE_PHYS and PROJ_CHAMP.

4.1.1 Keywords MEASUREMENT and NUME_MODE_MESURE

♦ MEASUREMENT = measurement,

Concept sd_resultat of type mode_meca or dyna_harmo who contains the modes to be extended on the digital model.
♦ NUME_MODE_MESURE = L_I,

Allows to select the sequence numbers of the modes which one wishes to extend.

4.1.2 Keyword CALCULATION

♦ CALCULATION = calculation,

Concept sd_resultat of the mode_meca type which will be the base of expansion. The choice of the base of expansion is important for the quality of the results.

♦ NUME_MODE_CALCUL = L_I,

Allows to select the sequence numbers of the modes which one wishes to use in the base of expansion. It is more interesting to keep only the modes which “resemble” the deformations to extend, the criterion of resemblance which can be obtained by calculation of MAC.

4.1.3 Keywords RESOLUTION and EPS

The expansion consists of the resolution of an opposite problem for the determination of the generalized coefficients PROJ_MESU_MODAL. The methods of inversion and coefficients of regularization are detailed in the user's documentation of this operator (cf [U4.73.01]).

4.2 Use in interactive

In interactive, the call of the macro-order opens the following window:

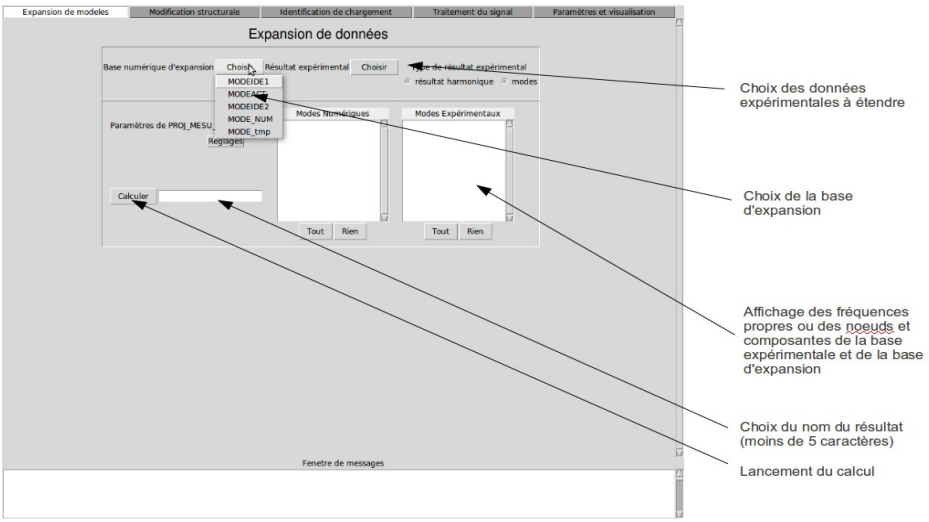

Figure **4-1** *: mitre “Expansion of data”.*

4.2.1 Theoretical principles

The principle of an expansion of data consists in finding the best combination linear of quite selected vectors (the base of expansion) allowing, projecting it on the space of measurement, to find the measured data. If one notes C, the operator of expansion of the digital model towards the space of measurement, one seeks to solve the problem of optimization according to (PROJ_MESU_MODAL in Aster):

$$\min_{\eta} \left\| C.\Phi_{num}.\eta - \Phi_{\exp} \right\|$$

The base of extend modes is then calculated in the following way (REST_GENE_PHYS in Aster):

$$\Phi_{et} = \Phi_{num}.\eta$$

The extend modes "resemble" the experimental modes, but are defined on all the nodes of the digital grid, which gives access data not measured by postprocessing as one would do it for any digital calculation.
The significant point is the choice of the base of expansion. The vectors which compose it can be clean modes of the digital models, nouveau riches by fields of deformations, such as static raisings.

4.2.2 Execution of calculation

While pressing on the button "to calculate", one calculates 4 concepts leaving:

- XX_EX, extraction of the deformations selected in the window "Experimental Modes",
- XX_ET, extend modes (Φ_{et}),
- XX_NX, extraction of the deformations selected in the window "Digital Modes",
- XX_RD , reprojection of the extend modes on the experimental grid.

XX is the basic name given in the window "To export". The concept XX_RD allows to check if the reprojetés modes "resemble" the extend modes. It is a quality standard.

4.2.3 Visualization

In the display window (mitre "parameters and visualization"), one can choose one or two concepts simultaneously to be visualized and compare. The comparison can be done by criterion of MAC, by superimposing the deformations, or by comparing two FRF. If the concepts are dyna_harmo, FRF is already calculated. If the concepts to be compared are bases of modes, one can simulate one FRF : while clicking on FRF, one then chooses a point of excitation, to which one applies an excitation of type "hammer" (constant spectrum on a given frequency). One chooses then a node of visualization.
When the MAC button is grayed, whereas two bases were selected in Results 1 and 2, that means that the two concepts are calculated on nume_ddl different and that the calculation of MAC is not possible.

5 Structural modification (MODIFSTRUCT)

This technique of structural modification is based on the method of under-structuring. The first substructure corresponds to the initial structure and the second substructure corresponds to the made modification.
The initial structure is modelled starting from in experiments identified clean modes. The second substructure is modelled numerically by finite elements. Except very particular case, the points of measurement are not at the level of the interface between the initial structure and the modification. It is thus necessary to pass by an intermediate stage which consists in carrying out an expansion of measurement on the degrees of freedom interfaces. This expansion is made via the digital model support. The following paragraphs describe the keywords necessary in CALC_ESSAI for this functionality.
More details on the method and the principles of implementation in Code_Aster are given in U2.07.03 documentation.

5.1 Keywords in not-interactive mode

5.1.1 Keyword MEASUREMENT

♦ MEASUREMENT = measurement [mode_meca]

measurement is the name of the concept which contains the identified clean modes.

5.1.2 Keyword MODELE_SUP

♦ MODELE_SUP = model [model]

Name of the model support on which the base of expansion is built.

5.1.3 Keyword MODELE_MODIF

♦ MODELE_MODIF = model [model]

Name of the model of the modification made to the initial structure.

5.1.4 Keyword MATR_RIGI

♦ MATR_RIGI = matrix, [matr_asse]

Matrix of rigidity defined on the model support, necessary for the calculation of the static modes.

5.1.5 Keyword RESOLUTION

♦ RESOLUTION = /'ES', [DEFECT]
/'LMME'

This keyword makes it possible to choose the method used for calculation of the base of expansion. ES corresponds to the static expansion and LMME corresponds to "Room Model Modeshapes Expansion".

5.1.6 Keyword NUME_MODE_MESU

♦ NUME_MODE_MESU = L_I, [l_I]

This keyword makes it possible to select the numbers of the modes to be exploited among the identified clean modes. By default, one takes into account all the clean modes of the concept measures.

5.1.7 Keyword NUME_MODE_CALCUL

♦ NUME_MODE_CALCUL = L_I, [l_I]

This keyword makes it possible to select the numbers of the modes to be used among the vectors of the base of expansion. By default, one takes into account all the vectors of the base of expansion.

5.1.8 Keyword GROUP_NO_CAPTEURS

◊ GROUP_NO_CAPTEURS = _F (♦ GROUP_NO = gr_no, [mode_meca]
♦ NOM_CMP = nom_cmp, [matr_asse]

This keyword factor makes it possible to select the list of the groups of nodes which will be used for the calculation of the static modes associated with the points of measurement. These groups of nodes are defined on the model support.

5.1.9 Keyword GROUP_NO_EXTERIEUR

◊ GROUP_NO_EXTERIEUR = _F (♦ GROUP_NO = gr_no, [mode_meca]
♦ NOM_CMP = nom_cmp, [matr_asse]

This keyword factor makes it possible to define the “external” groups of nodes where will be condensed measured information. These groups of nodes must at least contain the interface between the model support and the model of the modification.

5.2 Use in interactive mode

The mitre “Modification structural” comprises the following stages of calculation:

Data acquisition of entry:
The data input (concept aster) available are proposed in the form of pull-down menu. The selected user the data which correspond to its study. For the calculation of the base of expansion, the user has the choice between the method ES and method LMME (see U2.07.03).

Choice of the base of expansion:
After having seized the parameters of calculation, one can click on the button To validate which makes it possible to launch the calculation of the base of expansion. One selects then the basic vectors which one considers being most relevant for the expansion of measurement. **The number of basic vectors must be lower or equal to the number of degrees of freedom of measurement**.

Condensation of the model and coupling of the modification to the condensed model:
This stage is activated by the button to calculate. This button launches a modal calculation of the coupled model and evaluates the quality standard of the base of expansion.

Checking of the quality of the base of expansion:
It is considered that the base of expansion is acceptable if one arrives at well representing the field of displacement to the interface by using two different methods. The base of expansion is supposed to be correct if the diagonal terms of MAC (produced scalar) are close to 1, or if the diagonal terms of criterion IERI (energy gap) are worthless. The calculation of criterion IERI requires the seizure of a matrix of weighting. This matrix of weighting is either the matrix of rigidity, or the matrix of mass.

Visualization of the got results:
The display window makes it possible to compare the initial modal deformations measured with the modal deformations of the modified structure. It also makes it possible to compare the harmonic

answer measured on the initial structure selected by the user and the harmonic answer on the modified structure.

The IHM associated with this functionality is presented on the following figure:

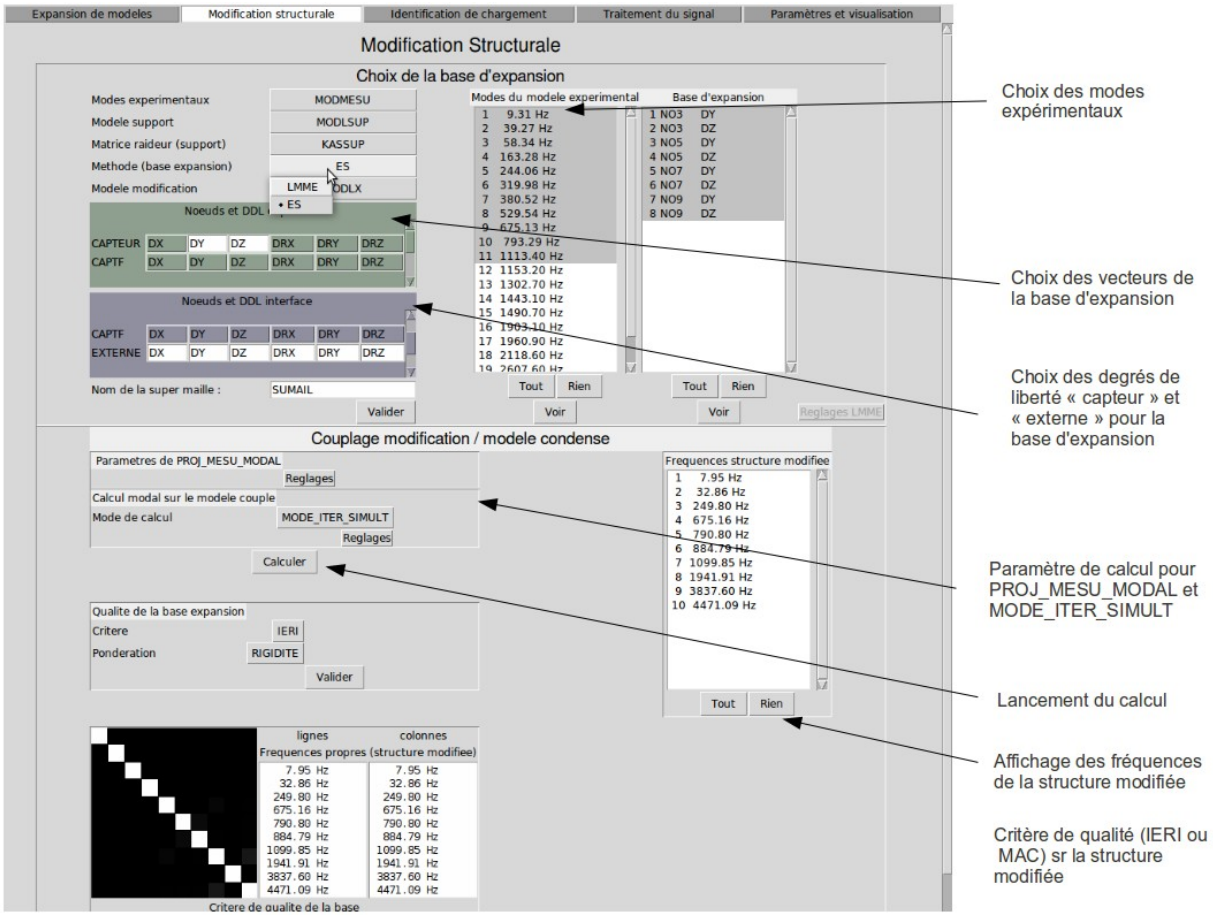

Figure 5-1 *: mitre of structural modification.*

It is pointed out that the various stages of calculation and the subjacent orders are presented in detail in the U2.07.03 document.

5.3 Produced concepts

The user can specify the names of the concepts produced by the interface by informing the keyword factor `RESU_MODIFSTRU`. These concepts could then be used for later calculations.

◊ `MODE_MECA = mode,` `[mode_meca]`

`mode` will be the name of the concept which contains the clean modes of the modified structure.

◊ `MODEL = model,` `[model]`

`model` will be the name associated with the model with the modified structure.

◊ `GRID = grid,` `[grid]`

`grid` will be the name of the grid associated with the modified structure.

◊ Digital NUME_DDL=, [nume_ddl]

digital will be the name of the concept nume_ddl associated with the modified structure.

◊ MASS_MECA = mass, [matr_asse]

mass will be the name of the concept which contains the matrix of mass assembled of the modified structure.

◊ RIGI_MECA = raid, [matr_asse]

raid will be the name of the concept which contains the matrix of rigidity assembled of the modified structure.

◊ AMOR_MECA = amor, [matr_asse]

amor will be the name of the concept which contains the matrix of damping assembled of the modified structure.

◊ MACR_ELEM = macrel, [macr_elem_stat]

macrel will be the name of the concept which contains the macronutrient where measurement is condensed.

◊ PROJ_MESU = proj, [mode_gene]

proj will be the name of the concept which contains the generalized coordinates of the identified modes relating to the base of expansion.

◊ BASE_LMME . = balmme, [mode_meca]

balmme will be the name of the base of expansion resulting from method LMME.

◊ BASE_ES . = bases, [mode_meca]

base will be the name of the base of expansion resulting from the static expansion (method ES).

◊ MODE_STAT = modest, [mode_stat_force]

modest will be the name of the concept which contains the static modes associated with the points with measurement.

6 Identification of localised efforts *a priori* (IDENTIFICATION)

6.1 Keywords in not-interactive mode

6.1.1 Keyword INTE_SPEC

♦ INTE_SPEC = intsp

Inter-spectrum which will be used for the not-interactive mode as displacements, to find the associated efforts.

6.1.2 Keyword RESU_EXPANSION

◊ RESU_EXPANSION = 'YES'/'NOT'

Allowed to realize in the same order CALC_ESSAI an expansion of clean modes, and to use the result of this one for the phase of identification. This functionality is not any more utliisable in not-interactive.

6.1.3 Keywords OBSERVABILITY and COMMANDABILITE

- OBSERVABILITY = observ
- COMMANDABILITE = command

Concept of the type mode_meca. Correspond respectively to the objects $C\Phi$ and $\Phi^T B$ described in the section 6.2. In interactive mode, one can create them starting from a model, of a base of deformations and an assistant of selection of the active degrees of freedom. In not-interactive mode, one can is to choose one mode_meca gross, that is to say to manufacture it with the operator OBSERVATION (U4.90.03).

6.1.4 Keywords ALPHA and EPS

- ALPHA = real
- EPS = real

Parameters of regularization. More details section 6.2.2. The parameter m is not skeletal in not-interactive, it is fixed at 0.

6.2 Use in interactive mode

The IHM associated with this functionality is the following one:

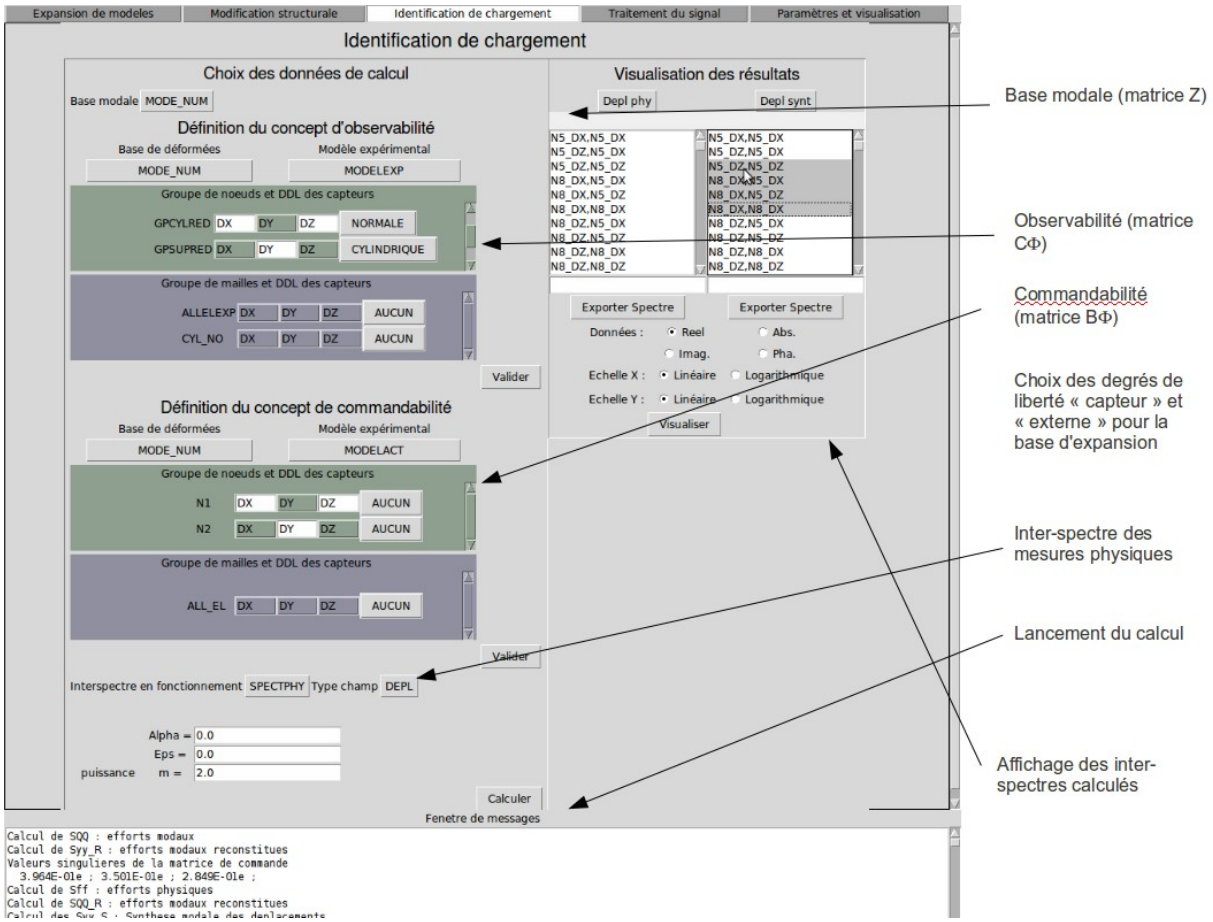

Figure **6-1** *: mitre identification of efforts.*

6.2.1 Recall of the theoretical principles

The identification of the efforts supposes that one can break up the movement of the structure studied on modal basis:

$$y(\omega)=\left[C\,\Phi\right].\left[Z(\omega)\right]^{-1.}\left[\Phi^T B\right].f(\omega)$$

In the following equations, one will omit the dependence compared to ω. Φ is a base of modal deformations associated with the studied structure. In theory, it is the base of the continuous deformations. In practice, one in general uses a base defined on a digital model with a relatively fine discretization. This base can be calculated numerically, or be the result of a modal expansion. The operator C allows to project this base of deformations on the subspace of the observable degrees of freedom.
The operator B allows to project the base of deformations on a set of degrees of freedom called actuators: one finds here one of the fundamental assumptions of the identification: **the identified efforts are located on declared degrees of freedom *a priori*** by the user, as one made to declare the degrees of freedom of measurement (use of the operator OBSERVATION). The objective is to decrease to the maximum the number of unknown factors to be determined, which makes it possible to avoid the problems of under-determination of the problem.
To identify the efforts amounts reversing the system above:

$$f=\left[\Phi^T B\right]^{-1.}\left[Z\right].\left[C\,\Phi\right]^{-1.}y \qquad (8\text{-}1)$$

NB: the base Φ can be different on the right and on the left from Z: it is the case when measurements available are deformations. The equation connecting the effort to measurement is written then:

$$f=\left[\Phi^T B\right]^{-1.}\left[Z\right].\left[C\,\Psi\right]^{-1.}\epsilon \qquad (8\text{-}2)$$

where the matrix Ψ is the data of the modes in deformation. Attention however: to write this last equation is an abuse language, because the passage of displacements to the deformations should be normally written in the operator of projection (who, let us recall it, is linear in the case of small deformations), and not while replacing Φ by Ψ. But in practice, a base of modes is often imported Ψ directly since the software of measurement.

6.2.2 Concepts to be used

Observability and commandability:
The calculation of $\left[C\,\Phi\right]$ is made within the framework “Definition of the concept of observability”, in which one gives the base of modes Φ, and an experimental model qu contains the degrees of freedom on which one projects it. One chooses in the degrees of freedom of the experimental model (gathered by groups of node and mesh) the degrees of freedom corresponding to measurement. One can thus choose only one direction if one used during the measurement of the monoaxial sensors. It is in addition possible to carry out a change of reference mark. For more detail, to refer to the documentation of the operator OBSERVATION (U4.90.03).

- **It is important that the nodes the components declared in the inter-spectrum are coherent with the degrees of freedom of the concept of observability**. If the inter-spectrum is read by LIRE_INTE_SPEC (FORMAT = 'IDEAS'), the nodes are defined at the head of each dataset; the table then created by this operator keeps the notations of this file.

The calculation of $\left[\Phi^T B\right]$ is made within the framework “Definition of the concept of commandability”.
The choice of the degrees of freedom and the changes of potential reference marks are done according to the same rule.
Each mitre has a button of basic choice, which allows, as for equation 8-2, to use two different bases.

Regularization:
The inversion of the transfer transfer function is done in two stages:

- inversion of $\left[C\Phi\right].\left[Z\right]^{-1}$, which makes it possible to calculate the modal efforts,
- inversion of $\left[\Phi^T B\right]$, which makes it possible to calculate the efforts on physical basis.

These two stages are done by SVD (SVD of LinearAlgebra, module of python, which calls on a bookstore lapack_lite, in the package numpy). It is possible to regularize the inversion in three manners:

1) truncation of the SVD (parameter ε),
2) regularization of Tikhonov (parameter α),
3) control of the slope: it is possible to multiply the parameter α by $\left(\omega-\omega_i\right)^m$, where ω_i is the own pulsation of the mode and m a parameter to be determined; that allows D to control the slope of the curve obtained for the high frequencies, when the measured signal is strongly made sound effects for out of HF.

6.2.3 Visualization of the results

In the column of right-hand side, one can visualize the following functions:

- measured inter-spectrum (`Depl phy`),
- modal efforts (`EFF MOD`),
- physical displacements reconstituted starting from the modal efforts (`Depl phy R`)
- physical efforts (`EFF phy`),
- modal efforts reconstituted starting from the physical efforts (`EFF MOD R`),
- physical displacements resynthetized starting from the physical efforts (`EFF synt`),
- singular values of the matrices $\left[C\Phi\right].\left[Z\right]^{-1}$ (`Values sing`),
- parameter of regularization $\alpha\left(\omega-\omega_i\right)^{m.} V$ (`regul`), where V is the matrices of the clean vectors on the right of $\left[C\Phi\right].\left[Z\right]^{-1}$ $\left(\left[C\Phi\right].\left[Z\right]^{-1}=\left[U\right].diag\left(\sigma_i\right)\left[V^H\right]\right)$.

While clicking on “Exporting inter-spectrum”, one creates a concept leaving the macro one. It is not possible to choose the name, this one pre-having been declared as starter of the macro-order, but one can add a title.
While clicking on “Displaying curve”, after having selected the curves to be visualized in the 2 columns, one launches the visualisor (XMGrace or Salomé).

7 Interface CALC_ESSAI – Mitre “Treatment of the signal”

The mitre “Treatment of the signal” of the IHM `CALC_ESSAI` allows to control the operator interactivement `CALC_SPEC` of *Code_Aster.* This operator allows to build inter-spectra, auto--spectra and transfer functions transfers starting from functions corresponding to temporal samples. Various options of fenestration and average are available. The use of `CALC_SPEC`, as well as the treatments carried out, are described precisely in U4.32.21 documentation. One presents here only the use of the mitre.

This mitre breaks up into three parts, distributed within the various frameworks. The first framework presents the concepts containing of information available, compatible with the treatments suggested by `CALC_SPEC`. These concepts must be of table_fonction type, and contain functions whose X-

coordinate is located by a list of moments (NOM_PARA=' INST') whose step is constant, and identical for all the functions. These functions are located by measurement and sequence numbers

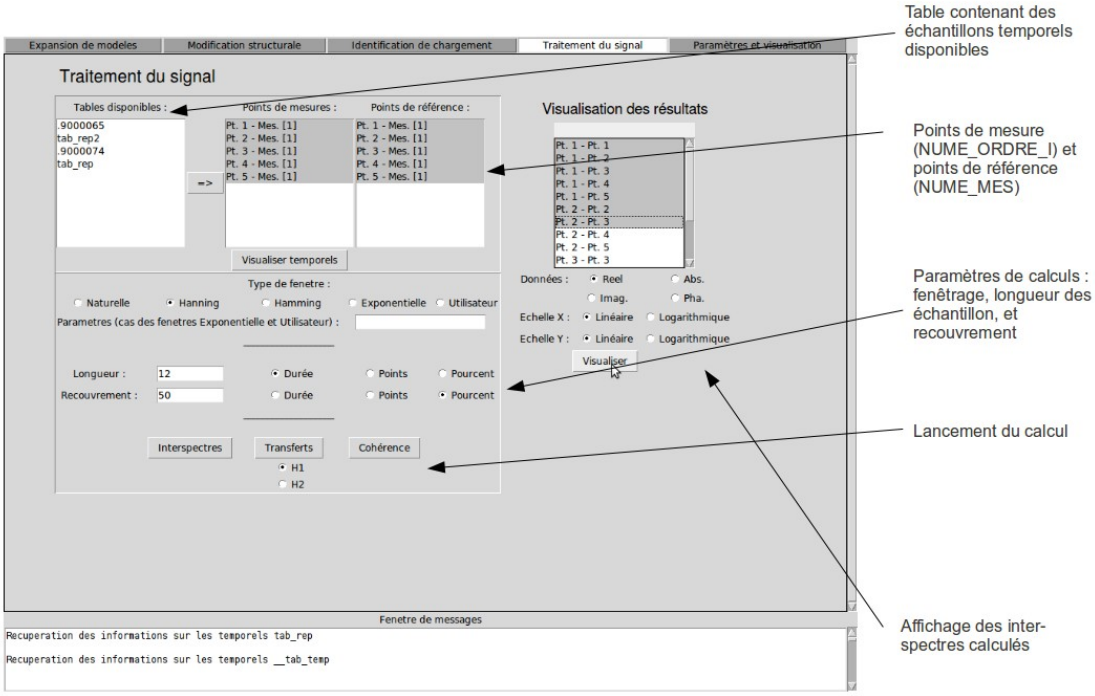

Figure 7-1: Mitre "Treatment of the signal" of the IHM CALC_ESSAI

The selection of the concept is carried out while clicking on the name of the concept, to put it in intensified brightness, then while clicking on the button presenting a pictogram of arrow (=>). Functions, located by the numbers of the points (NUME_ORDRE_I) and of measurement (NUME_MES), in the column under the title "Points of measurements appear". The samples likely to be used as points of reference are listed under the title "Points of reference". The selection of the data for the different treatment is carried out simply by putting in intensified brightness the names of the functions.

Currently, the results generated in the mitre cannot be exported in the environment of Code_Aster. They can however be used for visualization in Xmgrace or Salomé.

8 Parameters and visualization

The IHM "Parameters and visualization" makes it possible, initially, to choose the options of visualization:

- Gmsh/Xmgrace: results of the type mode_meca are visualized with Gmsh, the curves with Xmgrace and the matrices of MAC with a graphic utility python/Tk,
- Salomé: all the results are displayed in Salomé.

The studies open Salomé are listed in the corresponding table. It is not possible to work on a transfer of distant Salomé.

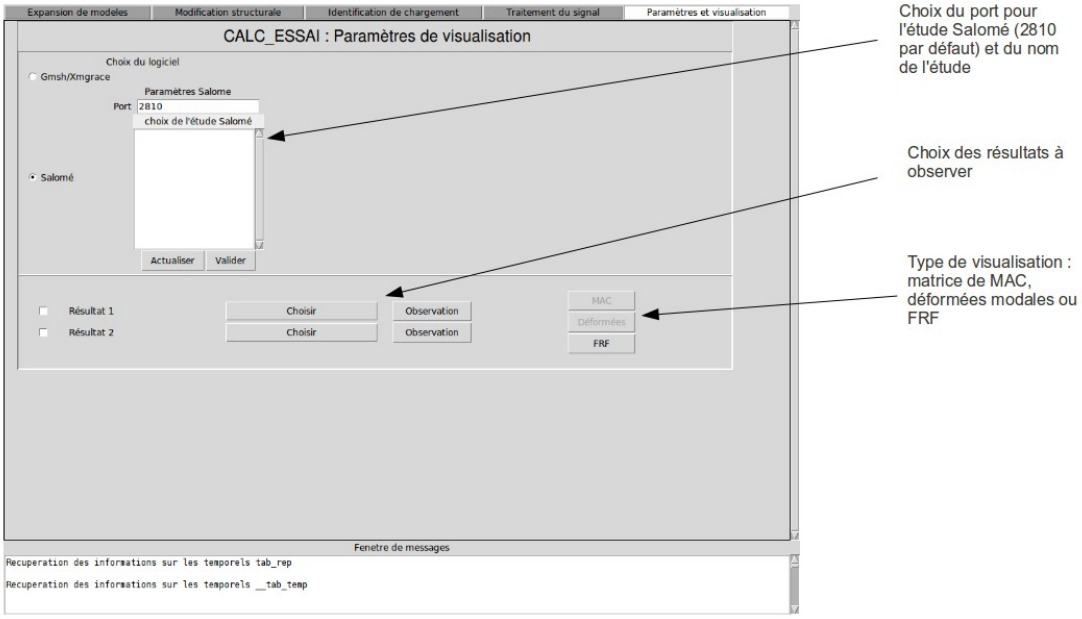

Figure 8-1: CALC_ESSAI, mitre "Parameters and visualization"

By selecting a result, one can, thereafter, click on the button "Observation" to project it on an experimental model with the macro-order OBSERVATION . The following window then is opened:

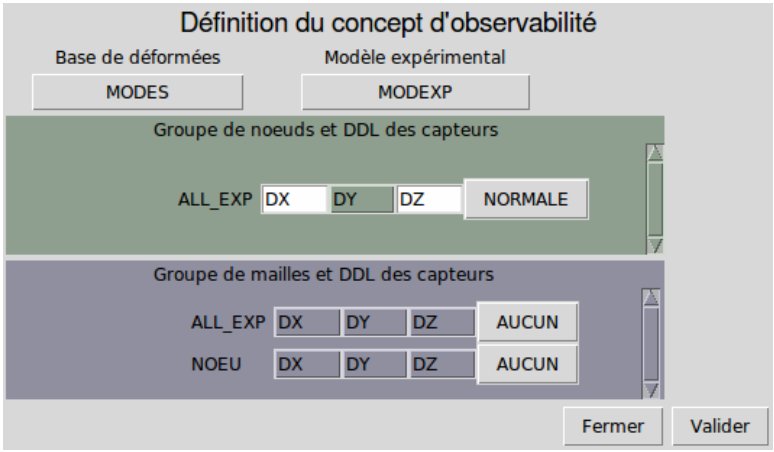

Figure 8-2: window OBSERVATION

If the selected result were already created by OBSERVATION, then the degrees of freedom and parameters of change of reference mark are notched by default in the interface. It is then possible to modify them in interactive. It is currently not possible to select the nodes alone (except creating a group of nodes for each node of the experimental model.