ZZZZ317 – Generation of seismic signals with Summarized

GENE_ACCE_SEISME:

The purpose of this test is to validate the generation of seismic signals with GENE_ACCE_SEISME.
This test is primarily a data-processing test: there is no mesh nor of model finite element.

1 Modelization A

1.1 Characteristic of the modelization

In the modelization A, one tests the simulation of a process (seismic signal) to separable spectral concentration. One makes tests for the three types of temporal modulation:

- function of Jennings&Housner
- function Gamma
- without modulation (option constant)

In the three cases, one considers a period of strong phase of $Ts=8\mathrm{s}$. For the constant modulation, the period of $8\mathrm{s}$ correspond to the total period of the steady signal. For the function of Jennings&Housner, the strong phase is taken equal to the length of the plate (t_2-t_1) what does not correspond to the definition of the strong phase from the intensity of Arias. For each of the three models, one considers the two following cases of simulation:

- Intensity of Arias given: INTE_ARIAS= $0.05\mathrm{g}$ ($g=9{,}81\,m/s^2$),
- standard deviation given ECART_TYPE= $1/9.81\mathrm{g}$,

One generates a signal and one makes then a test on the parameters imposed like over the period of the strong phase.

1.2 Quantities tested and results

1) function of Jennings & Standard

Housner	Identification of reference	Value of reference	Tolerance machine	Accuracy
INTE_ARIAS DUREE_PHAS_FORT	- AUTRE_ASTER	- 8.52	1.E. - 4 1.E. - 6	1.E. - 3 1.E. - 3
ECART_TYPE	ANALYTIQUE	1.0		0.10*

*confer remarks below

2) function Gamma
the tests on INTE_ARIAS and ECART_TYPE are of non regression with a tolerance machine of 1.E. - 4.

3) modulation constant

Standard	Identification of reference	Value of reference	Tolerance machine	Accuracy
INTE_ARIAS	-	-	1.E. - 4	-
ECART_TYPE	ANALYTIQUE	1.0		0.10*

*confer remarks below

For the constant modulation (i.e. not of modulation) One in addition carries out a test on the interspectrums. This case corresponds indeed to the generation of the steady signals (over the period Ts) from the spectral concentration of Kanai-Tajimi. One carries out $Nsim=26$ simulations and one considers the spectral concentration. One carries out a test on the value of the spectral concentration (DSP) to the frequencies 10Hz and with 1Hz . The standard deviation is obtained directly from the spectral concentration by POST_DYNA_ALEA.

Standard	identification of reference	Value of reference	Tolerance machine	Accuracy
DSP 10Hz 1.0Hz	ANALYTIQUE	1.4989E. - 4 3.24168E. - 3	1.E. - 6	1.E. - 3
ECART_TYPE	ANALYTIQUE	1.0/9.81	1.E. - 6	1.E. - 2

1.3 Remarks

the values of standard deviation and intensity of Arias provided by the user must be understood as of the averages for which the model of spectral concentration is built. The actual values on the generated seismic signals can vary from one realization to another. The values taken as references in the tests are the mean values, from where the difference between the actual values and the reference.

2 Modelization B

2.1 Characteristic of the modelization

In the modelization B, one tests the simulation of a process (seismic signal) to nonseparable spectral concentration with evolution of the center frequency. For that, the slope of the center frequency is taken equal to FREQ_PENTE= -0.01 . One makes tests for the two types of temporal modulation:

- function of Jennings&Housner
- function Gamma

For the two models, one considers the case of simulation with intensity of Arias given: INTE_ARIAS= $0.05\mathrm{g}$.

2.2 Quantities tested and results

One carries out tests of non regression on indicators INTE_ARIAS, DUREE_PHAS_FORT and ECART_TYPE of the signals generated with a tolerance machine of $1.\mathrm{E}-4$. (except DUREE_PHAS_FORT for the function Gamma with a tolerance of $1.\mathrm{E}-3$.

3 Modelization C

3.1 Characteristic of the modelization

In the modelization C, one tests the simulation of a process (seismic signal) to separable spectral concentration (without evolution of the center frequency) and the option with PGA given. For that, ACCE_MAX= is chosen $0.2\mathrm{g}$. One makes tests for the three types of temporal modulation:

- function of Jennings&Housner
- function Gamma
- without modulation (option constant)

the tests are of non regression for a given seismic signal. Then, one compares the median of a set of 25 signals with the target value of reference.

3.2 Quantities tested and results

Initially, one carries out tests on maximum ACCE_MAX (PGA) of the generated signals.

1) function of Jennings & Standard

Housner	Identification of reference	Value of reference	Tolerance machine	Accuracy
ACCE_MAX ECART_TYPE	- ANALYTIQUE	- 0.603	1.E. - 4 1.E. - 6	- 0.1*

*confer remarks below.

2) function Gamma
the test on ACCE_MAX is of non regression with a tolerance machine of $1.\mathrm{E.}-4$.

3) modulation constant

Standard	Identification of reference	Value of reference	Tolerance machine	Accuracy
ACCE_MAX ECART_TYPE	- ANALYTIQUE	- 0.60178	1.E. - 4 1.E. - 6	- 0.1*

*confer remarks below.

In the second time, one carries out tests on the median maximum on in set of 25 signals generated without modulation (constant modulation). This test of non regression is carried out for the three function of modulation with a tolerance machine of $1.\mathrm{E.}-4$.

3.3 Remarks

the values of standard deviation and PGA provided by the user must be understood like averages and medians for which the model of spectral concentration is built. The actual values on the generated seismic signals naturally vary from one realization to another. The values taken as references in the

tests are the mean values and medians, from where the difference between the actual values on a signal and the reference.

The analytical value of reference for the standard deviation comes directly from the restrain, through the factor of peak, between the maximum (median) of the signals generated and the standard deviation of the process, confer documentation [R4.05.05]. This factor of peak depends amongst other things on the period of the signal.

4 Summary of the results

the tests made it possible to check and validate different the options from the seismic generator of signals GENE_ACCE_SEISME. For certain test, the accuracy is weak because one compares the value of a realization of the statistical quantity with his average or median.