

MECHANICAL TEST REPORT

According to the standards:
 NF EN 60068-2-6 (2008)
 NF EN 60068-2-27 (2009)


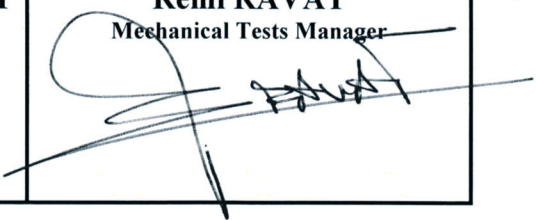
Equipment under test:
 One BGL 136
 One CPL 35-CMTCP
 One RPL 23
 One DSL 1-35-NUC

Company:
LOREME

DISTRIBUTION: Mr REPPERT

Company: LOREME

Number of de pages: 50

Ed.	Date	Modified Pages	Written by	Technical Verification & Quality Approval
			Name, Function and Visa	Name, Function and Visa
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EQUIPMENT UNDER TEST: One BGL 136
One CPL 35-CMTCP
One RPL 23
One DSL 1-35-NUC

MANUFACTURER: LOREME

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PURCHASE ORDER: N° E190570AMP

TEST DATES: From 24th to 29th April, 2019

TEST LOCATION: Environne'Tech
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BOURGOIN-JALLIEU 38300

TESTER: Keryann ALLEGRET-PILOT

SUMMARY

1. PURPOSE OF THE TESTS.	4
2. EQUIPMENT SUBMITTED FOR TESTING.	4
3. SPECIFICATIONS SHEET.	5 - 7
3.1. <i>Reference documents:</i>	5
3.2. <i>Reminder of the main criteria of tests:</i>	5
3.2.1. <i>Resonance frequency search, sine vibrations:</i>	5
3.2.2. <i>Endurance, sine vibrations:</i>	6
3.2.3. <i>Dwell, sine vibrations:</i>	6
3.2.4. <i>Shock tests:</i>	6
3.3. <i>Functional control verification:</i>	6
3.4. <i>Representation of standard tolerances:</i>	7
4. EQUIPMENT USED.	7 - 8
4.1. <i>Means of tests:</i>	7
4.2. <i>Measurement Equipment.</i>	8
4.3. <i>Tools:</i>	8
5. TEST LOG.	9 - 49
5.1. <i>Z axis:</i>	10 - 21
5.1.1. <i>Test set up for sine vibrations:</i>	10
5.1.2. <i>Sinus vibrations – RFR initial:</i>	12
5.1.3. <i>Sinus vibrations - Endurance:</i>	14
5.1.4. <i>Sinus vibrations – RFR final:</i>	16
5.1.5. <i>Test set up for shocks:</i>	18
5.1.6. <i>Shock tests:</i>	20
5.2. <i>X axis:</i>	22 - 35
5.2.1. <i>Test set up for sine vibrations:</i>	22
5.2.2. <i>Sinus vibrations – RFR initial:</i>	24
5.2.3. <i>Sinus vibrations - Endurance:</i>	27
5.2.4. <i>Sinus vibrations – RFR final:</i>	29
5.2.5. <i>Test set up for shocks:</i>	32
5.2.6. <i>Shock tests:</i>	34
5.3. <i>Y axis:</i>	36 - 49
5.3.1. <i>Test set up for sine vibrations:</i>	36
5.3.2. <i>Sinus vibrations – RFR initial:</i>	38
5.3.3. <i>Sinus vibrations - Endurance:</i>	41
5.3.4. <i>Sinus vibrations – RFR final:</i>	43
5.3.5. <i>Test set up for shocks:</i>	46
5.3.6. <i>Shock tests:</i>	48
6. CONCLUSION.	50

1. PURPOSE OF THE TESTS.

Test purpose was to certify one BGL 136, one CPL 35-CMTCP, one RPL 23 and one DSL 1-35-NUC under mechanical test conditions.

2. EQUIPMENT SUBMITTED FOR TESTING.

Equipment which must be tested is: **one BGL 136, one CPL 35-CMTCP, one RPL 23 and one DSL 1-35-NUC.**

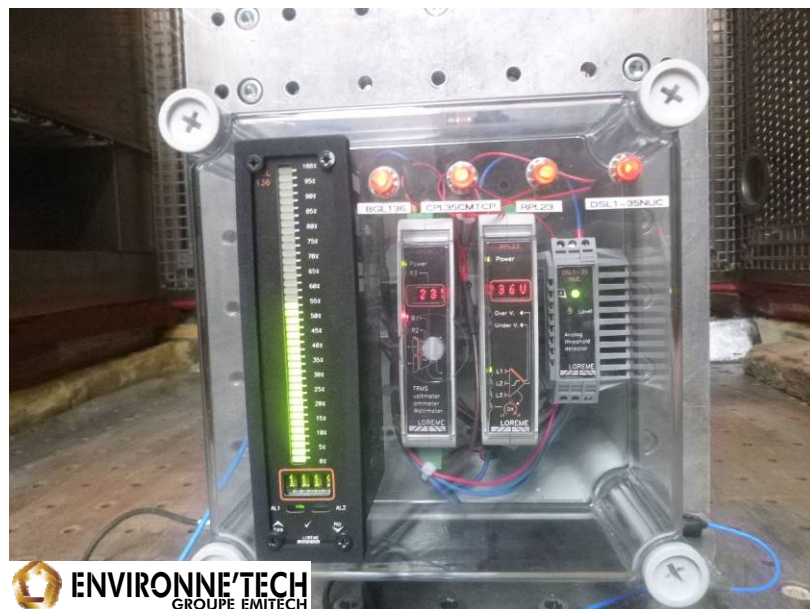


photo 1

The equipment carried the Environne'Tech test number: 19-400328.

3. SPECIFICATIONS SHEET.

The tests shall be conducted as per following document and as per *Environne'Tech Offer N°DENV-INN-19-400328*.

3.1. *Reference documents:*

- Environne'Tech Offer N° DENV-INN-19-400328-1
- The standards : **NF EN 60068-2-6 (2008)**
NF EN 60068-2-27 (2009)

3.2. *Reminder of the main criteria of tests:*

3.2.1. *Resonance frequency search, sine vibrations:*

- Frequency range: 0.1 Hz to 50 Hz
- Number of axis: along 3 axis
- Control points : P1, P2 and P3
- Level: **25 mm peak from 0.1 Hz to 1 Hz**
0.1g from 1 Hz to 5 Hz
1 mm peak from 5 Hz to 22Hz
2g from 22 Hz to 50 Hz
- Sweep rate: **1 oct/min**
- Number of cycle : 1
- State of equipment : ON

3.2.2. *Endurance, sine vibrations:*

- Frequency range: 0.1 Hz to 50 Hz
- Number of axis: along 3 axis
- Control points : P1, P2 and P3
- Level: **25 mm peak from 0.1 Hz to 1 Hz**
0.1g from 1 Hz to 5 Hz
1 mm peak from 5 Hz to 22Hz
2g from 22 Hz to 50 Hz
- Sweep rate: **1 oct/min**
- Number of cycle : 5
- State of equipment : ON

3.2.3. *Dwell, sine vibrations:*

- Frequency range: at the resonance frequency
- Number of axis: along 3 axis
- Control points : P1, P2 and P3
- Level: **25 mm peak from 0.1 Hz to 1 Hz**
0.1g from 1 Hz to 5 Hz
1 mm peak from 5 Hz to 22Hz
2g from 22 Hz to 50 Hz
- Sweep rate: **1 oct/min**
- Time : 30 min by resonance
- State of equipment : ON

3.2.4. *Shock tests:*

- Type: shock half-sine
- Number of axes: along 3 axes (Ox, Oy and Oz)
- Number of shocks: 3/direction/axis
- Control point: P
- Level: 15g 11ms
- State of equipment : ON



3.3. *Functional control verification:*

A visual inspection and verification test will be performed before and after each test by Environne'Tech Company.

The verification consists in seeing that all the LEDs are lit as well as the bar graph.

3.4. Representation of standard tolerances:

A summary table of graphical representations of normalized tolerances given below:

Type of test	Curve lay-out: Standard tolerances
Sinus vibration	
Shocks	

4. EQUIPMENT USED.

4.1. Means of tests.

Identity	Designation	Brand and Model	Characteristics
MECA 306	Double stem cylinder, double acting	QUIRI HiFi-S A32-100	cylinder, double rod, double acting with hydrostatic bearings, displacement: 100mm, 31kN, 0.1Hz to 200Hz
MECA 283	Hydraulic vibration generator	QUIRI HiFi-S A32-100	displacement: 100mm, 31kN, 0.1Hz to 200Hz static force
MECA 648	Electrodynamic vibrator	LDS V8-440 HBT 600	5Hz to 2500Hz ; resonance at 2000Hz ; sine: 57.8kN ; random: 66kN; impact: 1/2sine 198kN

4.2. Measurement Equipment.

Identity	Designation	Brand and Model	Characteristics	Metrological confirmation valid until :
MECA 694	Accelerometer	PCB 353B04	sensitivity: 10.20 mV/g at 160Hz	12/03/2019
MECA 688	Accelerometer	PCB 3713B1110G	X: 200.4 mV/g, Y: 201.3 mV/g, Z: 202.6 mV/g at 160Hz	01/15/2020
MECA 759	Accelerometer	PCB 353B03	sensitivity: 10.09mV/g at 160Hz	06/02/2020
MECA 661	Accelerometer	PCB 3711B1150G	sensitivity: 39.94 mV/g at 160Hz	06/11/2020
MECA 660	Accelerometer	PCB 3711B1150G	sensitivity: 39.68 mV/g at 160Hz	03/30/2020
MECA 723	Accelerometer	PCB 356B21	X: 10.46 mV/g, Y: 10.50 mV/g, Z: 10.51 mV/g at 160Hz	04/22/2020
MECA 744	Control generator	SIEMENS/LMS SCL2E20V	up to 32 measuring channels - sine, random, shocks, level limitation - 0.5Hz to 5000Hz - analysis 0.5Hz to 40kHz - Test.Lab 13A/17	09/11/2020

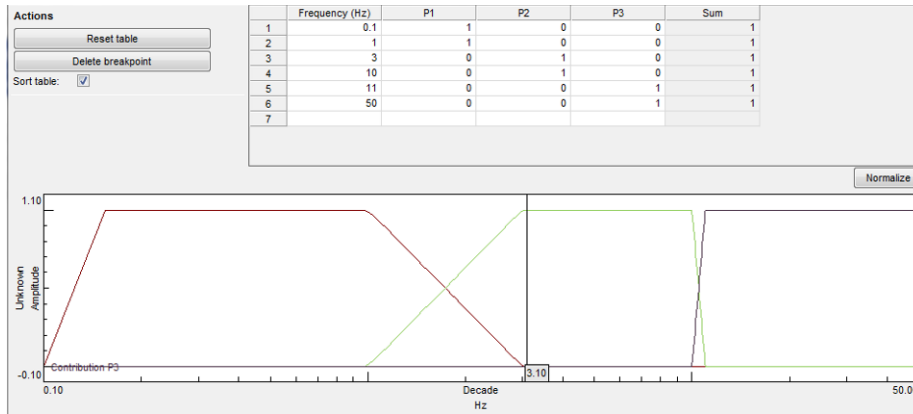
4.3. Tools.

Tooling is provided by Environne'Tech

5. TEST LOG.

Vibration tests are piloted on the points P1, P2 and P3.

P1, P2 and P3 each control part of the test as a function of frequency:



P1 is the displacement sensor of the test bench, used to control the test in the lowest frequencies (0.1 to 3 Hz).

P2 is an accelerometer used to control the test in the intermediate frequencies (3 to 10 Hz).

P3 is an accelerometer used to control the test in the highest frequencies (10 to 50 Hz).

M is a measure accelerometer on the module.

The tests occurred as follows:

Date	Test performed	Axis
24/04/2019	Initial resonance frequency search, sine vibrations	Z
	Endurance, sine vibrations	Z
	Final resonance frequency search, sine vibrations	Z
25/04/2019	Initial resonance frequency search, sine vibrations	X
	Endurance, sine vibrations	X
	Final resonance frequency search, sine vibrations	X
	Initial resonance frequency search, sine vibrations	Y
	Endurance, sine vibrations	Y
26/04/2019	Final resonance frequency search, sine vibrations	Y
29/04/2019	Shock tests	X
	Shock tests	Y
	Shock tests	Z

5.1. Z axis:

5.1.1. Test set up for sine vibrations:

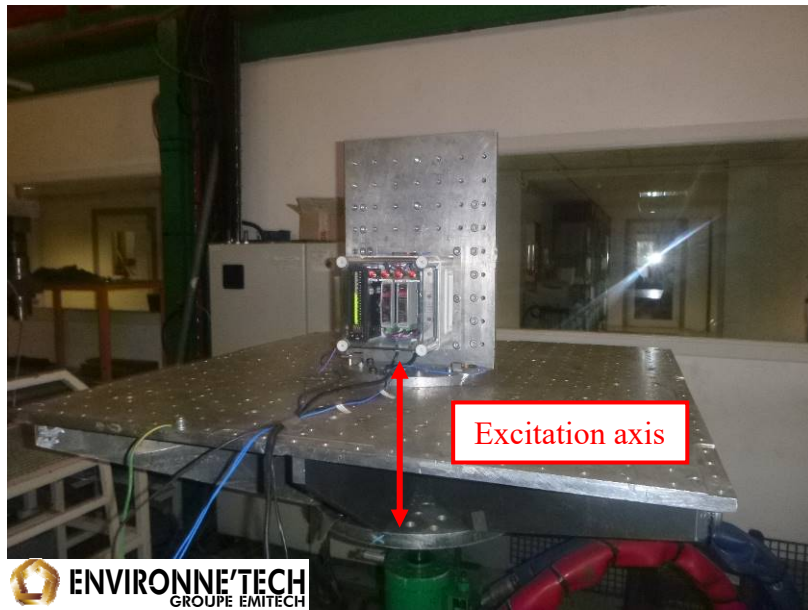


photo 2

P1 is the displacement sensor of the bench
Positioning of accelerometers P2 and P3 given below:

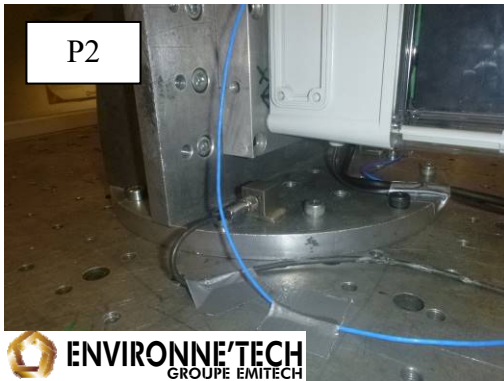


photo 3

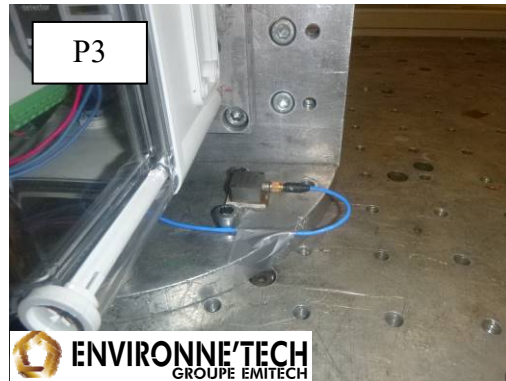


photo 4

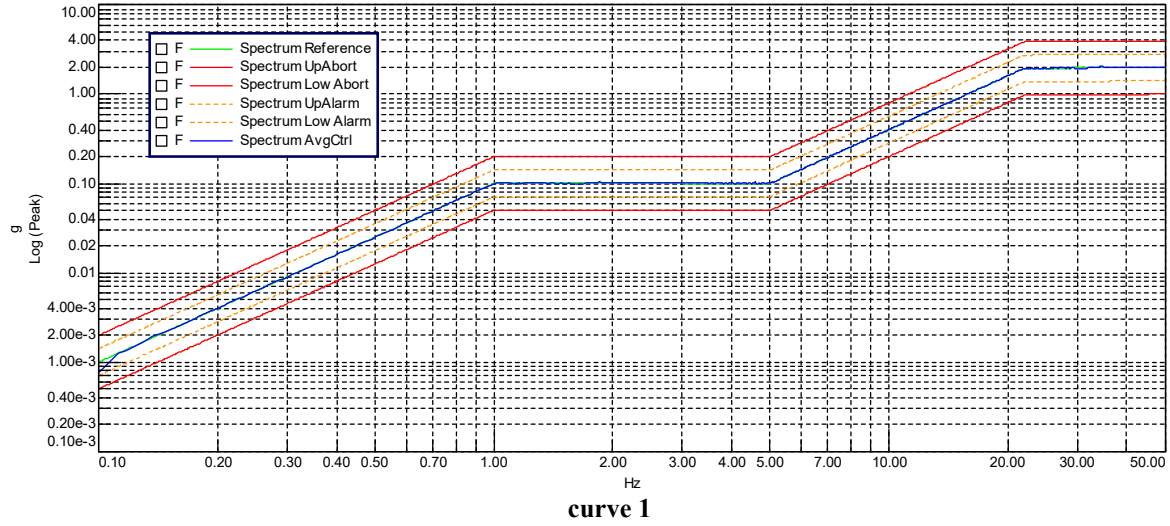
Positioning of accelerometer M given below:



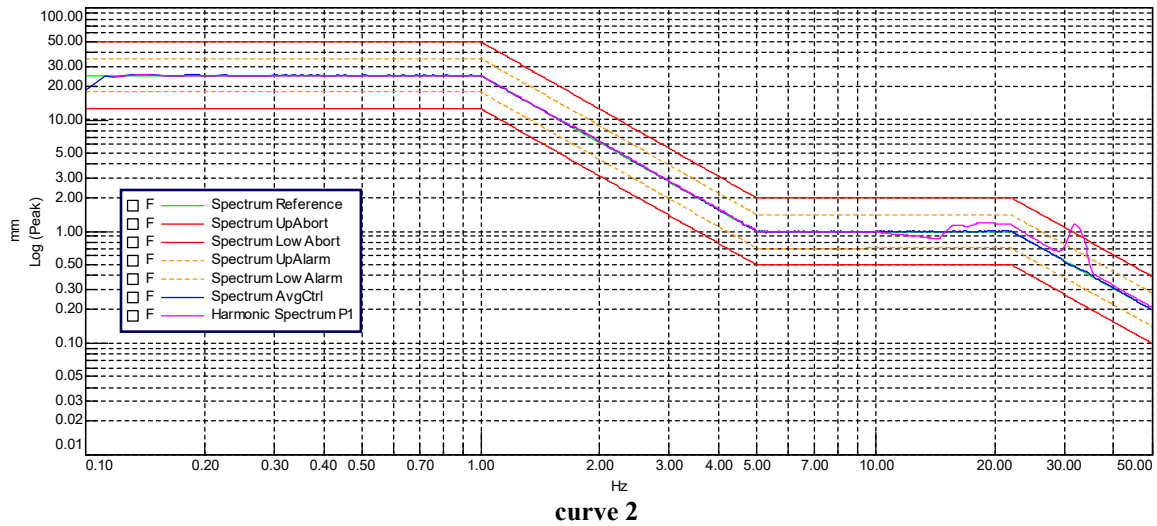
photo 5

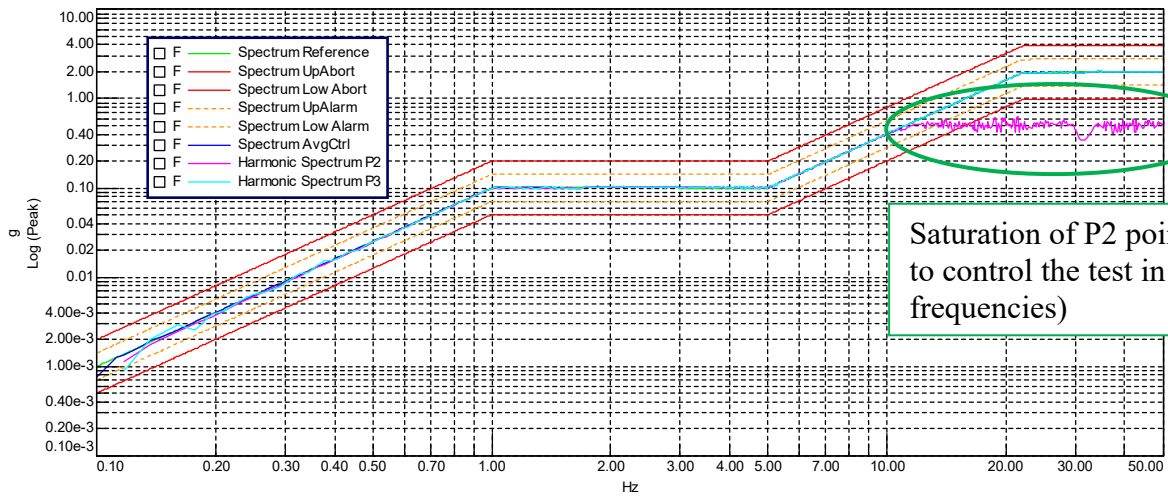
5.1.2. Sinus vibrations – RFR initial:

Control curve recorded at test end given below:



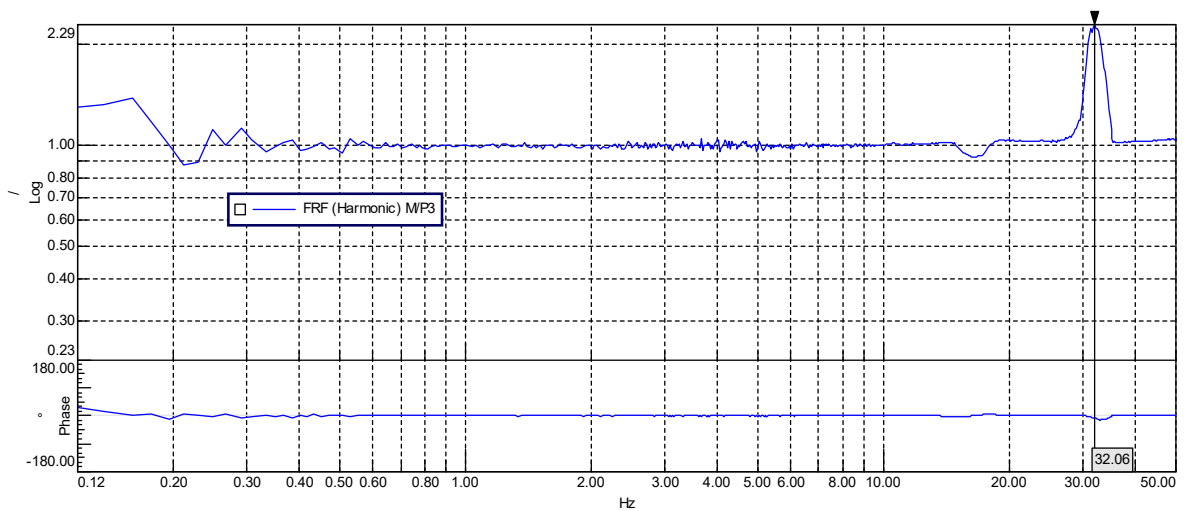
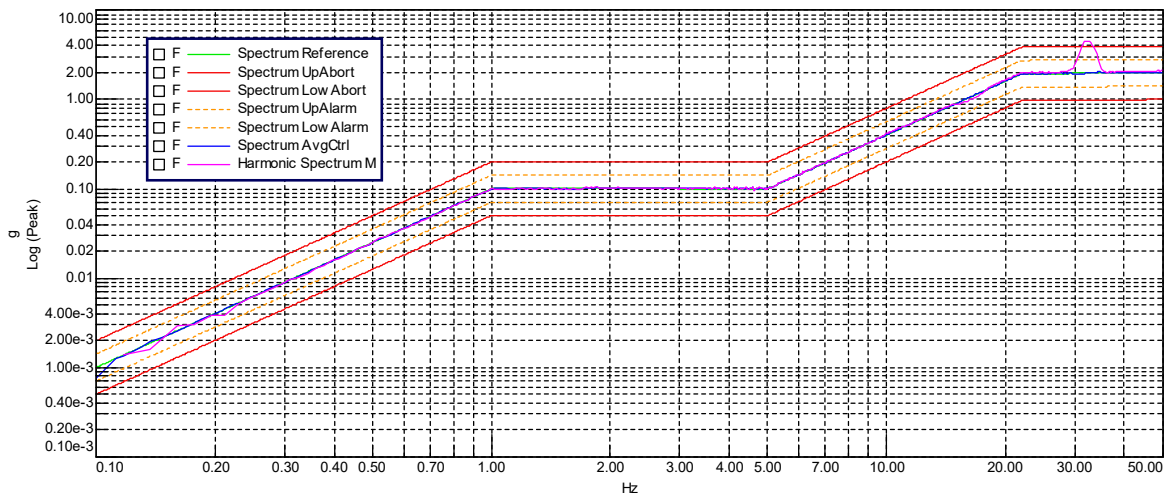
Acceleration measurement of P1, P2 and P3 points given below:





Saturation of P2 point (not used to control the test in the highest frequencies)

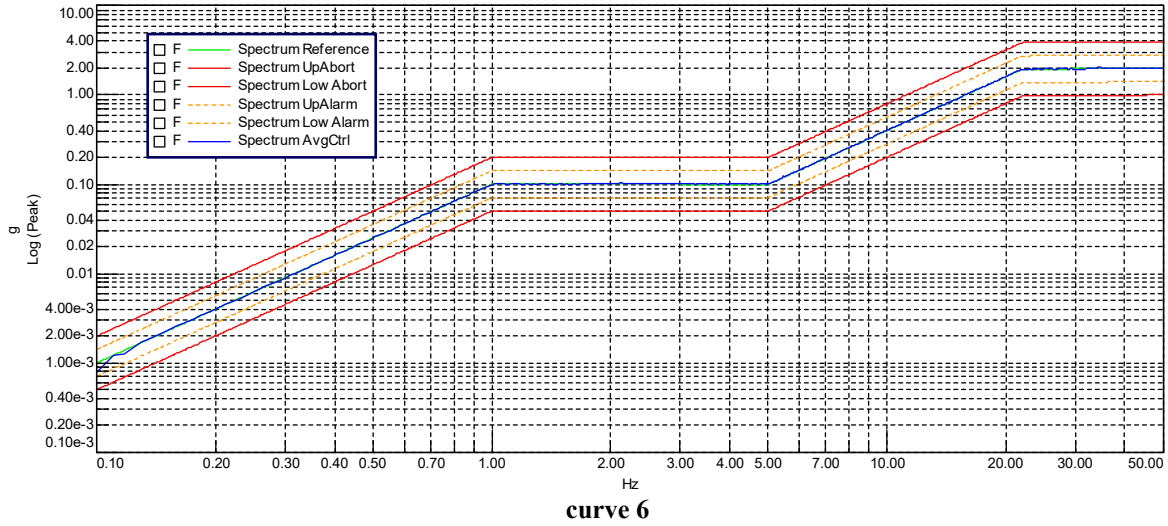
Measurements point given below:



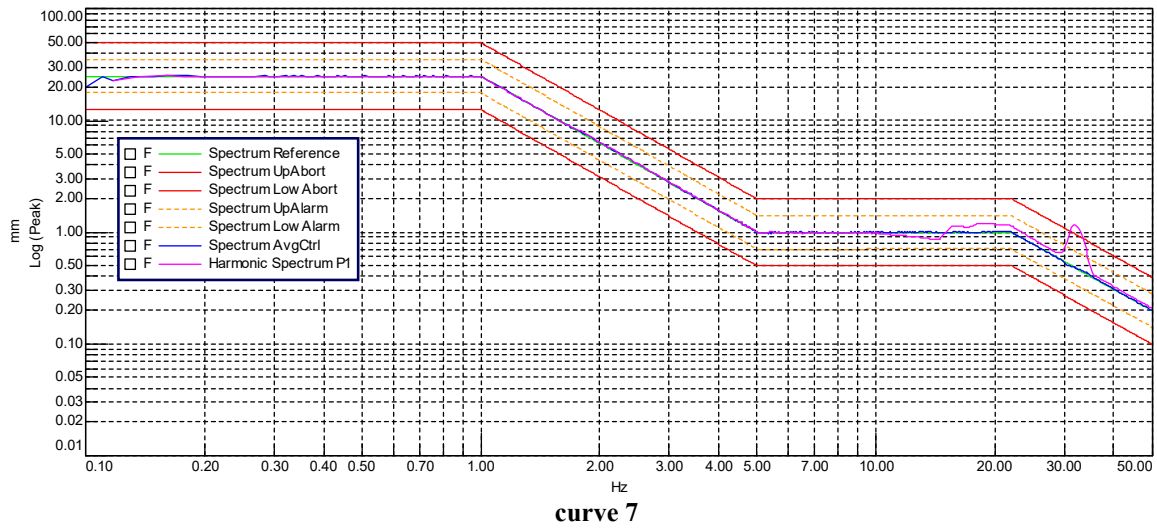
Results: No degradation was observed. There is no resonance frequency.

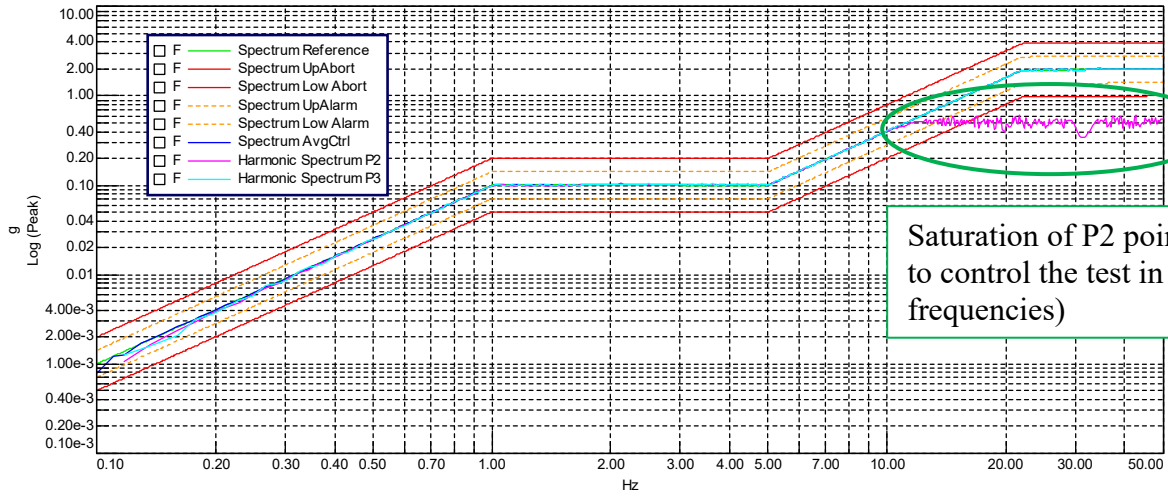
5.1.3. Sinus vibrations - Endurance:

Control curve recorded at test end given below:



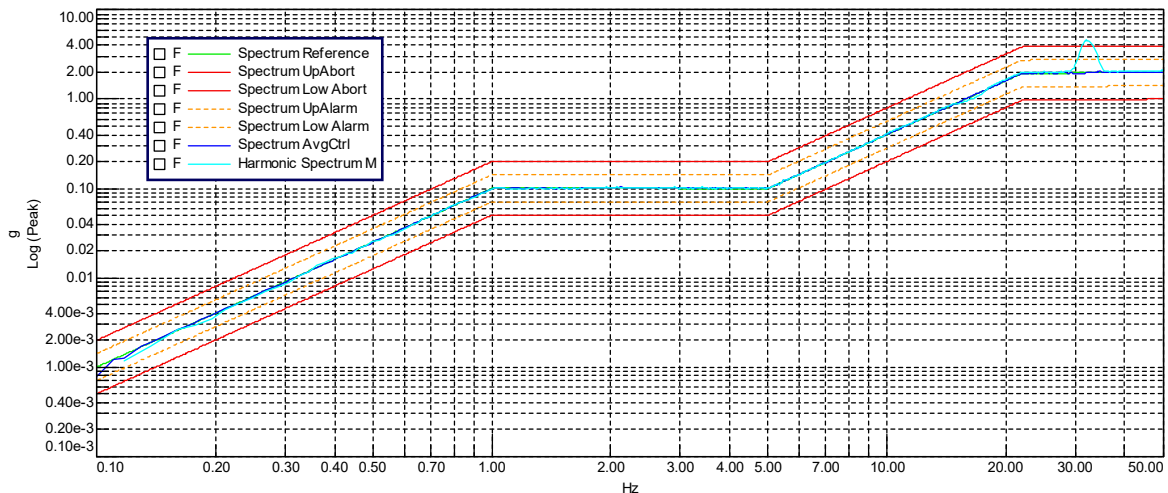
Acceleration measurement of P1, P2 and P3 points given below:





curve 8

Measurements point given below:

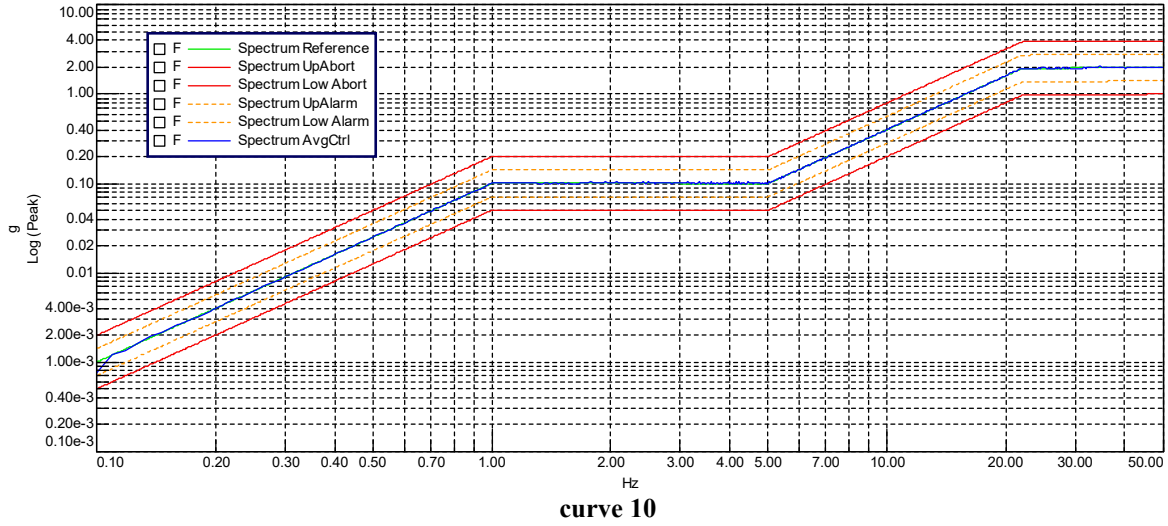


curve 9

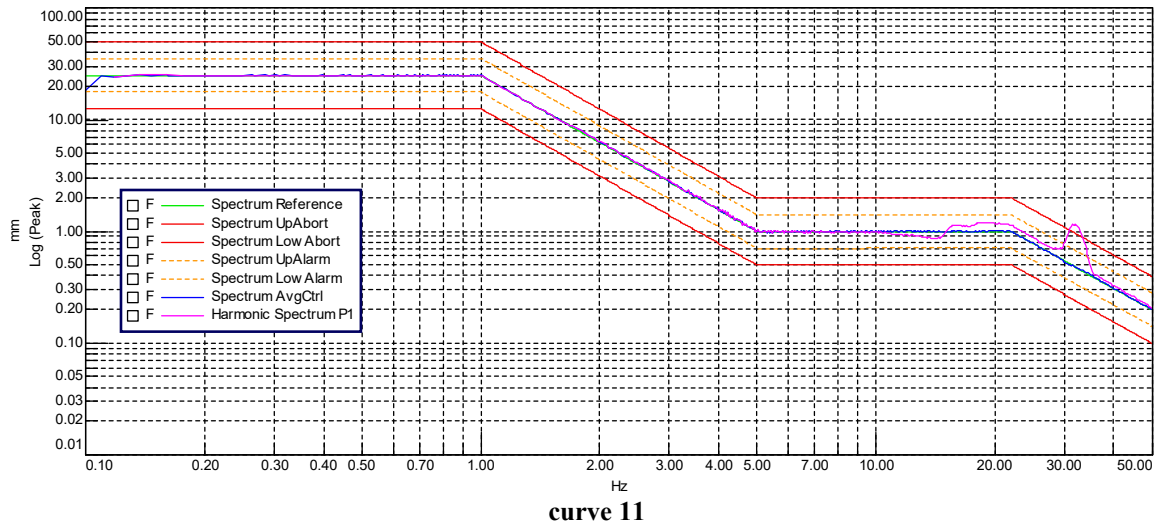
Results: No degradation was observed.

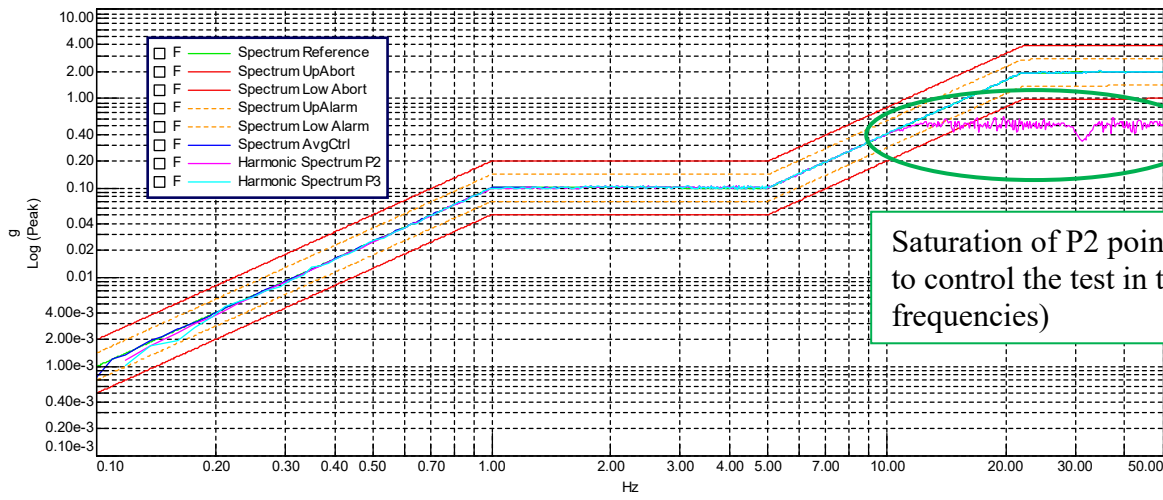
5.1.4. Sinus vibrations – RFR final:

Control curve recorded at test end given below:



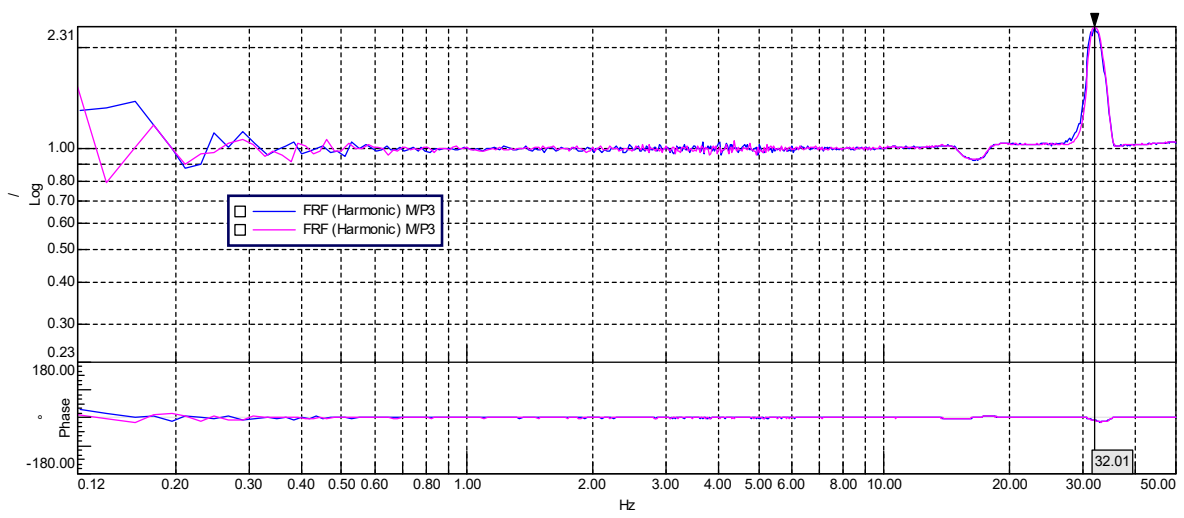
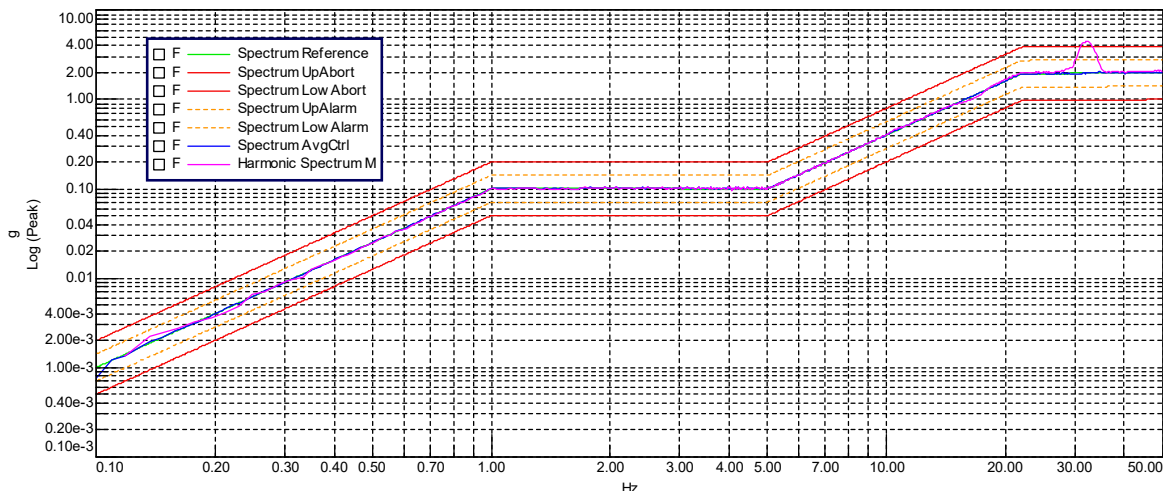
Acceleration measurement of P1, P2 and P3 points given below:





Saturation of P2 point (not used to control the test in the highest frequencies)

Measurements point given below:



Results: No degradation was observed. There is no resonance frequency.

5.1.5. Test set up for shocks:

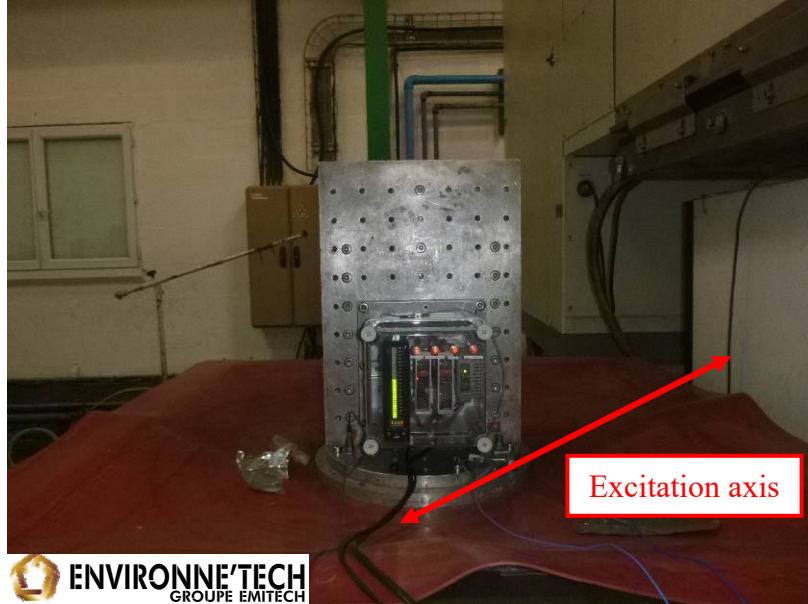


photo 6

Positioning of accelerometers P1 and P2 given below:

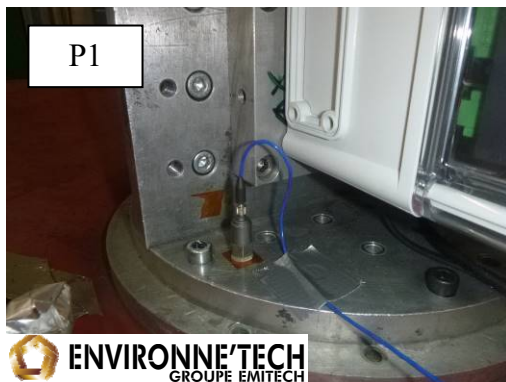


photo 7

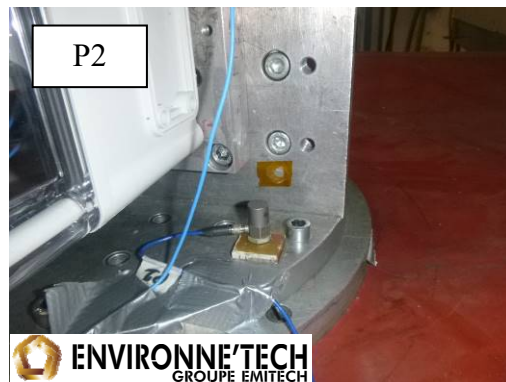


photo 8

Positioning of accelerometer M given below:

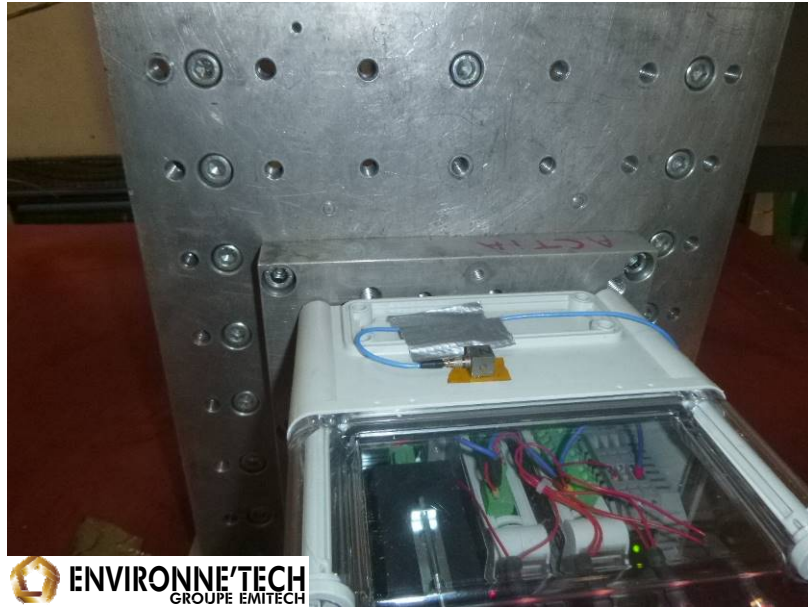


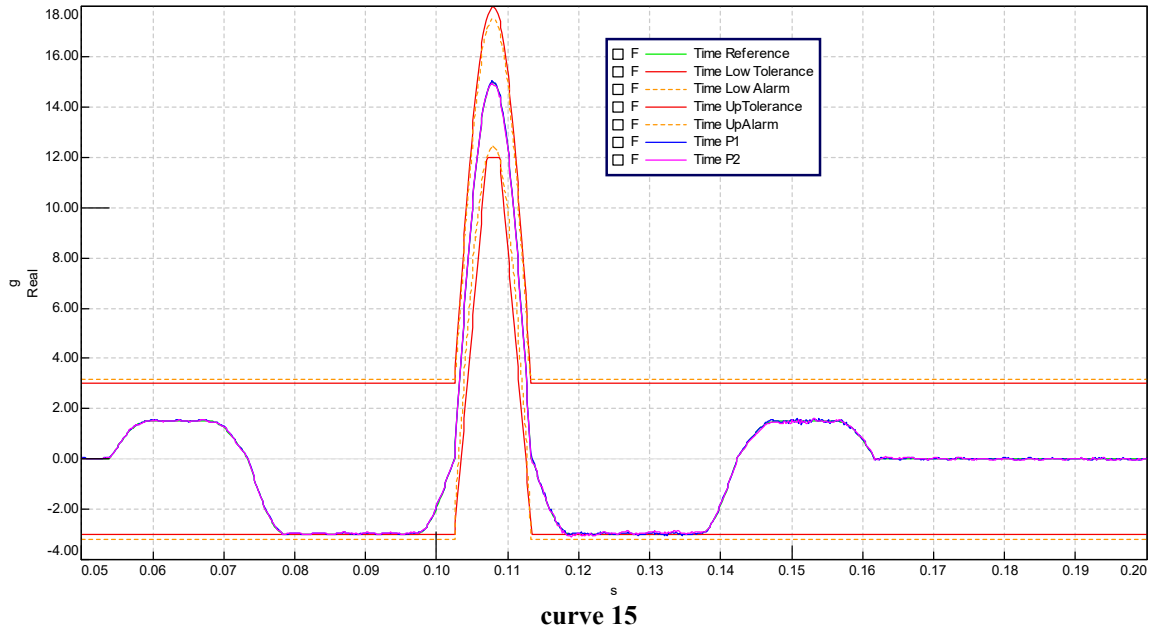
photo 9

5.1.6. Shock tests:

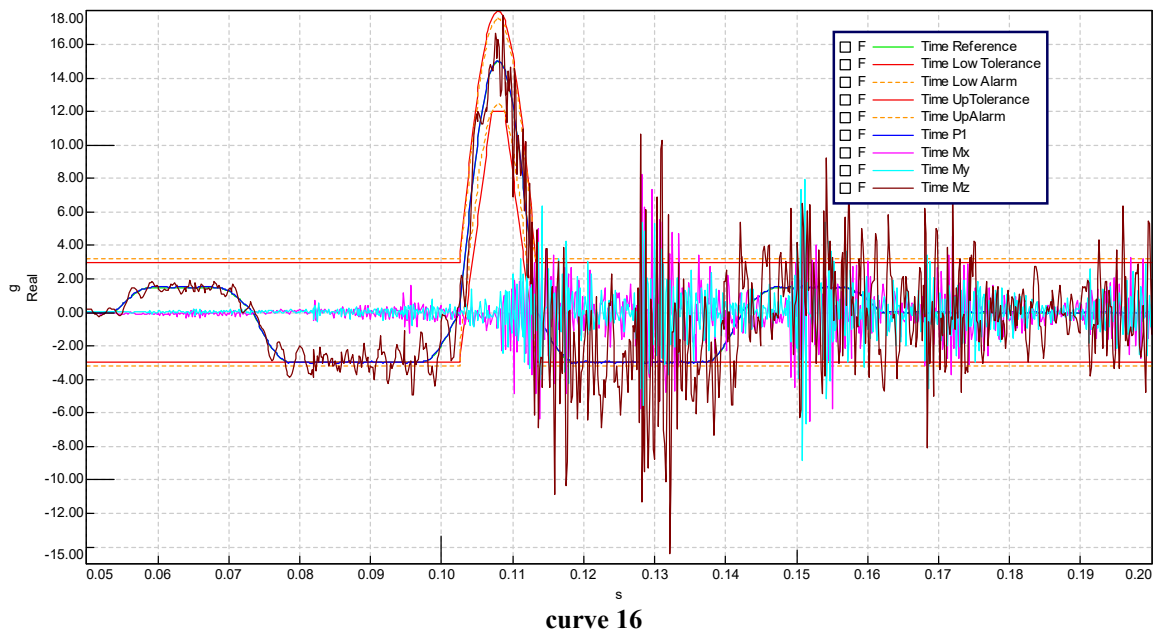
Control was done at P1 point.

Curve of the third positive impact given below.

Control curve with P1 and P2 are given below:

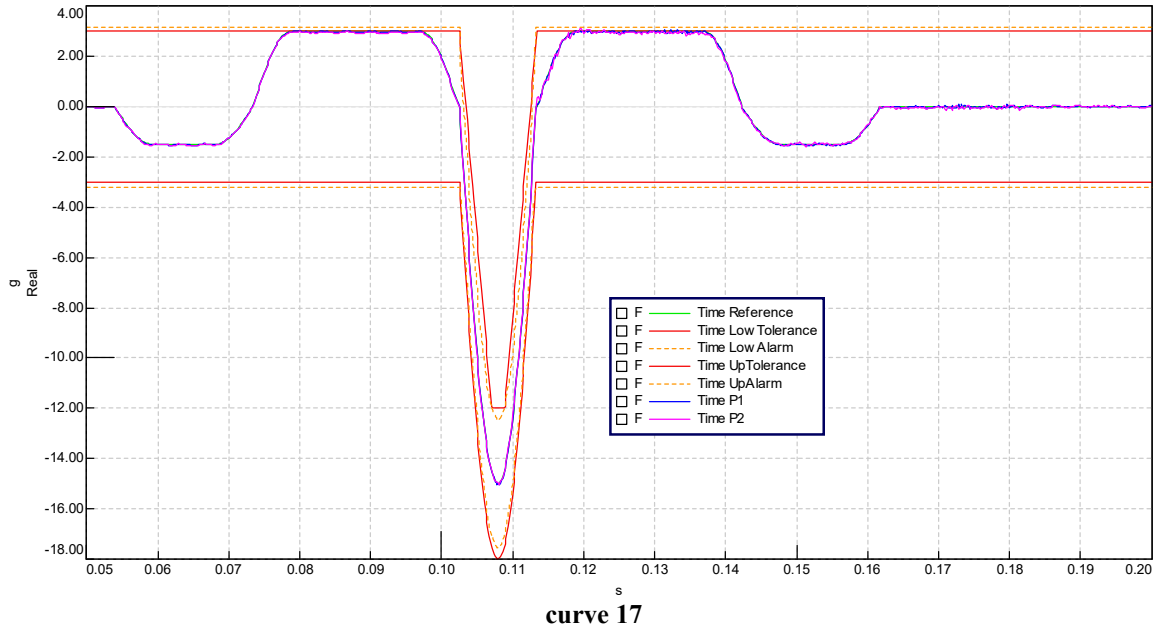


Curve at M point given below:

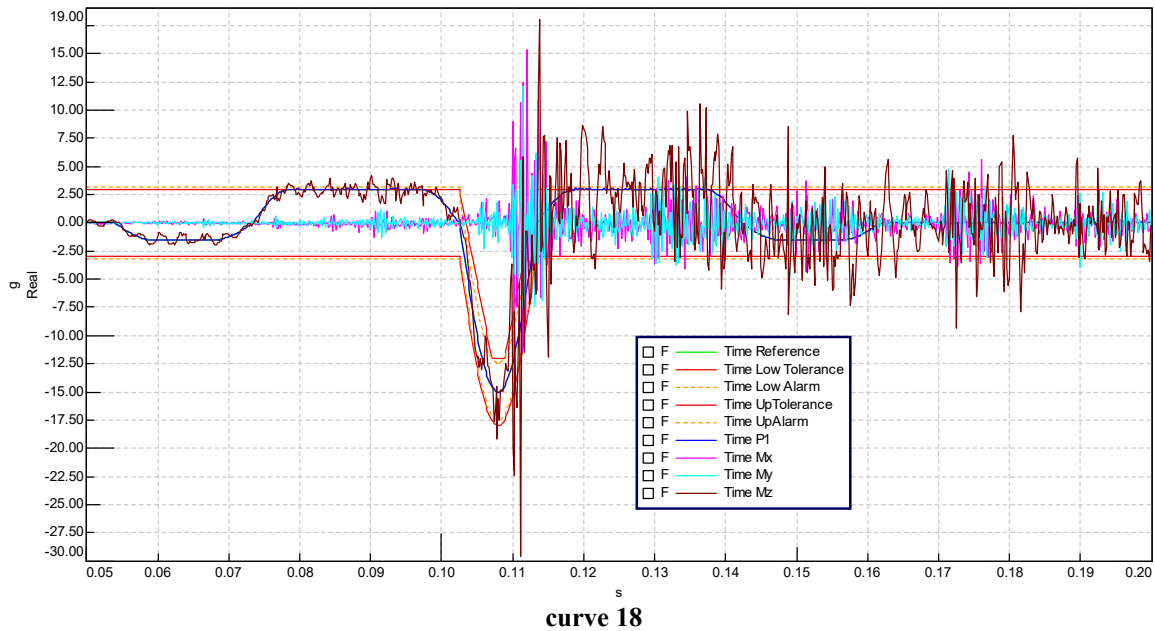


Curve of the third negative impact given below.

Control curve with P1 and P2 are given below:



Curve at M point given below:



5.2. *X axis:*

5.2.1. *Test set up for sine vibrations:*

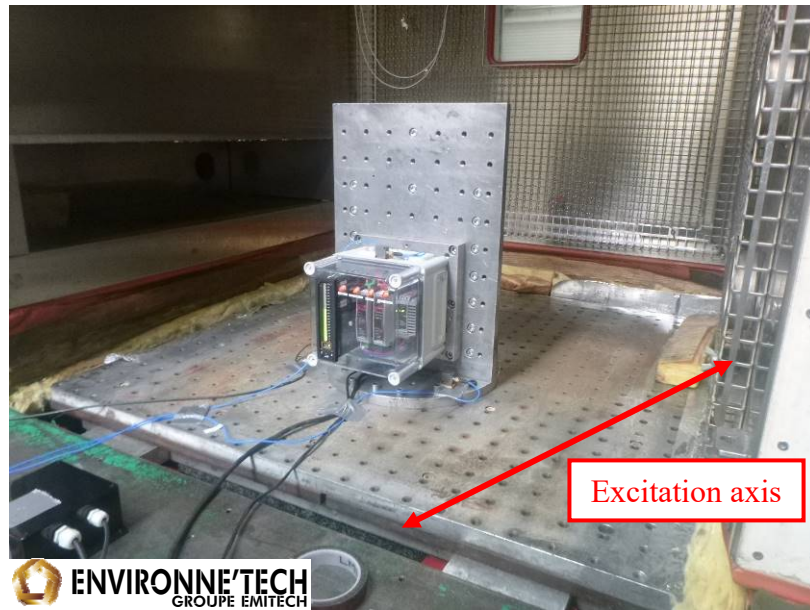


photo 10

P1 is the displacement sensor of the bench
Positioning of accelerometers P2 and P3 given below:



photo 11

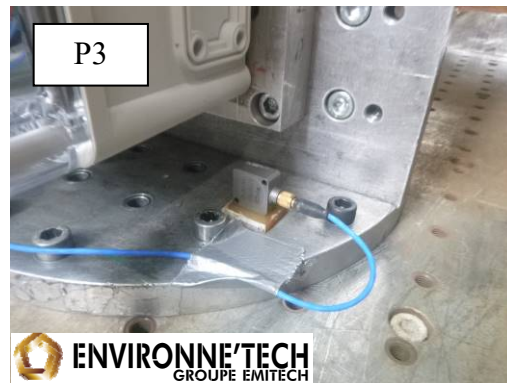


photo 12

Positioning of accelerometer M given below:

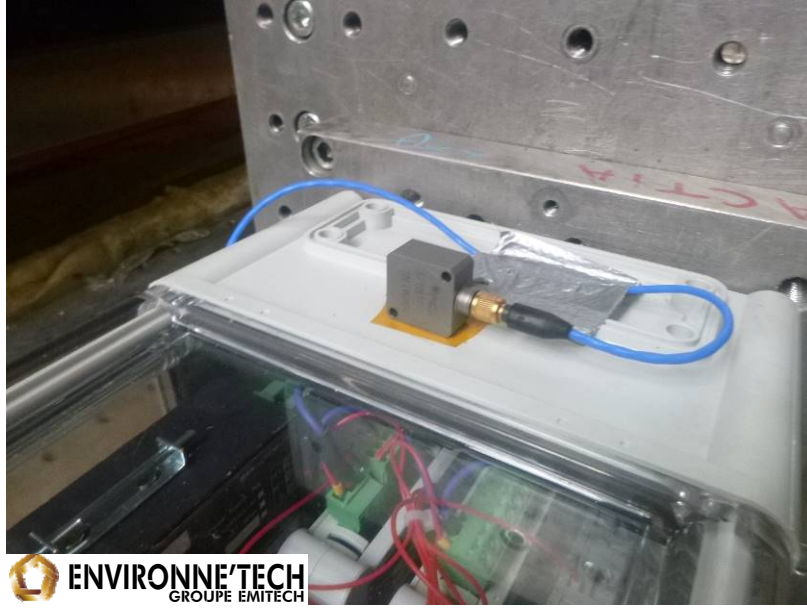
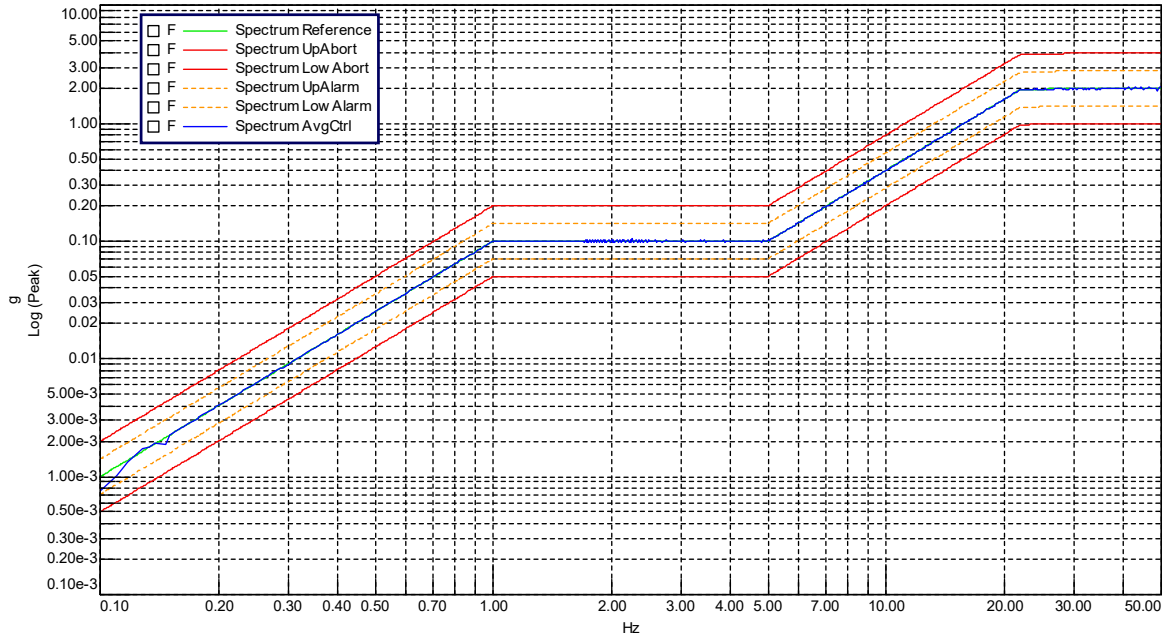


photo 13

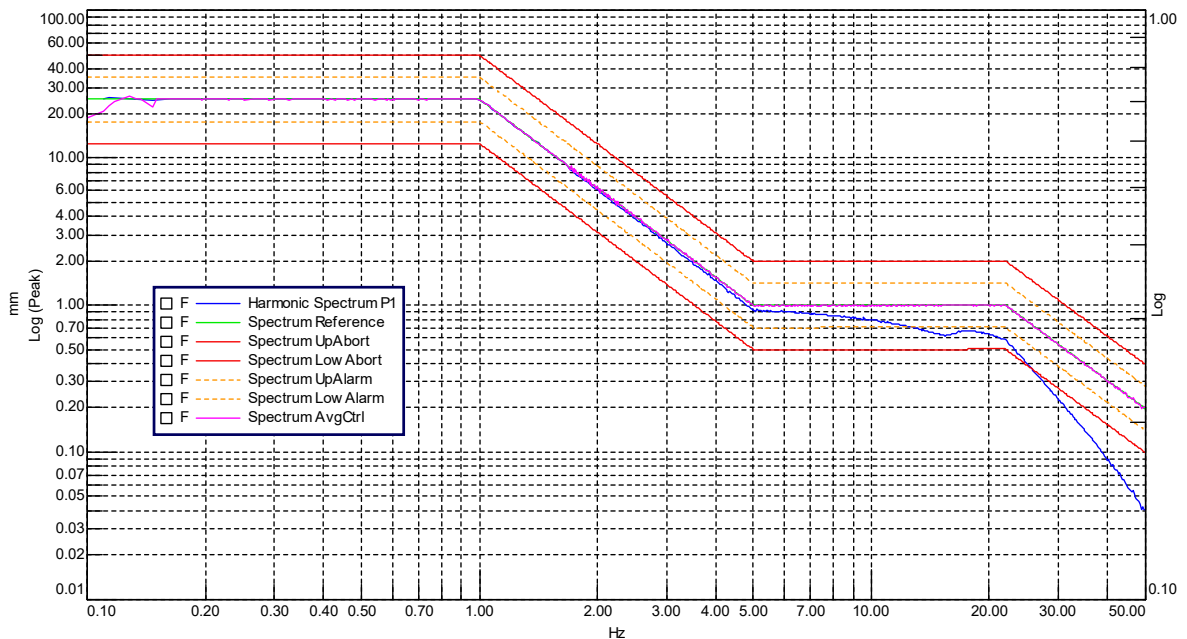
5.2.2. Sinus vibrations – RFR initial:

Control curve recorded at test end given below:

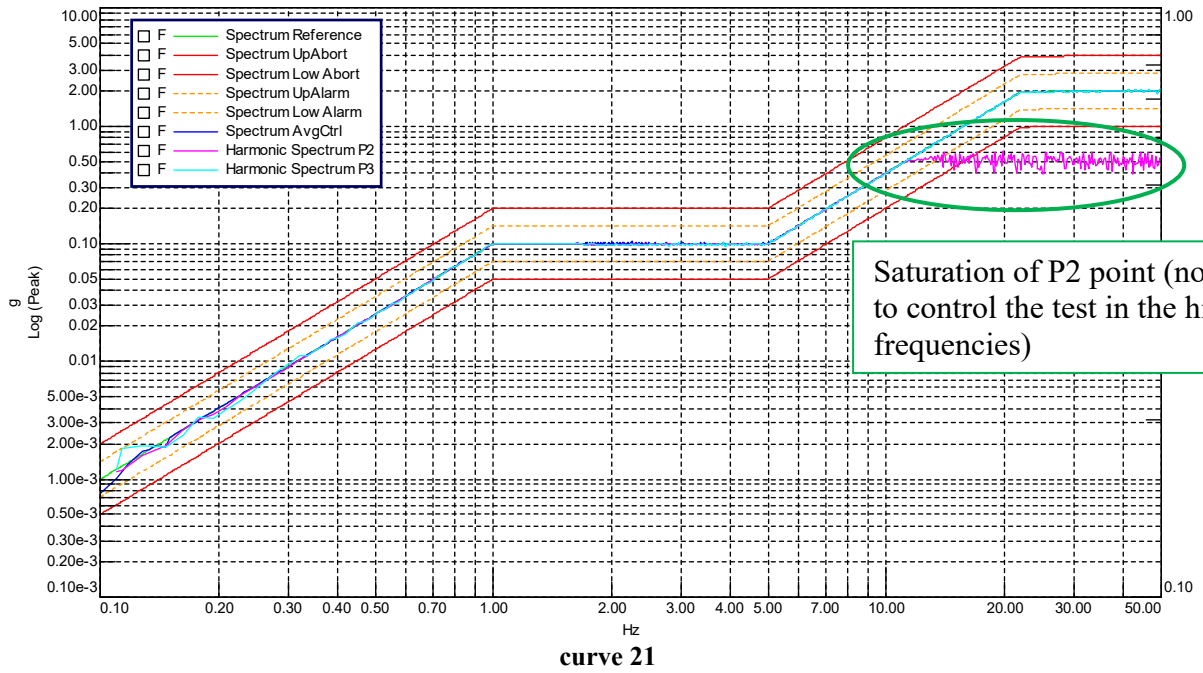


curve 19

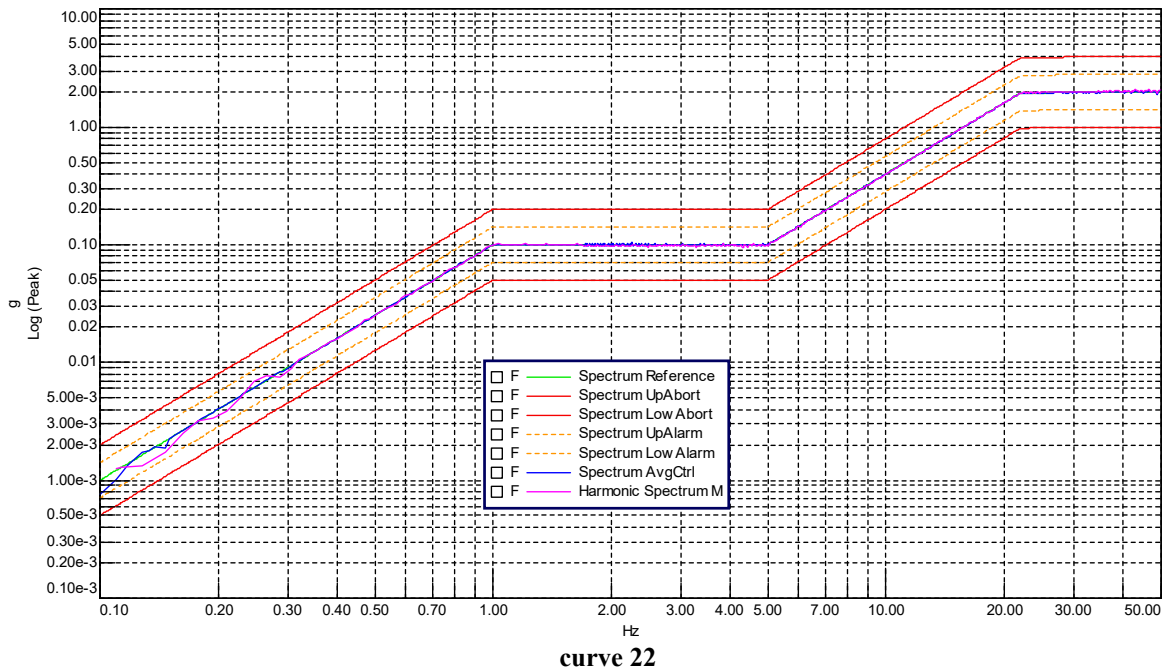
Acceleration measurement of P1, P2 and P3 points given below:

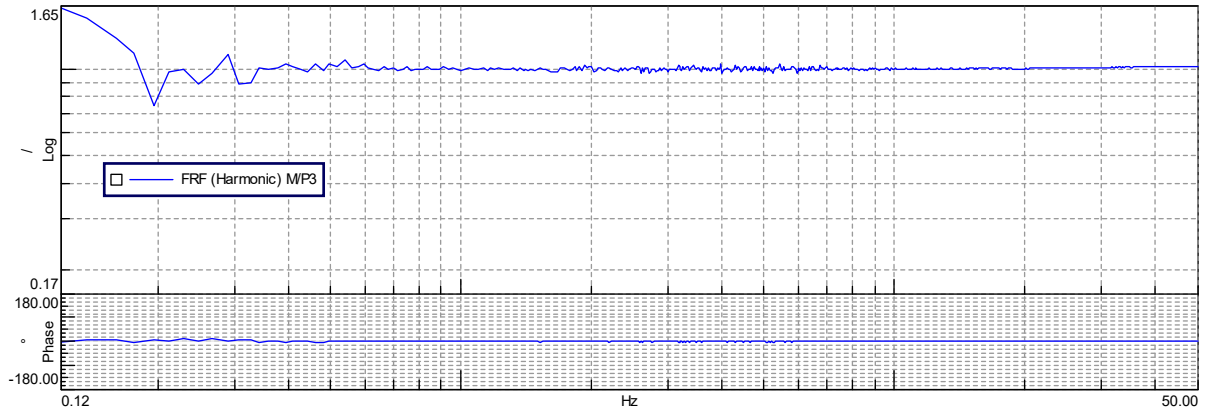


curve 20



Measurements point given below:



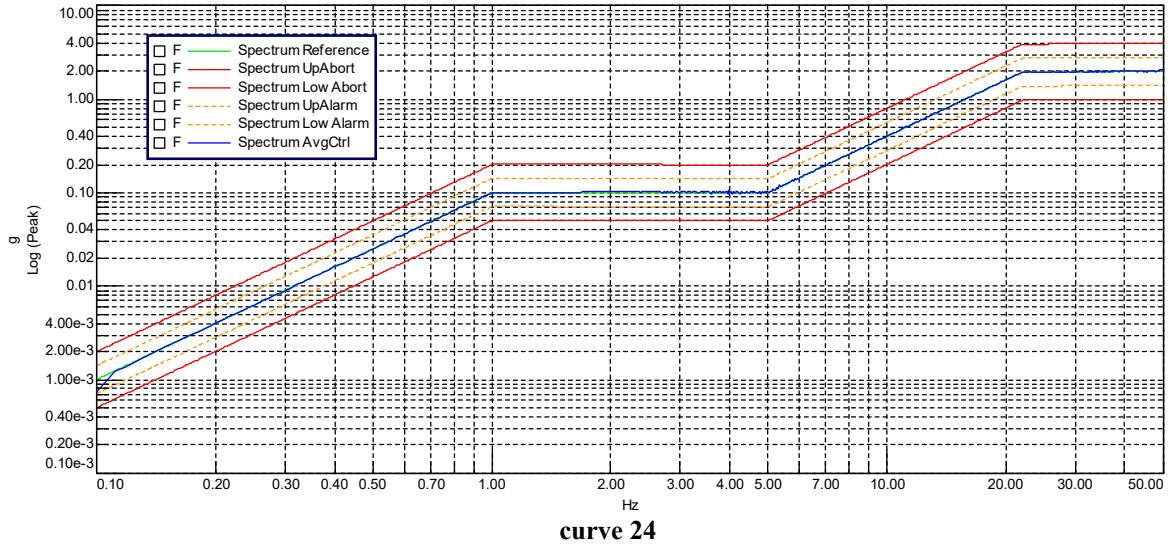


curve 23

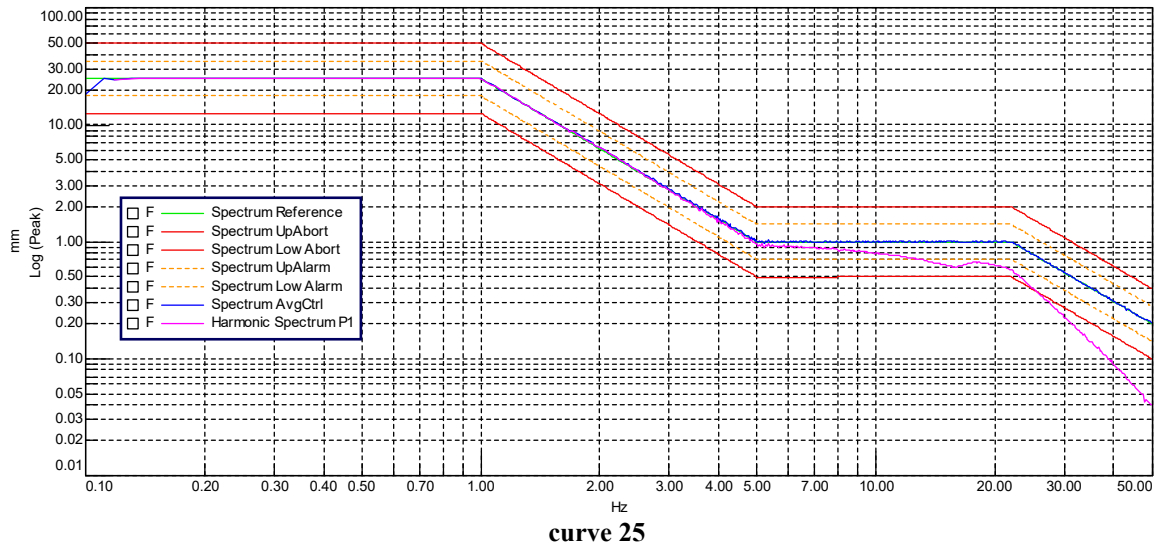
Results: No degradation was observed. There is no resonance frequency.

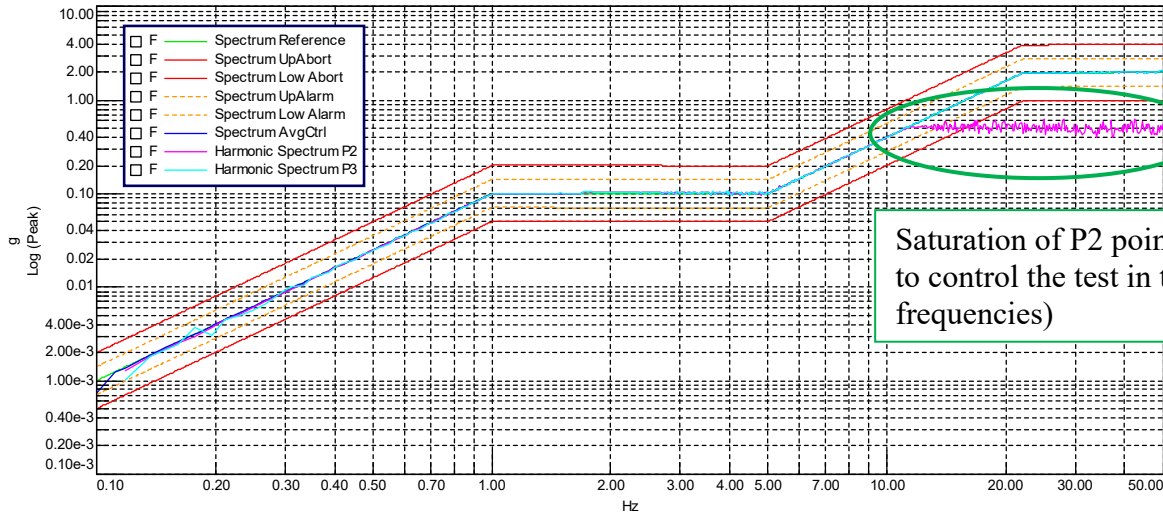
5.2.3. Sinus vibrations - Endurance:

Control curve recorded at test end given below:



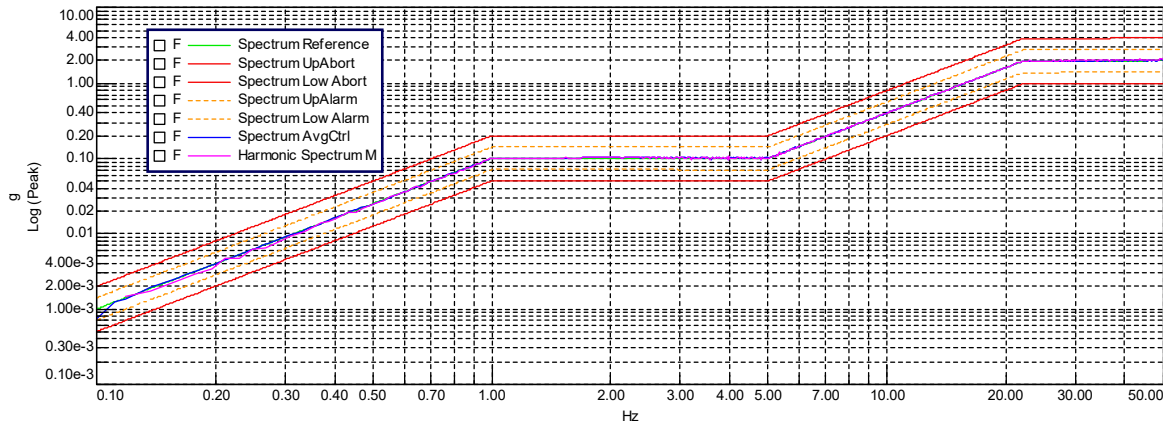
Acceleration measurement of P1, P2 and P3 points given below:





curve 26

Measurements point given below:

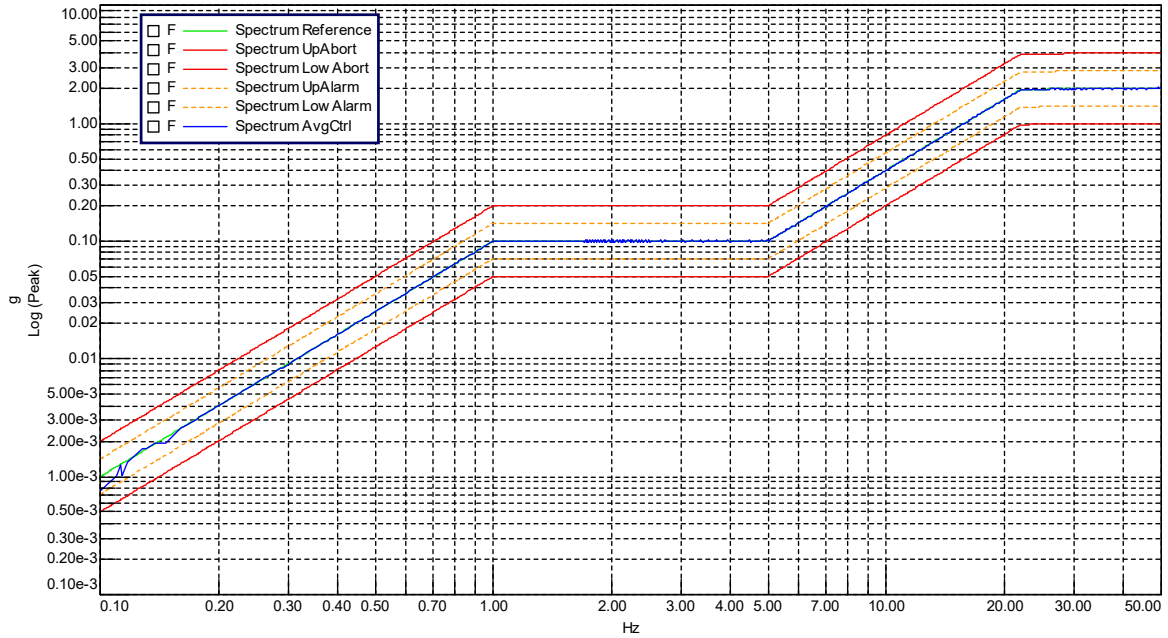


curve 27

Results: No degradation was observed.

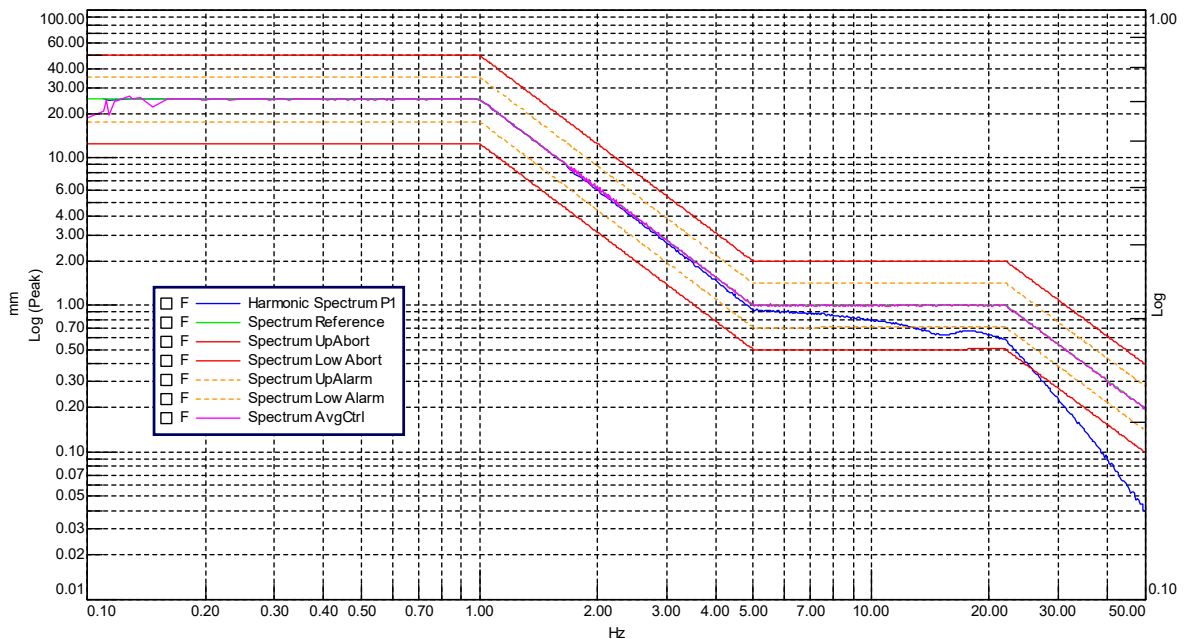
5.2.4. Sinus vibrations – RFR final:

Control curve recorded at test end given below:

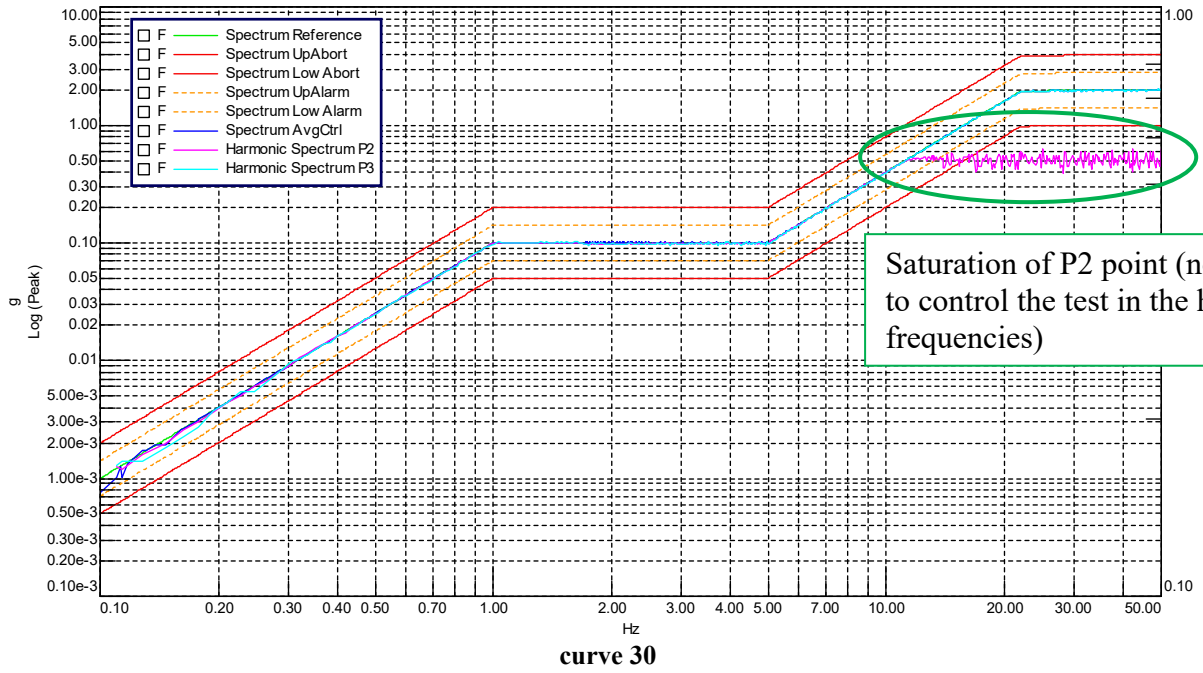


curve 28

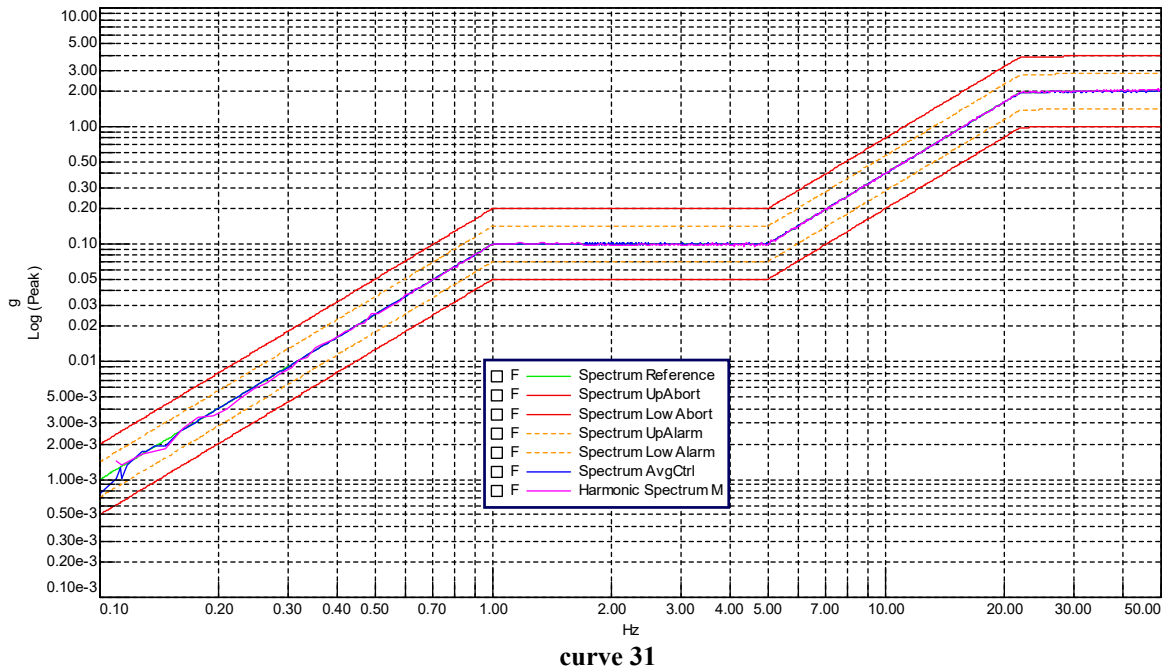
Acceleration measurement of P1, P2 and P3 points given below:

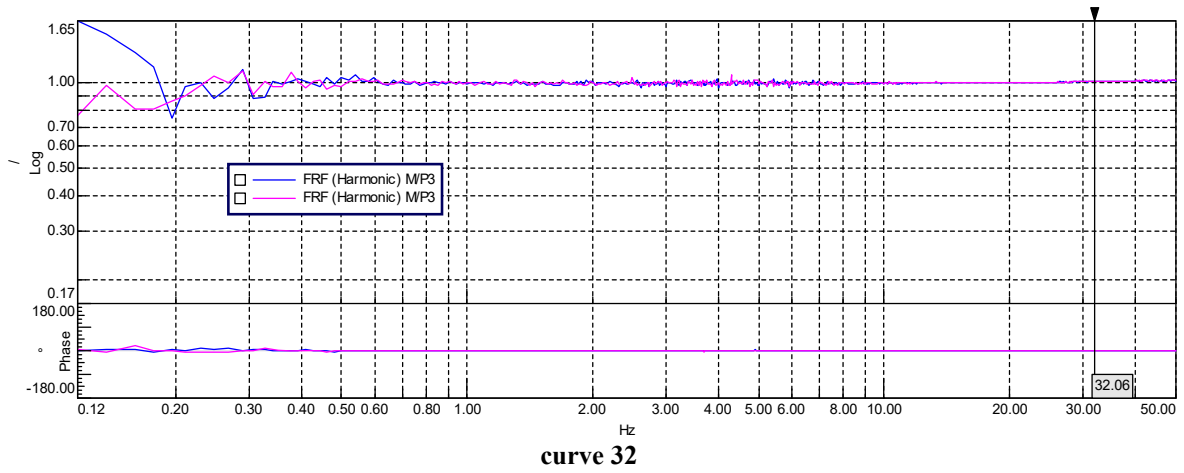


curve 29



Measurements point given below:





Results: No degradation was observed. There is no resonance frequency.

5.2.5. Test set up for shocks:

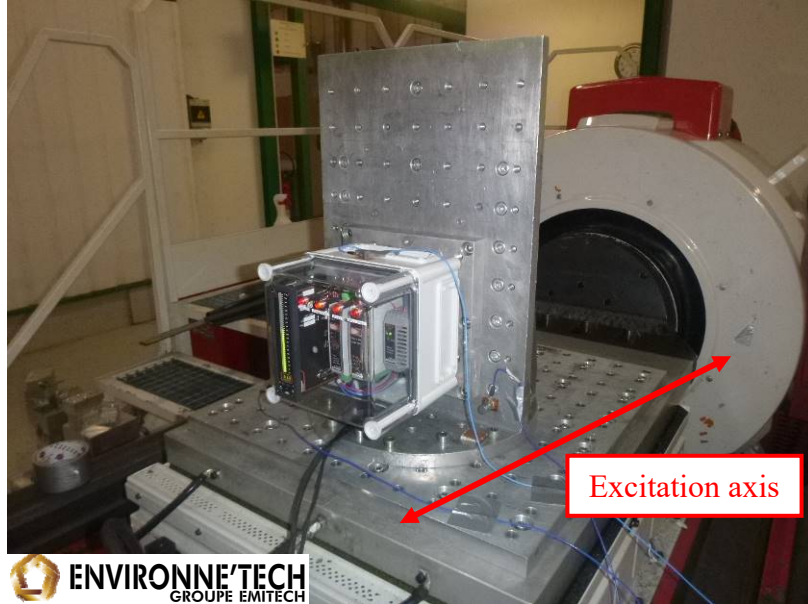


photo 14

Positioning of accelerometers P1 and P2 given below:

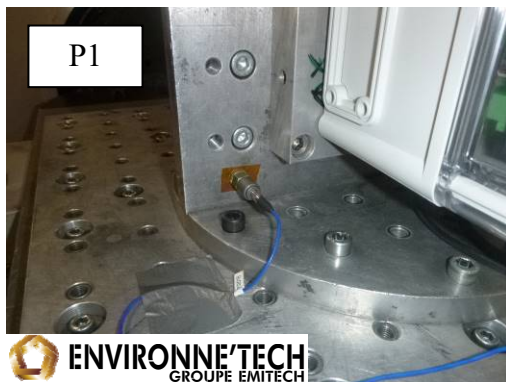


photo 15

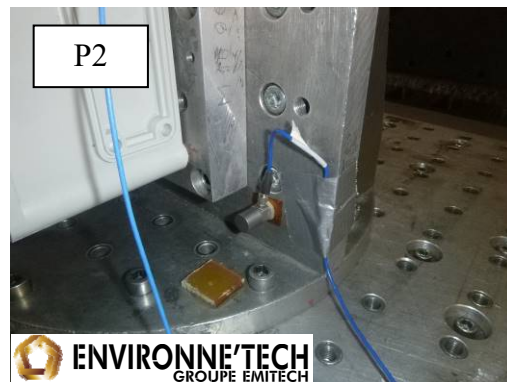


photo 16

Positioning of accelerometer M given below:

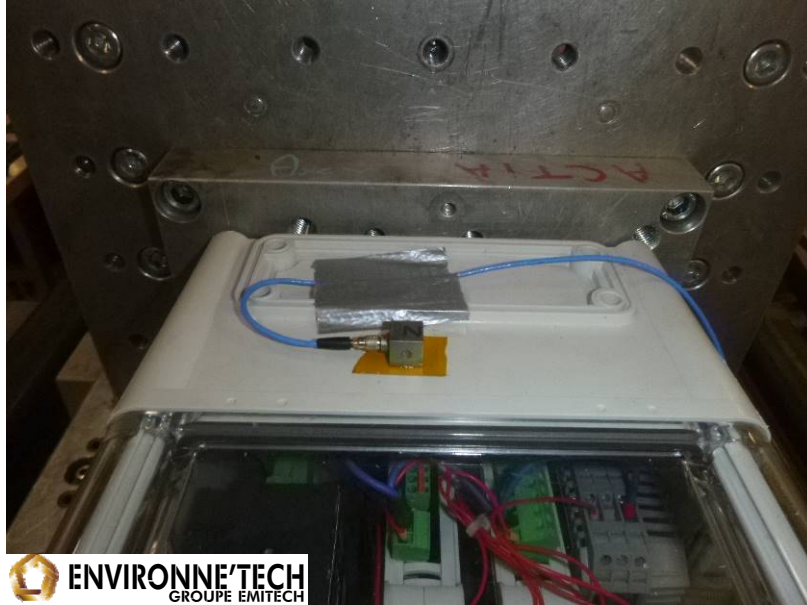


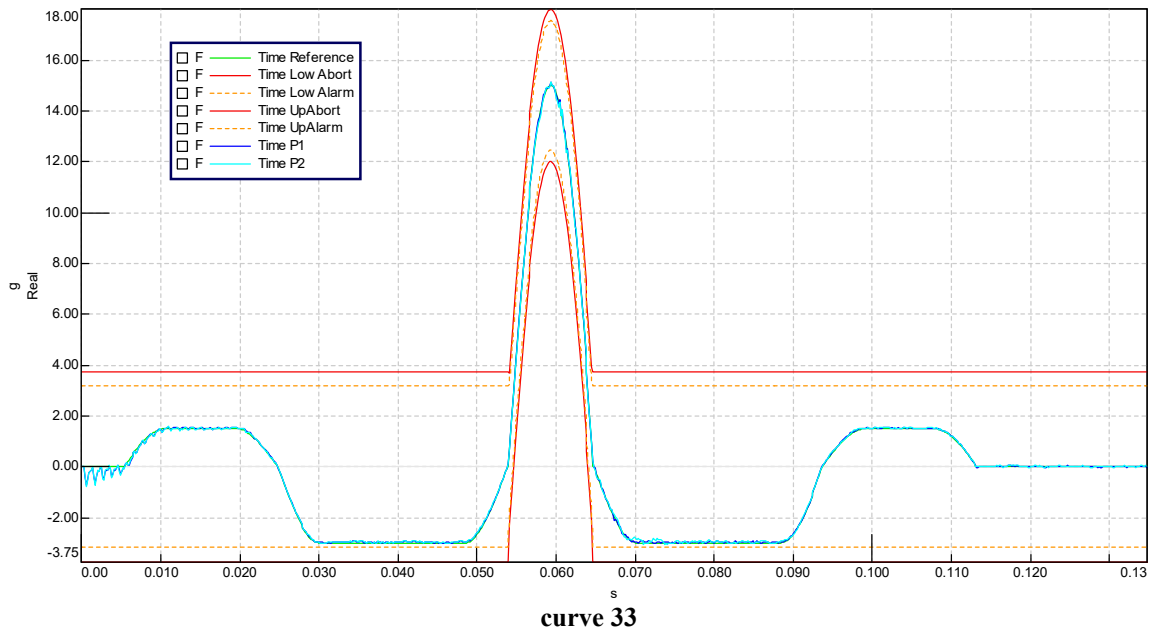
photo 17

5.2.6. Shock tests:

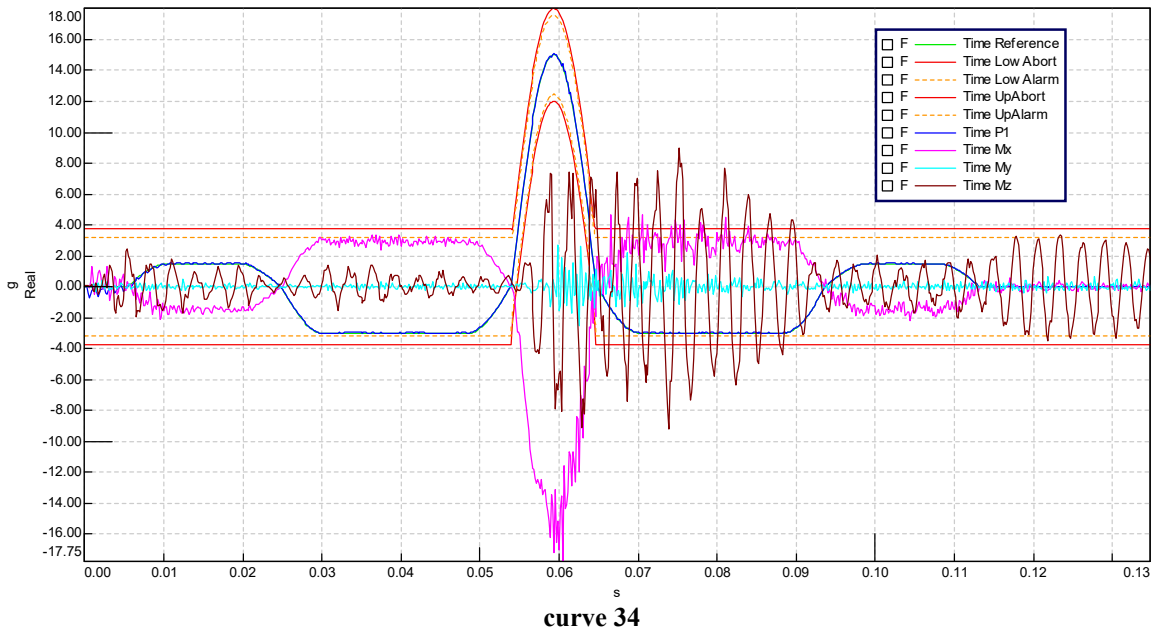
Control was done at P1 point.

Curve of the third positive impact given below.

Control curve with P1 and P2 are given below:

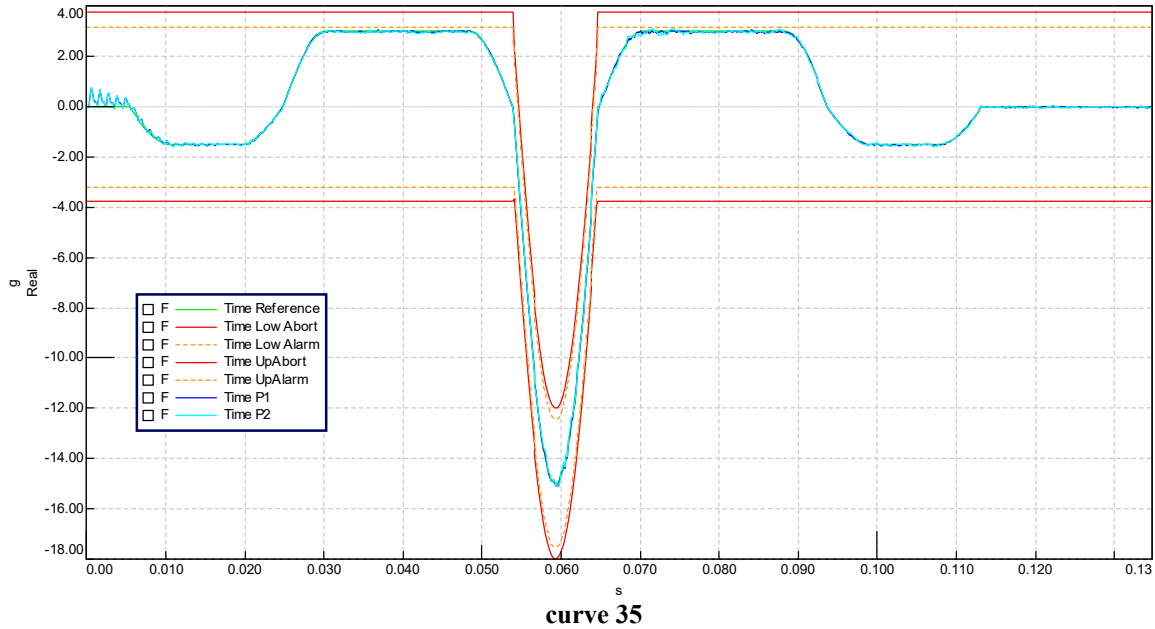


Curve at M point given below:

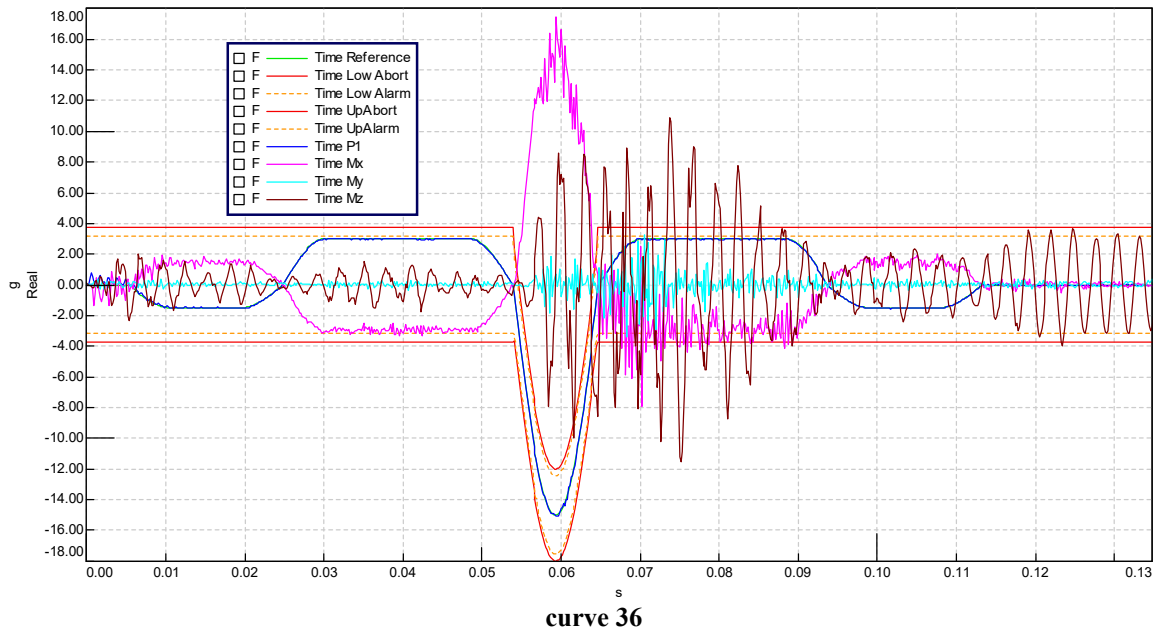


Curve of the third negative impact given below.

Control curve with P1 and P2 are given below:



Curve at M point given below:



5.3. *Y axis:*

5.3.1. *Test set up for sine vibrations:*

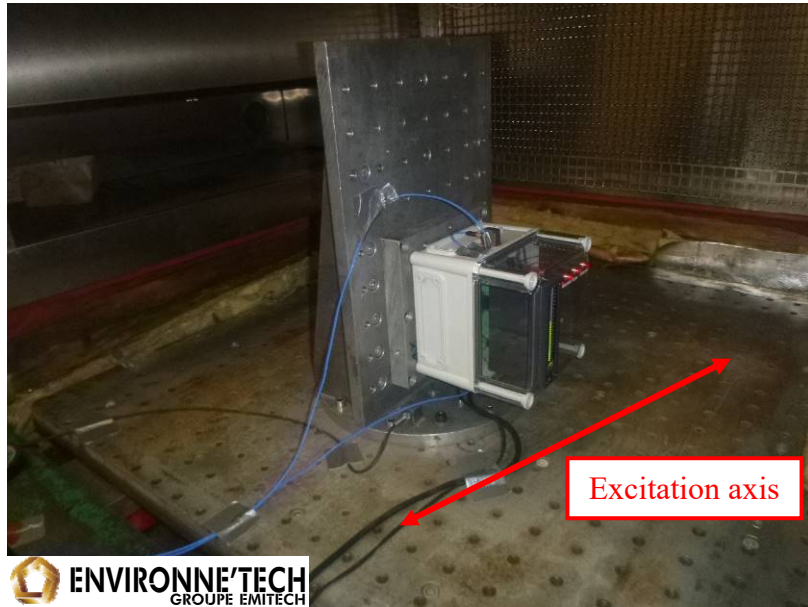


photo 18

P1 is the displacement sensor of the bench
Positioning of accelerometers P2 and P3 given below:



photo 19

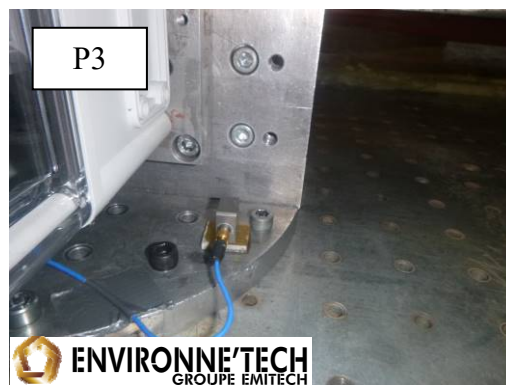


photo 20

Positioning of accelerometer M given below:

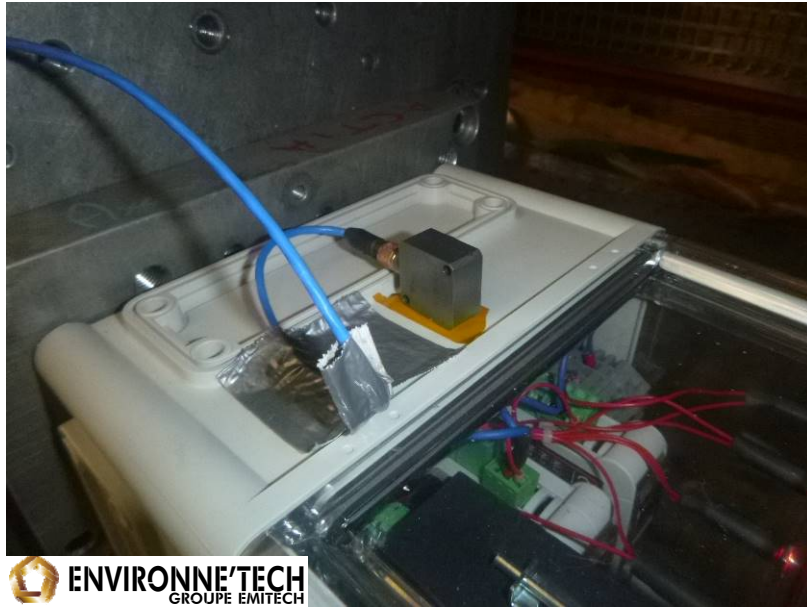
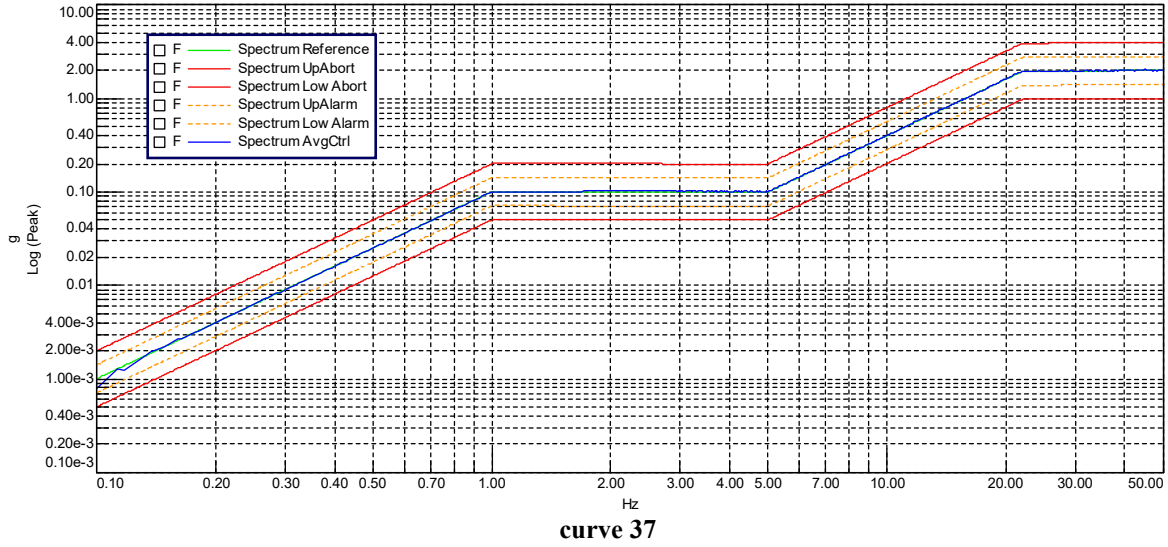


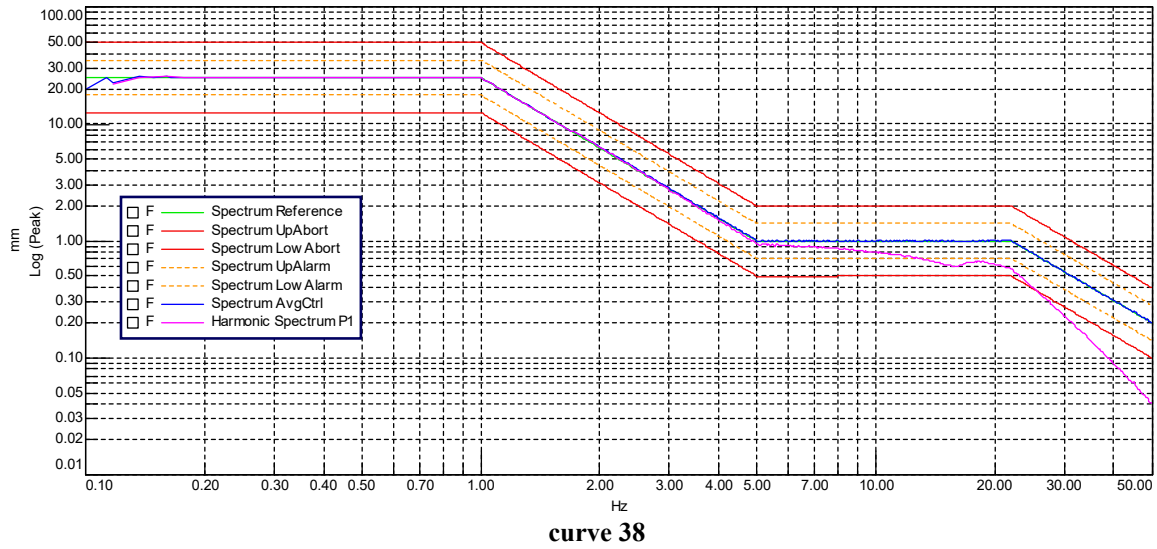
photo 21

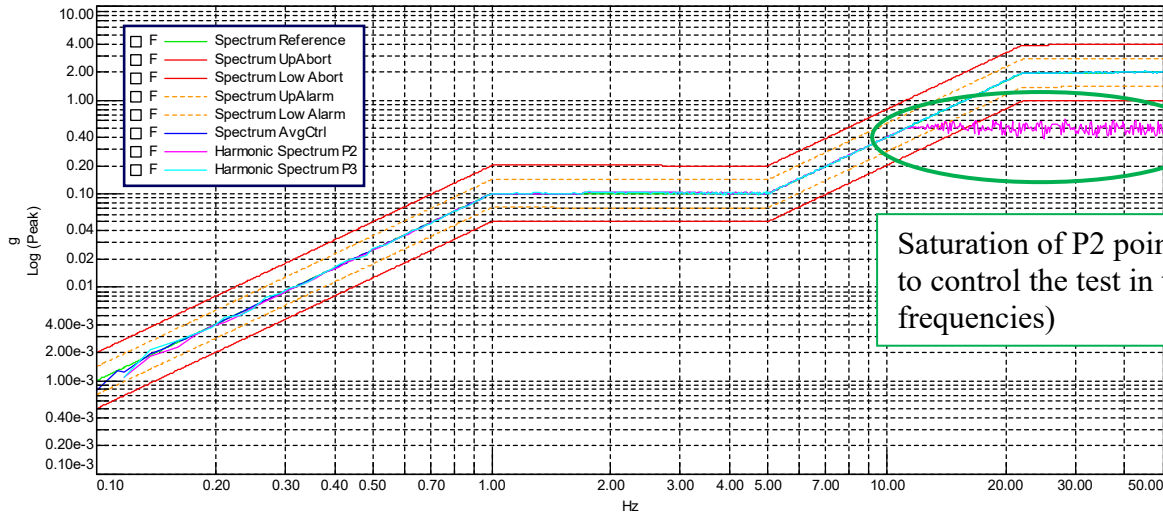
5.3.2. Sinus vibrations – RFR initial:

Control curve recorded at test end given below:



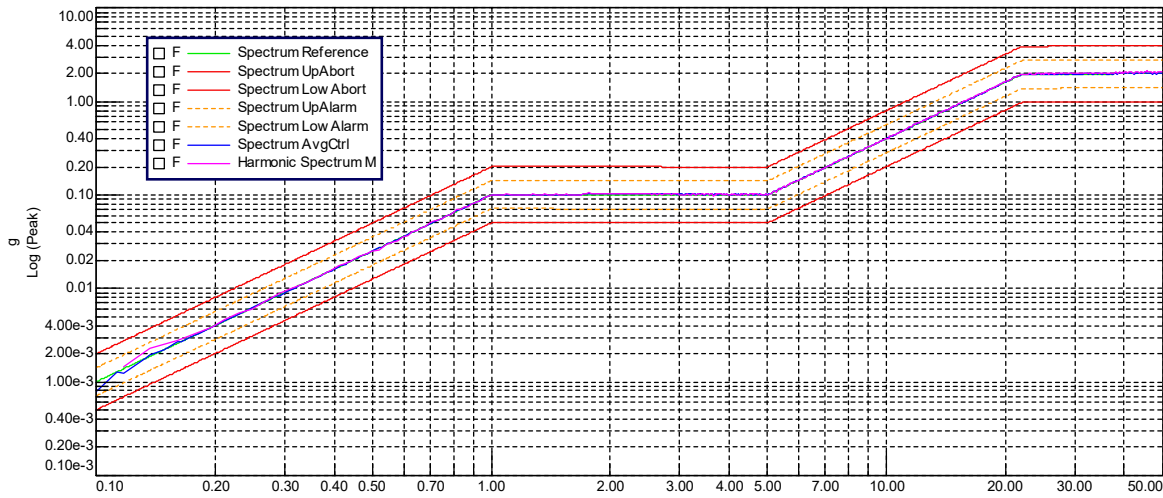
Acceleration measurement of P1, P2 and P3 points given below:



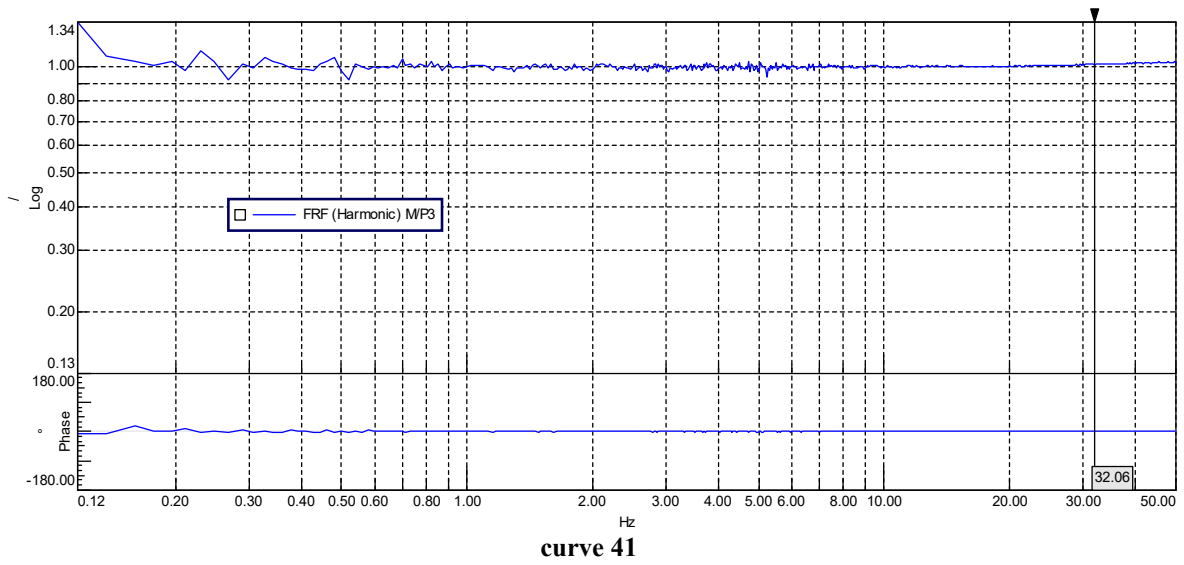


curve 39

Measurements point given below:



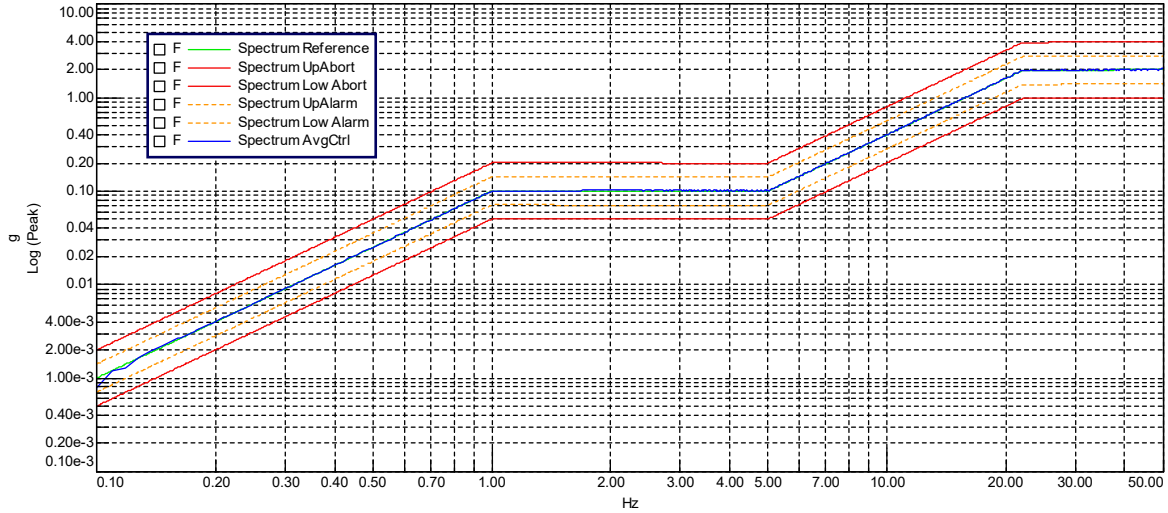
curve 40



Results: No degradation was observed. There is no resonance frequency.

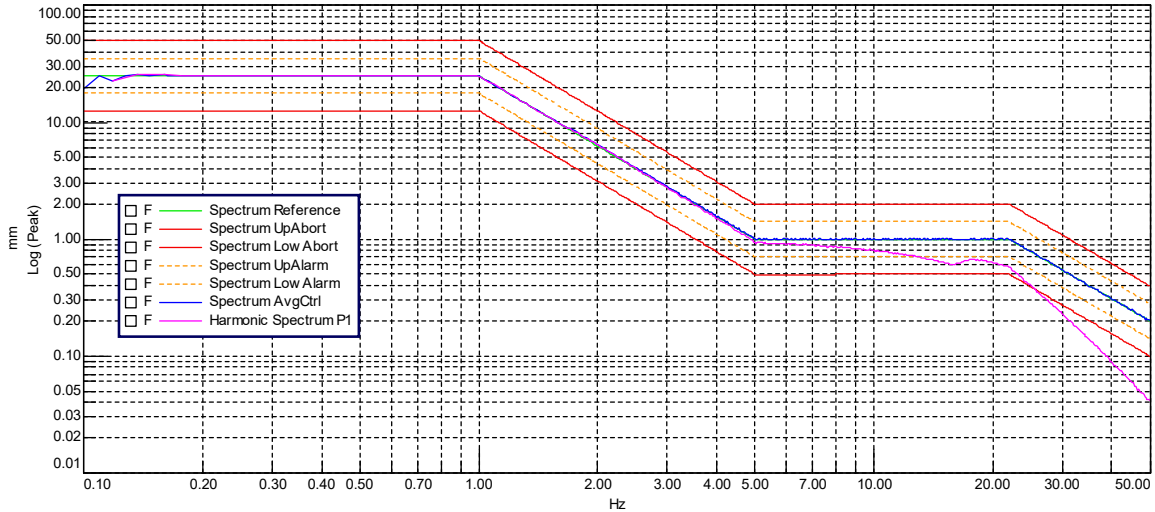
5.3.3. Sinus vibrations - Endurance:

Control curve recorded at test end given below:

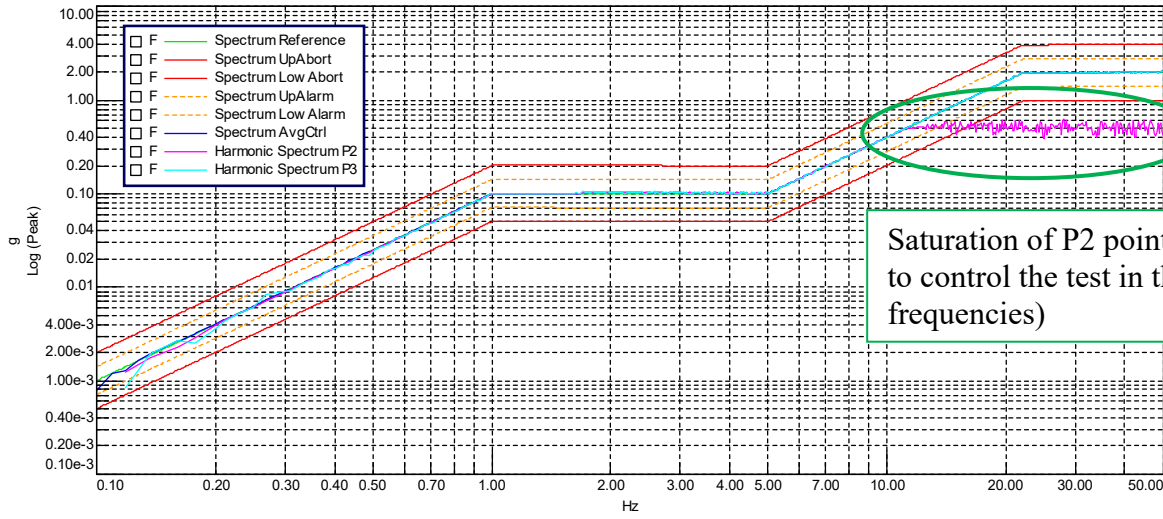


curve 42

Acceleration measurement of P1, P2 and P3 points given below:

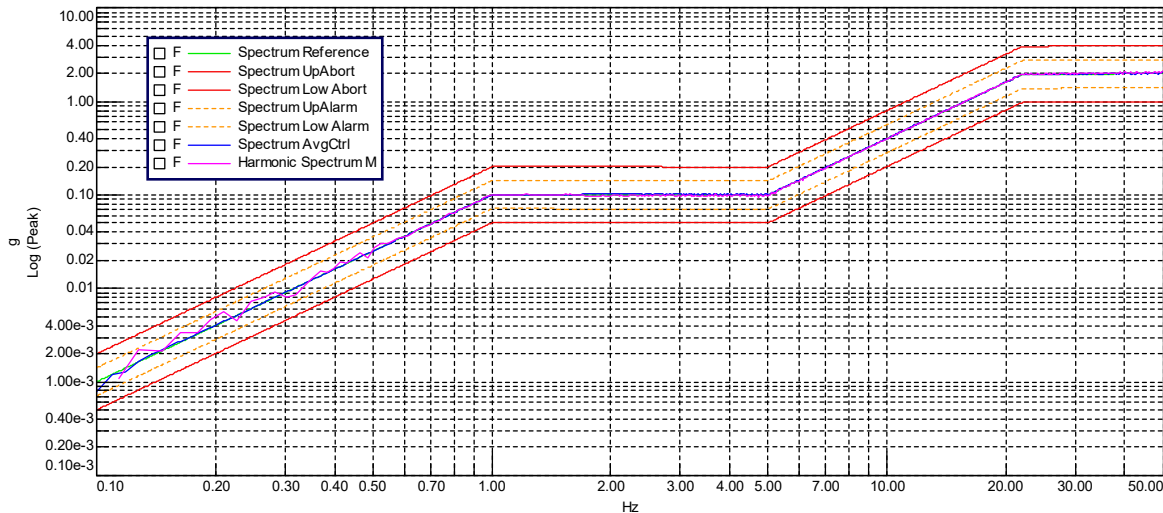


curve 43



curve 44

Measurements point given below:

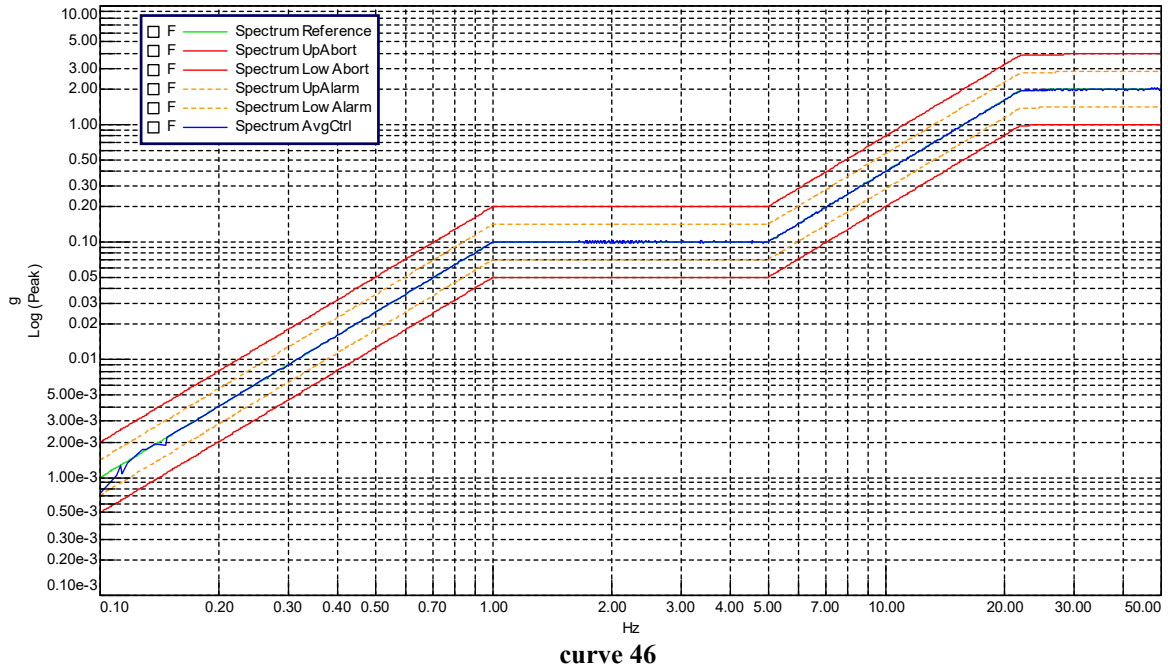


curve 45

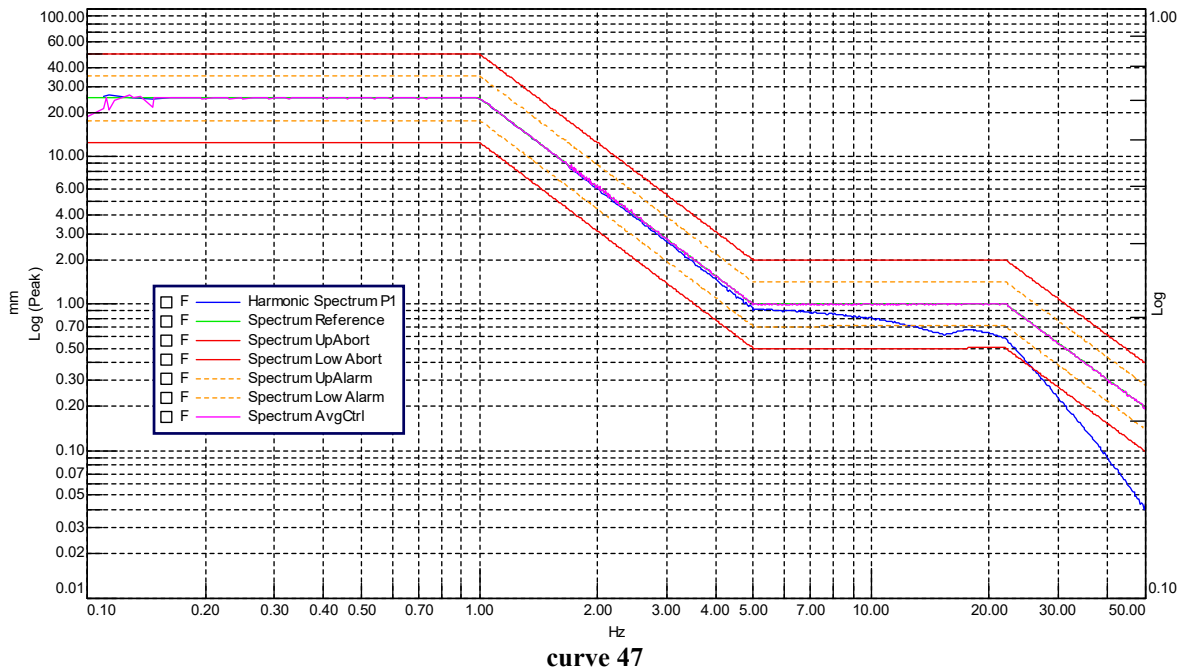
Results: No degradation was observed.

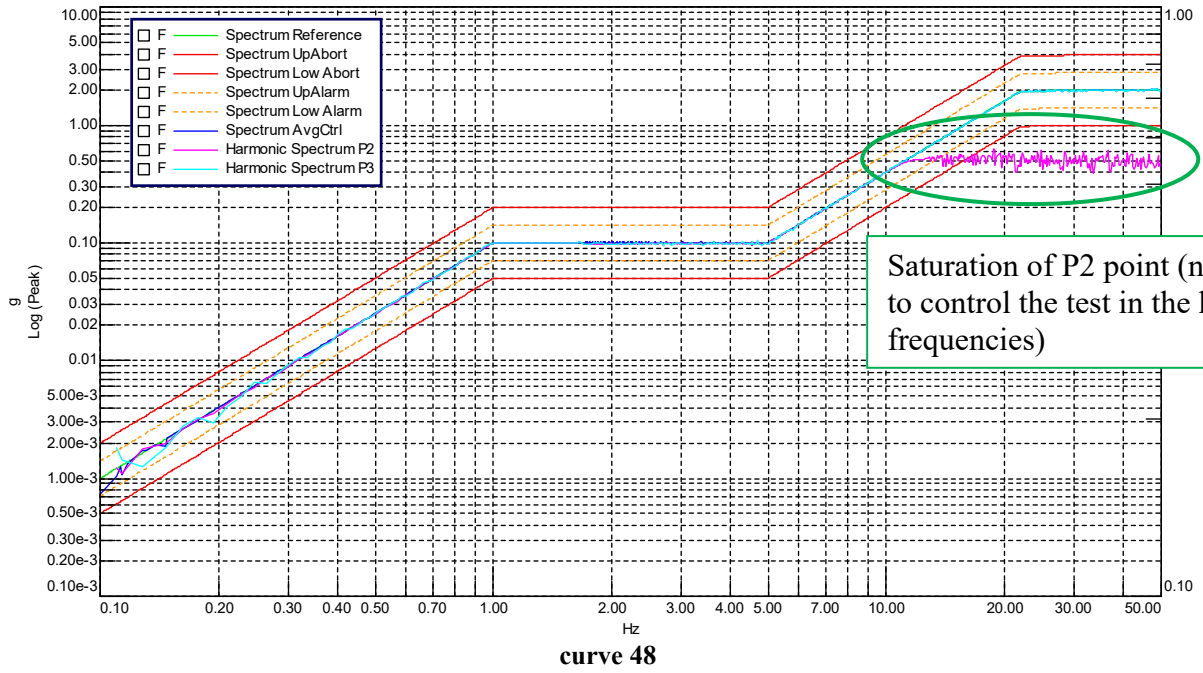
5.3.4. Sinus vibrations – RFR final:

Control curve recorded at test end given below:

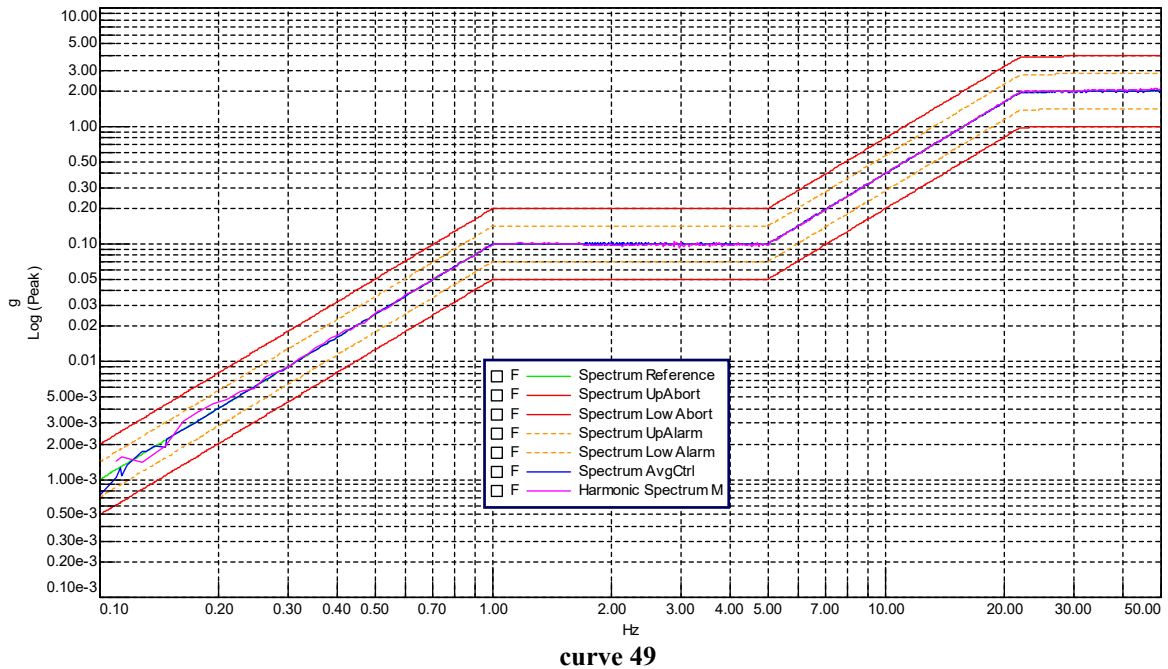


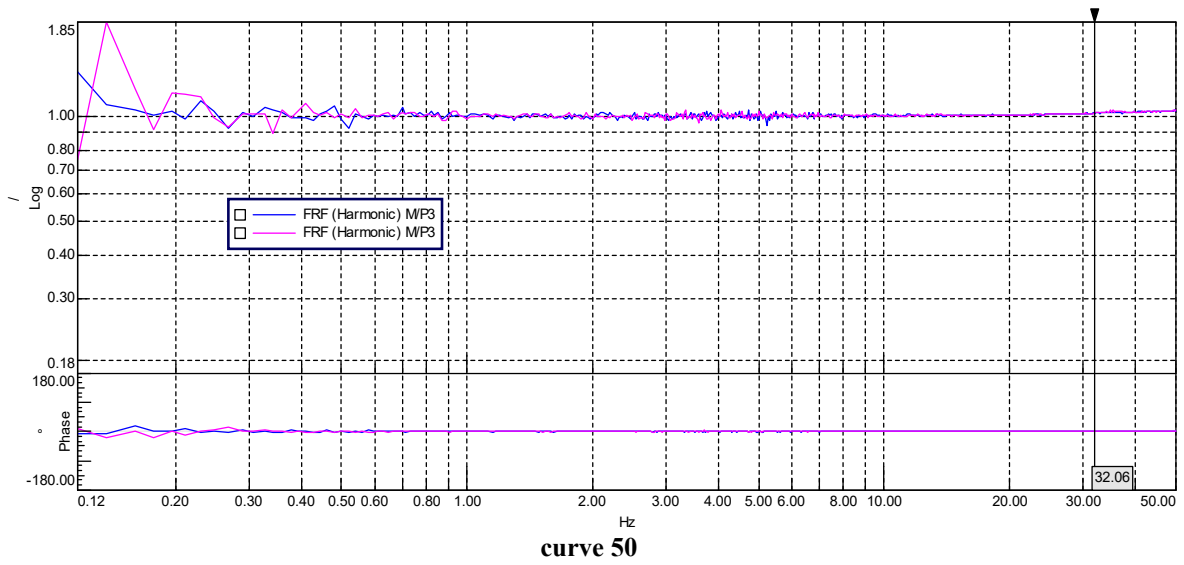
Acceleration measurement of P1, P2 and P3 points given below:





Measurements point given below:





Results: No degradation was observed. There is no resonance frequency.

5.3.5. Test set up for shocks:

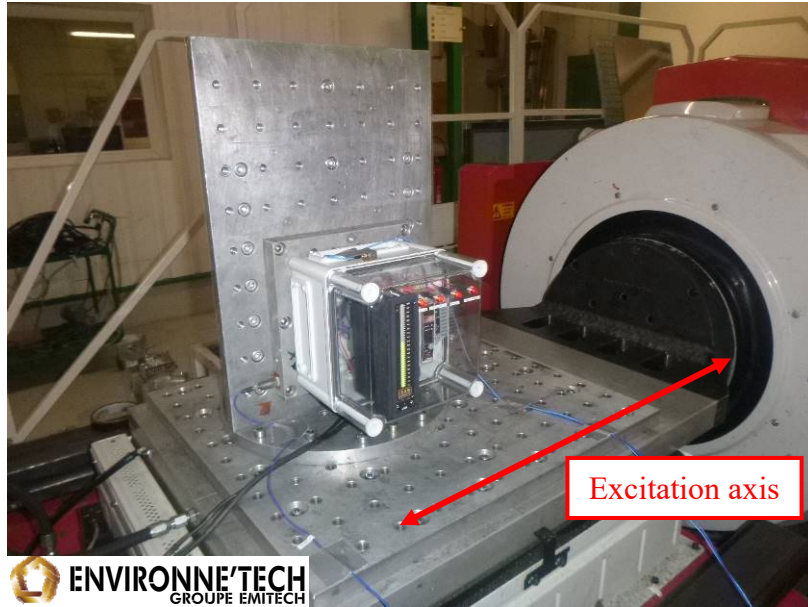


photo 22

Positioning of accelerometers P1 and P2 given below:

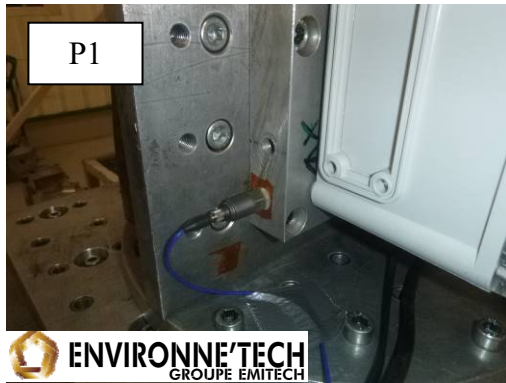


photo 23

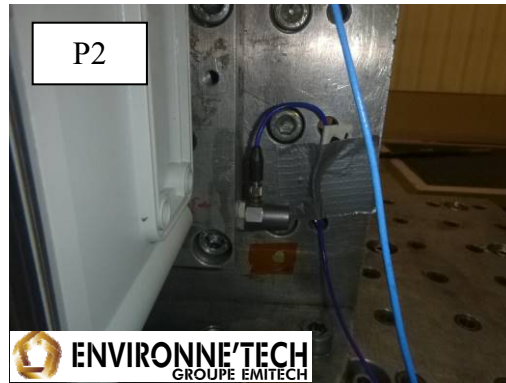


photo 24

Positioning of accelerometer M given below:

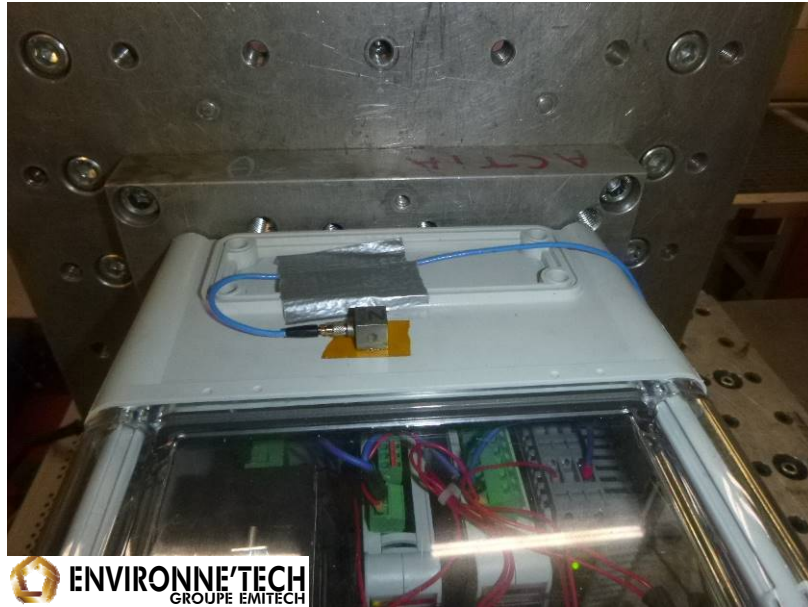


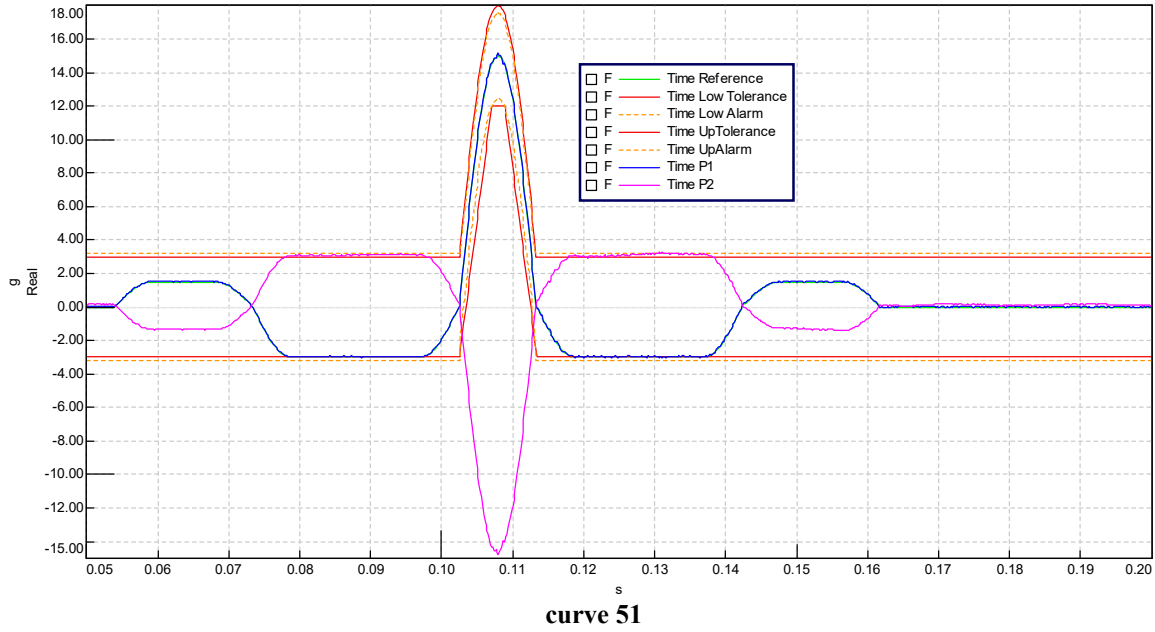
photo 25

5.3.6. Shock tests:

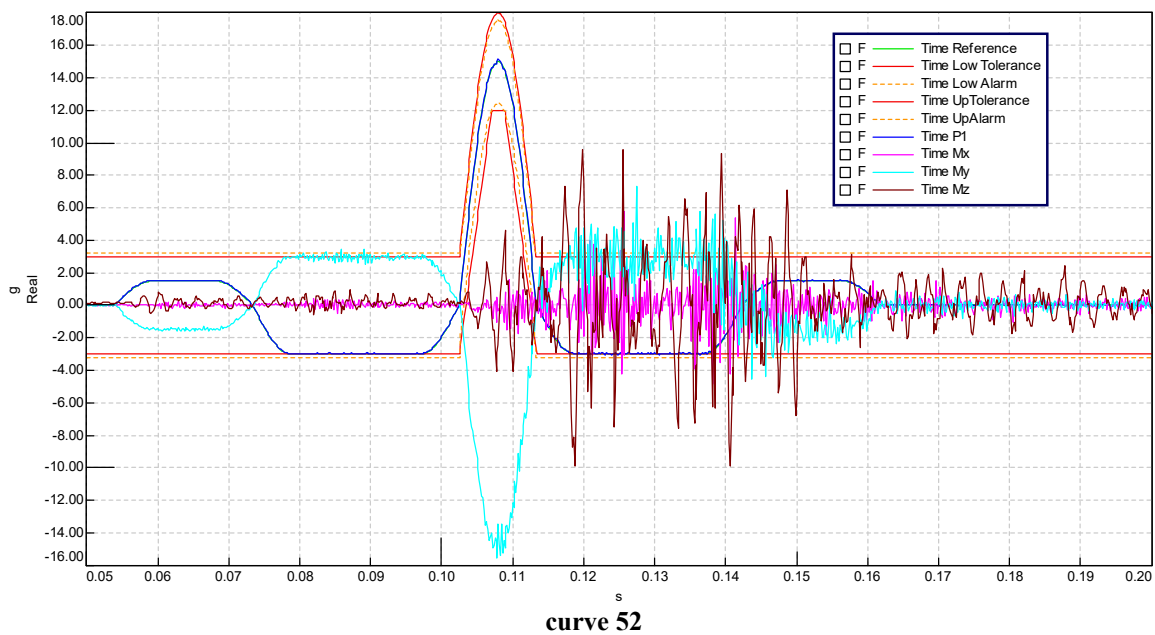
Control was done at P1 point.

Curve of the third positive impact given below.

Control curve with P1 and P2 are given below:

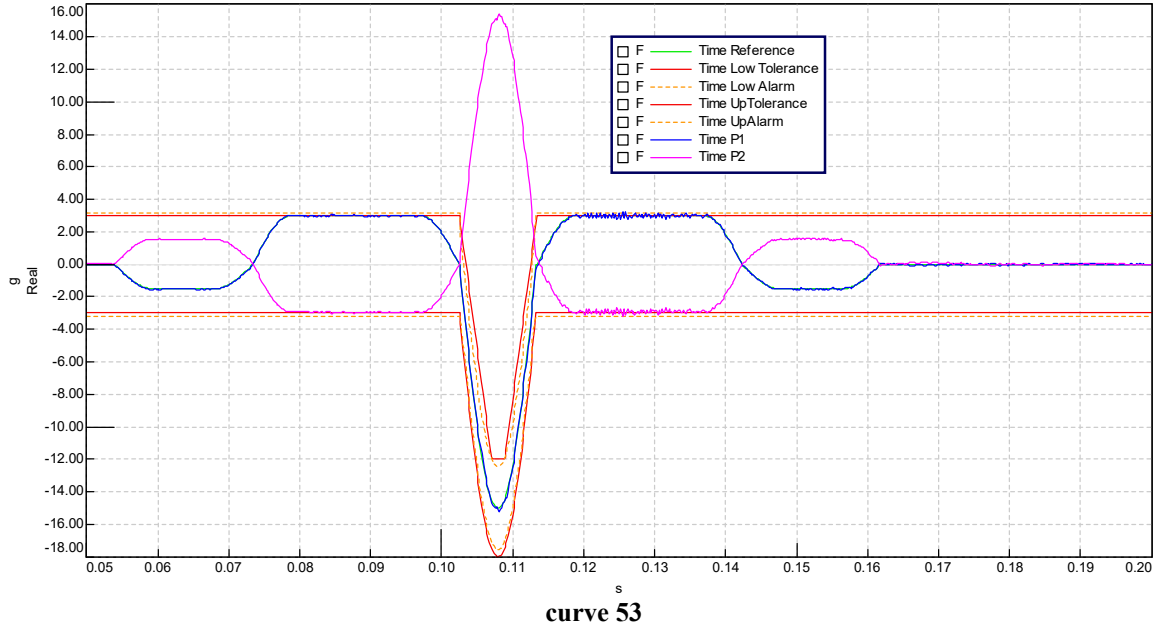


Curve at M point given below:

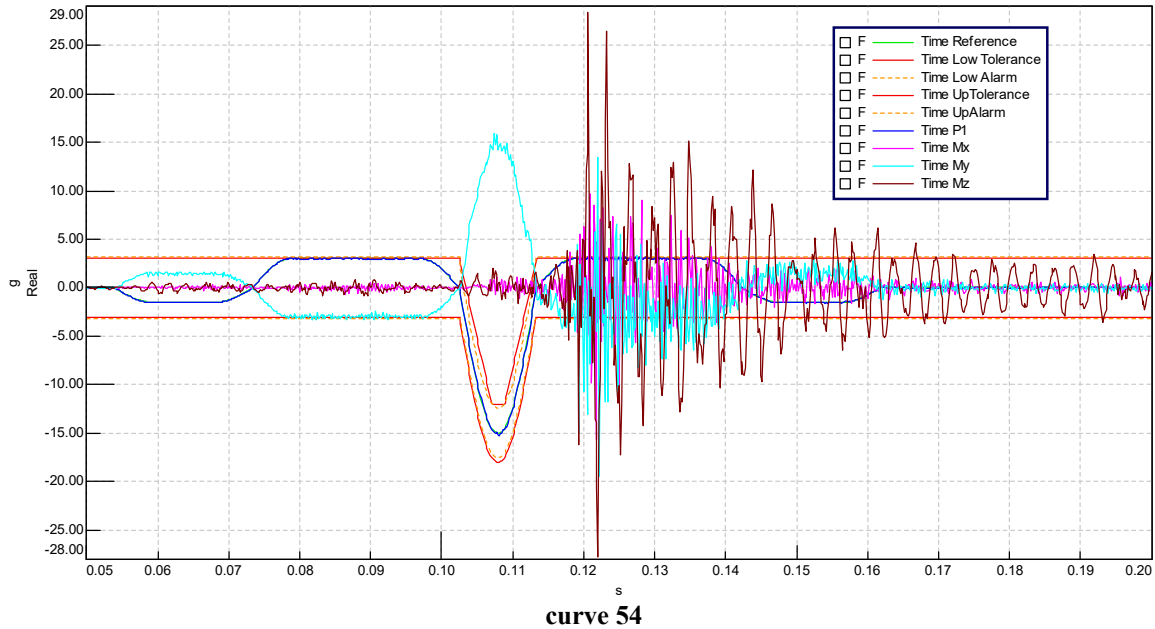


Curve of the third negative impact given below.

Control curve with P1 and P2 are given below:



Curve at M point given below:



6. CONCLUSION.

Specimen has been tested in accordance with the specifications described in section 3 of this report.

At the end of tests, no degradation was observed.

Specimen is returned to the LOREME Company for final expertise.

□□□ End of report □□□