SEISMIC AND TRANSPORTATION TESTS

ELECTRICAL PANEL YESPAN ELEKTRIK

QUALIFICATION REPORT

RAT-MTL-ELE23-072-R00

Customer: YESPAN Elektrik San. ve Tic. Ltd. Şti

casari stefano
06.02.2024
10:39:41
GMT+00:00
Advanced digital signature

Seriate, 06/12/2023

Laboratory Technician	Salvatore Nobile	
Manager of the Mechanical Testing Sector	Stefano Casari	

Function **Name and Surname** **Signature**

REVISION TRACKS

Date	Version	Description of changes	Reference
06/12/2023	00	First issue	-

The results contained in this Test Report is found exclusively to the items being tested.
The results were good for the sample as received.

P&P LMC S.r.l. has adopted the ISO 9001:2015 certified Quality Management System, CSQ Certificate n. 9175.ILMC - IQNet Certificate n. IT - 20582.

[#] Data provided by the Customer.
[*] Activity not accredited by ACCREDIA.

SUMMARY

1. GENERAL DATA

1.1. Customer

YESPAN Elektrik San. ve Tic. Ltd. Şti
Umurlu Mh. Aydın OSB 2. Cd.No:41
09630 Efeler, Aydın
Türkiye

1.2. Unit under test (UUT/EUT)

ID Sample	Quantity# (ID unit)	Sampling#	Description unit under test	Sample receipt date	Components of the unit#
S+ Series	1 (RD23017)	Customer	YESPAN Indoor Free Standing Type Modular Enclosure Mass (EUT): 605 kg in total with 250 kg shelf weights (160 kg on the swing frame & 90kg on the main frame) Dimensions (EUT): W: 800mm H: 2200+100mm D: 800mm	10/11/2023	-

1.3. Manufacturer

YESPAN Elektrik San. ve Tic. Ltd. Şti #
Umurlu Mh. Aydın OSB 2. Cd.No:41
09630 Efeler, Aydın
Türkiye

1.4. Reference documents

1.4.1. Contract documents

a. Offer of P&P LMC S.r.l. no. OFF-MTL-ELE23-098-R00 dated 13/11/2023.

b. Purchase order by acceptance of OFF-MTL-ELE23-098-R00 dated 11/12/2023.

1.4.2. Technical documents

doc. 1.	GR-63-CORE Issue no. 05, date 2017	*Telcordia Technologies Generic Requirements - NEBS TM Requirements: Physical Protection*
doc. 2.	IEC 60068-2-6:2007	*Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)*
doc. 3.	IEC 60068-2-47:2005	*Environmental testing - Part 2-47: Tests - Mounting of specimens for vibration, impact and similar dynamic tests*
doc. 4.	IEC 60068-2-57:2013	*Environmental testing – Part 2-57: Tests – Test Ff: Vibration – Time-history and sine-beat method*
doc. 5.	IEC 60068-3-3:2019	*Environmental testing - Part 3-3: Supporting documentation and guidance - Seismic test methods for equipment*
doc. 6.	ASTM D4169-16	*Standard Practice for Performing Testing of Shipping Containers and Systems*
doc. 7.	ASTM D4728-17	*Standard Test Method for Random Vibration Testing of Shipping Containers*
doc. 8.	ASTM D999-08 (2015)	*Standard Test Methods for Vibration Testing of Shipping Containers*
doc. 9.	YESPAN RD23017 - DATASHEET	*Datasheet of EUT provided by the Customer*
doc. 10.	S+ -800x2200+100x800 - Seismic Test Panel	*Technical drawing of EUT of YESPAN Elektrik San. ve Tic. Ltd. Şti*
doc. 11.	ISO 2041:2018	*Mechanical vibration, shock and condition monitoring – Vocabulary*

In the present report the reference documents will be identified by “doc.”.

1.5. Purpose of the tests

The purpose of transportation test was to determine that the sample complied with the requirements reported in §7.2, doc. 6, Product and packaging undamaged (Both criteria 1 and 2).

The purpose of the vibration tests was to determine that the sample complied with the requirements reported in §4.4, doc. 5 for “Criterion 3”.

1.6. Testing laboratory

P&P LMC S.r.l.
via Pastrengo, 9
24068 Seriate (BG)
Italy
VAT 02787860168

1.7. Tests date

Beginning date: November 13th 2023
Ending date: November 14th 2023

1.8. Responsibilities

Function	Name and surname	Company
Project manager (pro. PRO-MTL-ELE23-053)	Stefano Casari	P&P LMC S.r.l.
Laboratory technician	Salvatore Nobile	P&P LMC S.r.l.
Customer technical interface	Aydin Ata	A Belgelendirme - Aydın ATA
Customer administrative interface	Aydin Ata	A Belgelendirme - Aydın ATA

1.9. Witness during the tests

Function	Name and surname	Company	Date
Laboratory technician	Salvatore Nobile	P&P LMC S.r.l.	13/11/2023 ÷ 14/11/2023
Customer technical interface	Aydin Ata	A Belgelendirme - Aydın ATA	14/11/2023

2. TESTING PROCEDURES

2.1. General remarks

Vibration tests were performed with a monoaxial electrodynamic vibration shaker. Along the vertical direction they were conducted on the vibration shaker in vertical position. For the horizontal directions the vibration shaker was rotated 90° and connected to a horizontal hydraulic slip-table. The directions of excitation and the coordinate reference system are shown in Figure 2.

2.2. Mounting technique

For transportation test the packaged EUT was placed onto the expander 1500x1500 mm of the vibration shaker in its normal transportation conditions (on metallic rigid surface) and orientation allowing it to bounce and to move freely (ref. Photo 1). Wooden beams were fixed to the expander by means of steel stirrups and rods in order to ensure to the EUT a lateral free movement of 20 mm maximum in any horizontal directions (ref. Photo 2).

For the vibration test along Z axis, the base of the unit was connected to the expander 1500x1500 mm of the vibration shaker with n. 9 M14 bolts, with tightening at a torque of 80 Nm (ref. Photo 10), to reproduce the assembly operating conditions established by the Customer.
For X, Y axes vibration tests, the EUT was fixed to the expander by means of n.9 M14 bolts hand tightened and brackets fixed with n.12 M14 tightened at 80Nm.
The head expander (1500x1500 mm) was fixed on top of the shaker in Z direction or on top of slip table in X and Y directions with n. 16 M14 bolts with a tightening torque of 80 Nm.

2.3. Control and measuring positions

For transportation and vibration test motion control the mono-axial accelerometer (CP1) was placed on the expander in the direction of motion.
The chosen control strategy was to consider the average of the signals recorded by the control accelerometers (CP), shown in the legend of the test graphs with the AvgCtrl nomenclature.
For the vibration test the tri-axial accelerometers (MP1, MP2) were placed on the unit for the measurement positions.
The accelerometers were fixed by screwing them to a base at 1,5 Nm, then glued with methacrylate and on PET Liner adhesive tape treated with a special anti-adhesive for silicones.
The accelerometer MP3 was used as check point.
The MP accelerometers were used to recognise the resonance frequencies using the peaks of amplification factor (Q) and the corresponding angle phase.
The deflection at the top of the framework EUT's relative to its base (§ 5.4.1.2, doc. 1) was calculated in the direction of motion by double integration of the MP2 and MP3 acceleration time-histories and then by subtraction of their displacement time-histories.
The following table summarizes the control and measurement positions (CP and MP), identifying the transducers and their location during the tests.

Point ID	Description	Accelerometers			
		Type	s/n	Direction	N. output
CP1	Control point in the same direction of the motion: used for Z direction and positioned on the expander. (Used for transportation test).	Mono-axial	25210410 + LW210159	+Z	01
CP1	Control point in the same direction of the motion. Placed onto the expander for vertical testing and on the edge of the expander for horizontal testing. (Used for vibration test).	Mono-axial	25210410 + 48422	+Z, +X, -Y	01
MP1	Measurement point placed on the side of the unit	Tri-axial	25210410 + 9829	-Z	04
				+X	05
				-Y	06
MP2	Measurement point placed on the opposite side of MP1, on the top of the unit.	Tri-axial	25210410 + 9830	-Z	07
				-X	08
				+Y	09
MP3	Measurement point used as check point positioned on the top of expander near the fixing points of expander-UUT	Tri-axial	25210410 + 11804	+X	10
				+Y	11
				+Z	12

A digital camera with 1280 x 720 Pixel resolution and 30 fps (0,033 s < 0,1 s) was used to record the video, clearly recording the front view of the frame and the movement of the top of the EUT relative to its base (required by § 5.4.1.2, doc. 1).

2.4. Tests Description

The order of execution in the three directions was agreed with the Customer and was: Y, X, Z. The sequences of tests are as follows:

ID	Description	References	Carried out by
a)	Initial visual inspection for deformations or mechanical alterations.	-	P&P LMC S.r.l.
b)	Random Truck Low Level Vibration Test	§doc. 6	P&P LMC S.r.l.
c)	Random Truck Medium Level Vibration Test	§doc. 6	P&P LMC S.r.l.
d)	Random Truck High Level Vibration Test	§doc. 6	P&P LMC S.r.l.
e)	Visual inspection for deformation and package damaging.	-	P&P LMC S.r.l.
f)	Repeat steps from b) to e) two times.	-	P&P LMC S.r.l.
g)	Initial vibration response investigation test in the Z direction and analysis the resonance frequencies found based on the amplification factor.	§ 8.2, doc. 2 § 9.2, doc. 5	P&P LMC S.r.l.
h)	Perform the earthquake test in the Z direction.	§§ 4.4, 5.4, doc. 1 § 4.4, doc. 4	P&P LMC S.r.l.
i)	Final vibration response investigation test in the Z direction. Comparison of the initial and final resonance frequencies.	§ 8.2, §§ 11, A.9, doc. 2 § 9.2, doc. 5	P&P LMC S.r.l.
j)	Final visual inspection for deformations or mechanical alterations.	-	P&P LMC S.r.l.
k)	Repeated steps g to j) for X direction and then Y direction	-	P&P LMC S.r.l.

2.4.1. Vibration response investigation

The unit was subjected to sinusoidal sweep with the dynamic characteristics shown in the following table, along the Y, X and Z directions. The purpose of these tests was to find the resonance frequencies of the unit.

RESONANCE FREQUENCY SEARCH (ref. § 8.2, doc. 2; § 5.4.1.5, doc. 1 and § 9.2,doc. 5)			
Conditions		Not operational	
Frequency range [Hz]	**Level (peak)**	**Sweep rate**	**Number of sweeps**
1,00 [1] ÷ 50,0 Hz	± 0,20 g	1 oct/min	2 (down and up)
Duration			
09 min 28 s			
Filters			
High pass filter 0,5 Hz and Low pass filter 102400 Hz. "Harmonic estimator" to evaluate the amplitude (Q) of resonance frequency.			
Tolerances			
± 15 % on the control signal at the reference point (ref. § 4.1.4.1,doc. 2). ± 25 % @ ≤ 500 Hz on the control signal at the check point (MP3) (ref. § 4.1.4.2, doc. 2). ± 10 % @ 0,5 ÷ 5,0 Hz; ± 0,5 Hz @ 5 Hz ÷ 100 Hz on the critical frequencies measuring (ref. § 4.1.5.3, doc. 2). 50 % @ ≤ 500 Hz of specified amplitude at the check points (MP3) in any axis perpendicular to the excitation direction (ref. § 4.1.2.1, doc. 2). ± 10 % of the sweep rate (ref. § 4.1.6, doc. 2).			
Amplification factor (Q)			
Where there is a peak of Q with a phase change of 90°			
Criterion of conformity			
Comparison of the initial and final resonant frequencies as per §§ 11, A.9, doc. 2 without acceptance or refusal.			

The signals of the measurement accelerometers have been processed to obtain the absolute response functions[2] of the control channel and the frequency transfer functions of the measurement channels on the unit.

[1] Or the minimum achievable frequency due the vibration shaker limits.

[2] The absolute response function is the phasor of the response signal, a complex number whose amplitude is the amplitude of the first harmonic of the oscillation and whose angle is the phase. The Frequency Response transfer Function (FRF) is the frequency-dependent relationship between the motion response phasor and the excitation motion phasor; this is a complex function and is graphically given by curves showing the relationship between the amplitude of the first harmonic of the response signal and the amplitude of the first harmonic of the excitation signal and the relative phase shift or phase angle with respect to frequency.

2.4.2. Earthquake test method

The acceleration time history is a prescribed waveform "VERTEQII" (ref. figure 5-1 and §§ 5.4.1, 5.4.1.2,doc. 1) that allows to obtain the Required Response Spectrum (RRS) as reported in § 5.4 and figure 5-18 of doc. 1. The Test Response Spectrum (TRS) obtained from the vibration shaker acceleration (measured by CP1) shall dominate the RRS across the entire expected frequency range.
The TRS envelopes the RRS with tolerance according to § 4.4.4, doc. 4 and for every direction a comparison is given in the diagrams of the RRS with the TRS at the same damping value.
The parameters of the Required Response Spectrum (RRS) are shown below.

EARTHQUAKE TEST METHOD (ref. §§ 4.4, 5.4, doc. 1 and § 4.4, doc. 4)	
Conditions	Not operational
Severity level	Zone 4
RRS	
Frequency [Hz]	**Floor acceleration [g]**
0,30	0,20
0,60	2,00
2,00	5,00
5,00	5,00
15,00	1,60
50,00	1,60
Viscous damping ratio (ξ)	2 % → Q factor = 25 → 1/6 octave bands (ref. § 5.4.1.2, doc. 1)
Zero Period Acceleration (ZPA)	1,60 g → directions Y, X and Z
Duration	30 s
Sample rate	400 Hz → ≥ 200 Hz (ref. § 5.4.1.2, doc. 1)
Filters	
High Pass filter 0,5 Hz; Low pass filter 102400 Hz. BP 2,80÷100,00 Hz applied to VERTEQII time-history (§ 2.4.2.1).	
Tolerances	
± 25 % of the specified peak value in the time history at check point (MP3) in any axis perpendicular to the excitation direction (ref. § 4.4.2, doc. 4). ≤ +30 % @ 1 ÷ 7 Hz of RRS (ref. § 5.4.1.5, doc. 1). 0 ÷ +50 % of RRS; > 50 % is permitted @ > $1/3 \cdot f_2$ (ref. § 4.4.4, doc. 4). If a small portion of the individual points lies outside the tolerance zone the test must still be acceptable (ref. §§ 4.4.4, A.1.2, doc. 4).	
Conformity criterion	
Qualification criteria (according to § 4.4, doc. 5): Criterion 0: Equipment subjected to seismic testing which experienced no malfunction either during or after the test.	

2.4.2.1. Method deviation

Due the vibration shaker technical characteristics the requirement of displacement as per § 5.4.1.2, doc. 1, "The usable peak-to-peak stroke of the shaker shall be a minimum of 250 mm (10 in)", is reduced to the maximum stroke peak-to-peak 50,8 mm. Then, the acceleration time history waveform of VERTEQII (§ 5.4.1, doc. 1) was cut by applying a bandpass, starting from the minimum frequency at 2,80 Hz.

2.4.3. Schedule E - Vehicle Vibration: Truck profile

The unit was tested with the RMS and frequency values shown in the following table, along the Z direction, under conditions and duration prescribed by the Customer.

SCHEDULE E - VEHICLE VIBRATION: TRUCK PROFILE (ref. §§ 12.3, 12.4, Table 2, doc. 6)						
Classification	Vehicle vibration - Truck profile					
Conditions	Not operational during testing. Unit in final transportation packaging.[#] Rigid metal support surface.[#]					
Frequency range	1,00 ÷ 200,00 Hz					
Level						
Direction	**High Level**		**Medium Level**		**Low Level**	
	Frequency [Hz]	**PSD [g²/Hz]**	**Frequency [Hz]**	**PSD [g²/Hz]**	**Frequency [Hz]**	**PSD [g²/Hz]**
Z (vertical)	1.00	0.00072[3]	1.00	0.00072	1.00	0.0004
	3.00	0.030	3.00	0.018	3.00	0.010
	4.00	0.030	4.00	0.018	4.00	0.010
	6.00	0.0012	6.00	0.00072	6.00	0.00040
	12.00	0.0012	12.00	0.00072	12.00	0.00040
	16.00	0.0060	16.00	0.0036	16.00	0.0020
	25.00	0.0060	25.00	0.0036	25.00	0.0020
	30.00	0.0012	30.00	0.00072	30.00	0.00040
	40.00	0.0060	40.00	0.0036	40.00	0.0020
	80.00	0.0060	80.00	0.0036	80.00	0.0020
	100.00	0.00060	100.00	0.00036	100.00	0.00020
	200.00	0.000030	200.00	0.000018	200.00	0.000010
	0.70 g R.M.S.		0.54 g R.M.S.		0.40 g R.M.S.	
Crest factor						
3 (Ref. § 8.4.4 doc. 7)						
DOF						
240 (≥ 60 Ref. § 8.4.2 doc. 7)						
Duration						
60 min (40 min at Low level; 15 min at Medium level; 5 min at High level, ref. 12.4.2.1, doc. 1)						
Filters						
High pass filter 0,5 Hz and Low Pass filter 102400 Hz						
Tolerances						
± 3 dB @ 0,00 ÷ 200,00 Hz tolerance band (ref. § 8.4.1, doc. 7) ± 6 dB over a cumulative bandwidth of 10,00 Hz (ref. § 8.4.1, doc. 7) ± 15 % of the R.M.S. acceleration (ref. § 8.4.1, doc. 7)						
Conformity criterion						
Criterion 3 - Product and packaging undamaged (Both criteria 1 and 2) (ref. § 7.2, doc. 6)						

[3] Modified due to stroke limits of the vibration shaker and keeping unchanged the r.m.s. (see test results for changes applied).

3. MEASURING, EXCITATION AND DATE PROCESSING EQUIPMENT

3.1. Equipment

Description	Manufacturer	Model	s/n	Internal ID	Calibration certificate	Calibration date
Mono-axial electrodynamic vibratio shaker Maximum sinusoidal dynamic force: 100 kN Coil mass: 100 kg Frequency range: 0÷2000 Hz Max. displacement (peak-peak): 50,8 mm Max. accel.: 100 g	Elin	MZV 210 W 20	713255	MTL01SH02	-	-
Slip table Magnesium table moved with n. 4 hydrostatic bearings	Elin	MZL 1-070T 30	184314, 184315 184317, 184318 184319, 184320	MTL01TV01	-	-
Digital camera Optical zoom 8x; F3,3 (W) - 6,3 (T); f = da 4,5 a 36 mm; ISO 80-3200; Video 1.280 × 720/30fps	Sony Corp.	DSC-W830	7543315	MTL05NA03		

3.2. Measure equipment

Description	Manufacturer	Model	s/n	Internal ID	Calibration certificate	Calibration date
Acquisition system channel 1 + acc. mono-axial (CP1)	Siemens + PCB Piezotronics, Inc	SCM2E05V + 393B03	25210410 + LW210159	CH1 (MTL06SC00+ MTL27AC01)	S104/23	29/03/2023
Acquisition system channel 1 + acc. mono-axial (CP1)	Siemens + PCB Piezotronics, Inc	SCM2E05V + 393B04	25210410 + 48422	CH1 (MTL06SC00 + 48422)	S146/23	05/04/2023
Acquisition system channels 4, 5, 6 + acc. tri-axial (MP1)	Siemens + Dytran Instruments Inc	SCM2E05V + 3023A6	25210410 + 9829	CH4 (MTL06SC00 + MTL21AC01)	S110/23	30/03/2023
				CH5 (MTL06SC00 + MTL21AC01)	S111/23	30/03/2023
				CH6 (MTL06SC00 + MTL21AC01)	S112/23	30/03/2023

Description	Manufacturer	Model	s/n	Internal ID	Calibration certificate	Calibration date
Acquisition system channels 7, 8, 9 + acc. tri-axial (MP2)	Siemens + Dytran Instruments Inc	SCM2E05V + 3023A6	25210410 + 9830	CH7 (MTL06SC00 + MTL22AC01)	S113/23	30/03/2023
				CH8 (MTL06SC00 + MTL22AC01)	S114/23	30/03/2023
				CH9 (MTL06SC00 + MTL22AC01)	S115/23	30/03/2023
Acquisition system channels 10, 11, 12 + acc. tri-axial (MP3)	Siemens + Dytran Instruments Inc	SCM2E05V + 3023A6	25210410 + 11804	CH10 (MTL06SC00 + MTL23AC01)	S116/23	30/03/2023
				CH11 (MTL06SC00 + MTL23AC01)	S117/23	30/03/2023
				CH12 (MTL06SC00 + MTL23AC01)	S118/23	30/03/2023
Mini data logger to environmental temperature measurement. Accuracy: ±0,5 °C Resolution: 0,1 °C	Testo	174T	58908750	MTL02EV00	02_2023	07/03/2023
Dynamometer 6.000 kg, e_{max} = 2 kg	-	MCWLT6	61835	MTL01FR09	0551/23	18/04/2023
Torque bar, 1÷5 Nm	USAG	811N 5	Y120147	MTL07CS00	CT-CD-0500-2023	06/07/2023
Torque wrench 20 ÷ 100 Nm; Resolution 0,25 Nm; Error ± 4%	USAG	810N 100	V120422	MTL05CS00	CT-CD-0500-2023	06/07/2023

The main features of the accelerometers are as follows:

Manufacturer	PCB Piezotronics, Inc	PCB Piezotronics, Inc	Dytran Instruments, Inc
Model	393B04	353B03	3023A6
Nominal sensibility	1000 mV/g	10 mV/g	5 mV/g
Transverse sensibility (max)	< 5%	< 5%	< 5%
Frequency range	1 ÷ 1700 Hz	1 ÷ 7000 Hz	1,5 ÷ 5000 Hz (axis 1 e 2) 1,5 ÷ 10000 Hz (axis 3)
Maximum acceleration	+/- 5 g	+/- 500 g	+/- 1000 g
Resolution	0,01 g	0,01 g	0,010g
Weight	0,50 N	0,105 N	0,04 N

The instrumentation is subjected to a calibration program in accordance with internal procedures.

3.3. Data acquisition and processing equipment

Description	Manufacturer	Model	s/n	Internal ID	Calibration certificate	Calibration date
SCADAS Mobile 5 slots (with n. 2 SCM-V8-E 8 ch, n. 1 SCM-UPS Power supply and n. 1 LMS SCADAS Mobile 8 ch NVH input Module Ethercat)	Siemens (Simcenter)	SCM2E05V	25210410	MTL06SC00	2021-25210410	15/01/2021
Control and acquisition software	Siemens (Simcenter)	Software Sim.Center TestLab ver. 2021.1	-	-	-	-

During the tests, the shaker was controlled by a SCADAS system consisting of a 24-channel acquisition unit and a Personal Computer with Sim.Center Test.Lab software. This control system generates the required motion profile with a closed loop control chain, fed back using the signal from the accelerometer chosen for the control.
The analog signals from the accelerometers are conditioned by the same SCADA unit and once digitized, are transmitted to the computer responsible for their collection within the test Database and the necessary processing and calculation phases.
The block diagram of the excitation, acquisition and processing system is shown in Figure 1.

3.4. Uncertainty of the measure

The extended uncertainty U is estimated by the laboratory with a confidence level of 95% and coverage factor k equal to 2.

4. TEST RESULTS

4.1.1. Vibration response investigation

The following table shows the characteristic parameters (frequency, amplification factor and the relationship between final and initial frequency) of the detected resonance frequencies in the measuring positions.
To detect resonance frequencies by Frequency Response Function (FRF), the peak value of amplitude and corresponding phase has been considered.
The MP accelerometers were used to recognise the resonance frequencies using the amplification factor (Q).

X DIRECTION							
Point ID	**Direction**	**Sweep Direction**	**Beginning**		**Ending**		**fE/fB**
			Freq. [Hz]	**Q [adim]**	**Freq. [Hz]**	**Q [adim]**	**[%]**
MP1	+X	Down	4,97	5,16	6,60	3,55	32,8%
			11,60	2,42	11,07	2,45	-4,6%
			20,55	1,16	-	-	-
		Up	5,49	3,14	6,82	3,15	24,2%
			11,07	2,16	11,28	2,51	1,9%
MP2	-X	Down	4,97	11,22	6,69	7,38	34,6%
			11,82	5,01	11,34	5,12	-4,1%
			20,78	4,03	20,61	3,62	-0,8%
		Up	5,55	6,86	6,88	7,23	24,0%
			11,16	4,50	11,38	5,13	2,0%
			20,78	3,65	20,78	3,61	0,0%

Y DIRECTION							
Point ID	**Direction**	**Sweep Direction**	**Beginning**		**Ending**		**fE/fB**
			Freq. [Hz]	**Q [adim]**	**Freq. [Hz]**	**Q [adim]**	**[%]**
MP1	-Y	Down	5,50	1,51	4,30	1,43	-21,8%
			27,16	2,88	23,99	1,69	-11,7%
			33,14	1,67	-	-	-
		Up	5,72	1,58	4,25	1,44	-25,7%
			26,72	3,02	24,19	1,76	-9,5%
			33,33	1,62	29,51	1,13	-11,5%
MP2	+Y	Down	6,26	4,48	4,40	4,15	-29,7%
			31,71	2,14	31,02	1,37	-2,2%
		Up	6,33	4,45	4,52	1,44	-28,6%
			30,42	1,69	30,26	1,32	-0,5%

No resonances were found along Z axis.

4.1.2. Transportation Test along Z direction

ID sample #	ID unit #	Date execution test	Test method	Test parameters	Inspection after test and results	Reference technical documents	Reference value	Declaration of conformity[4]
S+ Series	RD2301 7	Beginning 13/11/2023 Ending 13/11/2023	(Transportation test - Truck Profile: Low level) §12.4.1, Table 2, ASTM D4169-16	Conditions: Not operational during testing. # Unit in final transport packaging. # Rigid metal support surface. # **RUN01** Frequency range: 1,00 ÷ 200,00 Hz Excitation level: Low level See §2.4.3 Crest factor: 3 DOF: 240 Duration [hh:mm:ss]: 00:40:00 Filter: High Pass 0,5 Hz; Low pass 102400 Hz Tolerances not respected: - Temperature env.: 14,9°C	As a result of the test, there was no damage observed on the products, which indicates that the product meets the condition of damage-free (Product is damage-free). No damage was observed in the packaging either (Package is intact).	§ 7.2, ASTM D4169-16	Criterion 3 - Product and packaging undamaged (Both criteria 1 and 2)	Compliant[4] (only for visual inspection of the packaging)
		Beginning 13/11/2023 Ending 13/11/2023	(Transportation test - Truck Profile: Medium level) §12.4.1, Table 2, ASTM D4169-16	Conditions: Not operational during testing. # Unit in final transport packaging. # Rigid metal support surface. # **RUN02** Frequency range: 1,00 ÷ 200,00 Hz Excitation level: Medium level See §2.4.3 Crest factor: 3 DOF: 240 Duration [hh:mm:ss]: 00:15:00 Filter: High Pass 0,5 Hz; Low pass 102400 Hz Tolerances not respected:				

[4] The performances requirements and declaration of compliance of the unit operation is performed by the Customer. P&P LMC S.r.l. declares compliance only on the basis of a visual inspection to assess deformations and mechanical alterations.

ID sample #	ID unit #	Date execution test	Test method	Test parameters	Inspection after test and results	Reference technical documents	Reference value	Declaration of conformity[4]
				- Temperature env.: 14,9°C				
		Beginning 13/11/2023 Ending 13/11/202	(Transportation test - Truck Profile: High level) §12.4.1, Table 2, ASTM D4169-16	Conditions: Not operational during testing. # Unit in final transport packaging. # Rigid metal support surface. # **RUN03** Frequency range: 1,00 ÷ 200,00 Hz Excitation level: High level See §2.4.3 PSD @ 1 Hz modified due to shaker stroke limits from 0,00072 to 0,0003 g^2/Hz Crest factor: 3 DOF: 240 Duration [hh:mm:ss]: 00:05:00 Filter: High Pass 0,5 Hz; Low pass 102400 0Hz Tolerances not respected: - Temperature env.: 14,9°C				
		Beginning 13/11/2023 Ending 13/11/202	(Transportation test - Truck Profile: Low level) §12.4.1, Table 2, ASTM D4169-16	Conditions: Not operational during testing. # Unit in final transport packaging. # Rigid metal support surface. # **RUN04** Frequency range: 1,00 ÷ 200,00 Hz Excitation level: Low level See §2.4.3 Crest factor: 3 DOF: 240 Duration [hh:mm:ss]: 00:40:00				

ID sample #	ID unit #	Date execution test	Test method	Test parameters	Inspection after test and results	Reference technical documents	Reference value	Declaration of conformity[4]
				Filter: High Pass 0,5 Hz; Low pass 102400 Hz Tolerances not respected: - Temperature env.: 14,9°C				
		Beginning 13/11/2023 Ending 13/11/202	(Transportation test - Truck Profile: Medium level) §12.4.1, Table 2, ASTM D4169-16	Conditions: Not operational during testing. # Unit in final transport packaging. # Rigid metal support surface. # **RUN05** Frequency range: 1,00 ÷ 200,00 Hz Excitation level: Medium level See §2.4.3 Crest factor: 3 DOF: 240 Duration [hh:mm:ss]: 00:15:00 Filter: High Pass 0,5 Hz; Low pass 102400 Hz Tolerances not respected: - Temperature env.: 14,9°C				
		Beginning 13/11/2023 Ending 13/11/202	(Transportation test - Truck Profile: High level) §12.4.1, Table 2, ASTM D4169-16	Conditions: Not operational during testing. # Unit in final transport packaging. # Rigid metal support surface. # **RUN06** Frequency range: 1,00 ÷ 200,00 Hz Excitation level: High level See §2.4.3 PSD @ 1 Hz modified due to shaker stroke limits from 0,00072 to 0,0003 g^2/Hz Crest factor: 3				

ID sample #	ID unit #	Date execution test	Test method	Test parameters	Inspection after test and results	Reference technical documents	Reference value	Declaration of conformity[4]
				DOF: 240 Duration [hh:mm:ss]: 00:05:00 Filter: High Pass 0,5 Hz; Low pass 102400 0Hz Tolerances not respected: - Temperature env.: 18,4°C				
		Beginning 13/11/2023 Ending 13/11/202	(Transportation test - Truck Profile: Low level) §12.4.1, Table 2, ASTM D4169-16	Conditions: Not operational during testing. # Unit in final transport packaging. # Rigid metal support surface. # **RUN07** Frequency range: 1,00 ÷ 200,00 Hz Excitation level: Low level See §2.4.3 Crest factor: 3 DOF: 240 Duration [hh:mm:ss]: 00:40:00 Filter: High Pass 0,5 Hz; Low pass 102400 Hz Tolerances not respected: - Temperature env.: 18,4°C				
		Beginning 13/11/2023 Ending 13/11/202	(Transportation test - Truck Profile: Medium level) §12.4.1, Table 2, ASTM D4169-16	Conditions: Not operational during testing. # Unit in final transport packaging. # Rigid metal support surface. # **RUN08** Frequency range: 1,00 ÷ 200,00 Hz Excitation level: Medium level See §2.4.3 Crest factor: 3				

ID sample #	ID unit #	Date execution test	Test method	Test parameters	Inspection after test and results	Reference technical documents	Reference value	Declaration of conformity[4]
				DOF: 240 Duration [hh:mm:ss]: 00:15:00 Filter: High Pass 0,5 Hz; Low pass 102400 Hz Tolerances not respected: - Temperature env.: 18,4°C				
		Beginning 13/11/2023 Ending 13/11/202	(Transportation test - Truck Profile: High level) §12.4.1, Table 2, ASTM D4169-16	Conditions: Not operational during testing. # Unit in final transport packaging. # Rigid metal support surface. # **RUN09** Frequency range: 1,00 ÷ 200,00 Hz Excitation level: High level See §2.4.3 PSD @ 1 Hz modified due to shaker stroke limits from 0,00072 to 0,0003 g^2/Hz Crest factor: 3 DOF: 240 Duration [hh:mm:ss]: 00:05:00 Filter: High Pass 0,5 Hz; Low pass 102400 0Hz Tolerances not respected: - Temperature env.: 18,4°C				

4.1.3. Vibration Tests along Z direction

ID sample#	ID unit#	Date execution test	Test method	Test parameters	Inspection after test and results	Reference technical documents	Reference value	Declaration of conformity
S+ Series	RD23017	Beginning 14/11/2023 Ending 14/11/2023	(initial vibration response investigation) § 8.2, IEC 60068-2-6:2007 § 5.4.1.5 Telcordia Technologies Generic Requirements GR-63-CORE Issue no. 05, date 2017 § 9.2, IEC 60068-3-3:2019	Conditions: Not operational **RUN01** Excitation levels: 2,00 ÷ 50,0 Hz @ ± 0,20 g (Sweep down and up) Sweep rate: 1 oct/min Duration [hh:mm:ss]: 00:09:17 Filters: High Pass 0,5; Low Pass 102.400; Harmonic estimator to evaluate the FRF. Uncertainty acceleration [g] U: ± 30 % @ < 1,00 Hz ± 20 %@ 1,00÷ < 3,00 Hz ± 5 %@ 3,00 ÷ 2.000,00 Hz Only for acc. 393B04: ± 8 % @ 315,00 ÷ 1.000,00 Hz Uncertainty frequency [Hz] U: ± 0,3 % Tolerances not respected: 50 % @ ≤ 500 Hz of specified amplitude at the check points (MP3) in any axis perpendicular to the excitation direction Temperature env.: 15 ÷ 18 °C	See §§4.1.1 Outside of the tolerance limit of cross axis motion down & up MP3 (X, Y): 46,29÷50,00 Hz	-	-	-
		Beginning 14/11/2023 Ending 14/11/2023	(Earthquake test method) § 5.4, Telcordia Technologies Generic Requirements GR-63-CORE	Conditions: Not operational **RUN02**	After the test: • Damage and plastic deformation were not observed on UUT.	§ 4.4, IEC 60068-3-3:2019	Criterion 0: Equipment subjected to seismic testing which experienced no malfunction	Compliant[5] (conformity verified only by visual inspection)

ID sample#	ID unit#	Date execution test	Test method	Test parameters	Inspection after test and results	Reference technical documents	Reference value	Declaration of conformity
			§ 4.4, IEC 60068-2-57:2013	Excitation level: Severity level Zone 4 RRS 0,30 Hz @ 0,20 g 0,60 Hz @ 2,00 g 2,00÷5,00 Hz @ 5,00 g 15,00÷50,00 Hz @ 1,60 g Duration [hh:mm:ss]: 00:00:30 Damping: 2% (Q factor = 25) Sampling freq.: 400 Hz Points per octave: 6 Tolerances not respected: ≤ +30 % @ 1 ÷ 7 Hz of RRS. 0 ÷ +50 % of RRS; > 50 % is permitted @ > 1/3·f2 If a small portion of the individual points lies outside the tolerance zone the test must still be acceptable Filters: High Pass at 2,00 Hz BP 2,80÷100,00 Hz applied to VERTEQII time-history. Uncertainty acceleration [g] U: ± 30 % @ < 1,00 Hz ± 20 %@ 1,00÷ < 3,00 Hz ± 5 %@ 3,00 ÷ 2.000,00 Hz Only for acc. 393B04: ± 8 % @ 315,00 ÷ 1.000,00 Hz Uncertainty frequency [Hz] U: ± 0,3 %	• Side and back covers of UUT were still engaged and not damaged. • Doors of UUT were still engaged and could operate as intended. • The shelves of the UUT were not dislodged, stable and not deformed. • The weights on the shelves of the UUT remained stable and no change was observed compared to pre-test. Outside the lower tolerance at the following frequency range: 0,5 ÷ 2,80 Hz Outside the upper 30% tolerance at the following frequency range: 3,78 ÷ 5,89 Hz Outside the upper 50% tolerance at the following frequency range: 8,42 ÷ 9,50 Hz &		either during or after the test.	

ID sample#	ID unit#	Date execution test	Test method	Test parameters	Inspection after test and results	Reference technical documents	Reference value	Declaration of conformity
				Temperature env.: 15 ÷ 18 °C				
		Beginning 14/11/2023 Ending 14/11/2023	(final vibration response investigation) § 8.2, IEC 60068-2-6:2007 § 5.4.1.5 Telcordia Technologies Generic Requirements GR-63-CORE Issue no. 05, date 2017 § 9.2, IEC 60068-3-3:2019	Conditions: Not operational **RUN03** Excitation levels: 2,00 ÷ 50,0 Hz @ ± 0,20 g (Sweep down and up) Sweep rate: 1 oct/min Duration [hh:mm:ss]: 00:09:17 Filters: High Pass 0,5; Low Pass 102.400; Harmonic estimator to evaluate the FRF. Uncertainty acceleration [g] U: ± 30 % @ < 1,00 Hz ± 20 %@ 1,00÷ < 3,00 Hz ± 5 %@ 3,00 ÷ 2.000,00 Hz Only for acc. 393B04: ± 8 % @ 315,00 ÷ 1.000,00 Hz Uncertainty frequency [Hz] U: ± 0,3 % Tolerances not respected: 50 % @ ≤ 500 Hz of specified amplitude at the check points (MP3) in any axis perpendicular to the excitation direction Temperature env.: 15 ÷ 18 °C	See §§4.1.1 Outside of the tolerance limit of cross axis motion down & up MP3 (X,Y): 43,09÷50,00 Hz	§§ 11, A.9 IEC 60068-2-6:2007	Comparison of the initial and final resonant frequencies without acceptance or refusal criteria provided by the Customer	

4.1.4. Vibration Tests along X direction

ID sample#	ID unit#	Date execution test	Test method	Test parameters	Inspection after test and results	Reference technical documents	Reference value	Declaration of conformity
S+ Series	RD23017	Beginning 14/11/2023 Ending 14/11/2023	(initial vibration response investigation) § 8.2, IEC 60068-2-6:2007 § 5.4.1.5 Telcordia Technologies Generic Requirements GR-63-CORE Issue no. 05, date 2017 § 9.2, IEC 60068-3-3:2019	Conditions: Not operational **RUN04** Excitation levels: 2,00 ÷ 50,0 Hz @ ± 0,20 g (Sweep down and up) Sweep rate: 1 oct/min Duration [hh:mm:ss]: 00:09:17 Filters: High Pass 0,5; Low Pass 102.400; Harmonic estimator to evaluate the FRF. Uncertainty acceleration [g] U: ± 30 % @ < 1,00 Hz ± 20 %@ 1,00÷ < 3,00 Hz ± 5 %@ 3,00 ÷ 2.000,00 Hz Only for acc. 393B04: ± 8 % @ 315,00 ÷ 1.000,00 Hz Uncertainty frequency [Hz] U: ± 0,3 % Tolerances not respected: 50 % @ ≤ 500 Hz of specified amplitude at the check points (MP3) in any axis perpendicular to the excitation direction. Temperature env.: 15 ÷ 18 °C	See §§4.1.1 Outside of the tolerance limit of cross axis motion down & up MP3 (Z,Y): 4,78÷5,87 Hz	-	-	-

ID sample[#]	ID unit[#]	Date execution test	Test method	Test parameters	Inspection after test and results	Reference technical documents	Reference value	Declaration of conformity
		Beginning 14/11/2023 Ending 14/11/2023	(Earthquake test method) § 5.4, Telcordia Technologies Generic Requirements GR-63-CORE § 4.4, IEC 60068-2-57:2013	Conditions: Not operational **RUN05** Excitation level: Severity level Zone 4 RRS 0,30 Hz @ 0,20 g 0,60 Hz @ 2,00 g 2,00÷5,00 Hz @ 5,00 g 15,00÷50,00 Hz @ 1,60 g Duration [hh:mm:ss]: 00:00:30 Damping: 2% (Q factor = 25) Sampling freq.: 400 Hz Points per octave: 6 Tolerances not respected: ≤ +30 % @ 1 ÷ 7 Hz of RRS. 0 ÷ +50 % of RRS ; > 50 % is permitted @ > 1/3·f2 If a small portion of the individual points lies outside the tolerance zone the test must still be acceptable. Filters: High pass filter 0,5 Hz; Low pass filter 102400 BP 2,80÷100,00 Hz applied to VERTEQII time-history.	After the test: • Damage and plastic deformation were not observed on UUT. • Side and back covers of UUT were still engaged and not damaged. • Doors of UUT were still engaged and could operate as intended. • The shelves of the UUT were not dislodged, stable and not deformed. • The weights on the shelves of the UUT remained stable and no change was observed compared to pre-test. Outside the lower tolerance at the following frequency range: 0,5 ÷ 2,85 Hz	§ 4.4, IEC 60068-3-3:2019	Criterion 0: Equipment subjected to seismic testing which experienced no malfunction either during or after the test.	Compliant[5] (conformity verified only by visual inspection)

ID sample#	ID unit#	Date execution test	Test method	Test parameters	Inspection after test and results	Reference technical documents	Reference value	Declaration of conformity
				Uncertainty acceleration [g] U: ± 30 % @ < 1,00 Hz ± 20 %@ 1,00÷ < 3,00 Hz ± 5 %@ 3,00 ÷ 2.000,00 Hz Only for acc. 393B04: ± 8 % @ 315,00 ÷ 1.000,00 Hz Uncertainty frequency [Hz] U: ± 0,3 % Temperature env.: 15 ÷ 18 °C				
		Beginning 14/11/2023 Ending 14/11/2023	(final vibration response investigation) § 8.2, IEC 60068-2-6:2007 § 5.4.1.5 Telcordia Technologies Generic Requirements GR-63-CORE Issue no. 05, date 2017 § 9.2, IEC 60068-3-3:2019	Conditions: Not operational **RUN06** Excitation levels: 2,00 ÷ 50,0 Hz @ ± 0,20 g (Sweep down and up) Sweep rate: 1 oct/min Duration [hh:mm:ss]: 00:09:17 Filters: High Pass 0,5; Low Pass 102.400; Harmonic estimator to evaluate the FRF. Uncertainty acceleration [g] U: ± 30 % @ < 1,00 Hz ± 20 %@ 1,00÷ < 3,00 Hz ± 5 %@ 3,00 ÷ 2.000,00 Hz Only for acc. 393B04:	See §§4.1.1	§§ 11, A.9 IEC 60068-2-6:2007	Comparison of the initial and final resonant frequencies without acceptance or refusal criteria provided by the Customer.	-

ID sample#	ID unit#	Date execution test	Test method	Test parameters	Inspection after test and results	Reference technical documents	Reference value	Declaration of conformity
				± 8 % @ 315,00 ÷ 1.000,00 Hz Uncertainty frequency [Hz] U: ± 0,3 % Tolerances not respected: - Temperature env.: 15 ÷ 18 °C				

4.1.5. Vibration Tests along Y direction

ID sample#	ID unit#	Date execution test	Test method	Test parameters	Inspection after test and results	Reference technical documents	Reference value	Declaration o conformity
S+ Series	RD23017	Beginning 14/11/2023 Ending 14/11/2023	(initial vibration response investigation) § 8.2, IEC 60068-2-6:2007 § 5.4.1.5 Telcordia Technologies Generic Requirements GR-63-CORE Issue no. 05, date 2017 § 9.2, IEC 60068-3-3:2019	Conditions: Not operational **RUN07** Excitation levels: 2,00 ÷ 50,0 Hz @ ± 0,20 g (Sweep down and up) Sweep rate: 1 oct/min Duration [hh:mm:ss]: 00:09:17 Filters: High Pass 0,5; Low Pass 102.400; Harmonic estimator to evaluate the FRF. Uncertainty acceleration [g] U: ± 30 % @ < 1,00 Hz ± 20 %@ 1,00÷ < 3,00 Hz ± 5 %@ 3,00 ÷ 2.000,00 Hz Only for acc. 393B04: ± 8 % @ 315,00 ÷ 1.000,00 Hz Uncertainty frequency [Hz] U: ± 0,3 % Tolerances not respected: - Temperature env.: 15 ÷ 18 °C	See §§4.1.1	-	-	-
		Beginning 14/11/2023 Ending 14/11/2023	(Earthquake test method) § 5.4, Telcordia Technologies	Conditions: Not operational **RUN08**	After the test: • Damage and plastic deformation	§ 4.4, IEC 60068-3-3:2019	Criterion 0: Equipment subjected to seismic testing which experienced	Compliant[5] (conformity verified only by visual inspection)

[5] The performances requirements and declaration of compliance of the unit operation is performed by the Customer. P&P LMC S.r.l. declares compliance only on the basis of a visual inspection to assess deformations and mechanical alterations.

ID sample#	ID unit#	Date execution test	Test method	Test parameters	Inspection after test and results	Reference technical documents	Reference value	Declaration o conformity
			Generic Requirements GR-63-CORE § 4.4, IEC 60068-2-57:2013	Excitation level: Severity level Zone 4 RRS 0,30 Hz @ 0,20 g 0,60 Hz @ 2,00 g 2,00÷5,00 Hz @ 5,00 g 15,00÷50,00 Hz @ 1,60 g Duration [hh:mm:ss]: 00:00:30 Damping: 2% (Q factor = 25) Sampling freq.: 400 Hz Points per octave: 6 Tolerances not respected: ≤ +30 % @ 1 ÷ 7 Hz of RRS. 0 ÷ +50 % of RRS ; > 50 % is permitted @ > 1/3·f2 If a small portion of the individual points lies outside the tolerance zone the test must still be acceptable. Filters: High pass filter 0,5 Hz; Low pass filter 102400 BP 2,80÷100,00 Hz applied to VERTEQII time-history. Uncertainty acceleration [g] U: ± 30 % @ < 1,00 Hz ± 20 %@ 1,00÷ < 3,00 Hz ± 5 %@ 3,00 ÷ 2.000,00 Hz	were not observed on UUT. • Side and back covers of UUT were still engaged and not damaged. • Doors of UUT were still engaged and could operate as intended. • The shelves of the UUT were not dislodged, stable and not deformed. • The weights on the shelves of the UUT remained stable and no change was observed compared to pre-test. Outside the lower tolerance at the following frequency range: 0,5 ÷ 2,80 Hz Outside the upper 30% tolerance at the following frequency range: 3,06 ÷ 7,00 Hz Outside the upper 50% tolerance at the following frequency range: 5,33 ÷ 8,57 Hz & 12,03 ÷ 13,37		no malfunction either during or after the test.	

ID sample#	ID unit#	Date execution test	Test method	Test parameters	Inspection after test and results	Reference technical documents	Reference value	Declaration o conformity
				Only for acc. 393B04: ± 8 % @ 315,00 ÷ 1.000,00 Hz Uncertainty frequency [Hz] U: ± 0,3 % Temperature env.: 15 ÷ 18 °C				
		Beginning 14/11/2023 Ending 14/11/2023	(final vibration response investigation) § 8.2, IEC 60068-2-6:2007 § 5.4.1.5 Telcordia Technologies Generic Requirements GR-63-CORE Issue no. 05, date 2017 § 9.2, IEC 60068-3-3:2019	Conditions: Not operational **RUN09** Excitation levels: 2,00 ÷ 50,0 Hz @ ± 0,20 g (Sweep down and up) Sweep rate: 1 oct/min Duration [hh:mm:ss]: 00:09:17 Filters: High Pass 0,5; Low Pass 102.400; Harmonic estimator to evaluate the FRF. Uncertainty acceleration [g] U: ± 30 % @ < 1,00 Hz ± 20 %@ 1,00÷ < 3,00 Hz ± 5 %@ 3,00 ÷ 2.000,00 Hz Only for acc. 393B04: ± 8 % @ 315,00 ÷ 1.000,00 Hz Uncertainty frequency [Hz] U: ± 0,3 % Tolerances not respected: -	See §§4.1.1	§§ 11, A.9 IEC 60068-2-6:2007	Comparison of the initial and final resonant frequencies without acceptance or refusal criteria provided by the Customer.	-

ID sample[#]	ID unit[#]	Date execution test	Test method	Test parameters	Inspection after test and results	Reference technical documents	Reference value	Declaration o conformity
				Temperature env.: 15 ÷ 18 °C				

4.1.6. Summary of test results

4.1.6.1. Transportation test

Date of test: 13/11/2023

RUN	Axis	Test type	Parameters	Results
01	Z	Transportation test: Schedule E – Vehicle vibration: Truck profile: Low Level	*Frequency range*: 1,00 ÷ 200,0 Hz *Excitation levels*: Low Level (see § 2.4.3) *RMS*: 0,40g *Duration* [hh:mm:ss]: 00:40:00	Visually unaltered after test[4]
02		Transportation test: Schedule E – Vehicle vibration: Truck profile: Medium Level	*Frequency range*: 1,00 ÷ 200,0 Hz *Excitation levels*: Medium Level (see § 2.4.3) *RMS*: 0,54g *Duration* [hh:mm:ss]: 00:15:00	Visually unaltered after test[4]
03		Transportation test: Schedule E – Vehicle vibration: Truck profile: High Level	*Frequency range*: 1,00 ÷ 200,0 Hz *Excitation levels*: High Level (see § 2.4.3) *RMS*: 0,70g *Duration* [hh:mm:ss]: 00:05:00 PSD @ 1 Hz modified due to shaker stroke limits from 0,00072 to 0,0003 g^2/Hz	Visually unaltered after test[4]
04		Transportation test: Schedule E – Vehicle vibration: Truck profile: Low Level	*Frequency range*: 1,00 ÷ 200,0 Hz *Excitation levels*: Low Level (see § 2.4.3) *RMS*: 0,40g *Duration* [hh:mm:ss]: 00:40:00	Visually unaltered after test[4]

RUN	Axis	Test type	Parameters	Results
05		Transportation test: Schedule E – Vehicle vibration: Truck profile: Medium Level	*Frequency range*: 1,00 ÷ 200,0 Hz *Excitation levels*: Medium Level (see § 2.4.3) *RMS*: 0,54g *Duration* [hh:mm:ss]: 00:15:00	Visually unaltered after test[4]
06		Transportation test: Schedule E – Vehicle vibration: Truck profile: High Level	*Frequency range*: 1,00 ÷ 200,0 Hz *Excitation levels*: High Level (see § 2.4.3) *RMS*: 0,70g *Duration* [hh:mm:ss]: 00:05:00 PSD @ 1 Hz modified due to shaker stroke limits from 0,00072 to 0,0003 g^2/Hz	Visually unaltered after test[4]
07		Transportation test: Schedule E – Vehicle vibration: Truck profile: Low Level	*Frequency range*: 1,00 ÷ 200,0 Hz *Excitation levels*: Low Level (see § 2.4.3) *RMS*: 0,4g *Duration* [hh:mm:ss]: 00:40:00	Visually unaltered after test[4]
08		Transportation test: Schedule E – Vehicle vibration: Truck profile: Medium Level	*Frequency range*: 1,00 ÷ 200,0 Hz *Excitation levels*: Medium Level (see § 2.4.3) *RMS*: 0,54g *Duration* [hh:mm:ss]: 00:15:00	Visually unaltered after test[4]
09		Transportation test: Schedule E – Vehicle vibration: Truck profile: High Level	*Frequency range*: 1,00 ÷ 200,0 Hz *Excitation levels*: High Level (see § 2.4.3) *RMS*: 0,70g *Duration* [hh:mm:ss]: 00:05:00 PSD @ 1 Hz modified due to shaker stroke limits from 0,00072 to 0,0003 g^2/Hz	Visually unaltered after test, no damage observed both in product and packaging[4] EUT meets criterion 3 condition specified in ASTM D4169-16[4]

4.1.6.2. Seismic test

Date of test: 14/11/2023

RUN	Axis	Test type	Parameters	Results
01	Z	Vibration response investigation	*Frequency range*: 2,00 ÷ 50,0 Hz *Excitation levels*: ± 0,20 g *Sweep rate*: 1 oct/min *Duration* [hh:mm:ss]: 00:09:17	Visually unaltered after test[4] No resonance frequency found
02		Earthquake test method	*Frequency range*: 2,80 ÷ 50,0 Hz *Excitation levels*: Severity level Zone IV *ZPA*: 1,6g *Duration* [hh:mm:ss]: 00:00:30 *Damping*: 2%	Visually unaltered after test[4] EUT provides the seismic criteria of IEC 60068-3-3:2019[4]
03		Vibration response investigation	*Frequency range*: 2,00 ÷ 50,0 Hz *Excitation levels*: ± 0,20 g *Sweep rate*: 1 oct/min *Duration* [hh:mm:ss]: 00:09:17	Visually unaltered after test[4] No resonance frequency found
04	X	Vibration response investigation	*Frequency range*: 2,00 ÷ 50,0 Hz *Excitation levels*: ± 0,20 g *Sweep rate*: 1 oct/min *Duration* [hh:mm:ss]: 00:09:17	Visually unaltered after test[4] Resonance frequency found: see § 4.1.1
05		Earthquake test method	*Frequency range*: 2,80 ÷ 50,0 Hz *Excitation levels*: Severity level Zone IV *ZPA*: 1,6g *Duration* [hh:mm:ss]: 00:00:30 *Damping*: 2%	Visually unaltered after test[4] EUT provides the seismic criteria of IEC 60068-3-3:2019[4]
06		Vibration response investigation	*Frequency range*: 2,00 ÷ 50,0 Hz *Excitation levels*: ± 0,20 g *Sweep rate*: 1 oct/min *Duration* [hh:mm:ss]: 00:09:17	Visually unaltered after test[4] Resonance frequency found: see § 4.1.1
07	Y	Vibration response investigation	*Frequency range*: 2,00 ÷ 50,0 Hz *Excitation levels*: ± 0,20 g *Sweep rate*: 1 oct/min *Duration* [hh:mm:ss]: 00:09:17	Visually unaltered after test[4] Resonance frequency found: see § 4.1.1

RUN	Axis	Test type	Parameters	Results
08		Earthquake test method	*Frequency range*: 2,80 ÷ 50,0 Hz *Excitation levels*: Severity level Zone IV *ZPA*: 1,6g *Duration* [hh:mm:ss]: 00:00:30 *Damping*: 2%	Visually unaltered after test[4] EUT provides the seismic criteria of IEC 60068-3-3:2019[4]
09		Vibration response investigation	*Frequency range*: 2,00 ÷ 50,0 Hz *Excitation levels*: ± 0,20 g *Sweep rate*: 1 oct/min *Duration* [hh:mm:ss]: 00:09:17	Visually unaltered after test[4] Resonance frequency found: see § 4.1.1

4.1.7. Declaration of conformity

The declarations of conformity for each test direction are indicated in §§ 4.1.2, 4.1.3, 4.1.4 and 4.1.5.
For each transportation test performed, the unit under test was found to comply with the Criterion 3 of the corresponding test method ASTM D4169-16 [5].
For each direction and for each test performed, the unit under test was found to comply with the reference value of the corresponding test method IEC 60068-2-6:2007 [5].
For each direction and for each test performed, the unit under test was found to comply with the reference value of the corresponding test method IEC 60068-3-3:2019 [5].

4.2. Opinions and interpretations - Not subject to ACCREDIA accreditation

-

PHOTO DOCUMENTATION

LIST OF FIGURES

Photo 1 – Transportation test - setup

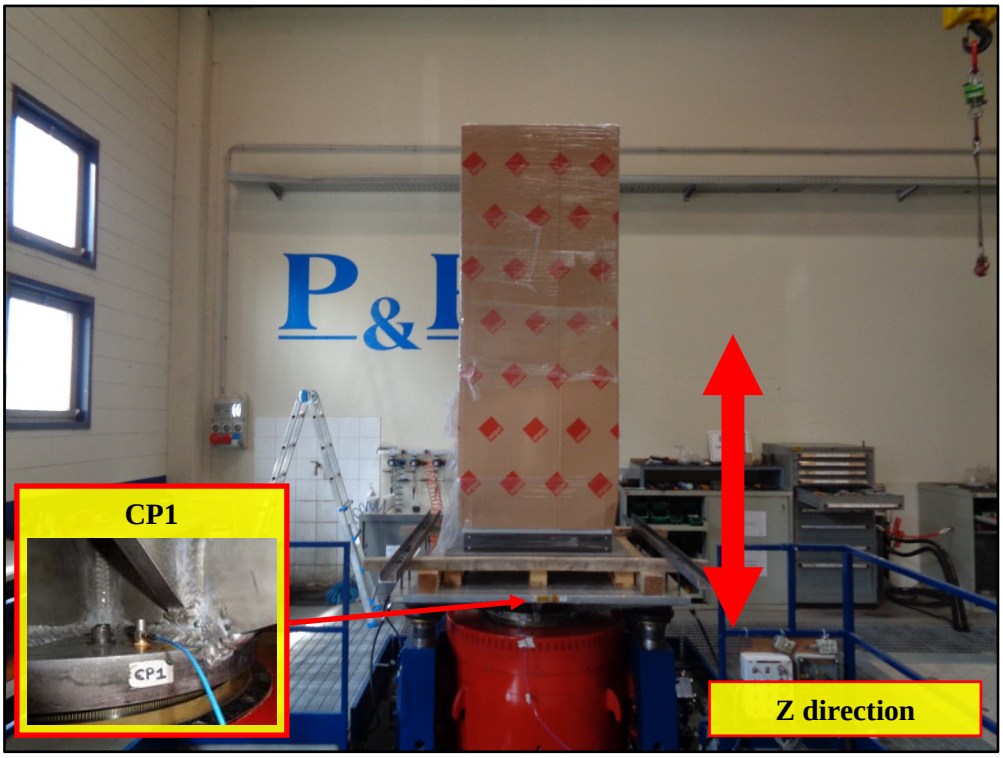


Photo 2 - Test configuration in Z direction – Constraining setup

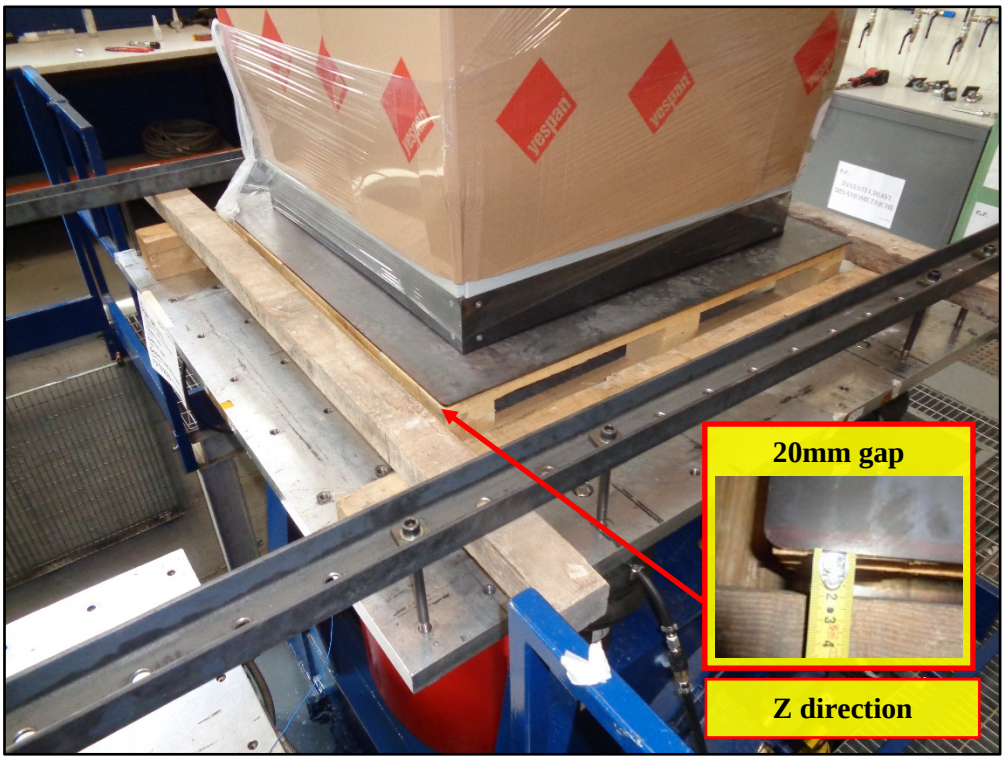


Photo 3 - Test configuration in Y direction

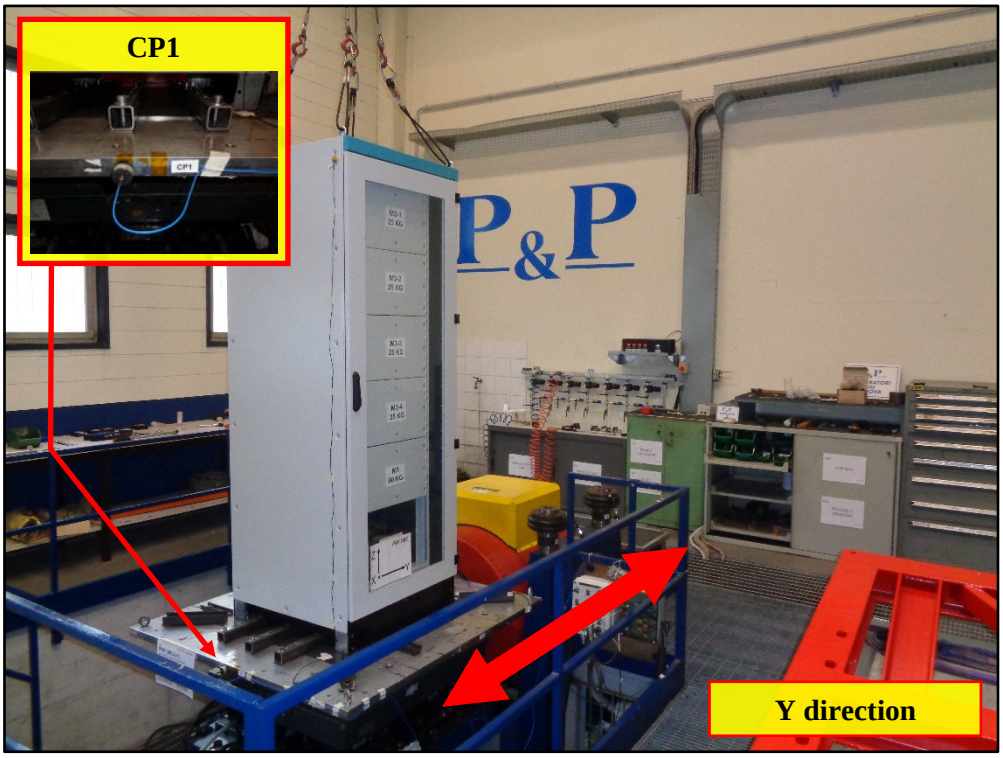


Photo 4 - Test configuration in X direction

Photo 5 - Test configuration in Z direction

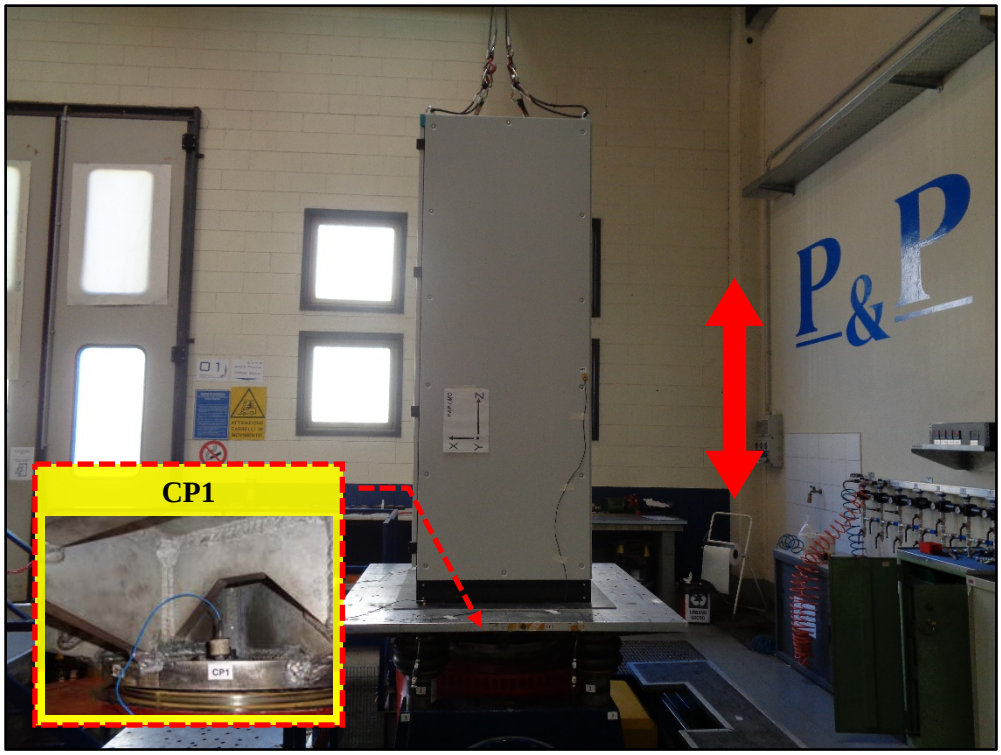


Photo 6 - Measuring point on the unit (MP2 and MP3)

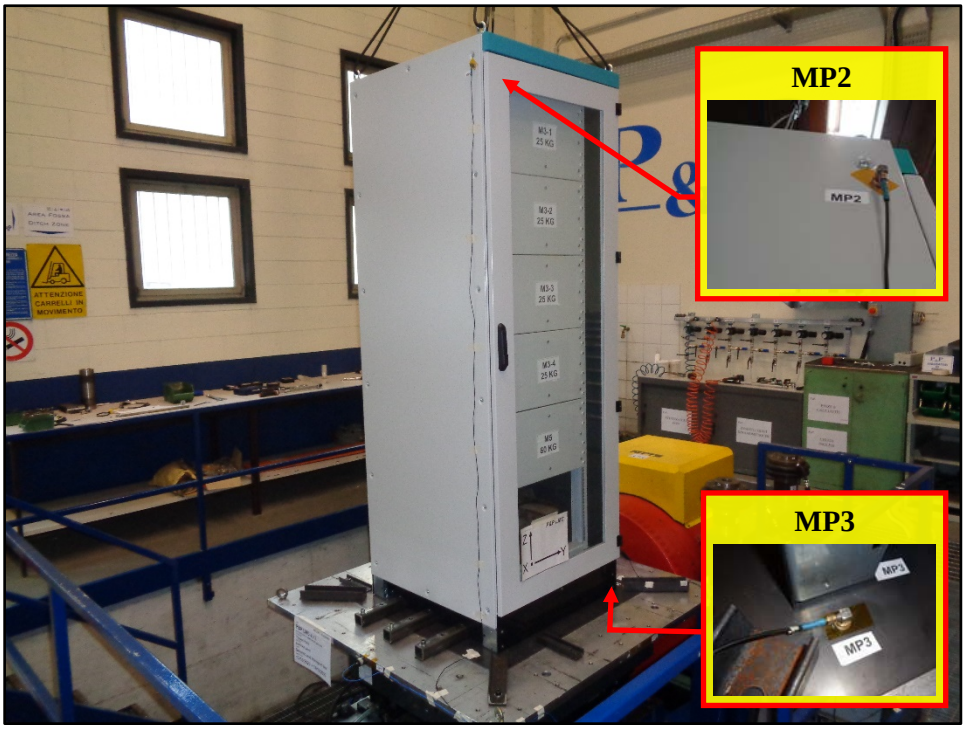


Photo 7 - Measuring points on the unit (MP1)

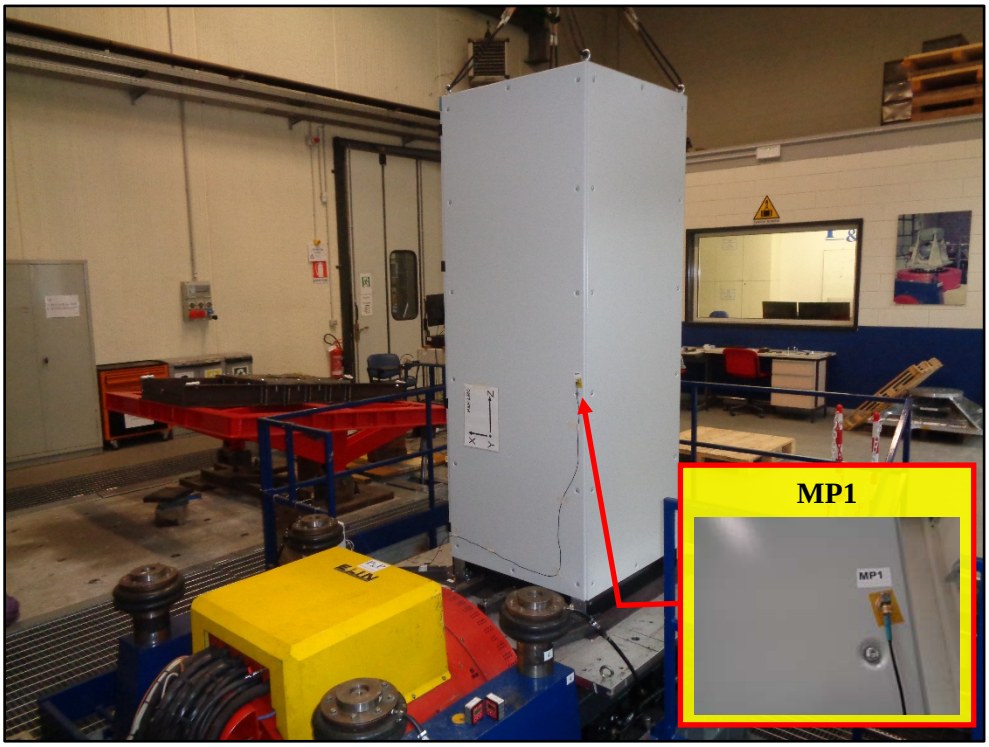


Photo 8 – Mounting technique – Z direction configuration

Photo 9 – Mounting technique – X and Y directions configuration

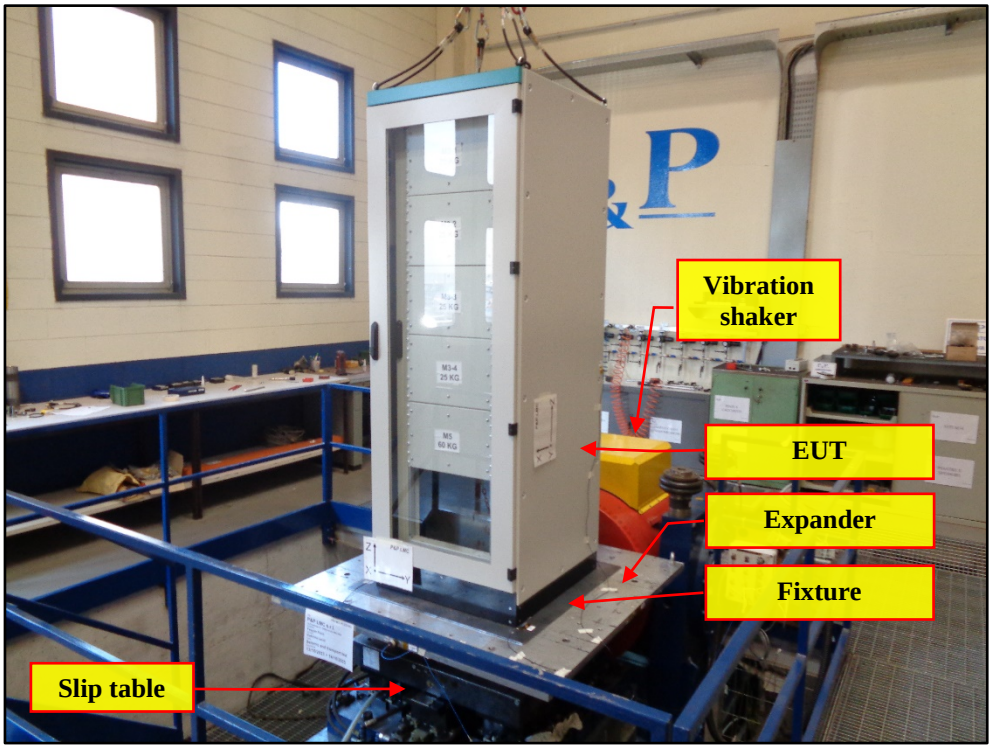


Photo 10 – Mounting technique – Fixing points of expander-Fixture-EUT

Photo 11 – EUT components

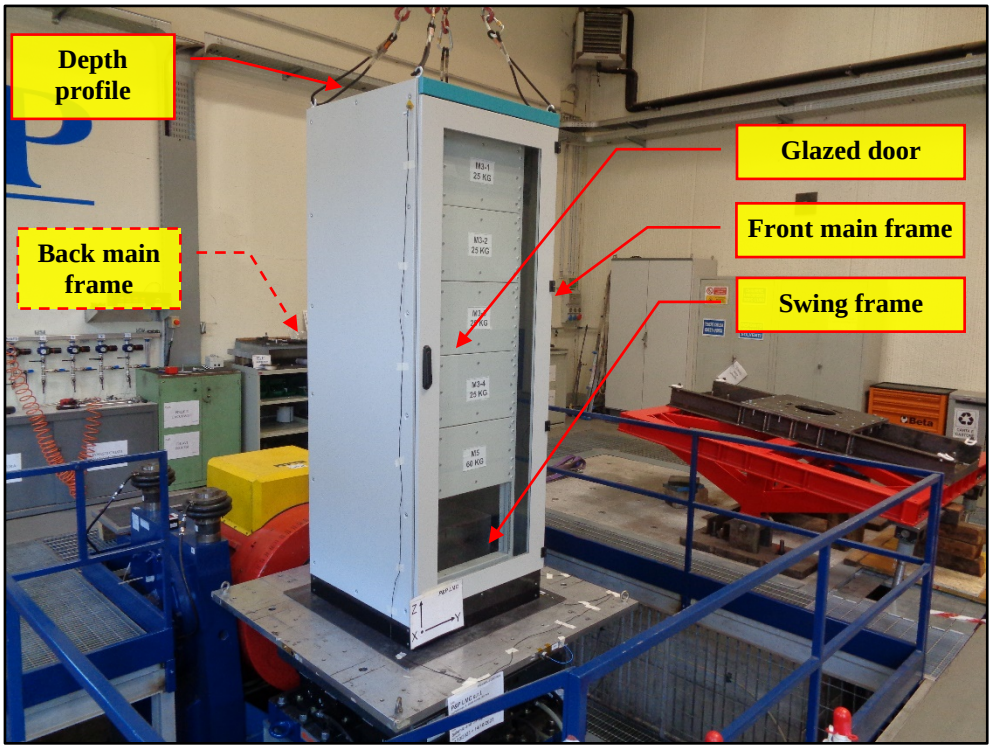


Photo 12 – EUT joints

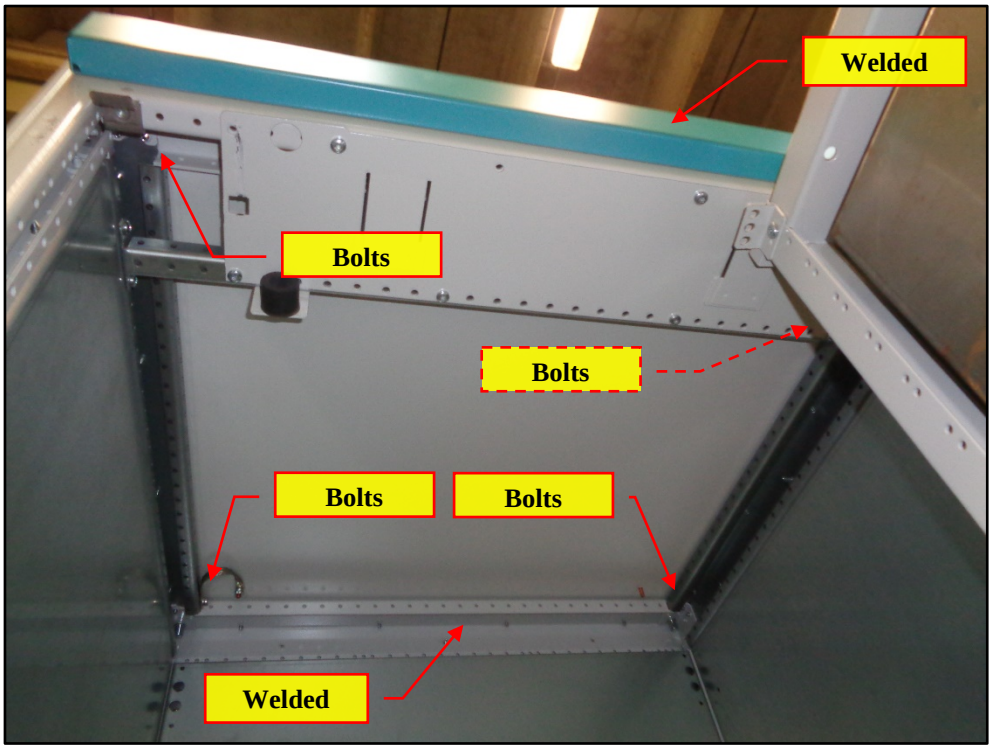


Photo 13 – Weight of EUT

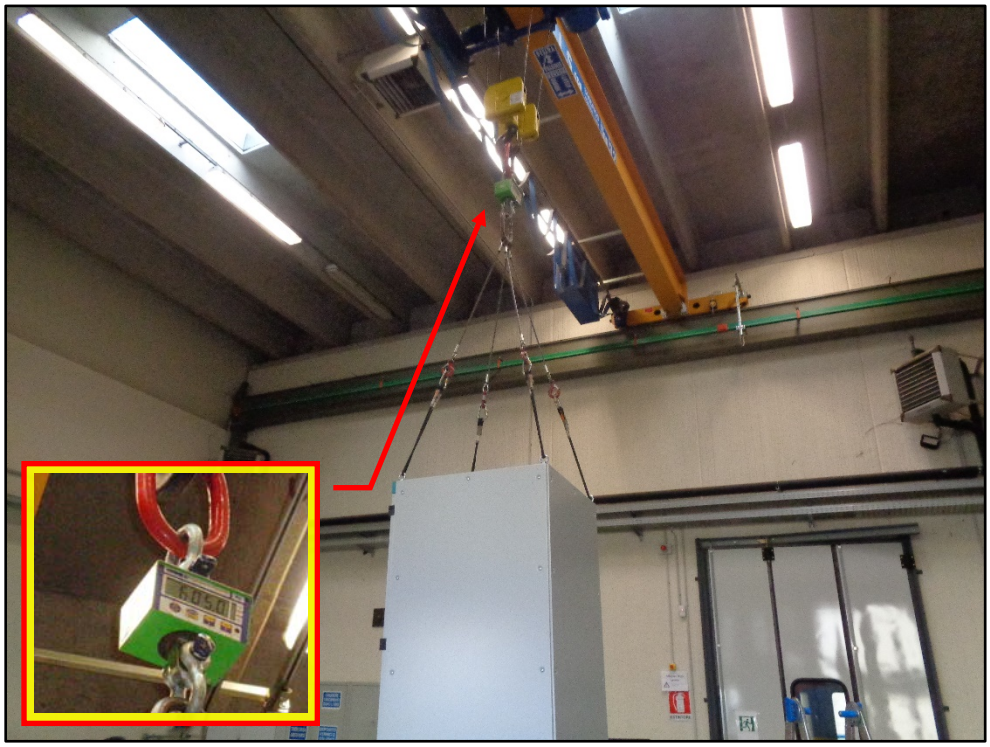
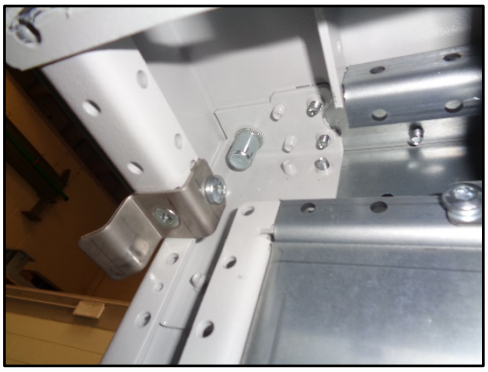


Photo 14 – Visual inspection after all tests



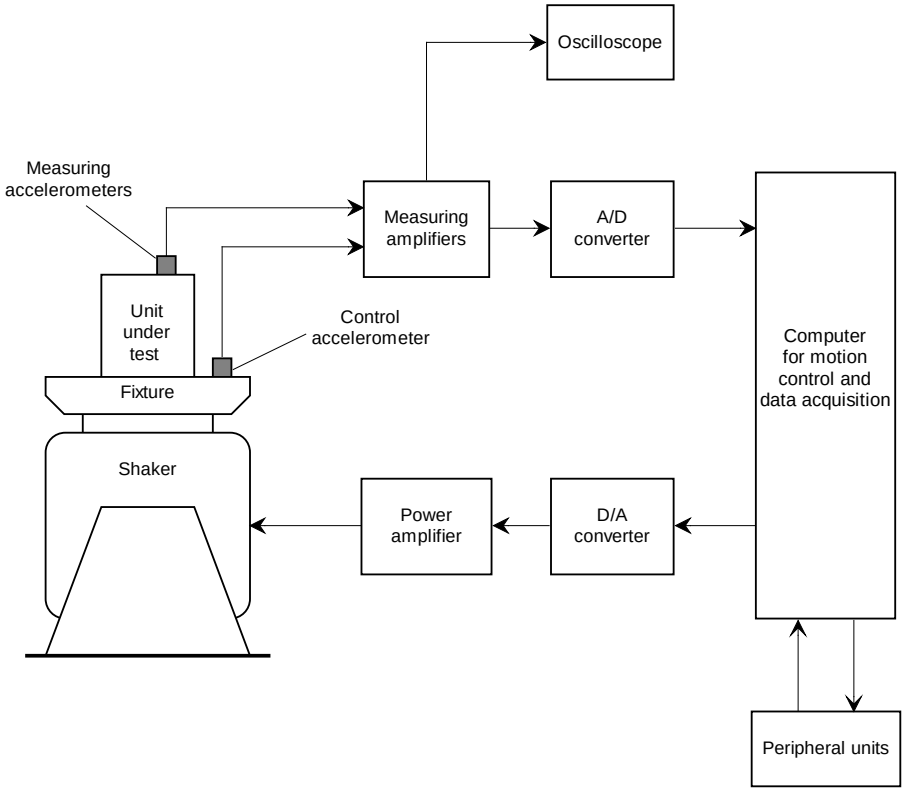


Figure 1 - Block diagram of the test equipment

Figure 2 – Reference axis X, Y, Z of the tests

DATASHEET

ISO9001-2015
TS EN 60439
TS EN 62208

yespan

CE
GOST-R

S+ SERIES

Free Standing Type Modular Enclosure

DIMENSIONS: W(800) x H(2200+100) x D(800)

PLACE OF USE - PROTECTION CLASS: INDOOR IP 55

SHEET STEEL:

	Thickness	Material	Coating
Enclosure Front & Back Frames	3,00 mm	Galvanized CRS	7035 / 7035
Depth Profiles	3,00 mm	Galvanized CRS	Unpainted
Door	2,00 mm	Galvanized CRS	7035 / 7035
Side/Back wall	1,50 mm	Galvanized CRS	7035 / 7035
Side mounting plate	2,00 mm	Galvanized CRS	Unpainted
Back mounting plate	2,00 mm	Galvanized CRS	Unpainted
19" Swing Frame	2,50 mm	Galvanized CRS	7035 / 7035
Cover Plates	2,00 mm	Galvanized CRS	7035 / 7035
Bottom Plate	3,00 mm	Galvanized CRS	Unpainted
Top Plate	2,00 mm	Galvanized CRS	7035 / 7035
Plinth Cover	2,00 mm	Galvanized CRS	Black
Plinth Corner	3,00 mm	Galvanized CRS	Unpainted
Trim Strip	1,50 mm	Galvanized CRS	Turquoise

SURFACE TREATMENT:

Nanoceramic coating (when coating applied).

COATING:

Ral 7035 wrinkle UV resistive polyester powder coating (Inside)
Ral 7035 wrinkle UV resistive polyester powder coating (Outside)
Ral 5018 Turquoise Powder Coating (Trim Strip)
Ral 9005 Black Powder Coating (Plinth Cover)

LOCK:

Polyamide Handle with Push Button Insert (1325-U1 Emka)

HINGES:

Easy removable corner hinges, zinc & stainless steel, powder coated
240° opening angle (130° with stopper)

INSETS:

Glazed Door with 5 mm tempered glass
Back Mounting Plate
2 Side Mounting Plates
19" 43U Swing Frame (160kgs simulation weight attached)
90kg simulation weight attached to main frame
Door & Swing Frame Stoppers
Door & Swing Frame earthing cables
Trim Strip

MISCELLANEOUS:

Galvanized steel: 275 gr/m² Zinc
Screwed and partially welded main frame, including corner pieces
Width & height profiles are screwed and welded, depth profiles are without welding
Standard packaging with ISPM Heat treated pallets and styrofoam corner protection is included.

YESPAN ELEKTRİK SAN. ve TİC. LTD. ŞTİ.
Umurlu Mah. Aydın Organize Sanayi Bölgesi 2.Cad. No: 41
09830 EFELER - AYDIN / TÜRKİYE
PHONE: 00 90 256 211 58 58 (pbx) FAX: 00 90 256 211 38 88
http://www.yespan.com e-mail: info@yespan.com

Figure 3 – EUT datasheet (doc. 9)

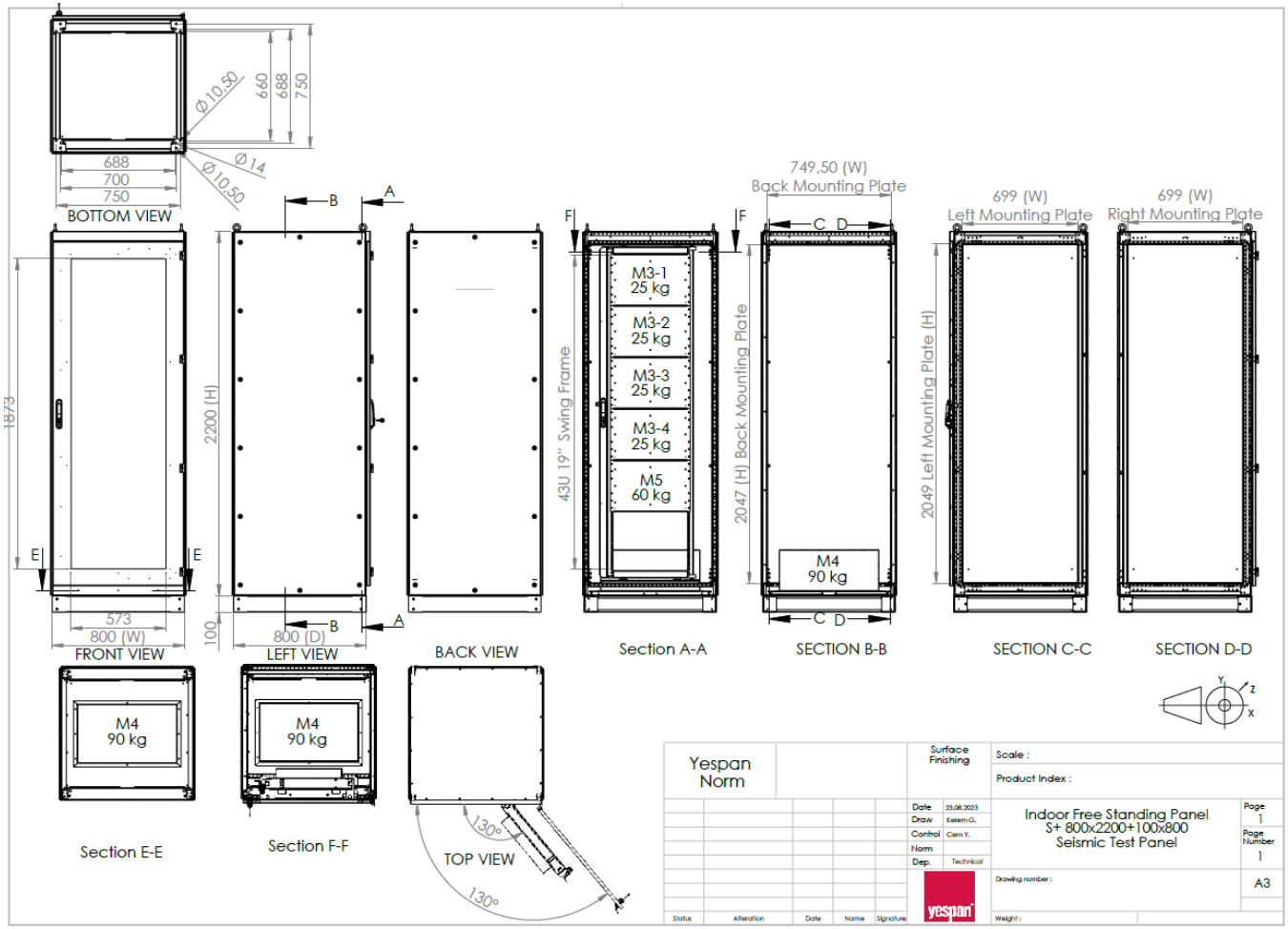


Figure 4 –EUT technical drawing (doc. 10)

Project: MTL-ELE23-053
Section: Z Axis – RUN01
Test Number: 01
Test: Random Truck – Low Level
Date: 13/11/2023
Id: AvgCtrl (of CP1)
RMS: 0,41 g

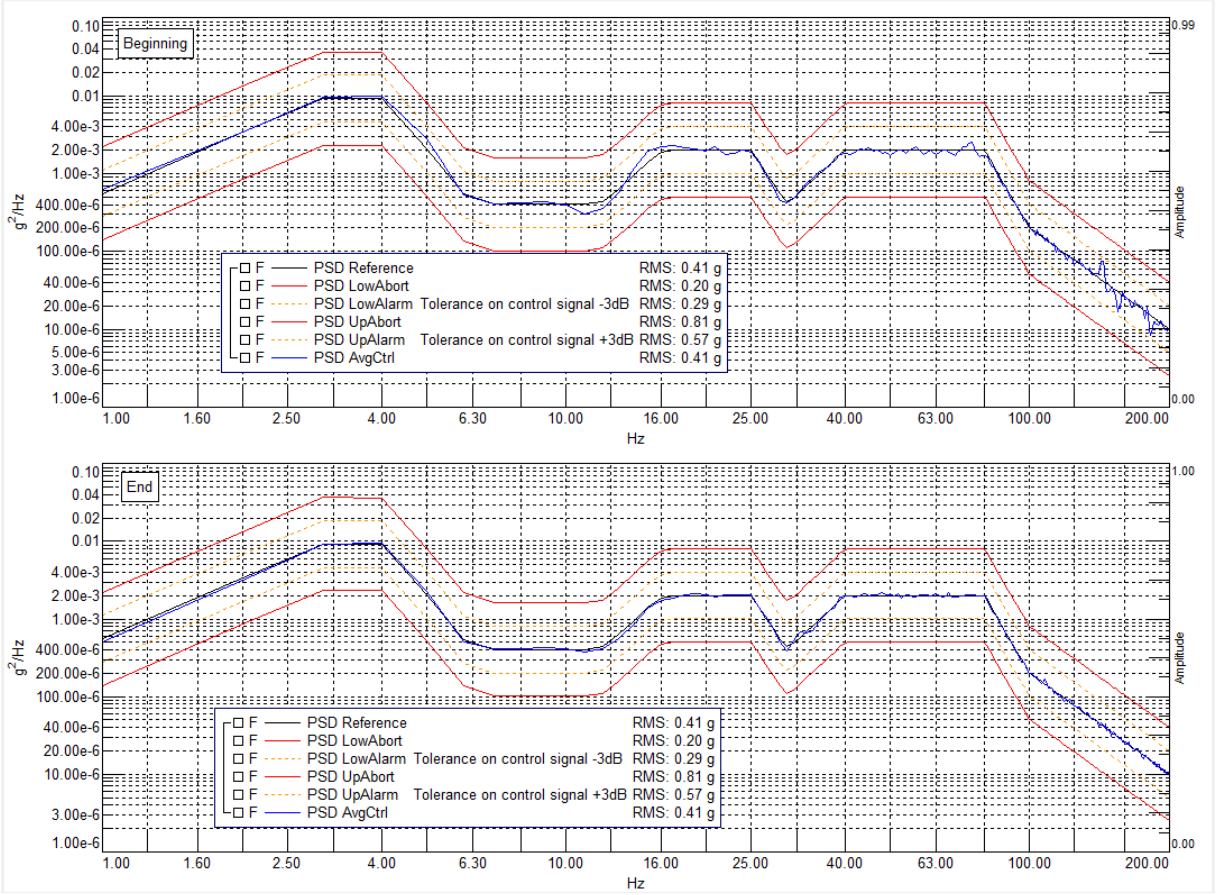


Figure 5 – Z Axis – RUN01, AvgCtrl: Diagram of Random Truck Low Level – Test Number 01

Project: MTL-ELE23-053
Section: Z Axis – RUN04
Test Number: 02
Test: Random Truck – Low Level
Date: 13/11/2023
Id: AvgCtrl (of CP1)
RMS: 0,41 g

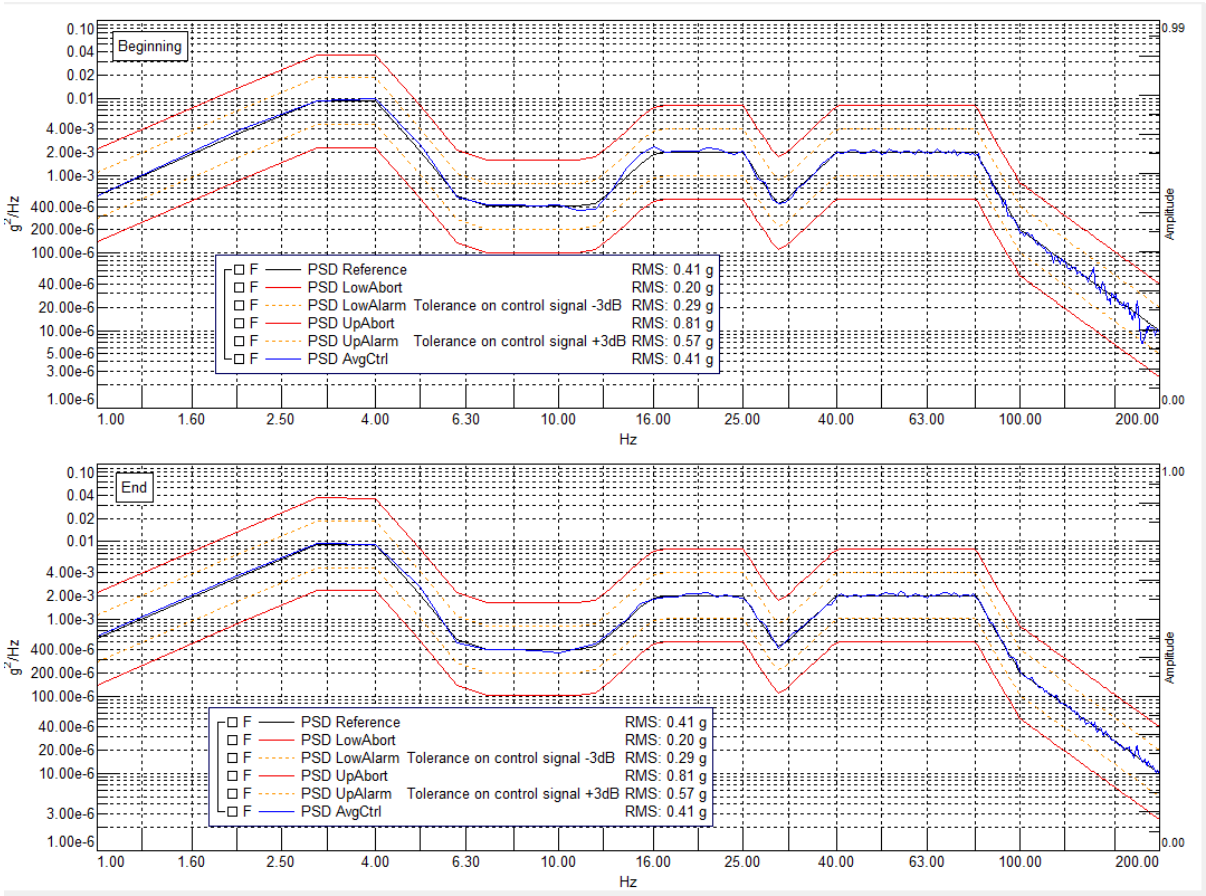


Figure 6 – Z Axis – RUN04, AvgCtrl: Diagram of Random Truck Low Level – Test Number 02

Project: MTL-ELE23-053
Section: Z Axis – RUN07
Test Number: 03
Test: Random Truck – Low Level
Date: 13/11/2023
Id: AvgCtrl (of CP1)
RMS: 0,41 g

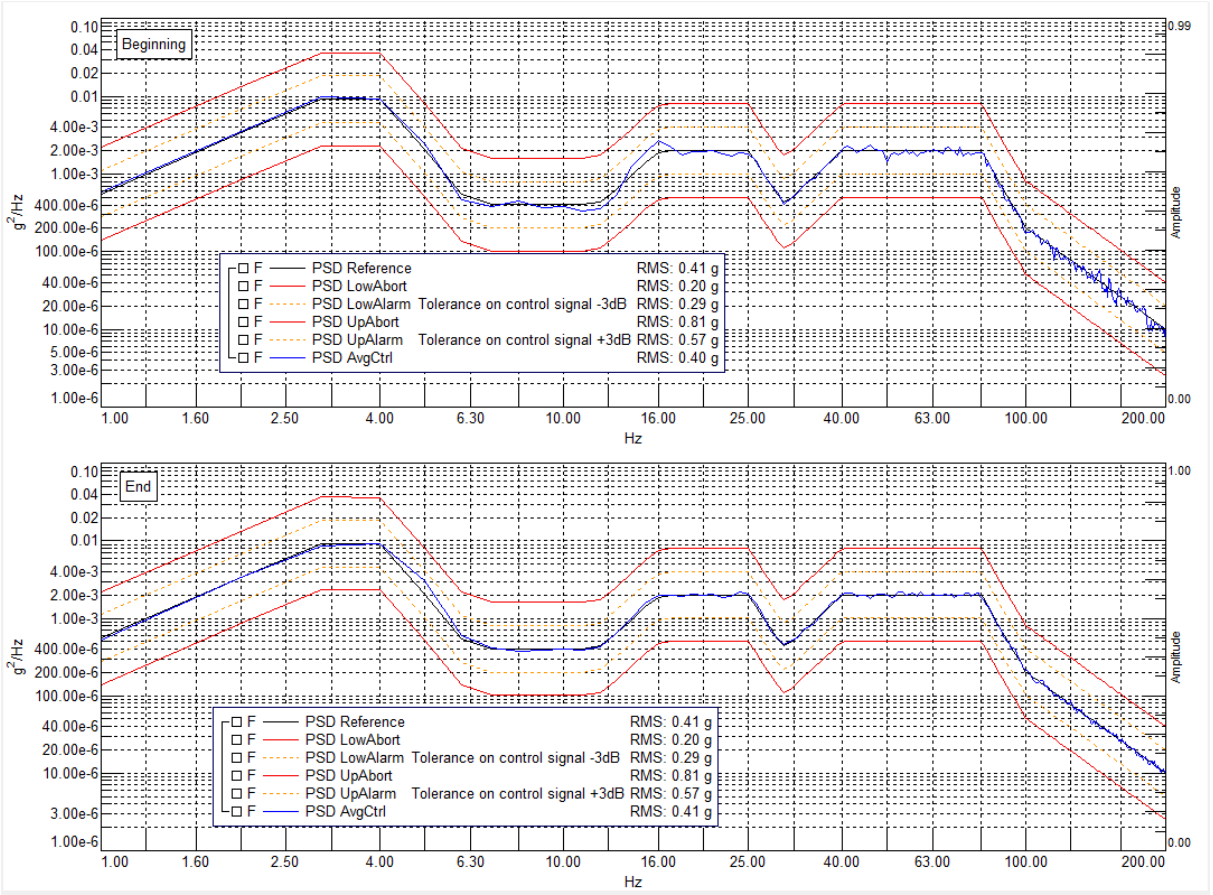


Figure 7 – Z Axis – RUN07, AvgCtrl: Diagram of Random Truck Low Level – Test Number 03

Project: MTL-ELE23-053
Section: Z Axis – RUN02
Test: Random Truck – Medium Level
Test Number: 01
Date: 13/11/2023
Id: AvgCtrl (of CP1)
RMS: 0,55 g

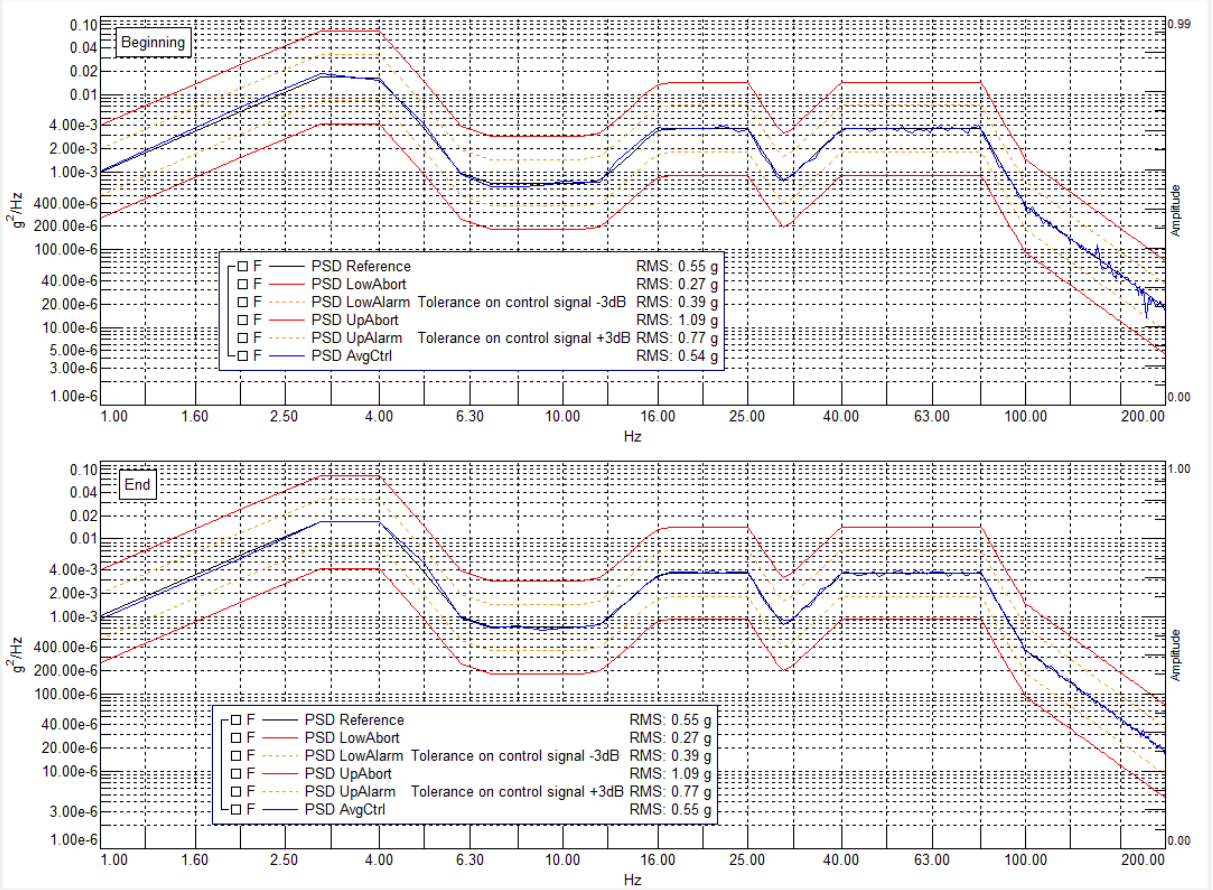


Figure 8 – Z Axis – RUN02, AvgCtrl: Diagram of Random Truck Medium Level – Test Number 01

Project: MTL-ELE23-053
Section: Z Axis – RUN05
Test: Random Truck – Medium Level
Test Number: 02
Date: 13/11/2023
Id: AvgCtrl (of CP1)
RMS: 0,55 g

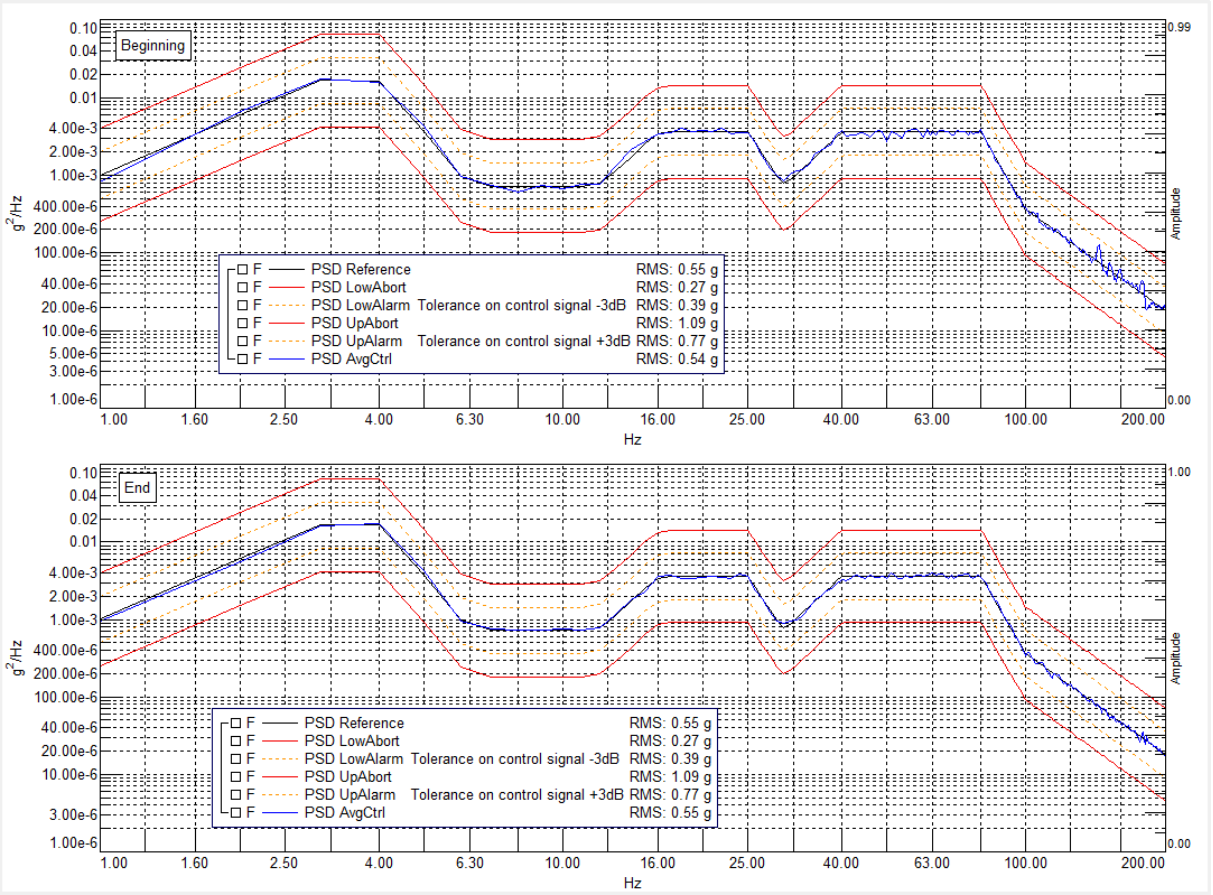


Figure 9 – Z Axis – RUN05, AvgCtrl: Diagram of Random Truck Medium Level – Test Number 02

Project: MTL-ELE23-053
Section: Z Axis – RUN08
Test: Random Truck – Medium Level
Test Number: 03
Date: 13/11/2023
Id: AvgCtrl (of CP1)
RMS: 0,55 g

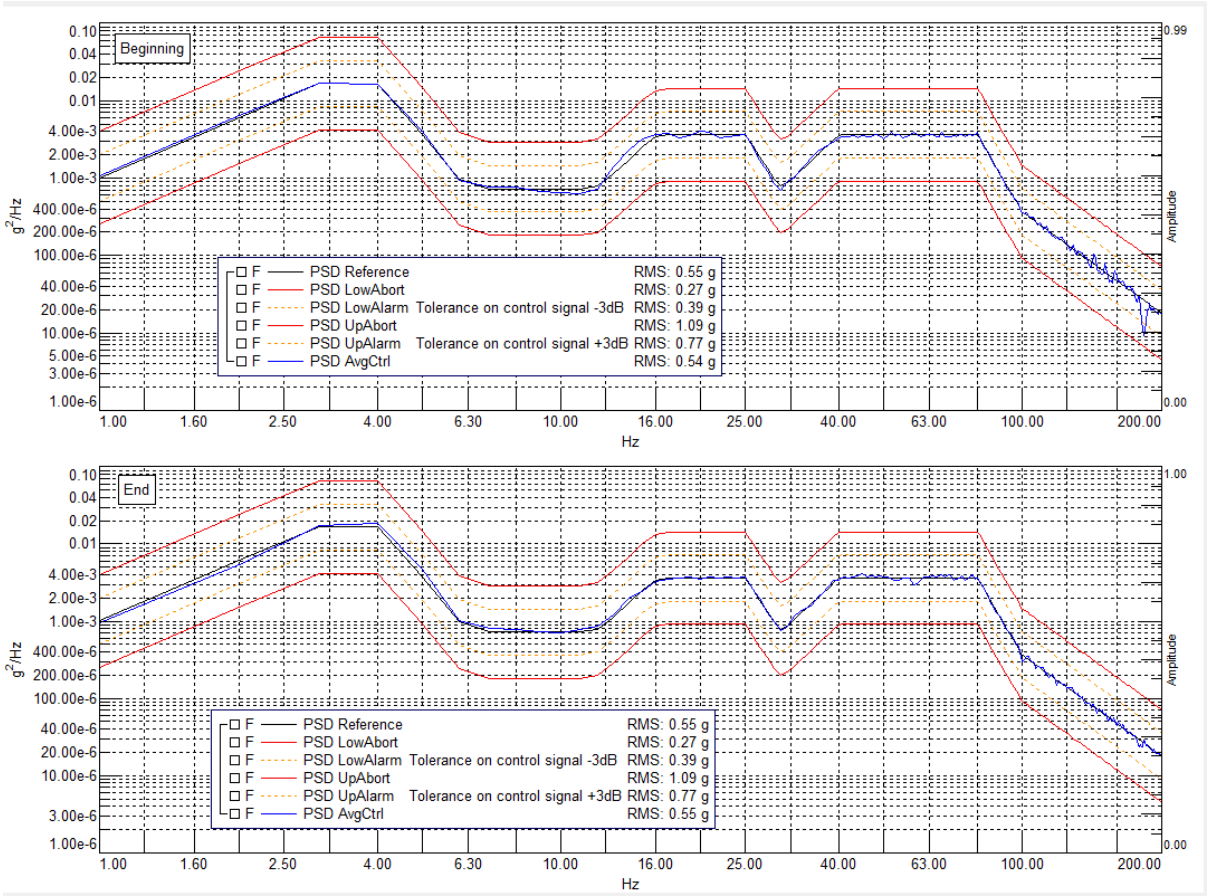


Figure 10 – Z Axis – RUN08, AvgCtrl: Diagram of Random Truck Medium Level – Test Number 03

Project: MTL-ELE23-053
Section: Z Axis – RUN03
Test: Random Truck – High Level
Test Number: 01
Date: 13/11/2023
Id: AvgCtrl (of CP1)
RMS: 0,71 g

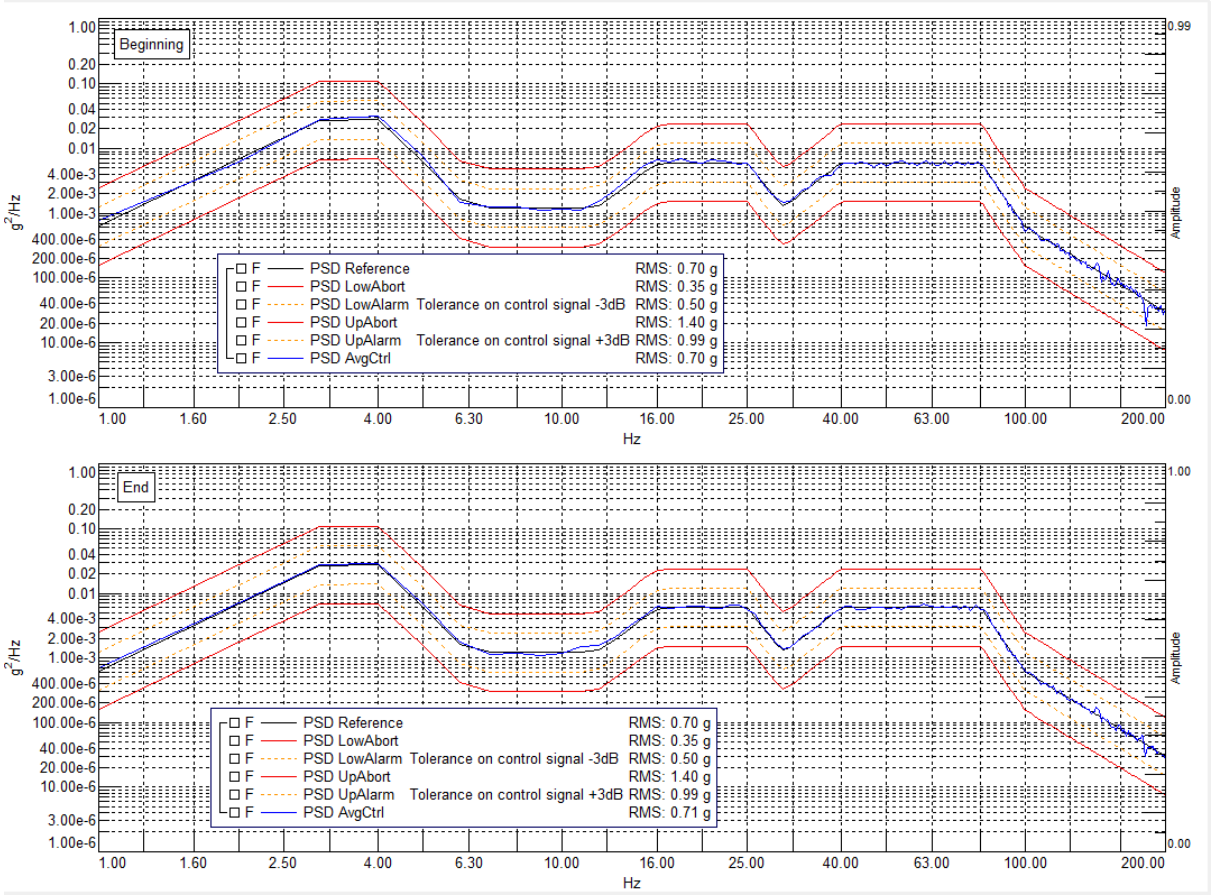


Figure 11 – Z Axis – RUN03, AvgCtrl: Diagram of Random Truck High Level – Test Number 01

Project: MTL-ELE23-053
Section: Z Axis – RUN06
Test: Random Truck – High Level
Test Number: 02
Date: 13/11/2023
Id: AvgCtrl (of CP1)
RMS: 0,70 g

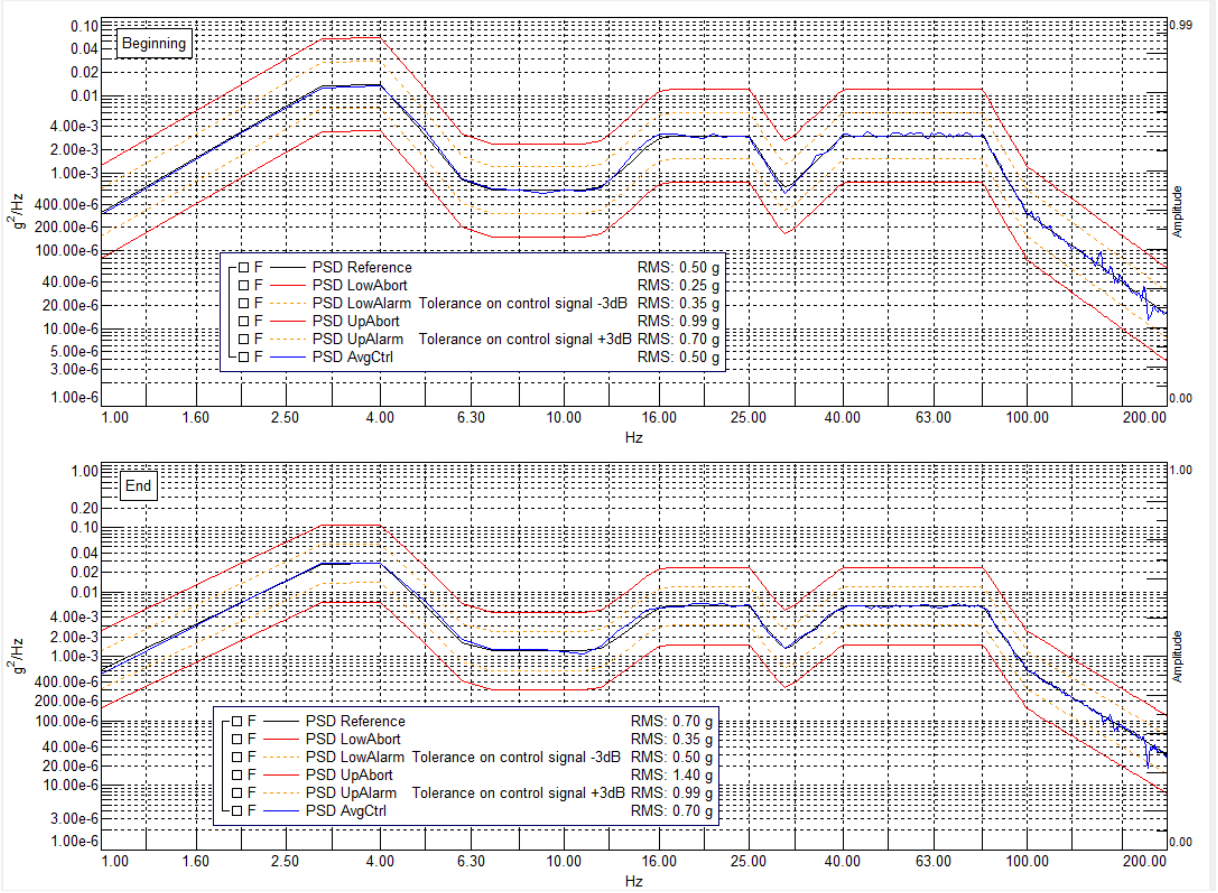


Figure 12 – Z Axis – RUN06, AvgCtrl: Diagram of Random Truck High Level – Test Number 02

Project: MTL-ELE23-053
Section: Z Axis – RUN09
Test: Random Truck – High Level
Test Number: 03
Date: 13/11/2023
Id: AvgCtrl (of CP1)
RMS: 0,71 g

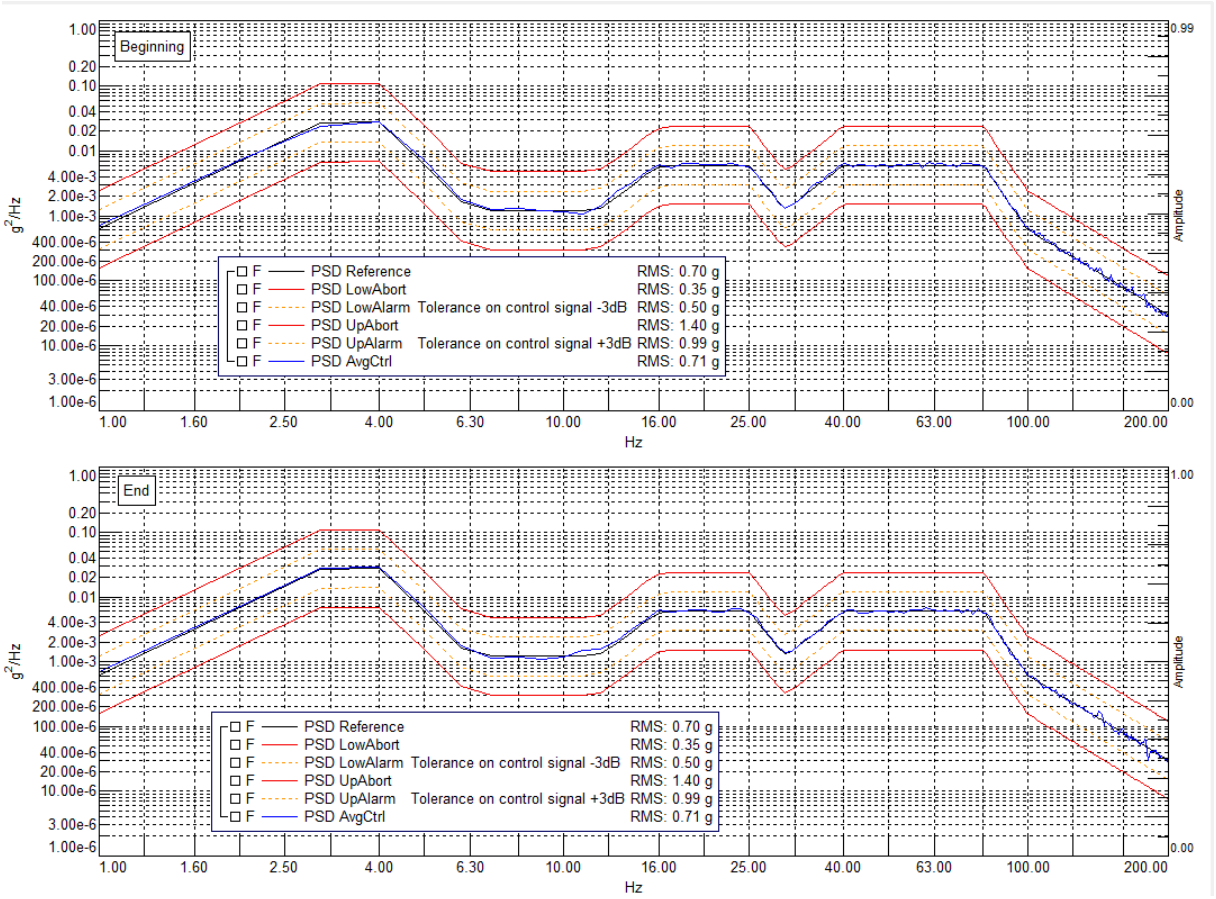


Figure 13 – Z Axis – RUN09, AvgCtrl: Diagram of Random Truck High Level – Test Number 03

Project: MTL-ELE23-053
Section: Z Axis – RUN01
Test: Initial vibration response investigation
Date: 14/11/2023
Id: AvgCtrl (of CP1)
RMS: 0,70g

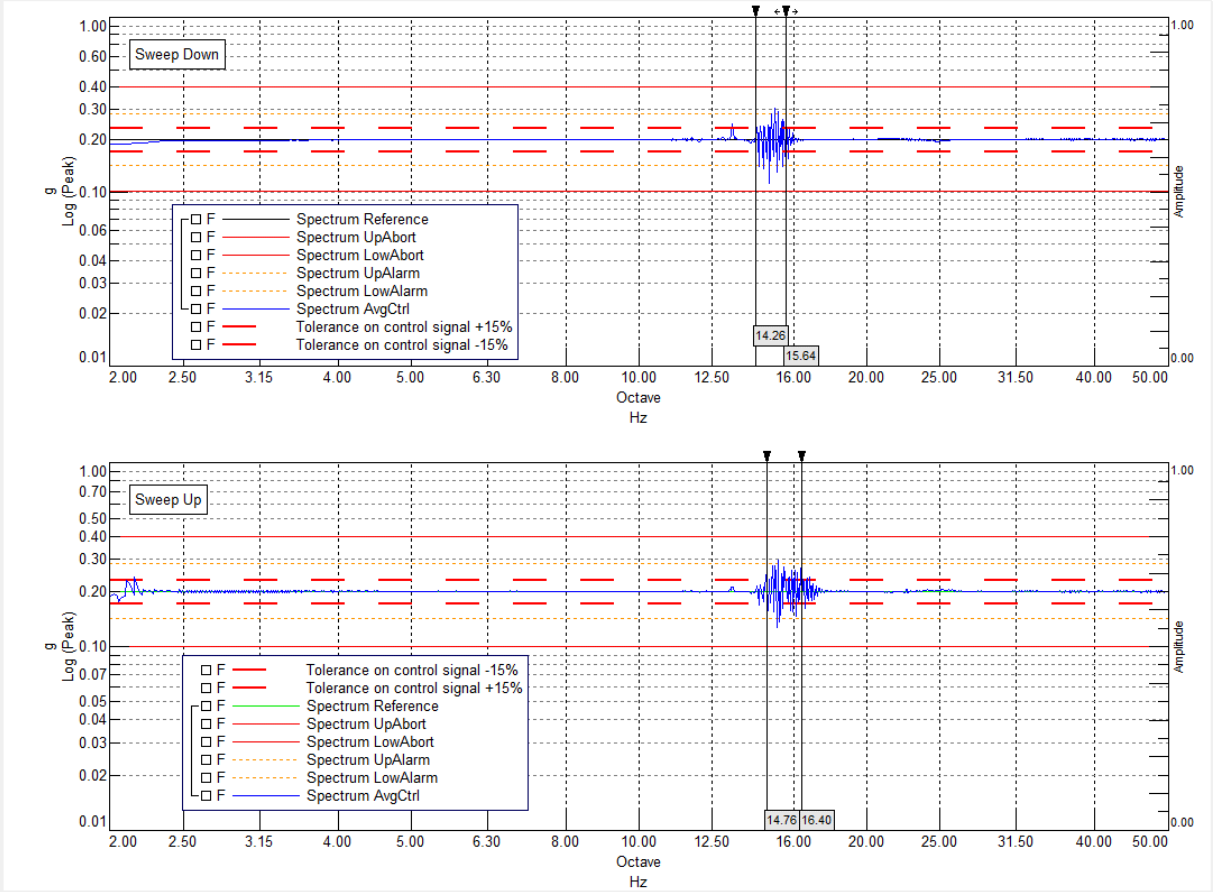


Figure 14 – Z Axis – RUN01, AvgCtrl: Diagram of Random Truck High Level – Test Number 03

Project: MTL-ELE23-053
Section: Z Axis – RUN01
Test: Initial vibration response investigation
Date: 14/11/2023
Id: AvgCtrl (of CP1)
Sweep rate: 1 Oct/min
Sweep direction: down and up

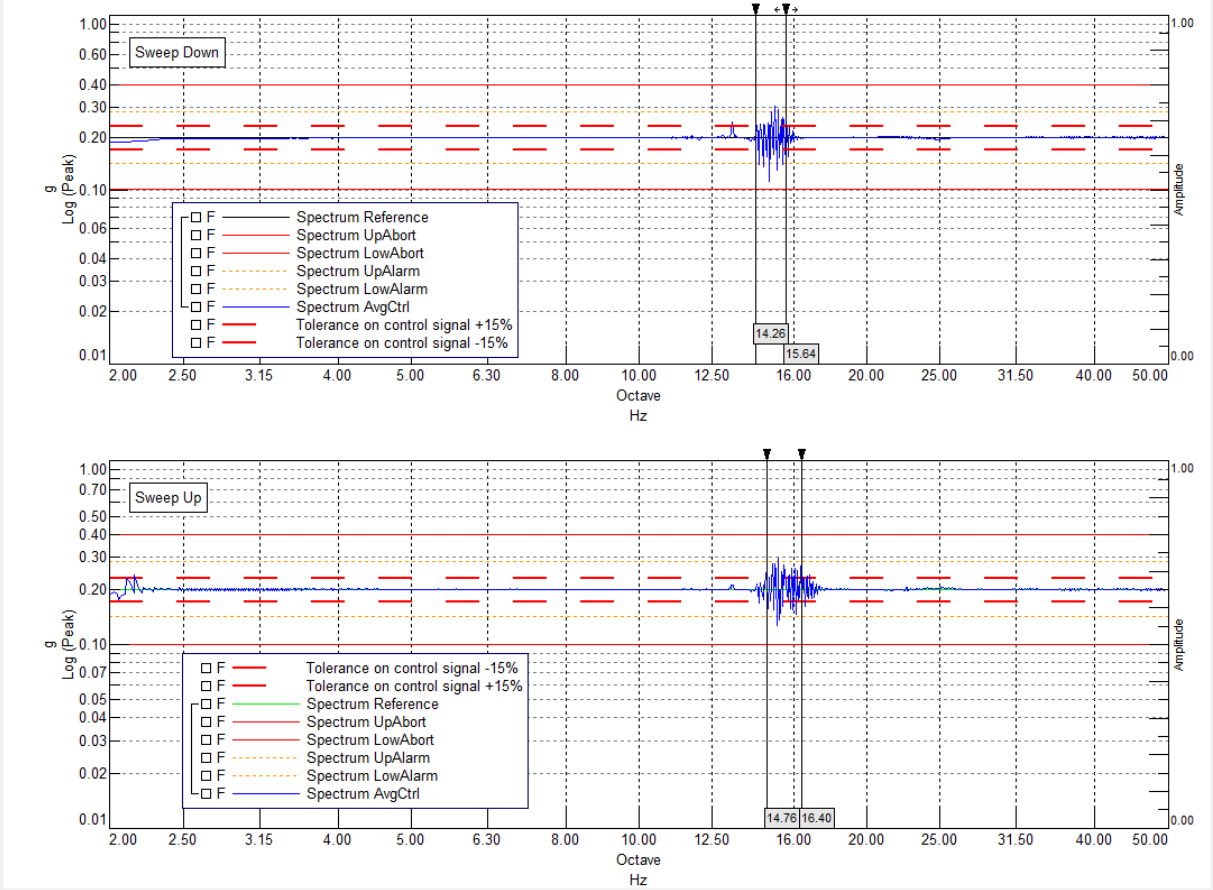


Figure 15 – Z Axis – RUN01, AvgCtrl: Diagram of initial vibration response investigation – Sweep down and up

Project: MTL-ELE23-053
Section: Z Axis – RUN01
Test: Initial vibration response investigation
Date: 14/11/2023
Id: MP1
Reference point: CP1
Sweep direction: Down
Sweep rate: 1 Oct/min

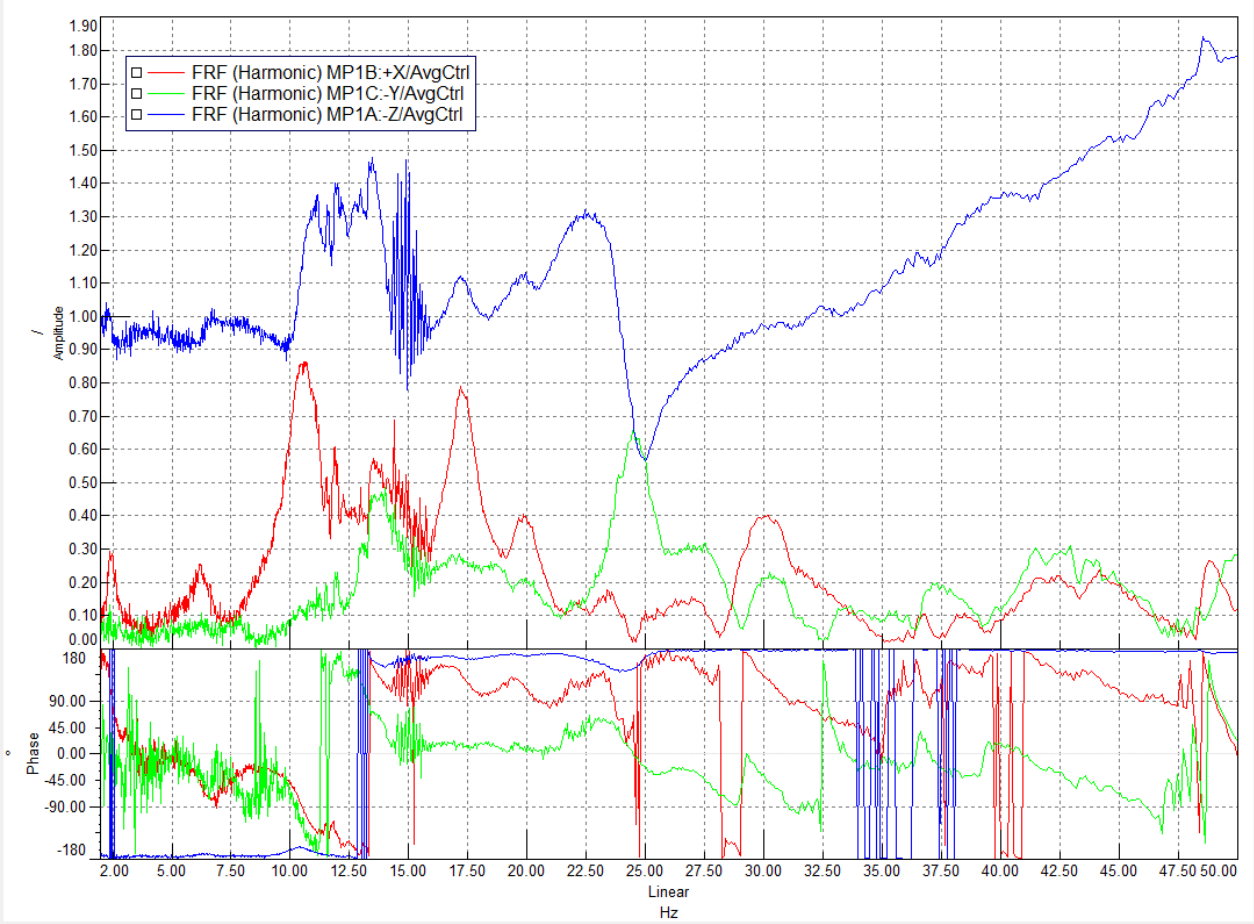


Figure 16 – Z Axis – RUN01, MP1: Diagram of initial vibration response investigation – Sweep Down

Project: MTL-ELE23-053
Section: Z Axis – RUN01
Test: Initial vibration response investigation
Date: 14/11/2023
Id: MP2
Reference point: CP1
Sweep direction: Down
Sweep rate: 1 Oct/min

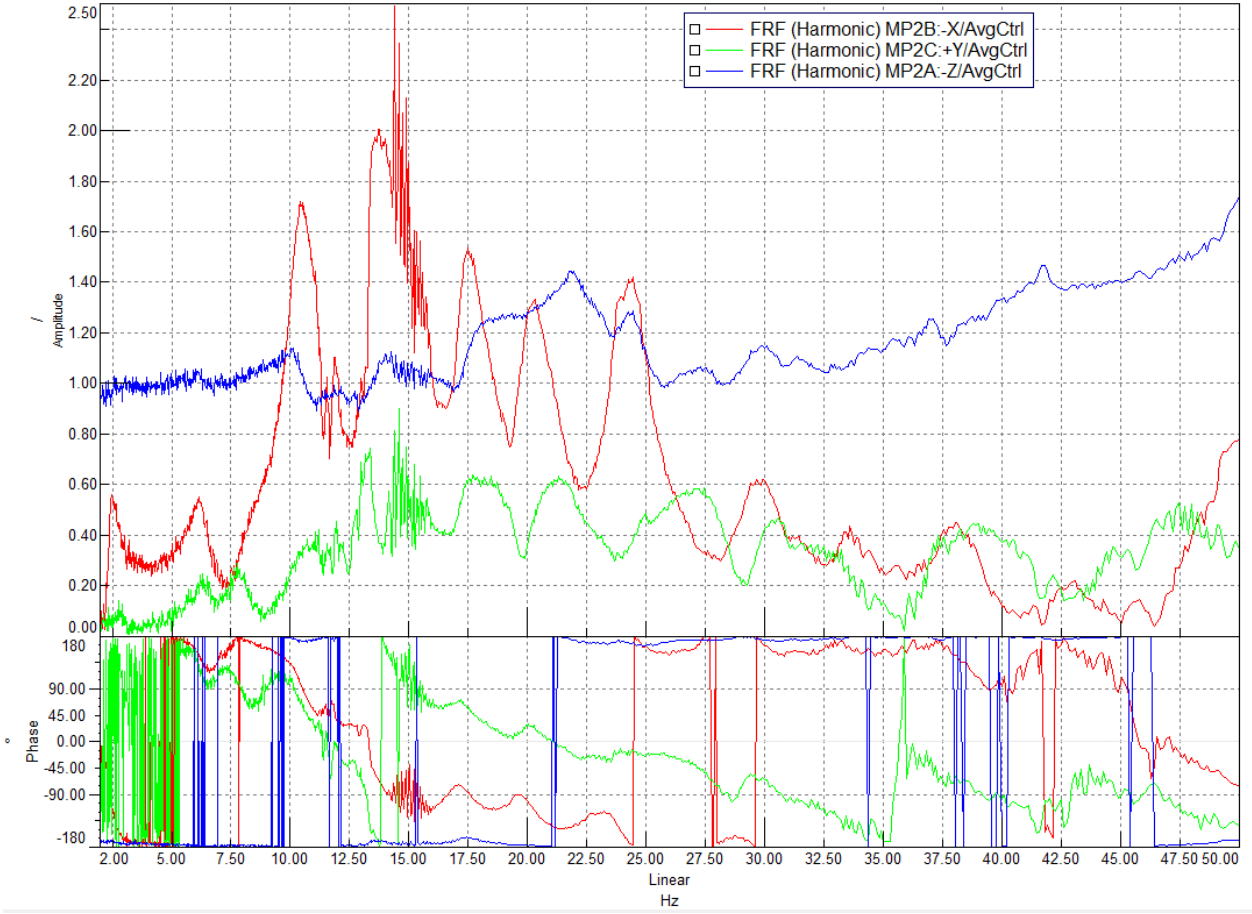


Figure 17 – Z Axis – RUN01, MP2: Diagram of initial vibration response investigation – Sweep Down

Project: MTL-ELE23-053
Section: Z Axis – RUN01
Test: Initial vibration response investigation
Date: 14/11/2023
Id: MP1
Reference point: CP1
Sweep direction: Up
Sweep rate: 1 Oct/min

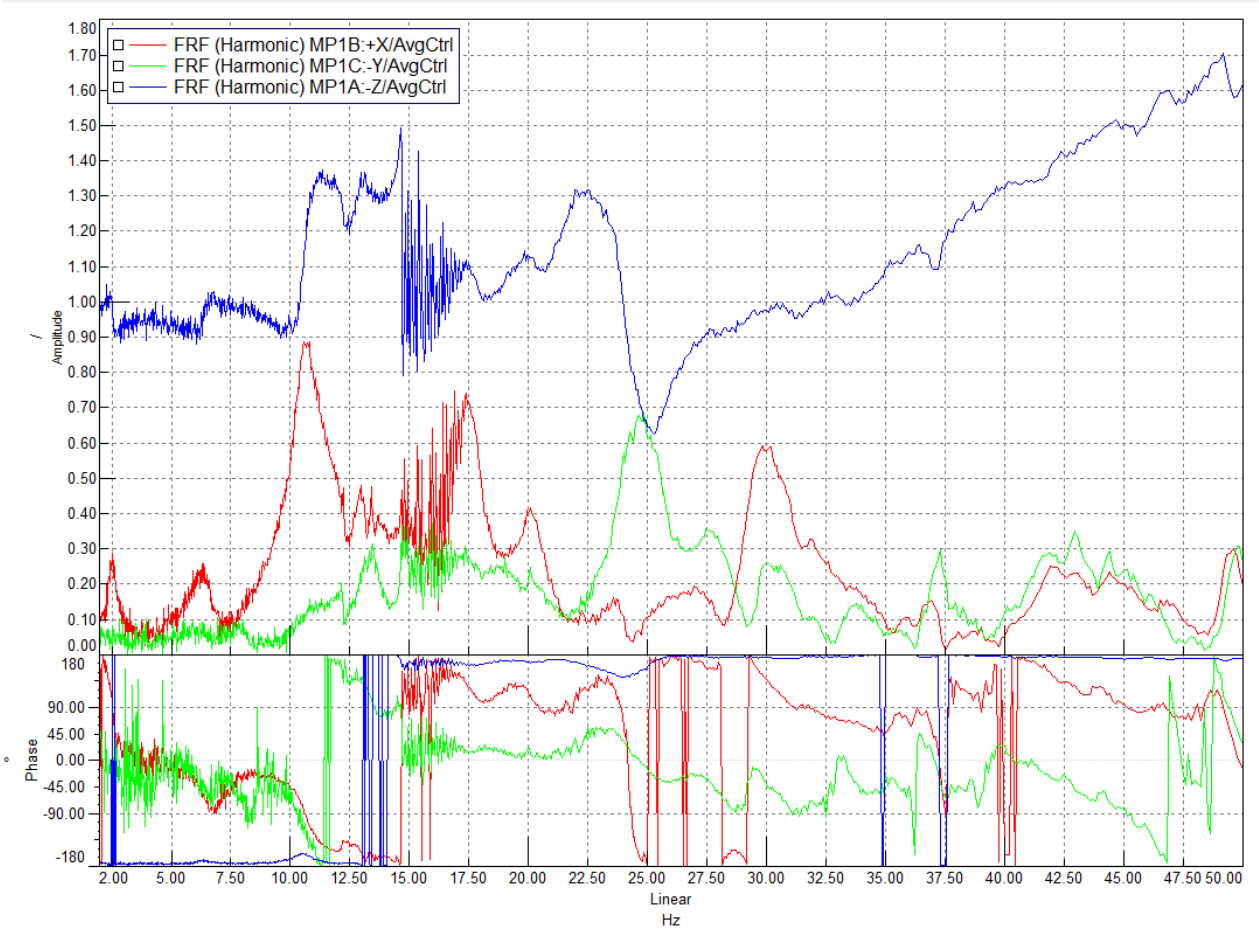


Figure 18 – Z Axis – RUN01, MP1: Diagram of initial vibration response investigation – Sweep Up

Project: MTL-ELE23-053
Section: Z Axis – RUN01
Test: Initial vibration response investigation
Date: 14/11/2023
Id: MP2
Reference point: CP1
Sweep direction: Up
Sweep rate: 1 Oct/min

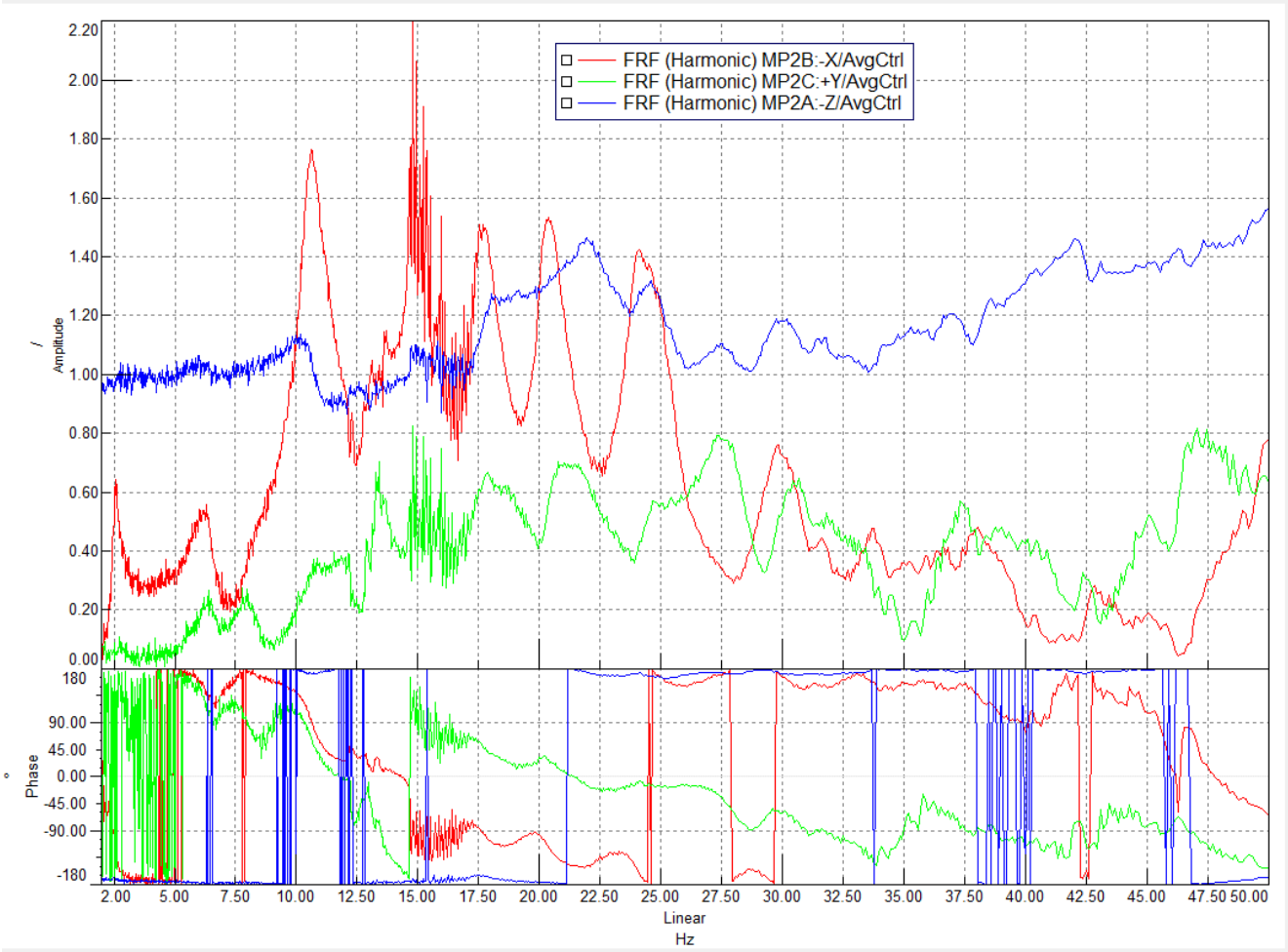


Figure 19 – Z Axis – RUN01, MP2: Diagram of initial vibration response investigation – Sweep Up

Project: MTL-ELE23-053
Section: Z Axis – RUN01
Test: Initial vibration response investigation
Date: 14/11/2023
Id: MP3
Reference point: AvgCtrl (of CP1)
Sweep rate: 1 Oct/min
Sweep direction: down and up

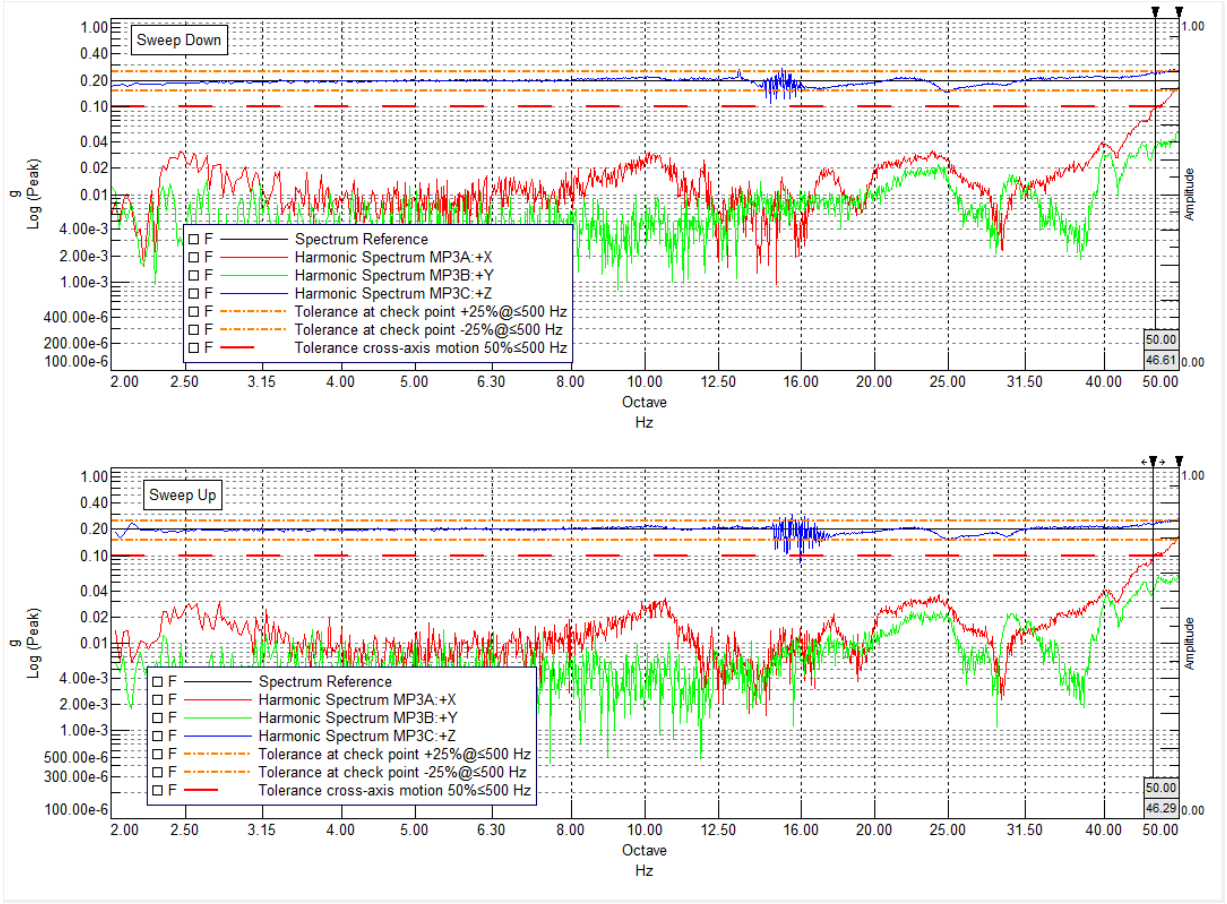


Figure 20 – Z Axis – RUN01, MP3: Diagram of initial vibration response investigation - Tolerances - Sweep down and up

Project: MTL-ELE23-053
Section: Z Axis – RUN02
Test: Earthquake test method
Date: 14/11/2023
Id: CP1
ZPA: 1,60 g

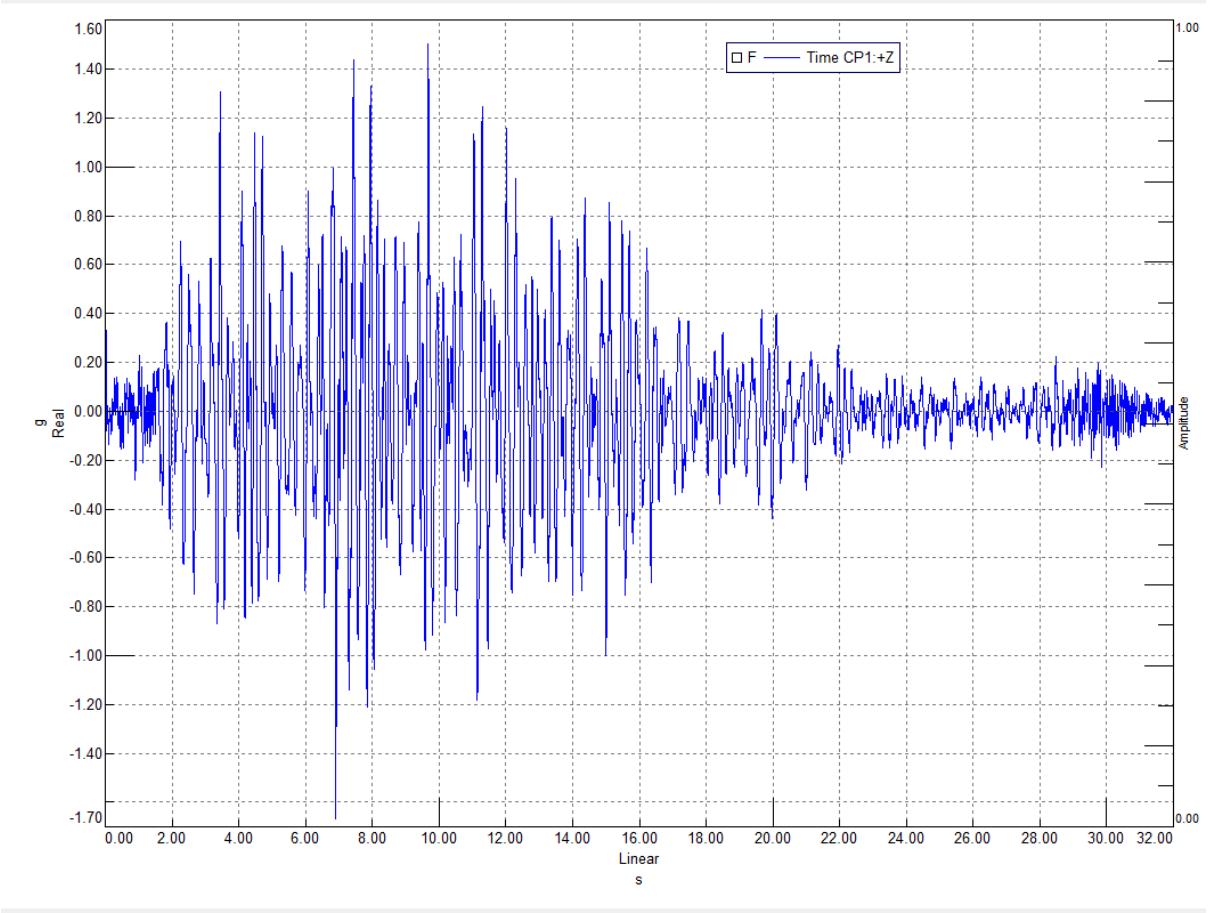


Figure 21 – Z Axis – RUN02, CP1: Diagram of Seismic Test

Project: MTL-ELE23-053
Section: Z Axis – RUN02
Test: Earthquake test method
Date: 14/11/2023
Id: MP1
ZPA: 1,60 g

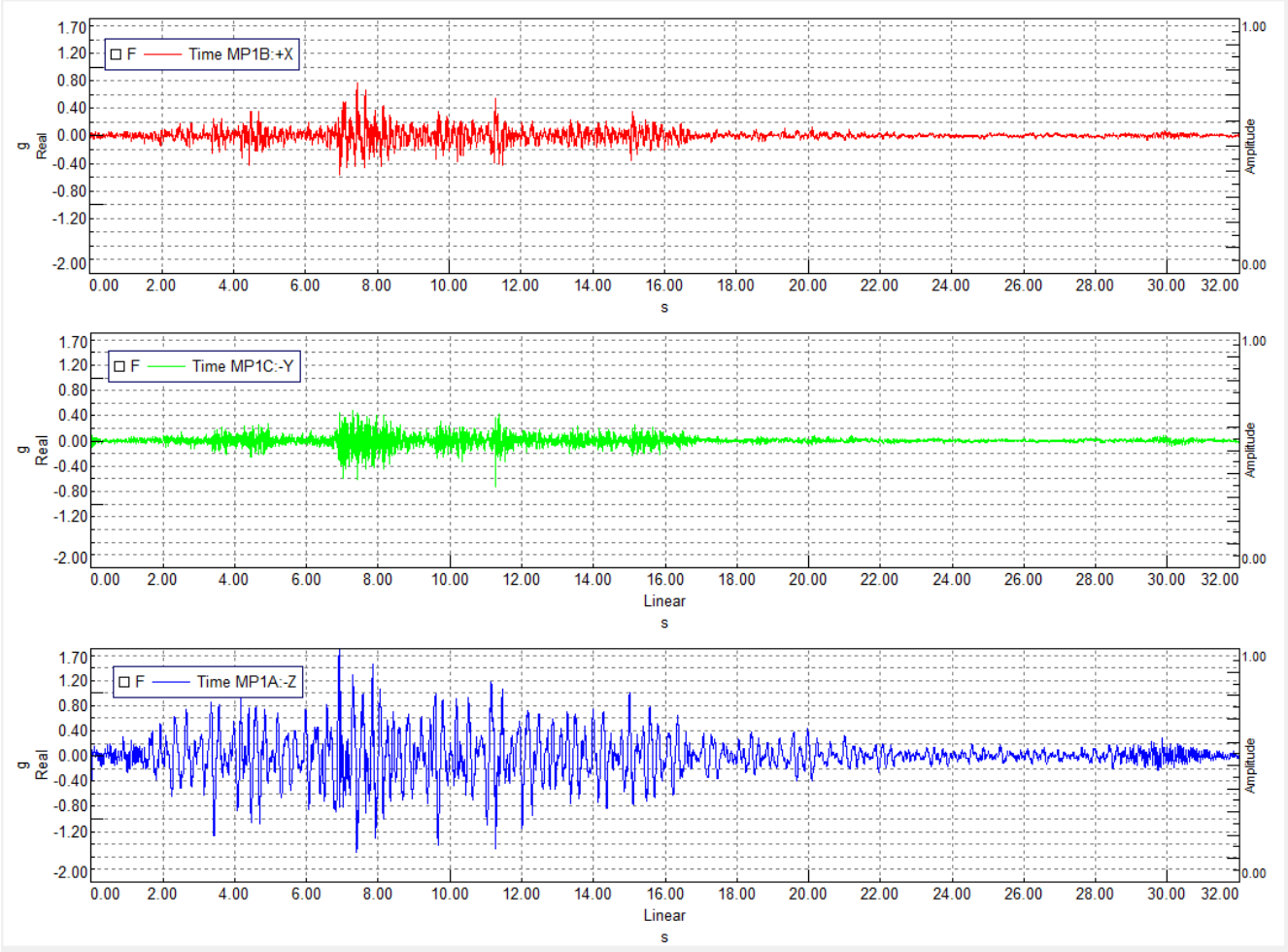


Figure 22 – Z Axis – RUN02, MP1: Diagram of Seismic Test

Project: MTL-ELE23-053
Section: Z Axis – RUN02
Test: Earthquake test method
Date: 14/11/2023
Id: MP2
ZPA: 1,60 g

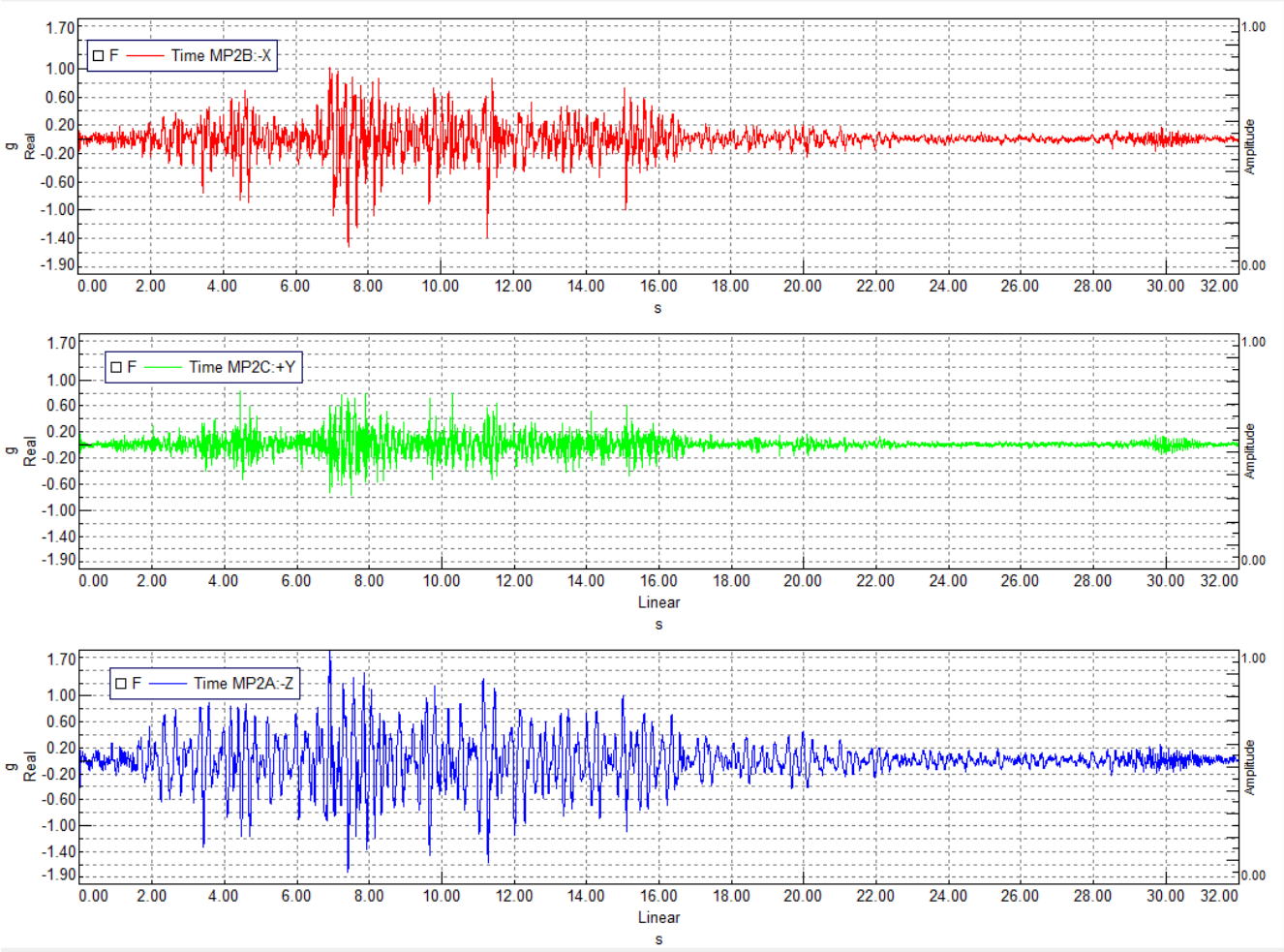


Figure 23 – Z Axis – RUN02, MP2: Diagram of Seismic Test

Project: MTL-ELE23-053
Section: Z Axis – RUN02
Test: Earthquake test method
Date: 14/11/2023
Id: MP3
ZPA: 1,60 g

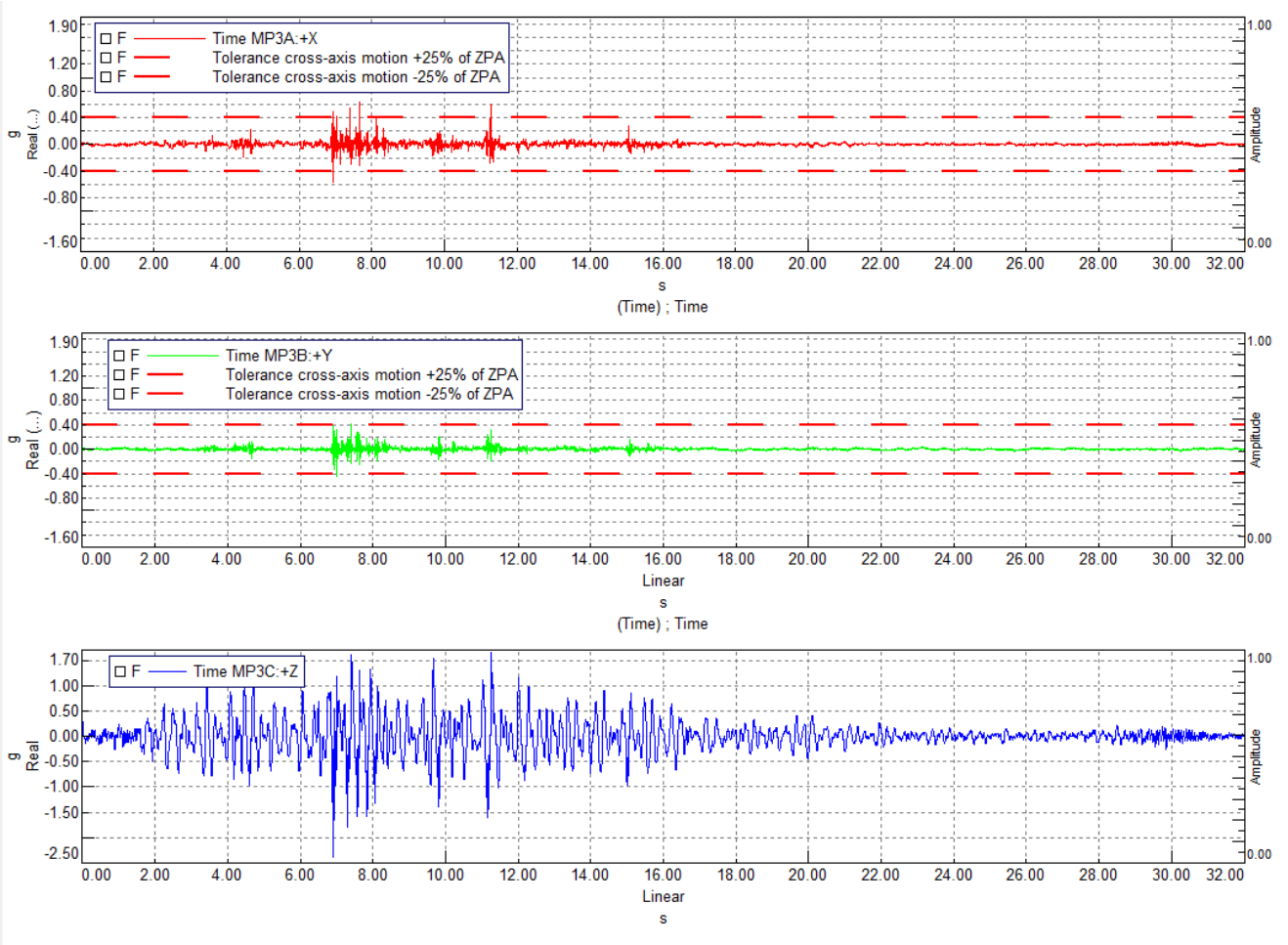


Figure 24 – Z Axis – RUN02, MP3: Diagram of Seismic Test - Tolerances

Project: MTL-ELE23-053
Section: Z Axis – RUN02
Test: Earthquake test method
Date: 14/11/2023
Id: AvgCtrl (of CP1)
ZPA: 1,60 g

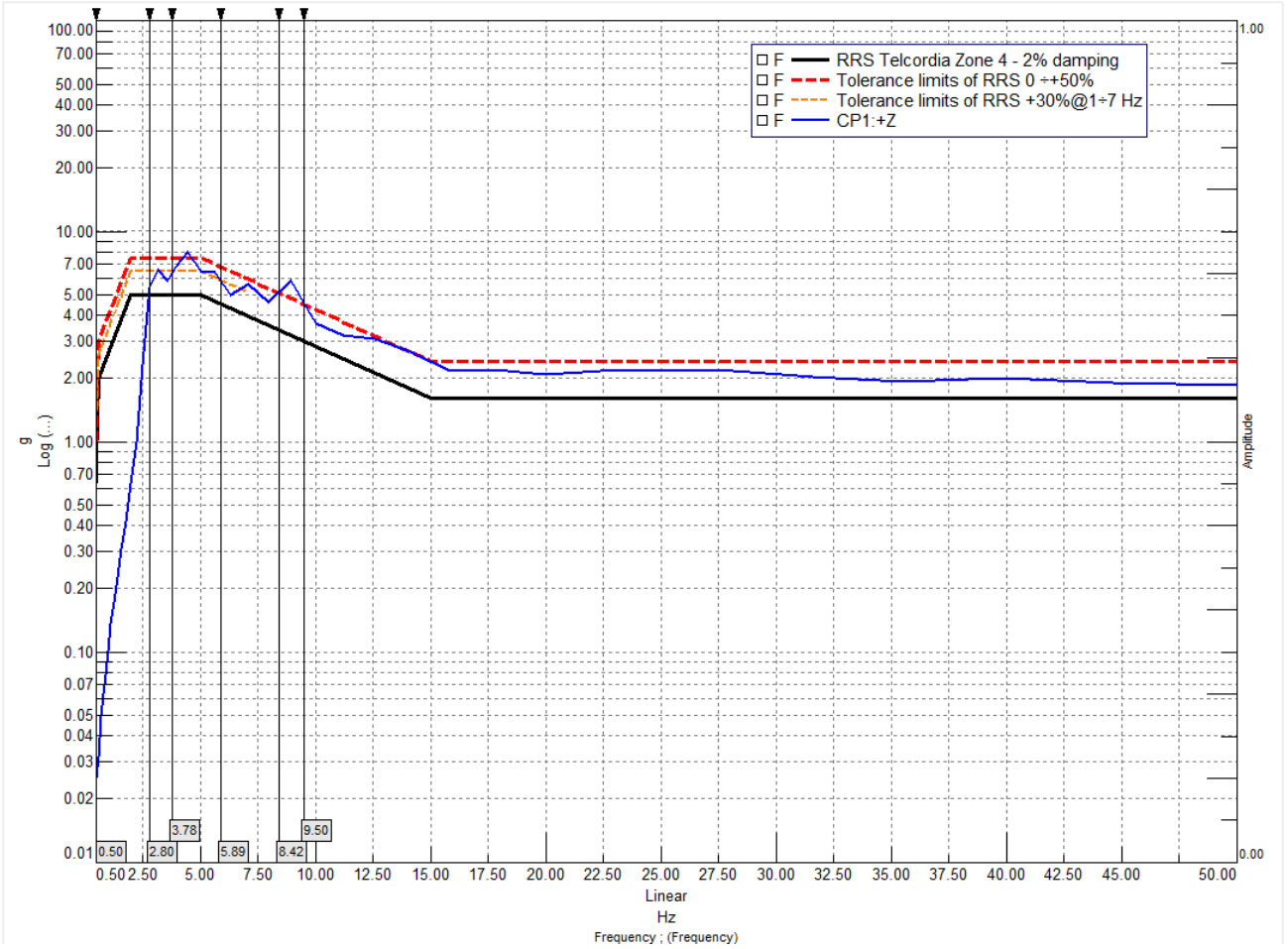


Figure 25 – Z Axis – RUN02, AvgCtrl: Diagram of Test Response Spectrum

Project: MTL-ELE23-053
Section: Z Axis – RUN02
Test: Earthquake test method
Date: 14/11/2023
Id: MP2 – MP3
ZPA: 1,60 g

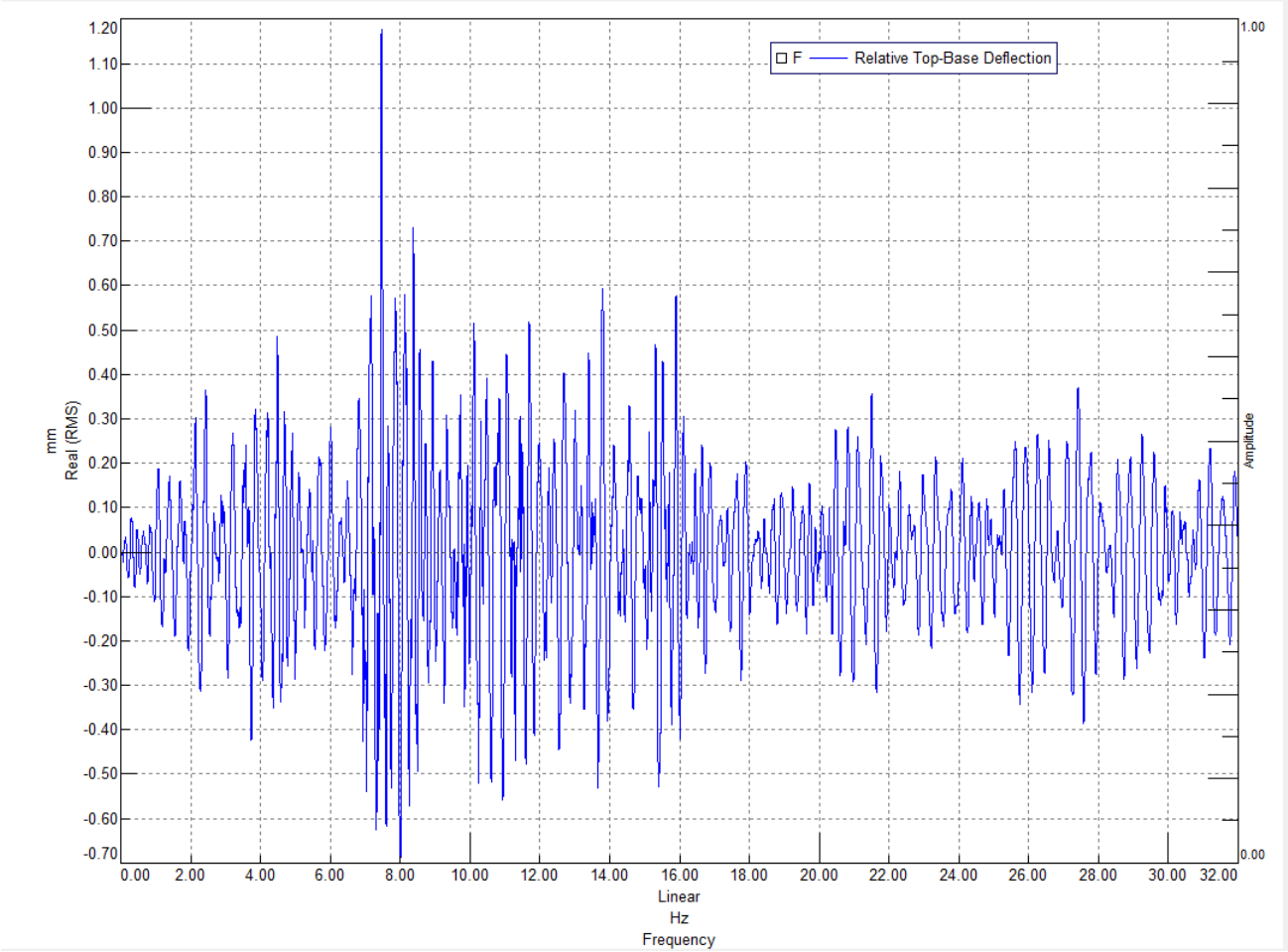


Figure 26 – Z Axis – RUN02, MP2-MP3: Diagram of Seismic test: Time-history of the relative displacement between the frame top and base of the UUT

Project: MTL-ELE23-053
Section: Z Axis – RUN03
Test: Final vibration response investigation
Date: 14/11/2023
Id: AvgCtrl (of CP1)
Sweep rate: 1 Oct/min
Sweep direction: down and up

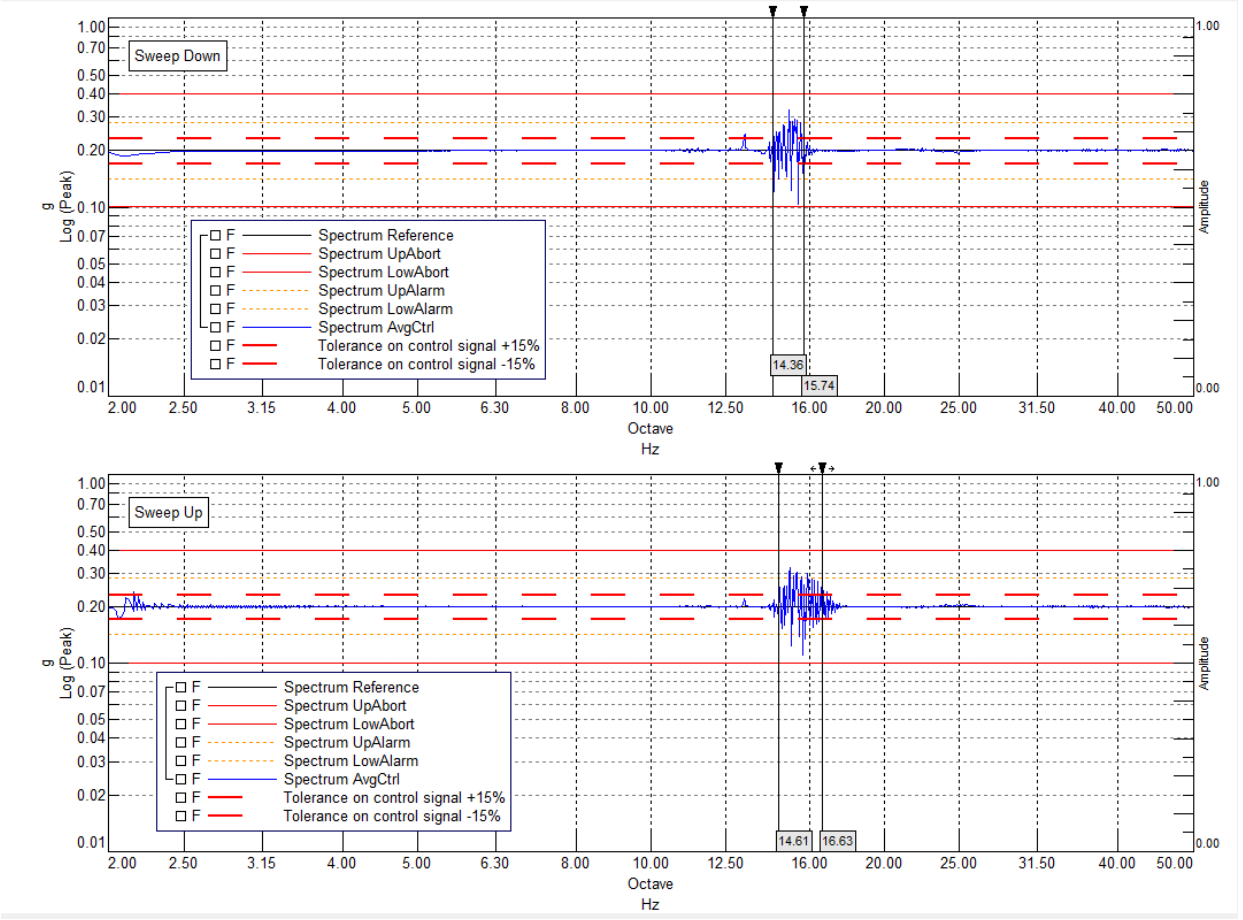


Figure 27 – Z Axis – RUN03, AvgCtrl: Diagram of initial vibration response investigation – Sweep down and up

Project: MTL-ELE23-053
Section: Z Axis – RUN03
Test: Final vibration response investigation
Date: 14/11/2023
Id: MP1
Reference point: CP1
Sweep direction: Down
Sweep rate: 1 Oct/min

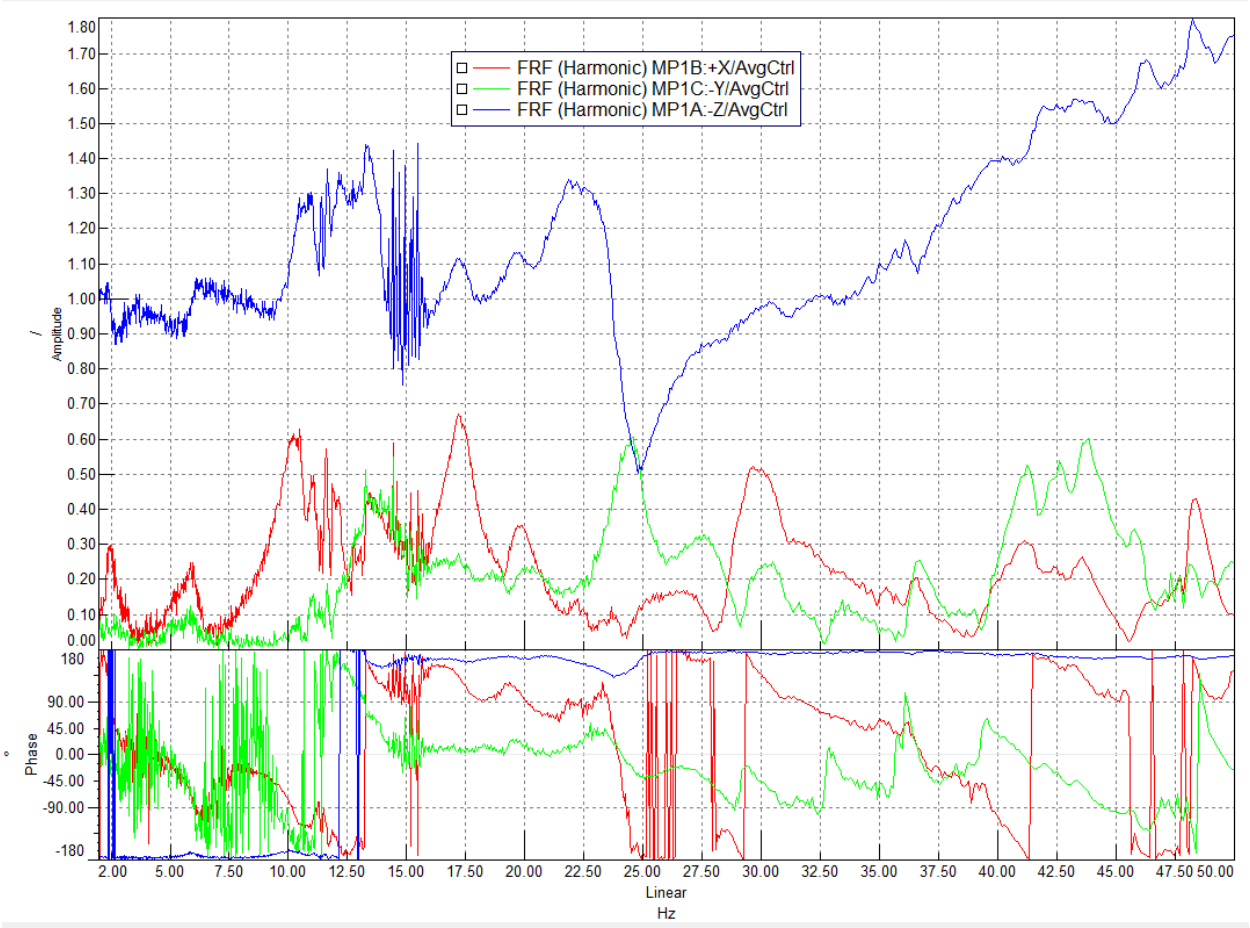


Figure 28 – Z Axis – RUN03, MP1: Diagram of final vibration response investigation – Sweep Down

Project: MTL-ELE23-053
Section: Z Axis – RUN03
Test: Final vibration response investigation
Date: 14/11/2023
Id: MP2
Reference point: CP1
Sweep direction: Down
Sweep rate: 1 Oct/min

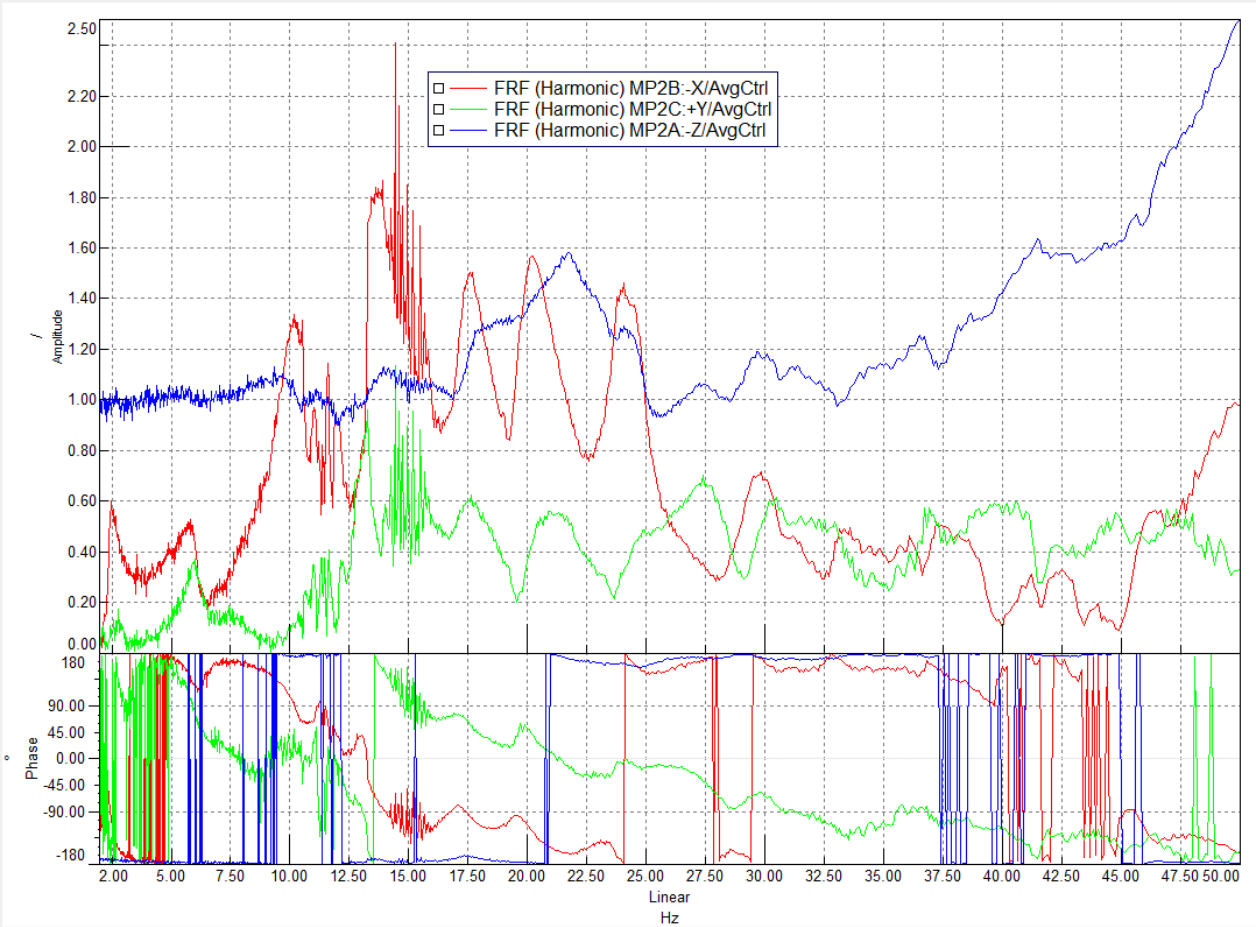


Figure 29 – Z Axis – RUN03, MP2: Diagram of final vibration response investigation – Sweep Down

Project: MTL-ELE23-053
Section: Z Axis – RUN03
Test: Final vibration response investigation
Date: 14/11/2023
Id: MP1
Reference point: CP1
Sweep direction: Up
Sweep rate: 1 Oct/min

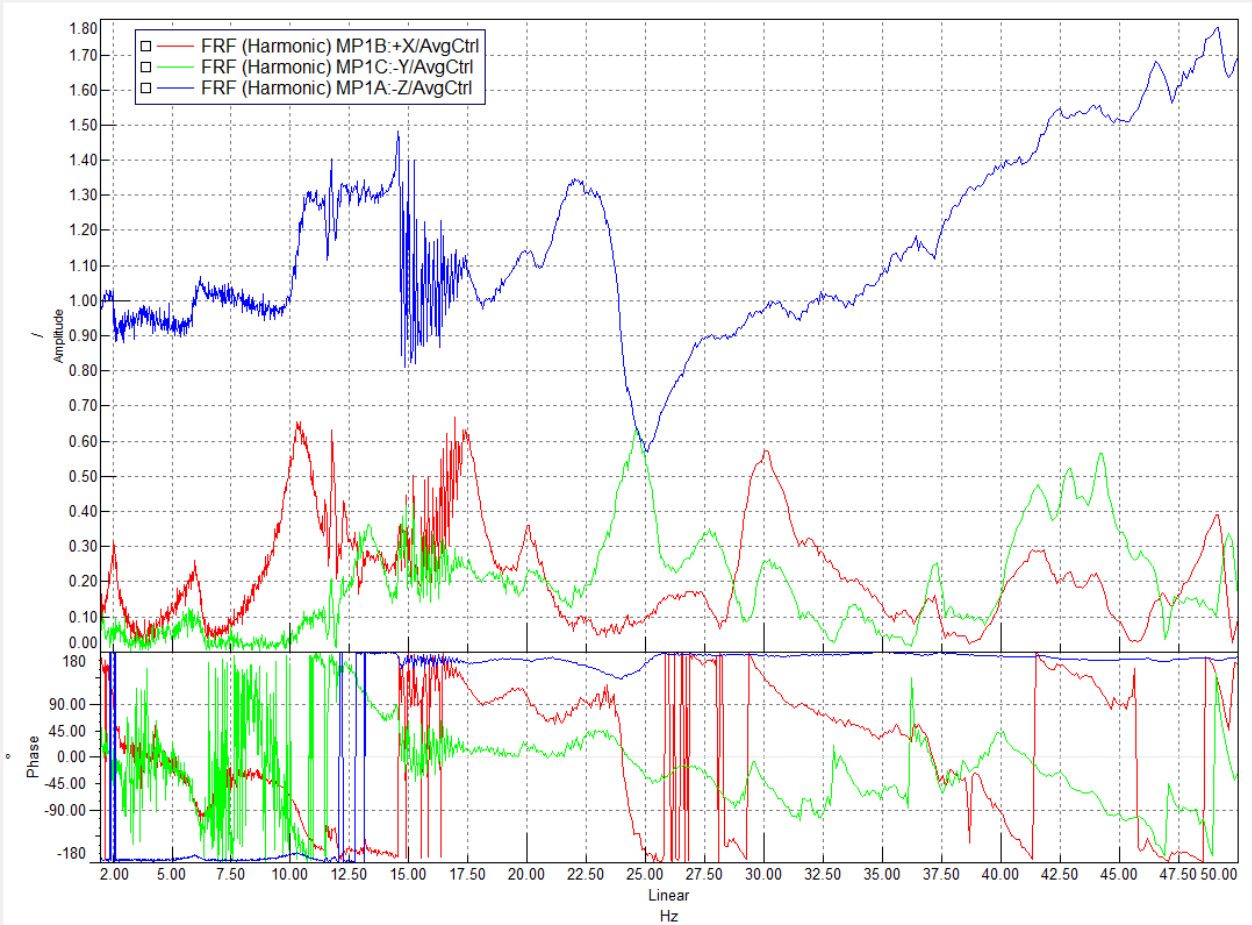


Figure 30 – Z Axis – RUN03, MP1: Diagram of final vibration response investigation – Sweep Up

Project: MTL-ELE23-053
Section: Z Axis – RUN03
Test: Final vibration response investigation
Date: 14/11/2023
Id: MP2
Reference point: CP1
Sweep direction: Up
Sweep rate: 1 Oct/min

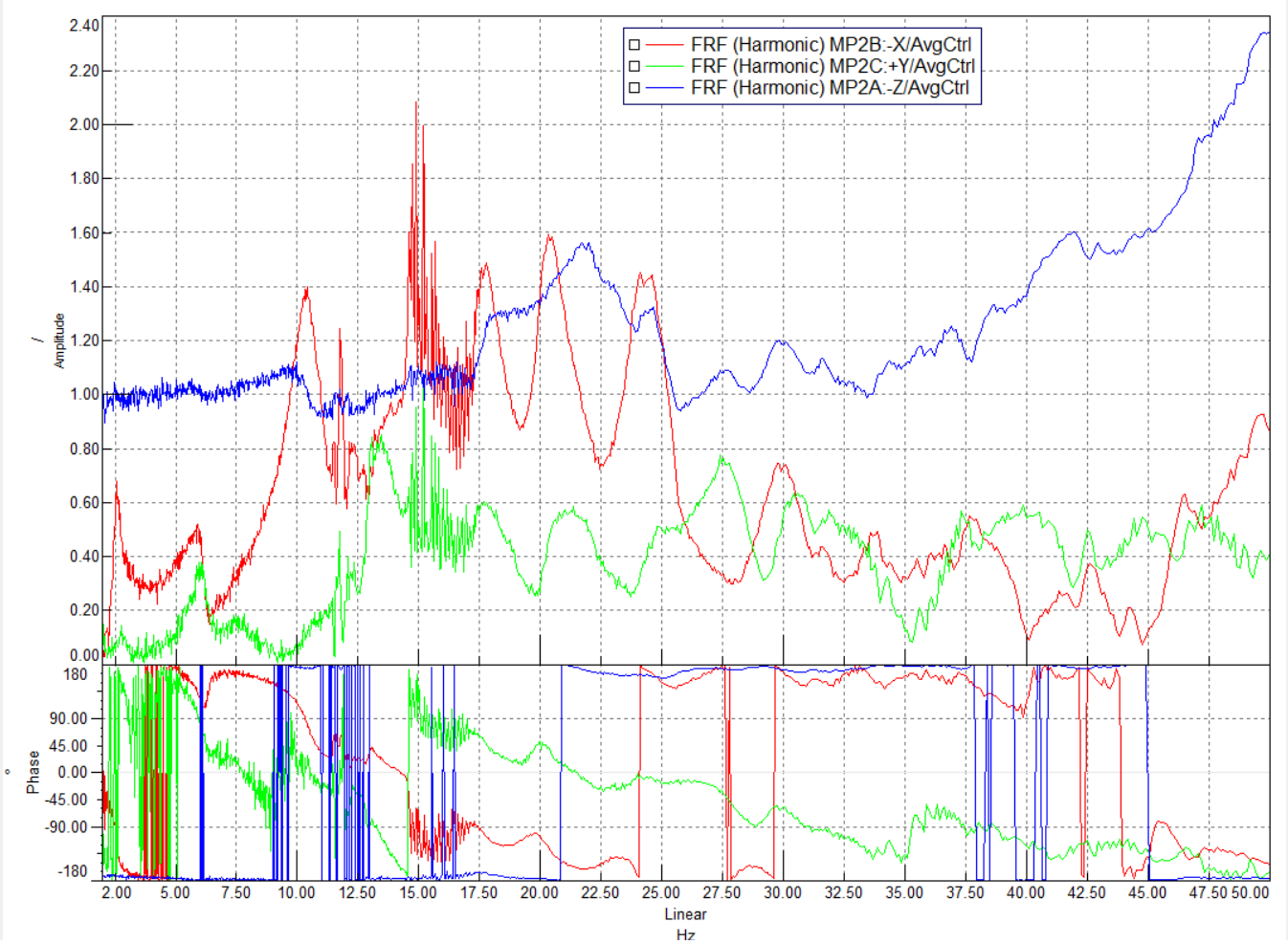


Figure 31 – Z Axis – RUN03, MP2: Diagram of final vibration response investigation – Sweep Up

Project: MTL-ELE23-053
Section: Z Axis – RUN03
Test: Final vibration response investigation
Date: 14/11/2023
Id: MP3
Reference point: AvgCtrl (of CP1)
Sweep rate: 1 Oct/min
Sweep direction: down and up

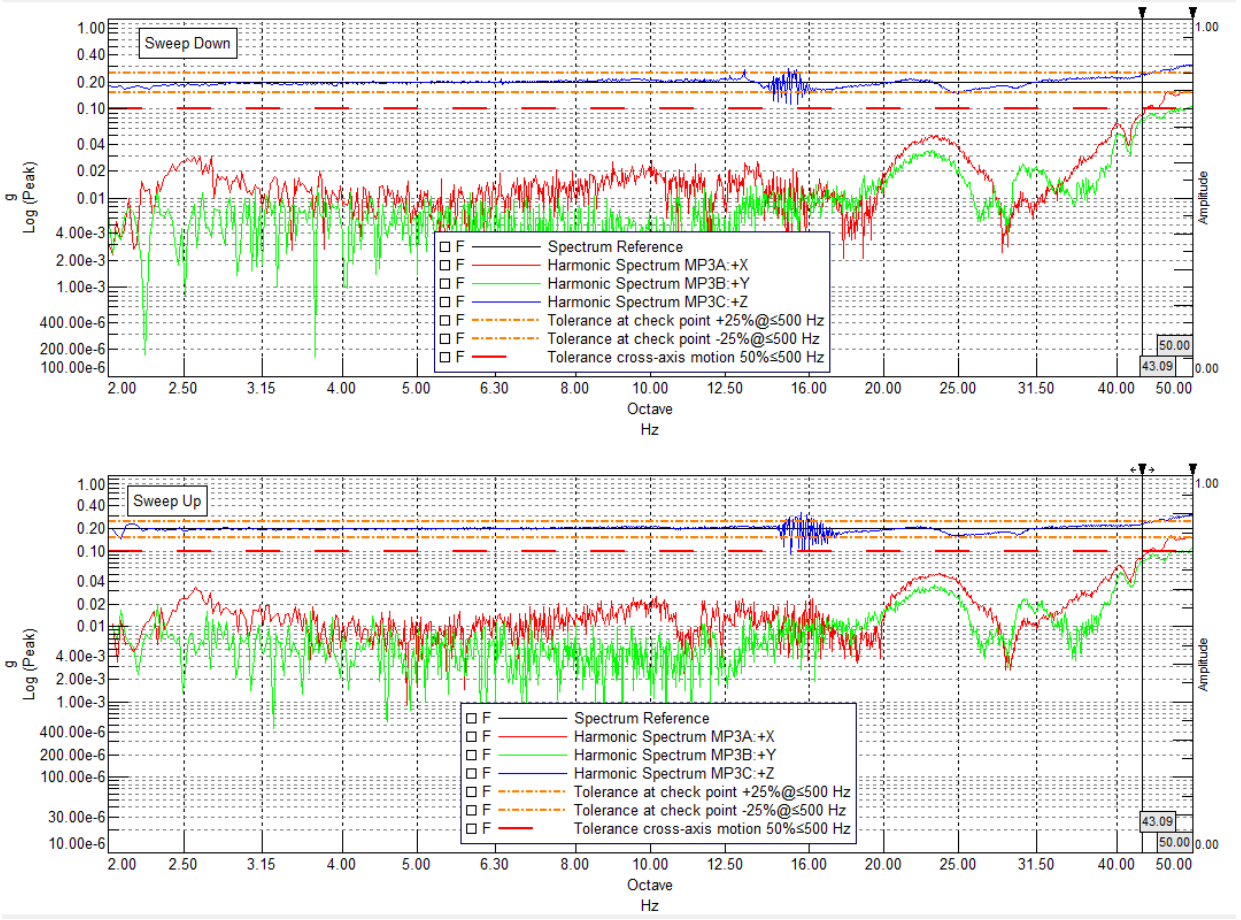


Figure 32 – Z Axis – RUN03, MP3: Diagram of final vibration response investigation- Tolerances - Sweep down and up

Project: MTL-ELE23-053
Section: X Axis – RUN04
Test: Initial vibration response investigation
Date: 14/11/2023
Id: AvgCtrl (of CP1)
Sweep rate: 1 Oct/min
Sweep direction: down and up

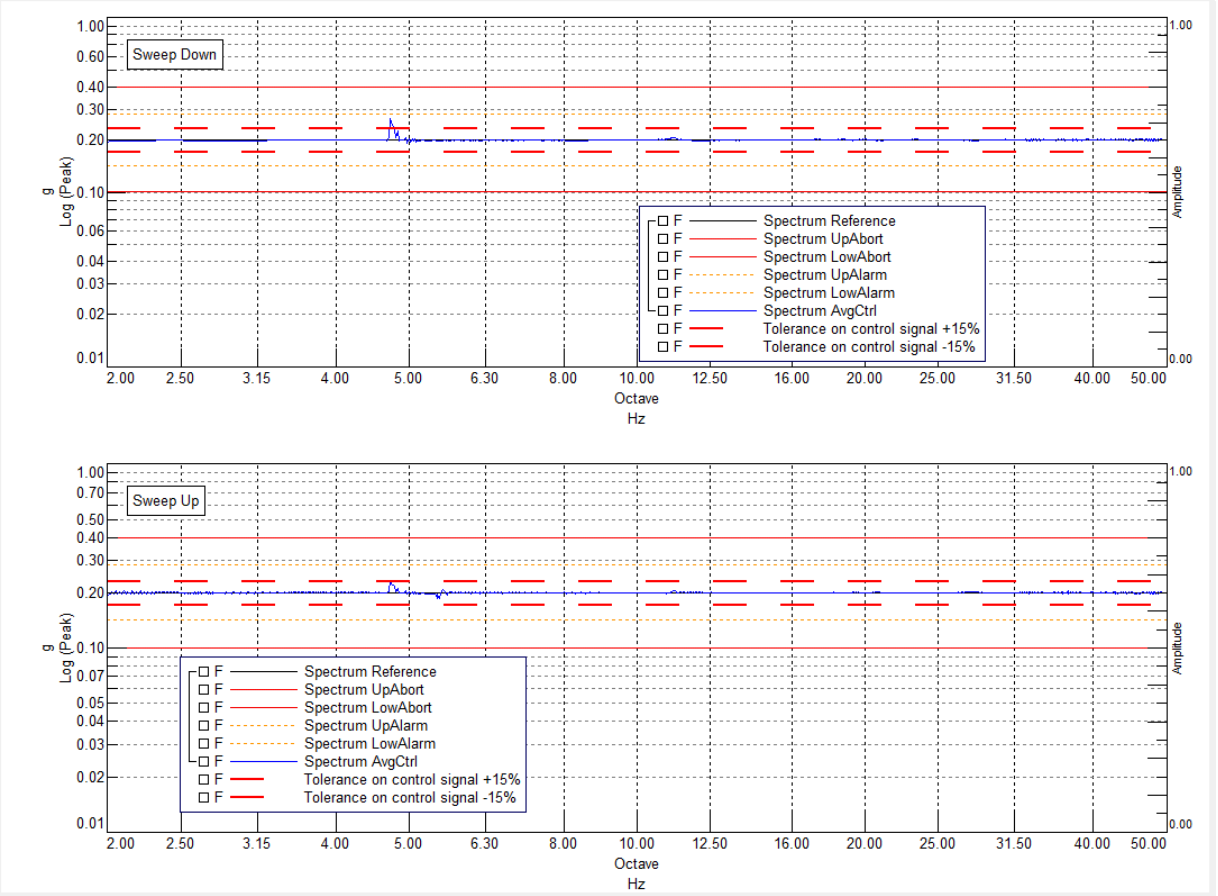


Figure 33 – X Axis – RUN04, AvgCtrl: Diagram of initial vibration response investigation – Sweep down and up

Project: MTL-ELE23-053
Section: X Axis – RUN04
Test: Initial vibration response investigation
Date: 14/11/2023
Id: MP1
Reference point: CP1
Sweep direction: Down
Sweep rate: 1 Oct/min

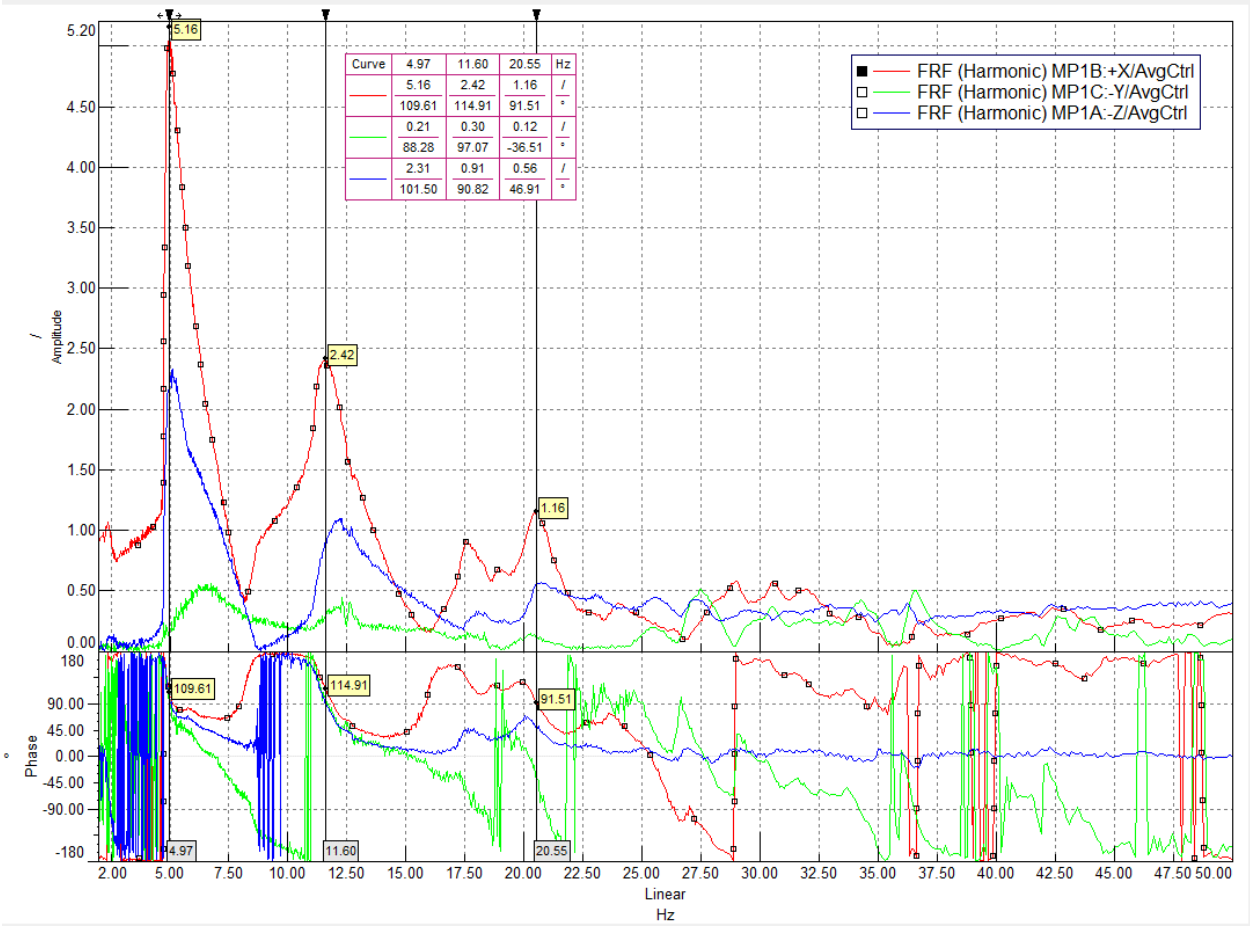


Figure 34 – X Axis – RUN04, MP1: Diagram of initial vibration response investigation – Sweep Down

Project: MTL-ELE23-053
Section: X Axis – RUN04
Test: Initial vibration response investigation
Date: 14/11/2023
Id: MP1
Reference point: CP1
Sweep direction: Up
Sweep rate: 1 Oct/min

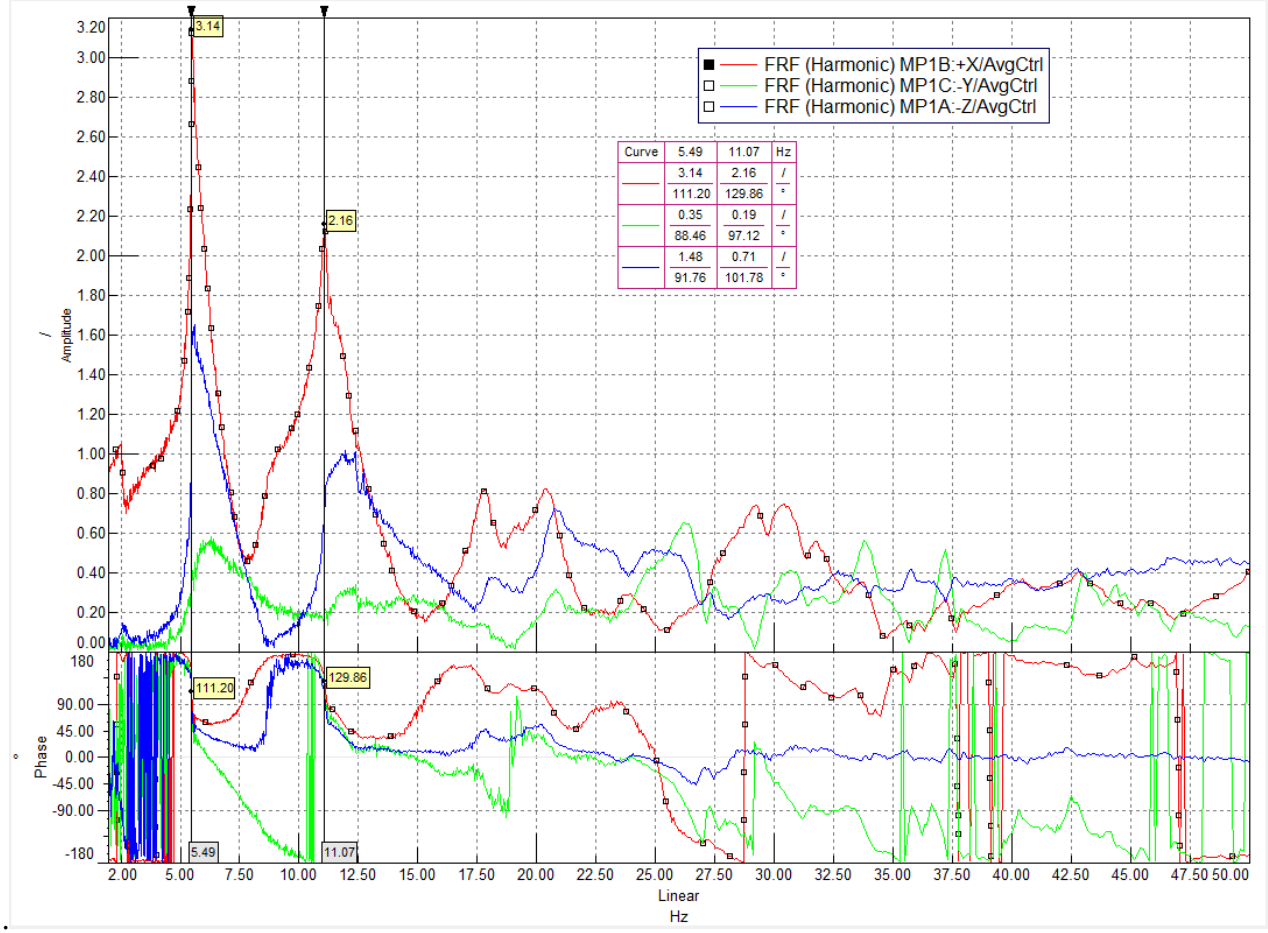


Figure 35 – X Axis – RUN04, MP1: Diagram of initial vibration response investigation – Sweep Up

Project: MTL-ELE23-053
Section: X Axis – RUN04
Test: Initial vibration response investigation
Date: 14/11/2023
Id: MP2
Reference point: CP1
Sweep direction: Up
Sweep rate: 1 Oct/min

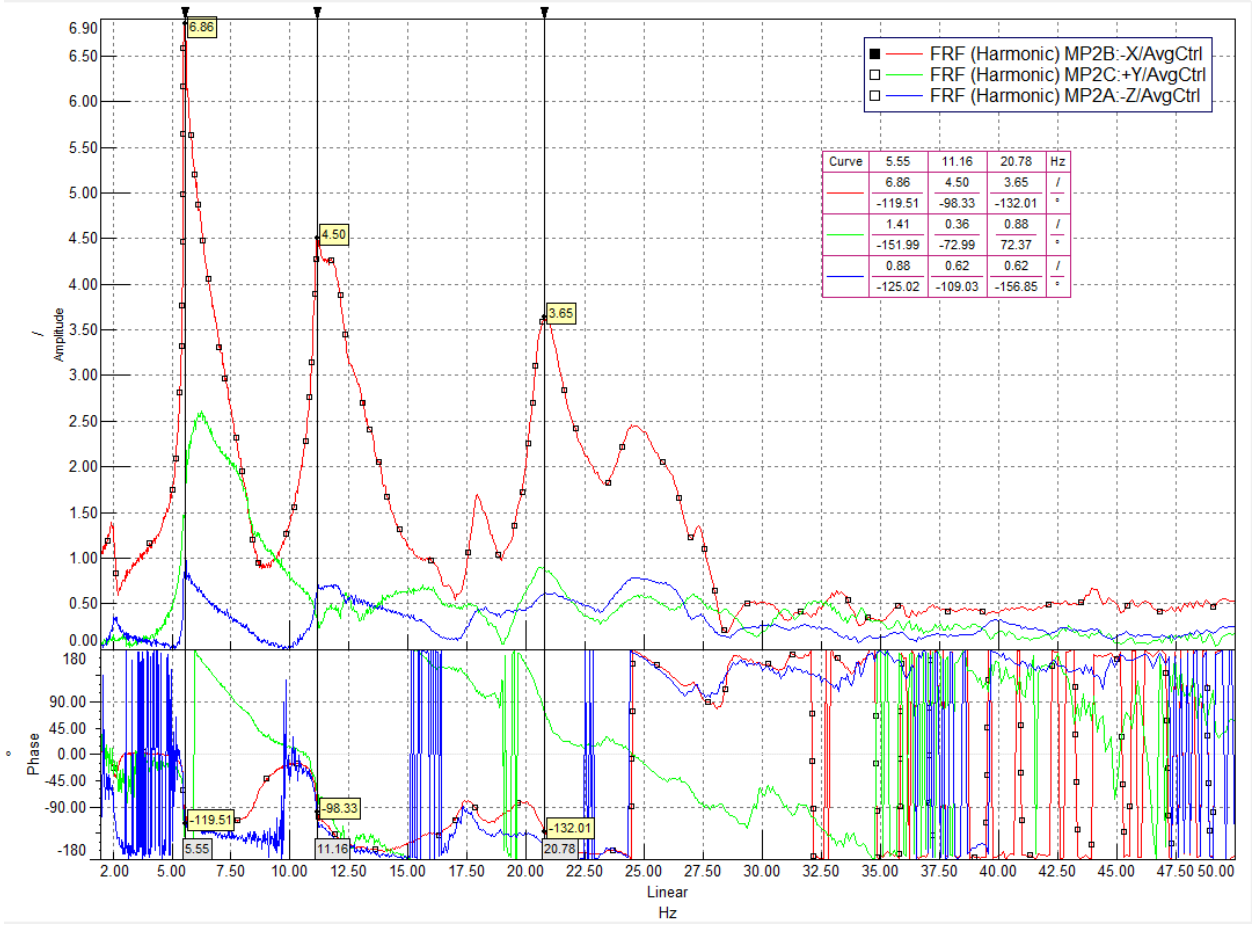


Figure 36 – X Axis – RUN04, MP2: Diagram of initial vibration response investigation – Sweep Up

Project: MTL-ELE23-053
Section: X Axis – RUN04
Test: Initial vibration response investigation
Date: 14/11/2023
Id: MP3
Reference point: AvgCtrl (of CP1)
Sweep rate: 1 Oct/min
Sweep direction: down and up

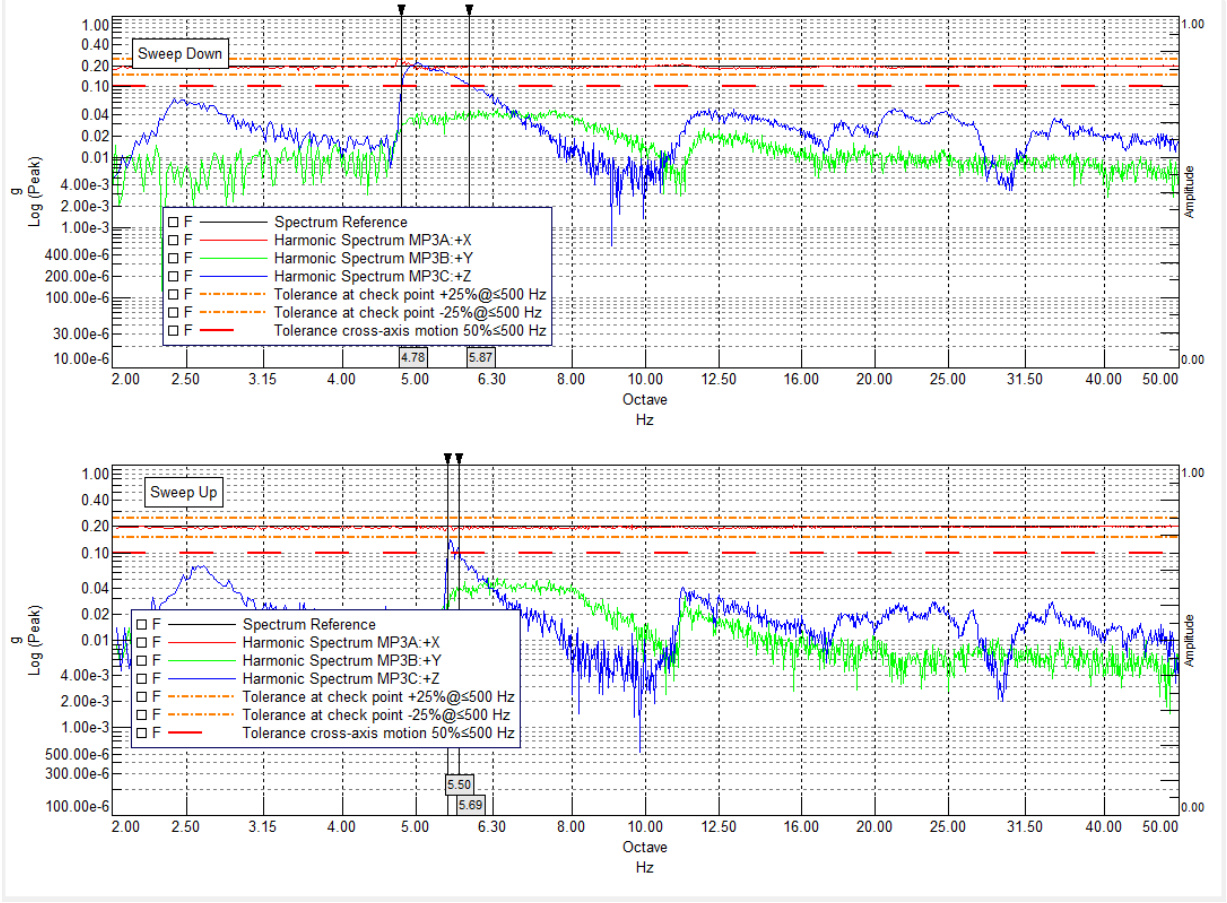


Figure 37 – X Axis – RUN04, MP3: Diagram of initial vibration response investigation - Tolerances - Sweep down and up

Project: MTL-ELE23-053
Section: X Axis – RUN05
Test: Time-history test - seismic load test
Date: 14/11/2023
Id: CP1
ZPA: 1,60 g

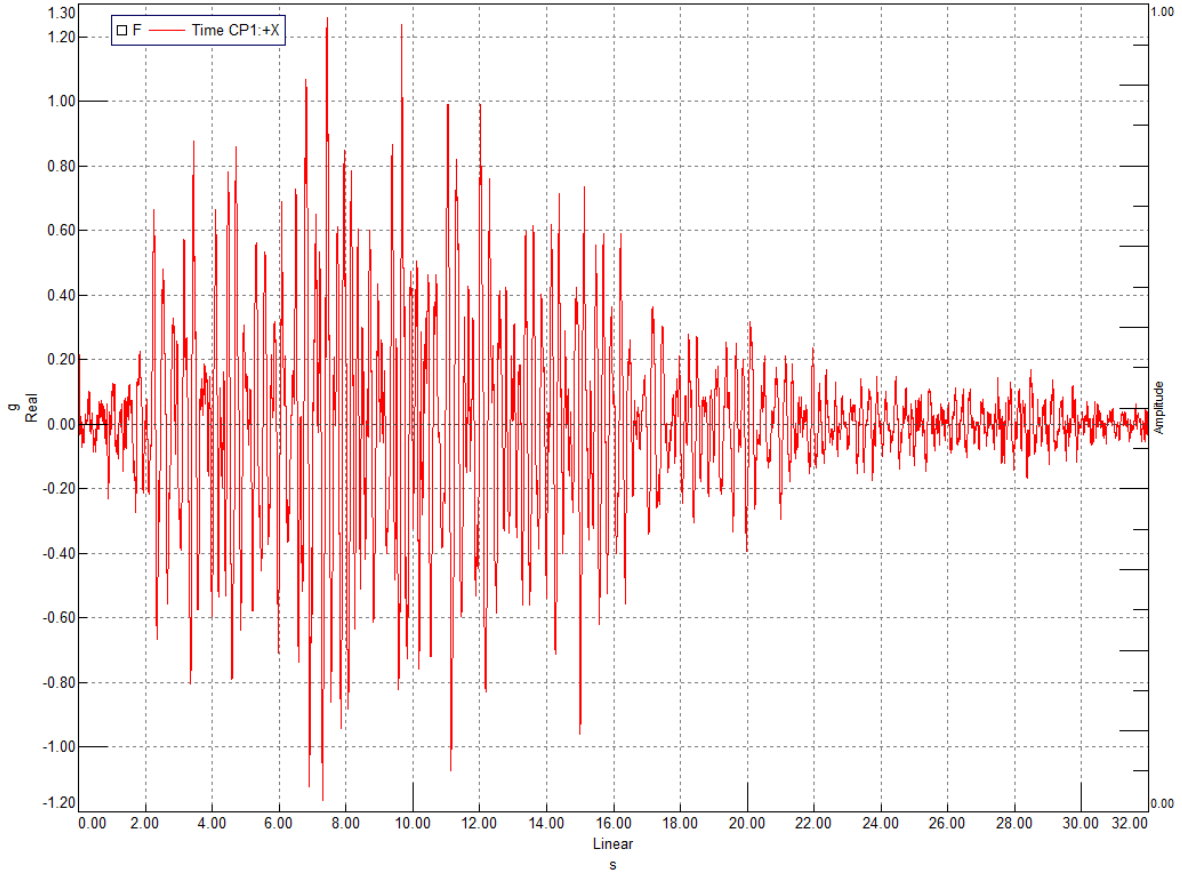


Figure 38 – X Axis – RUN05, CP1: Diagram of Seismic Test

Project: MTL-ELE23-053
Section: X Axis – RUN05
Test: Time-history test - seismic load test
Date: 14/11/2023
Id: MP1
ZPA: 1,60 g

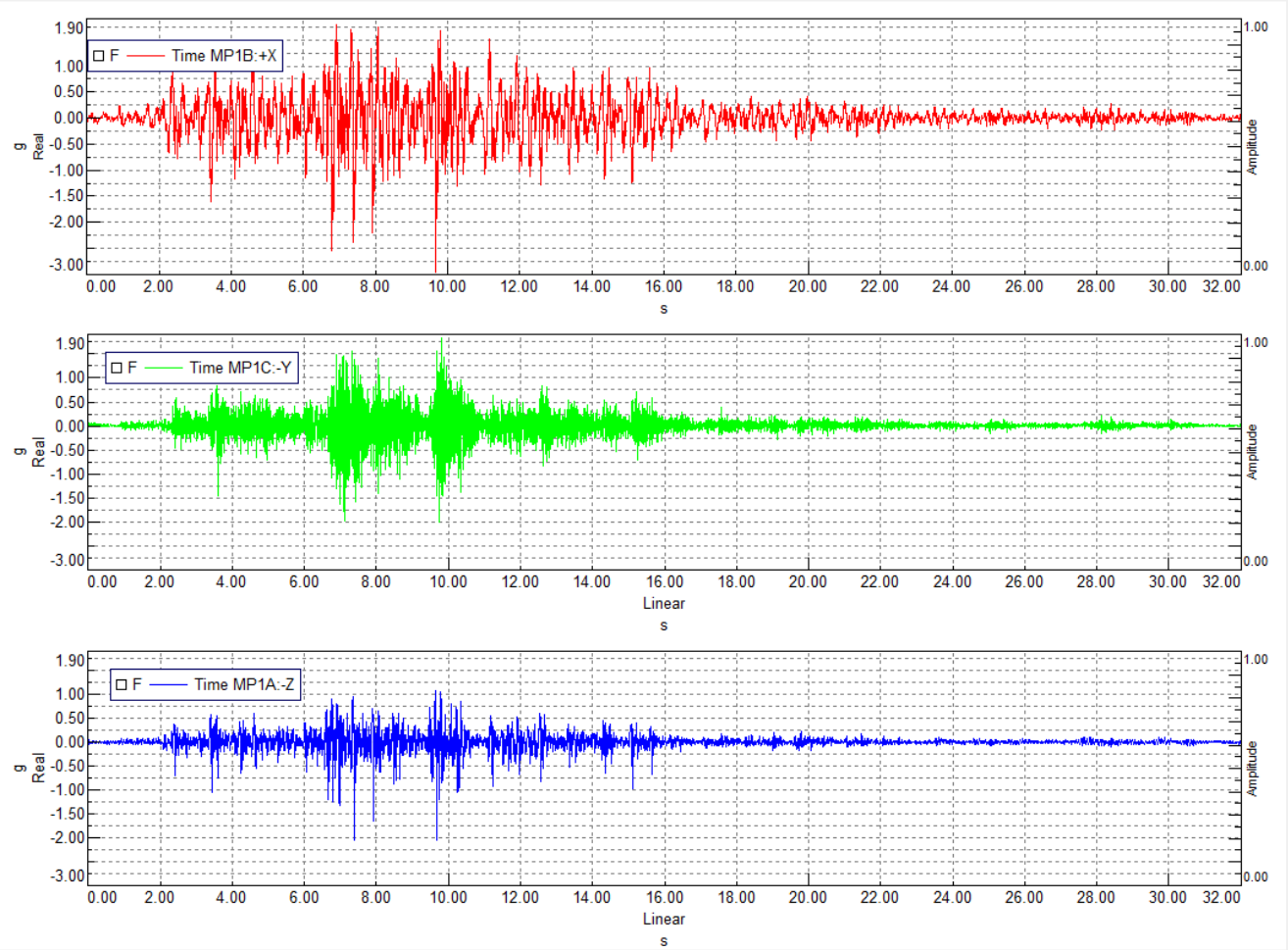


Figure 39 – X Axis – RUN05, MP1: Diagram of Seismic Test

Project: MTL-ELE23-053
Section: X Axis – RUN05
Test: Time-history test - seismic load test
Date: 14/11/2023
Id: MP2
ZPA: 1,60 g

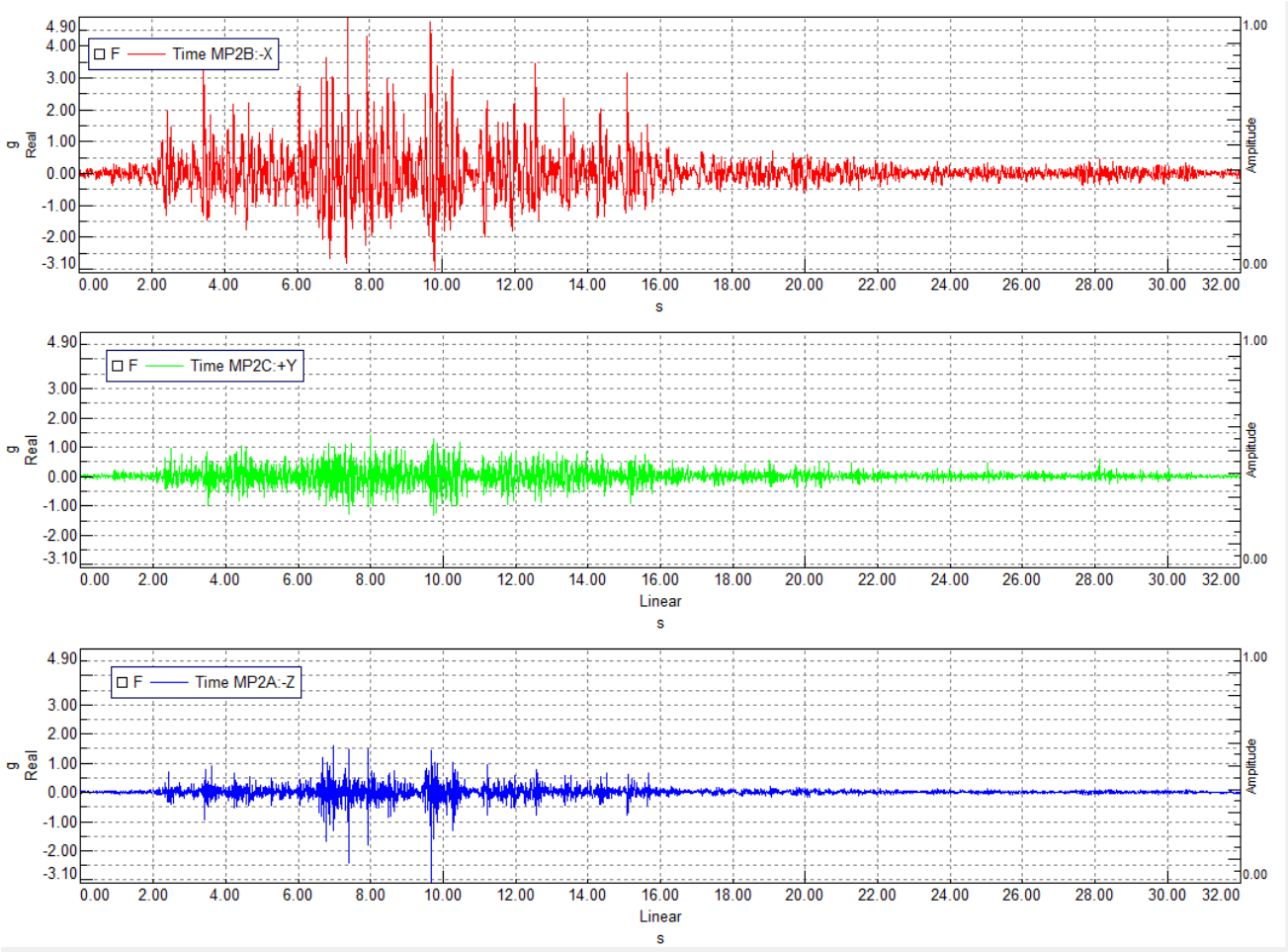


Figure 40 – X Axis – RUN05, MP2: Diagram of Seismic Test

Project: MTL-ELE23-053
Section: X Axis – RUN05
Test: Time-history test - seismic load test
Date: 14/11/2023
Id: MP3
ZPA: 1,60 g

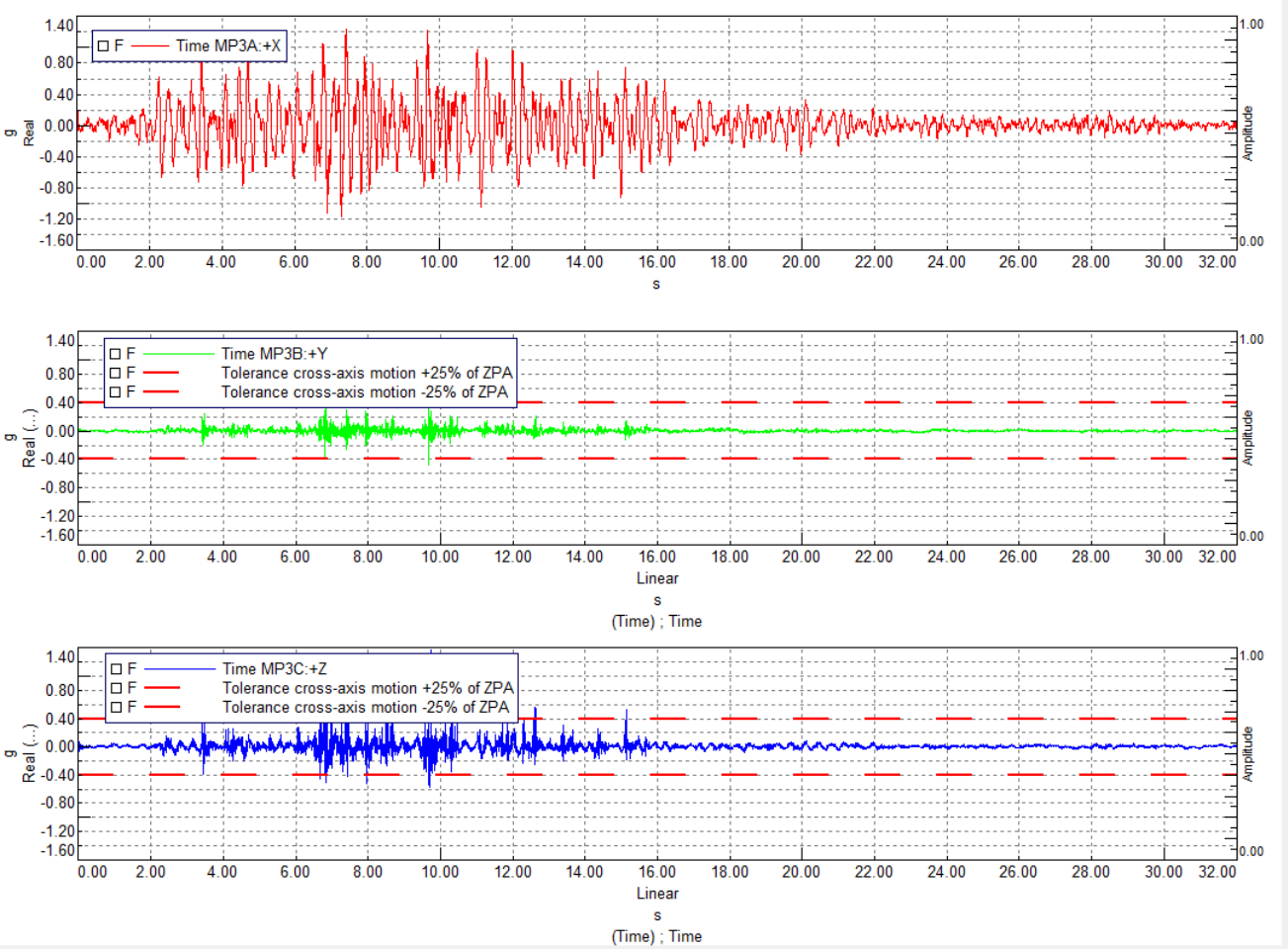


Figure 41 – X Axis – RUN05, MP3: Diagram of Seismic Test - Tolerances

Project: MTL-ELE23-053
Section: X Axis – RUN05
Test: Time-history test - seismic load test
Date: 14/11/2023
Id: AvgCtrl (of CP1)
ZPA: 1,60 g

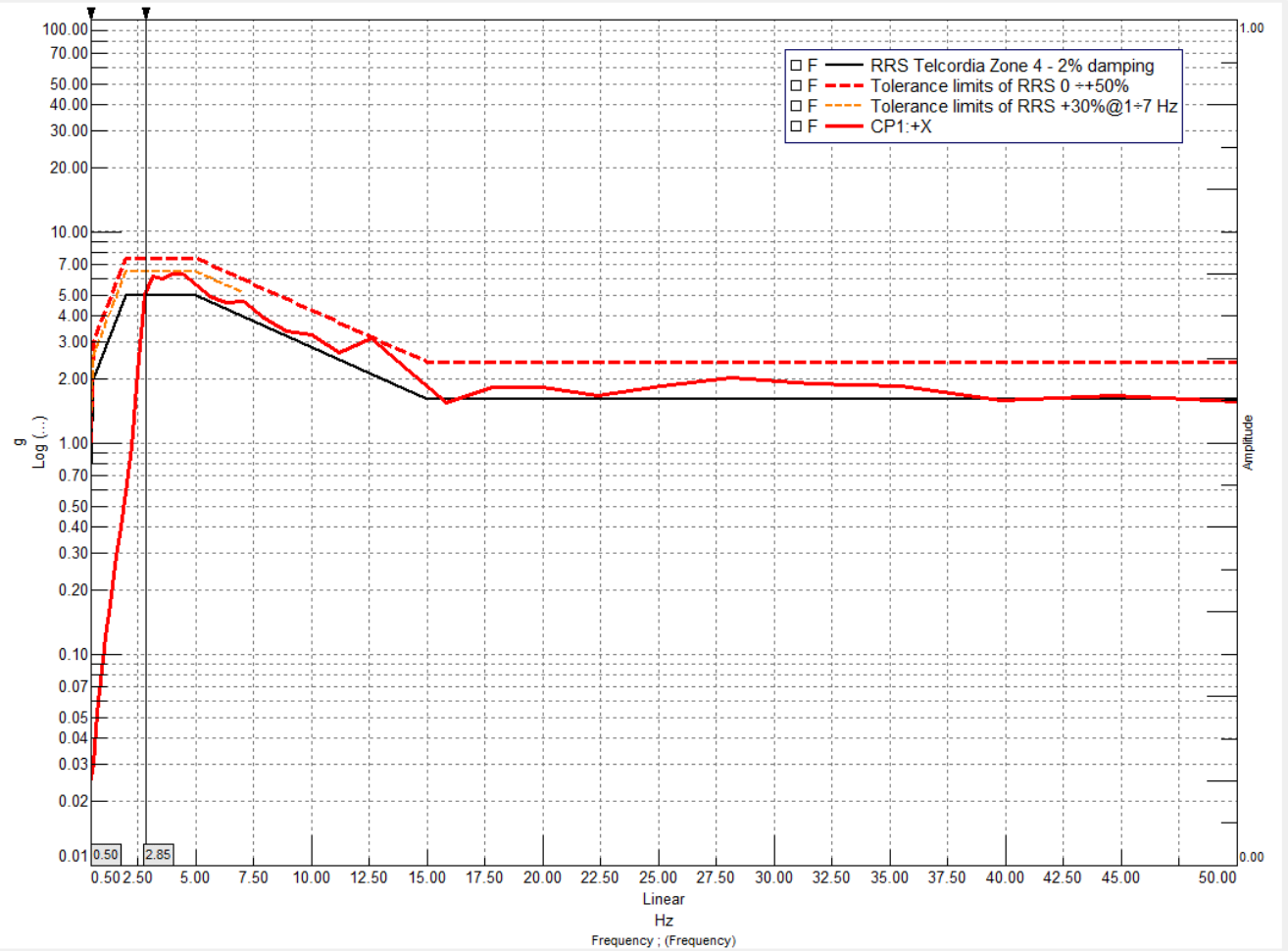


Figure 42 – X Axis – RUN05, AvgCtrl: Diagram of Test Response Spectrum

Project: MTL-ELE23-053
Section: X Axis – RUN06
Test: Earthquake test method
Date: 14/11/2023
Id: MP2 – MP3
ZPA: 1,60 g

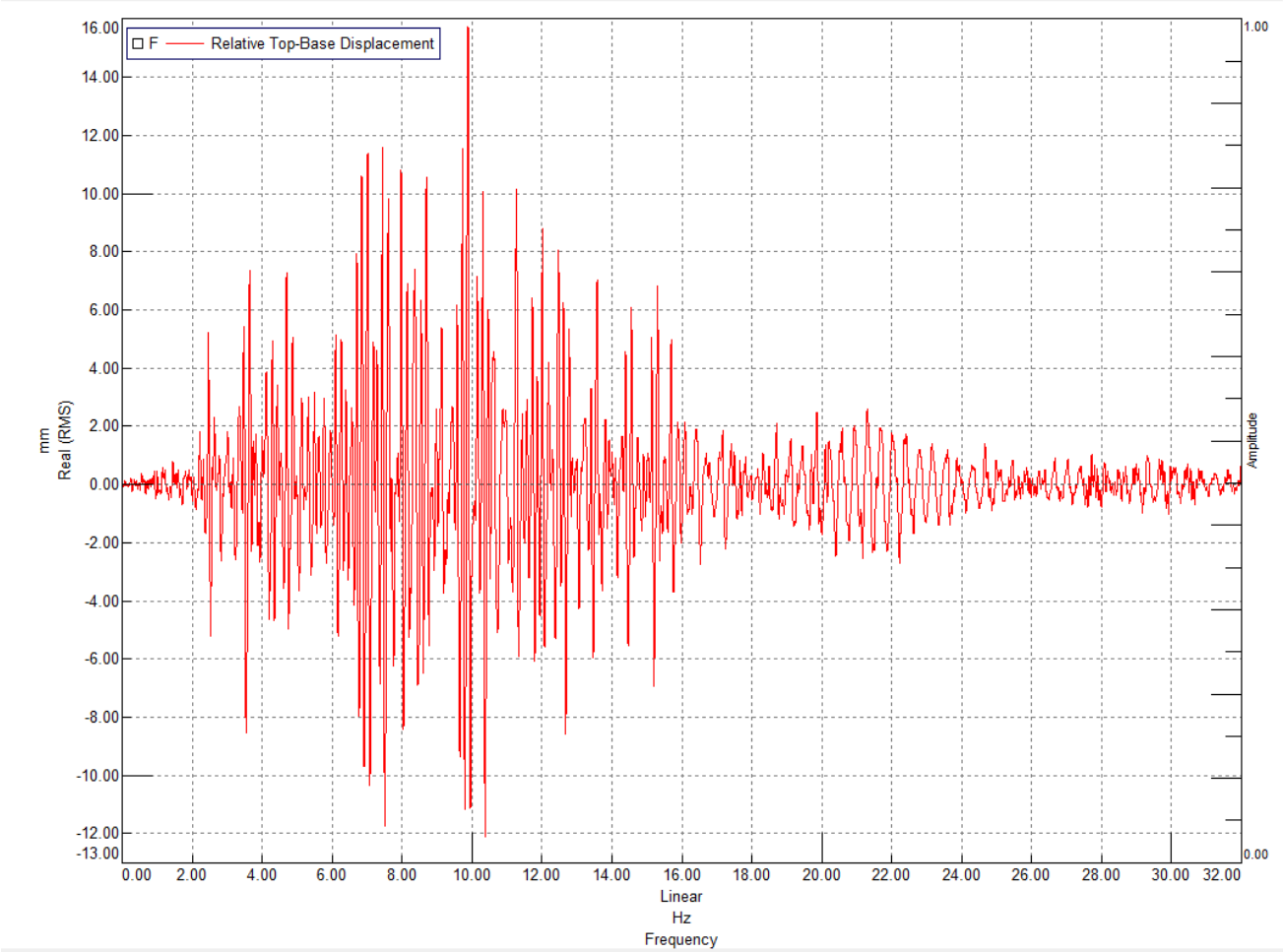


Figure 43 – X Axis – RUN06, MP2-MP3: Diagram of Seismic test: Time-history of the relative displacement between the frame top and base of the UUT

Project: MTL-ELE23-053
Section: X Axis – RUN06
Test: Final vibration response investigation
Date: 14/11/2023
Id: AvgCtrl (of CP1)
Sweep rate: 1 Oct/min
Sweep direction: down and up

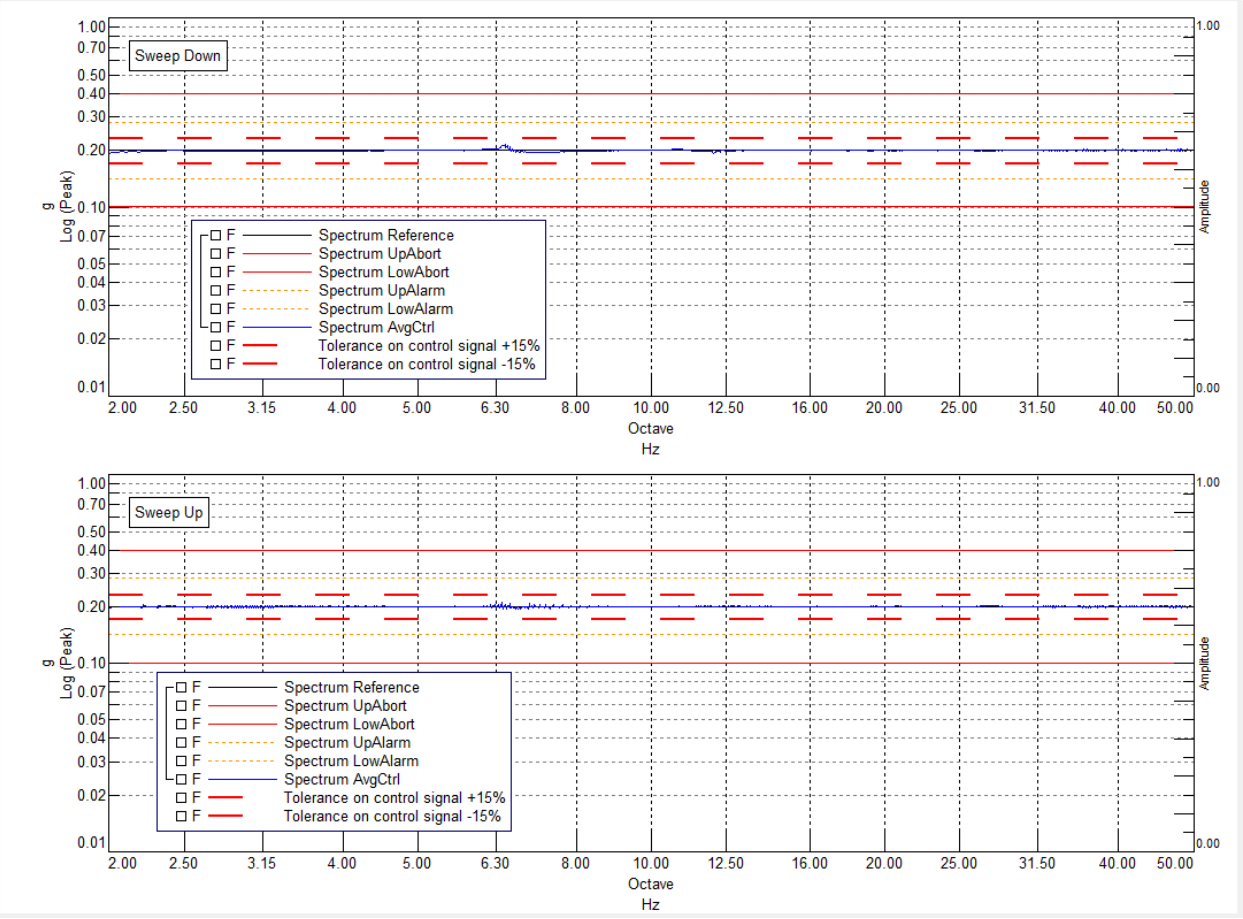


Figure 44 – X Axis – RUN06, AvgCtrl: Diagram of final vibration response investigation – Sweep down and up

Project: MTL-ELE23-053
Section: X Axis – RUN06
Test: Final vibration response investigation
Date: 14/11/2023
Id: MP1
Reference point: CP1
Sweep direction: Down
Sweep rate: 1 Oct/min

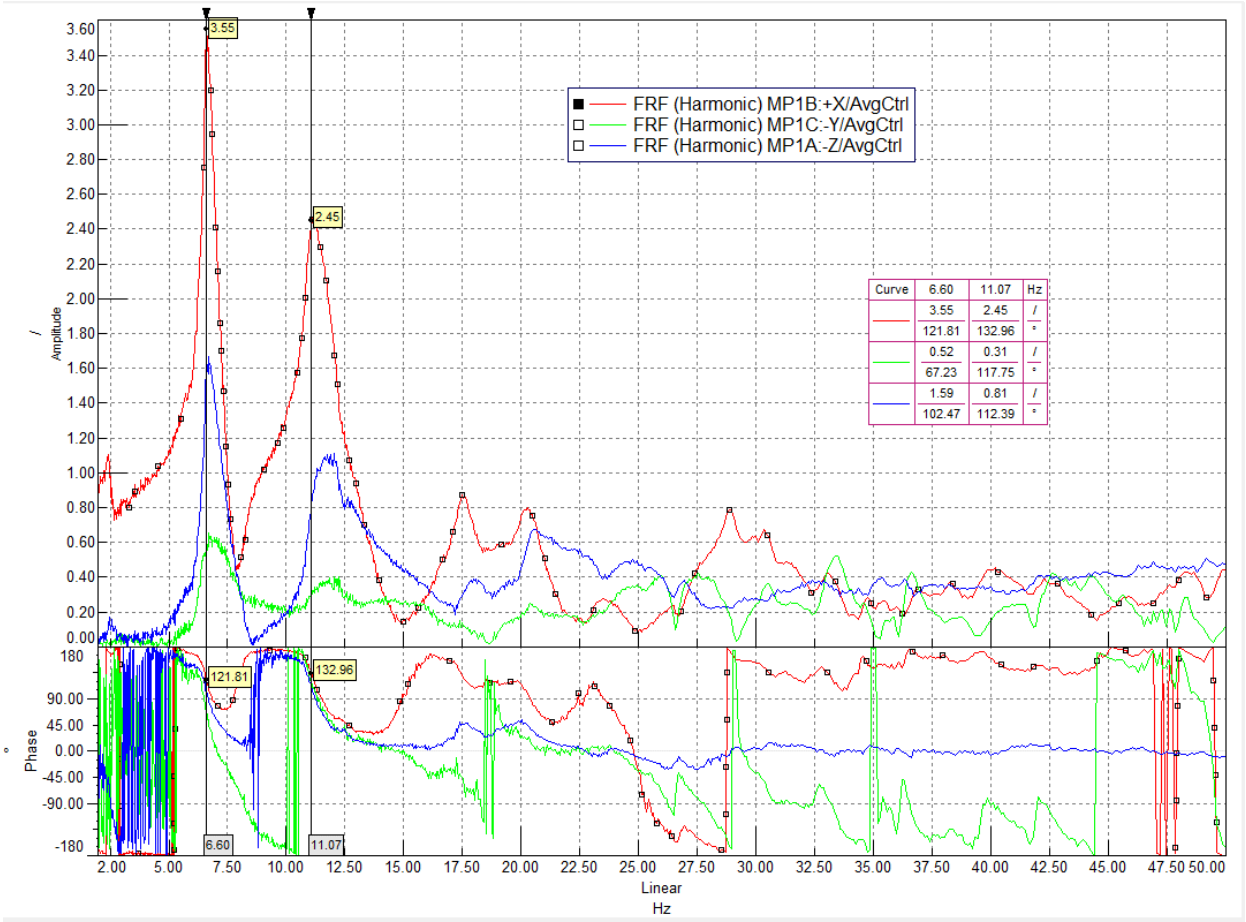


Figure 45 – X Axis – RUN06, MP1: Diagram of final vibration response investigation – Sweep Down

Project: MTL-ELE23-053
Section: X Axis – RUN06
Test: Final vibration response investigation
Date: 14/11/2023
Id: MP2
Reference point: CP1
Sweep direction: Down
Sweep rate: 1 Oct/min

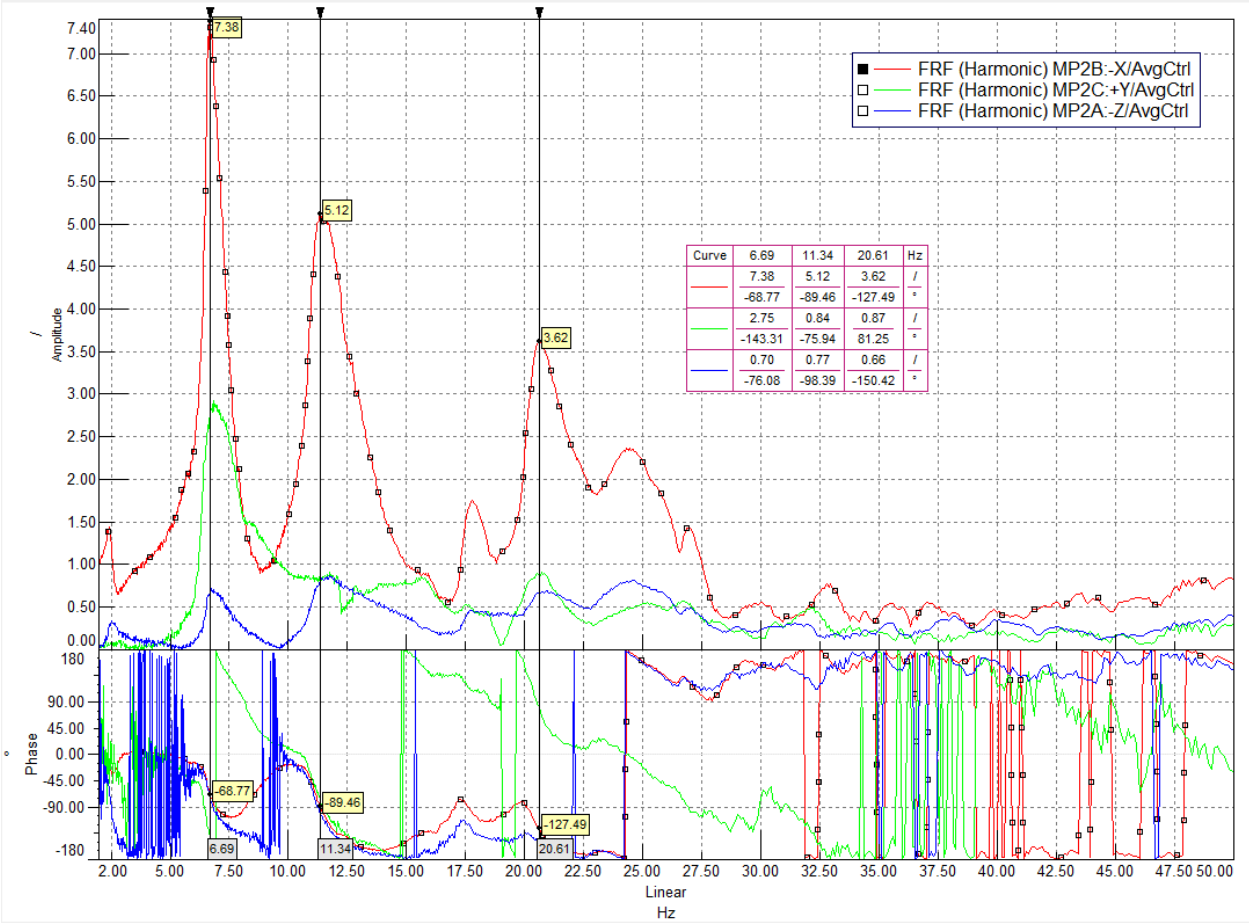


Figure 46 – X Axis – RUN06, MP2: Diagram of final vibration response investigation – Sweep Down

Project: MTL-ELE23-053
Section: X Axis – RUN06
Test: Final vibration response investigation
Date: 14/11/2023
Id: MP1
Reference point: CP1
Sweep direction: Up
Sweep rate: 1 Oct/min

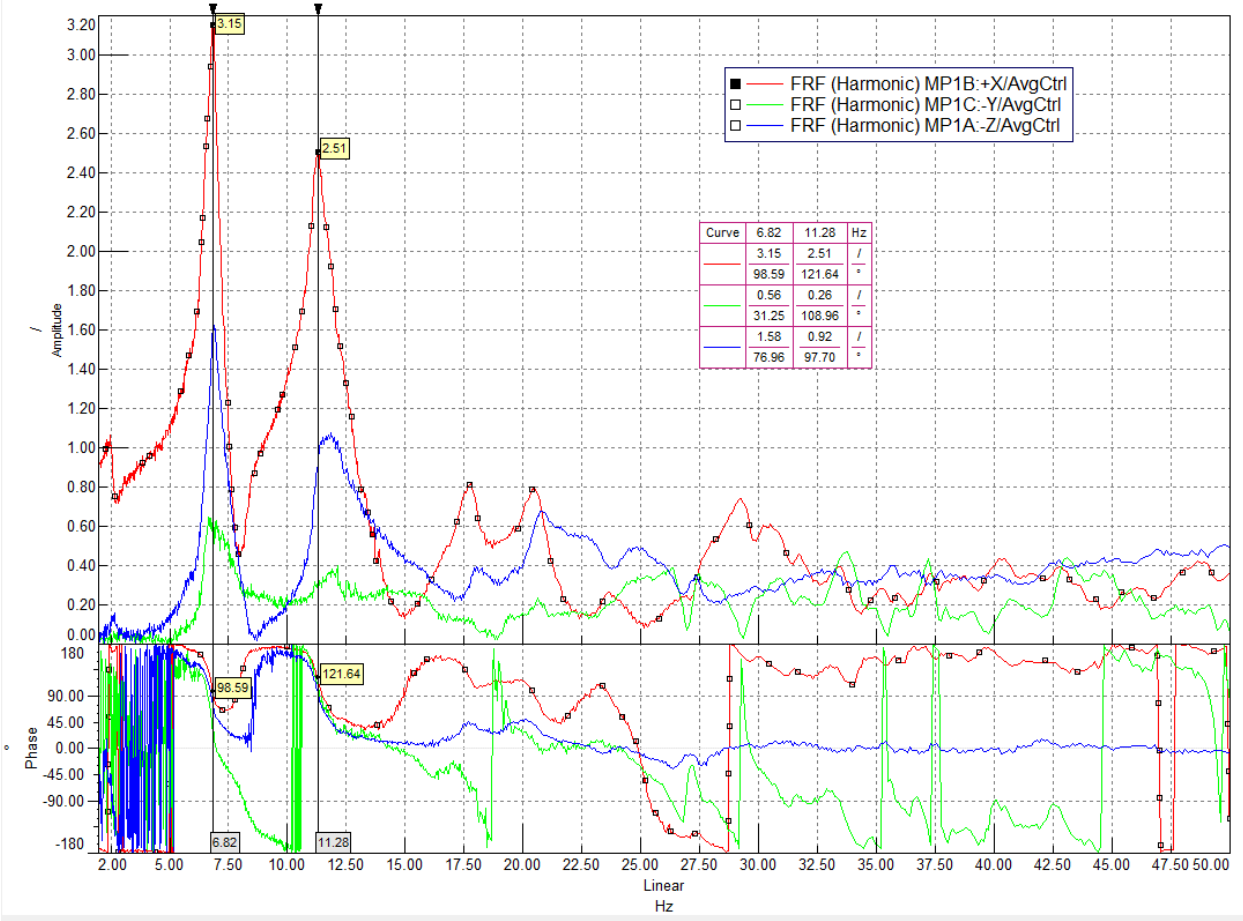


Figure 47 – X Axis – RUN06, MP1: Diagram of final vibration response investigation – Sweep Up

Project: MTL-ELE23-053
Section: X Axis – RUN06
Test: Final vibration response investigation
Date: 14/11/2023
Id: MP2
Reference point: CP1
Sweep direction: Up
Sweep rate: 1 Oct/min

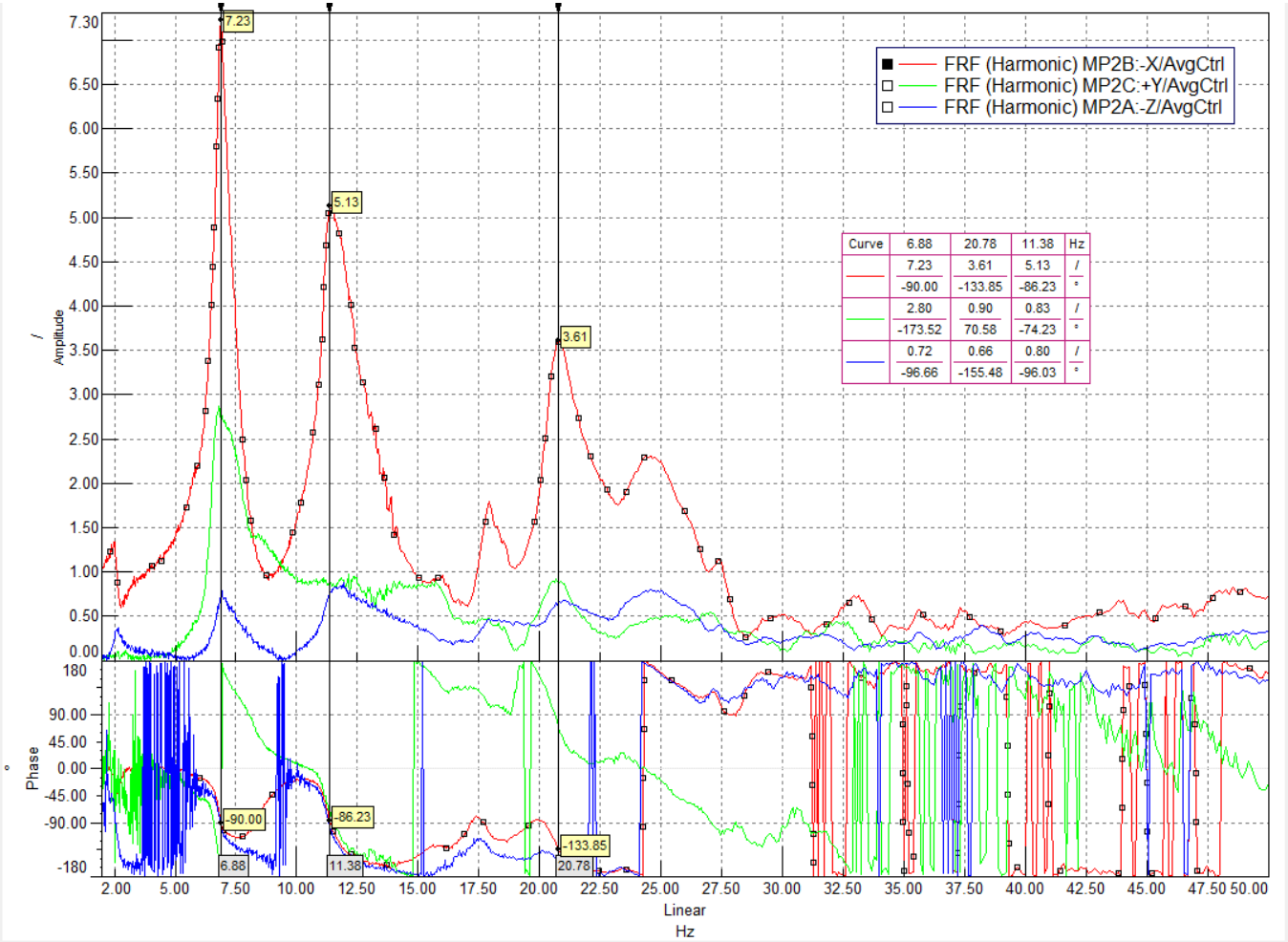


Figure 48 – X Axis – RUN06, MP2: Diagram of final vibration response investigation – Sweep Up

Project: MTL-ELE23-053
Section: X Axis – RUN06
Test: Final vibration response investigation
Date: 14/11/2023
Id: MP3
Reference point: AvgCtrl (of CP1)
Sweep rate: 1 Oct/min
Sweep direction: down and up

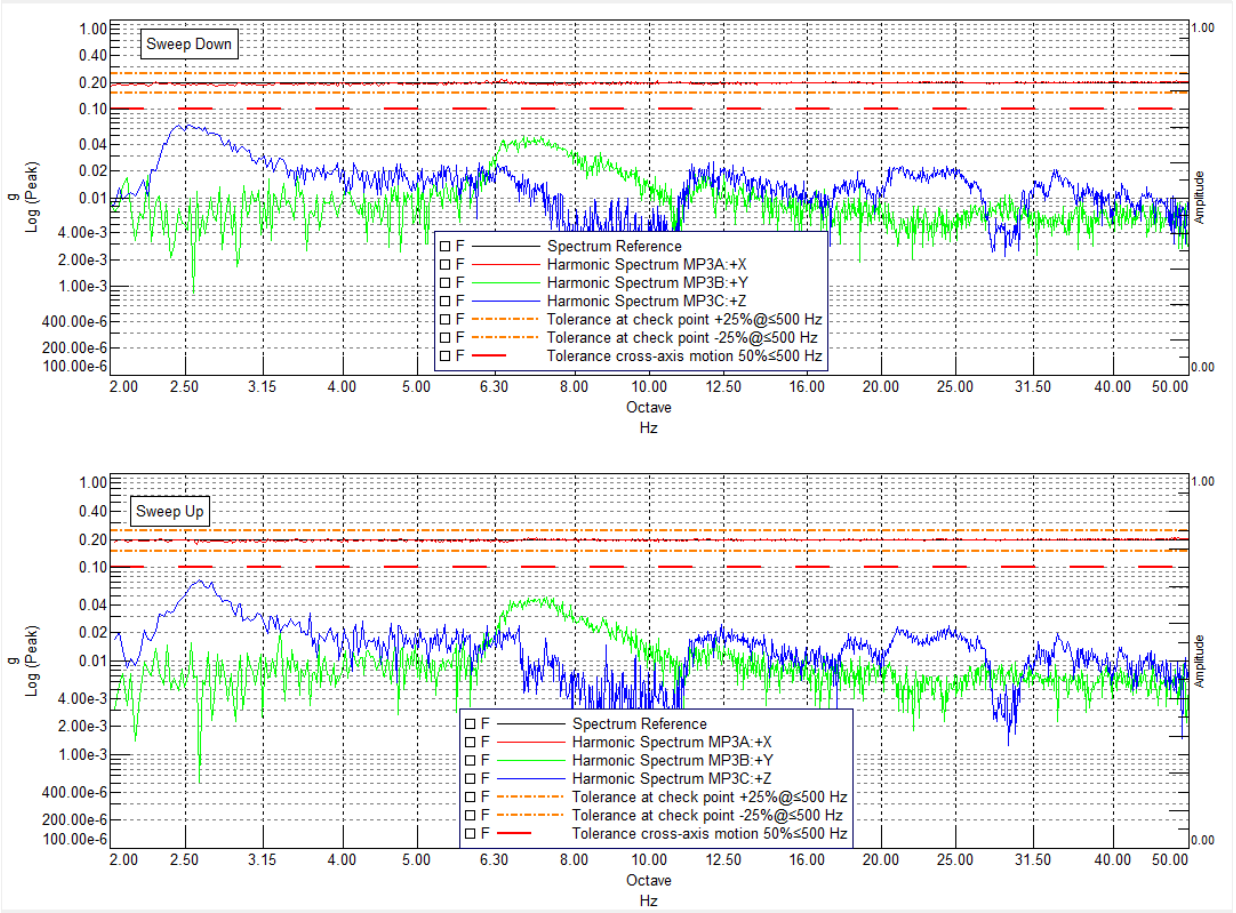


Figure 49 – X Axis – RUN06, MP3: Diagram of final vibration response investigation - Tolerances - Sweep down and up

Project: MTL-ELE23-053
Section: Y Axis – RUN07
Test: Initial vibration response investigation
Date: 14/11/2023
Id: AvgCtrl (of CP1)
Sweep rate: 1 Oct/min
Sweep direction: down and up

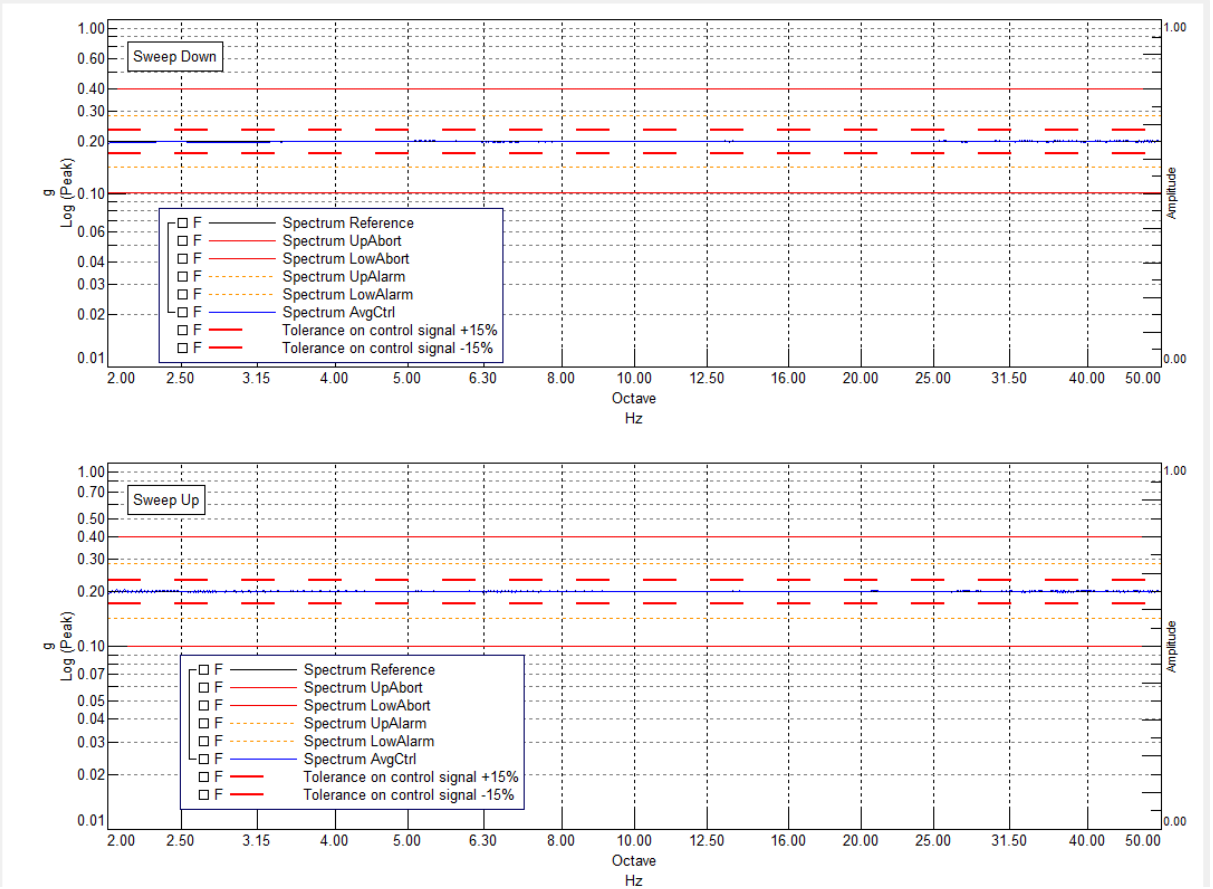


Figure 50 – Y Axis – RUN07, AvgCtrl: Diagram of initial vibration response investigation – Sweep down and up

Project: MTL-ELE23-053
Section: Y Axis – RUN07
Test: Initial vibration response investigation
Date: 14/11/2023
Id: MP1
Reference point: CP1
Sweep direction: Down
Sweep rate: 1 Oct/min

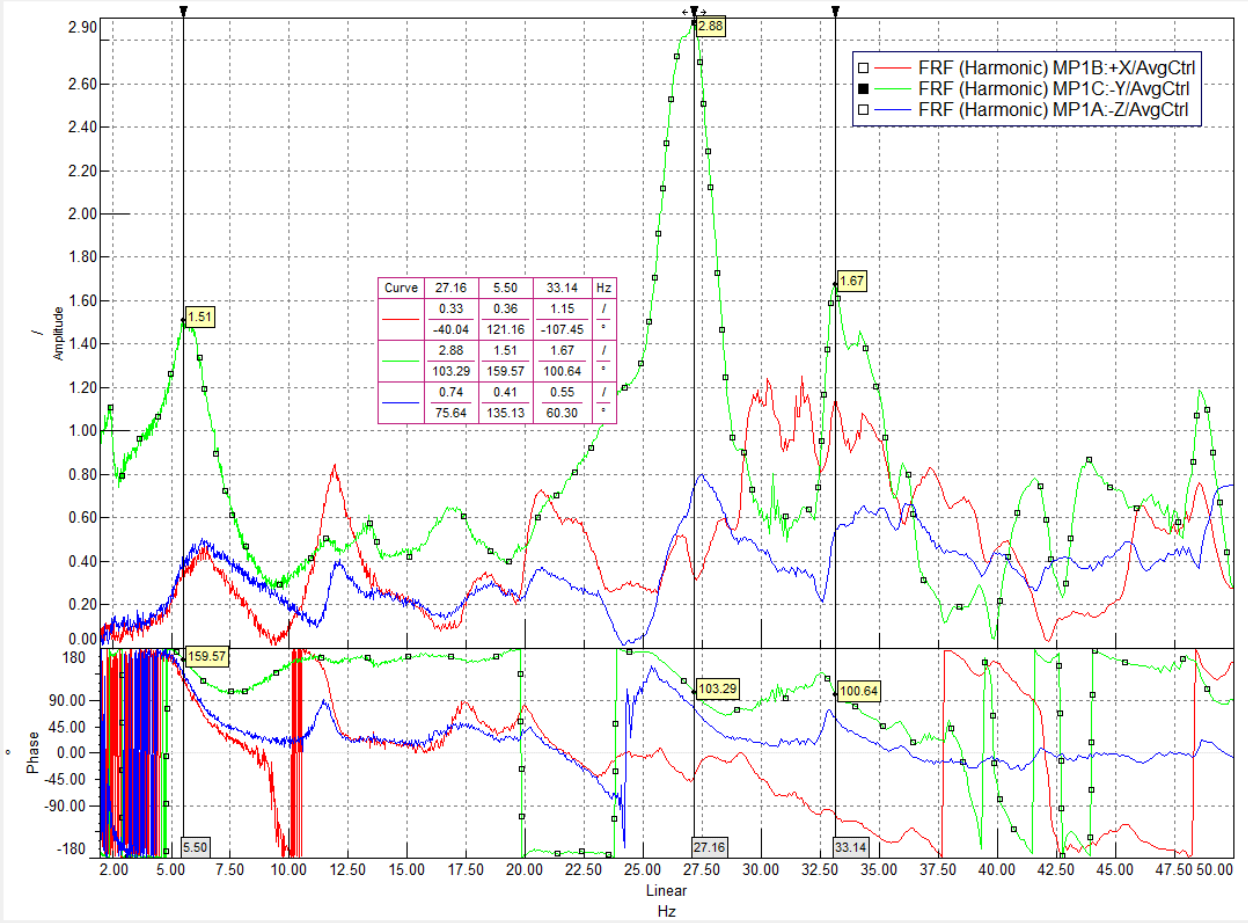


Figure 51 – Y Axis – RUN07, MP1: Diagram of initial vibration response investigation – Sweep Down

Project: MTL-ELE23-053
Section: Y Axis – RUN07
Test: Initial vibration response investigation
Date: 14/11/2023
Id: MP2
Reference point: CP1
Sweep direction: Down
Sweep rate: 1 Oct/min

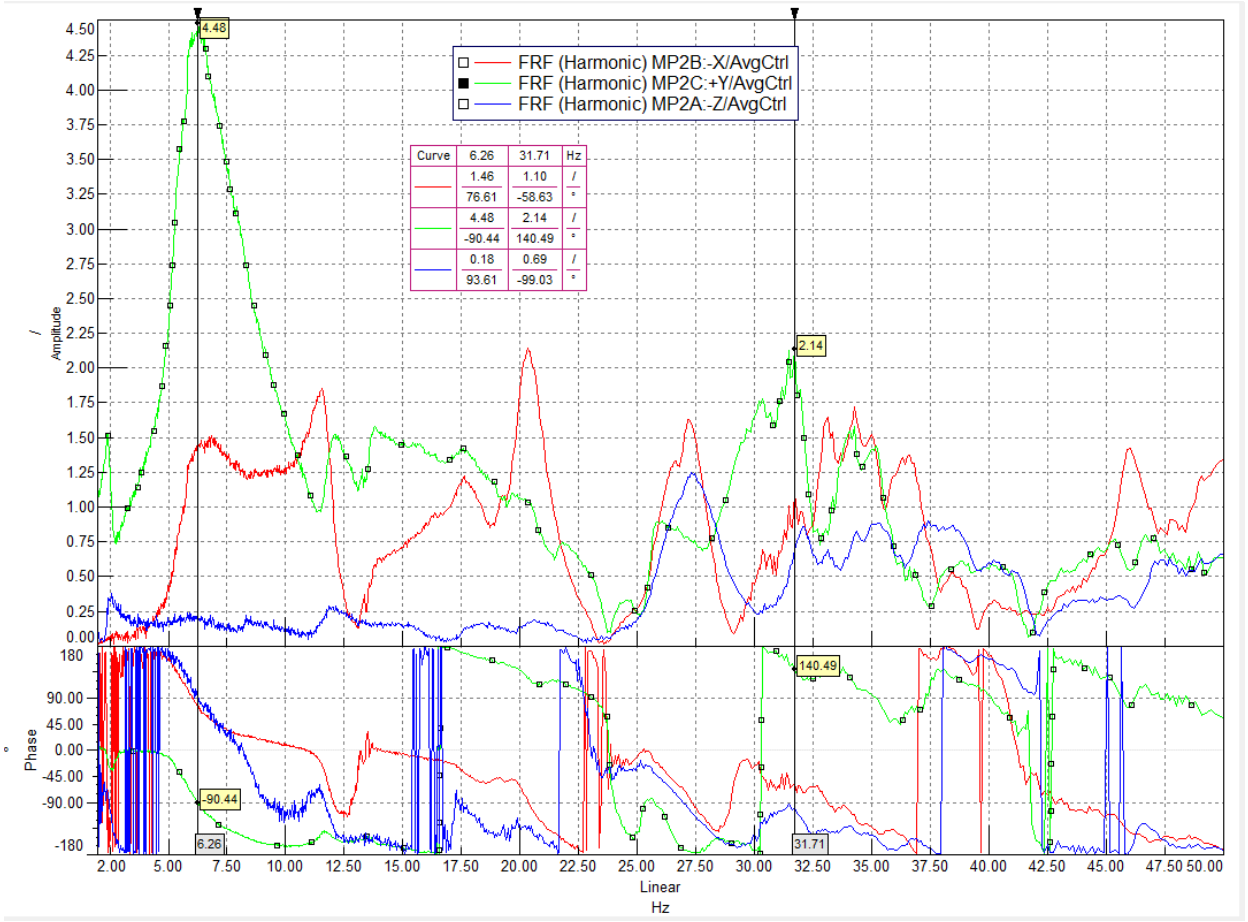


Figure 52 – Y Axis – RUN07, MP2: Diagram of initial vibration response investigation – Sweep Down

Project: MTL-ELE23-053
Section: Y Axis – RUN07
Test: Initial vibration response investigation
Date: 14/11/2023
Id: MP1
Reference point: CP1
Sweep direction: Up
Sweep rate: 1 Oct/min

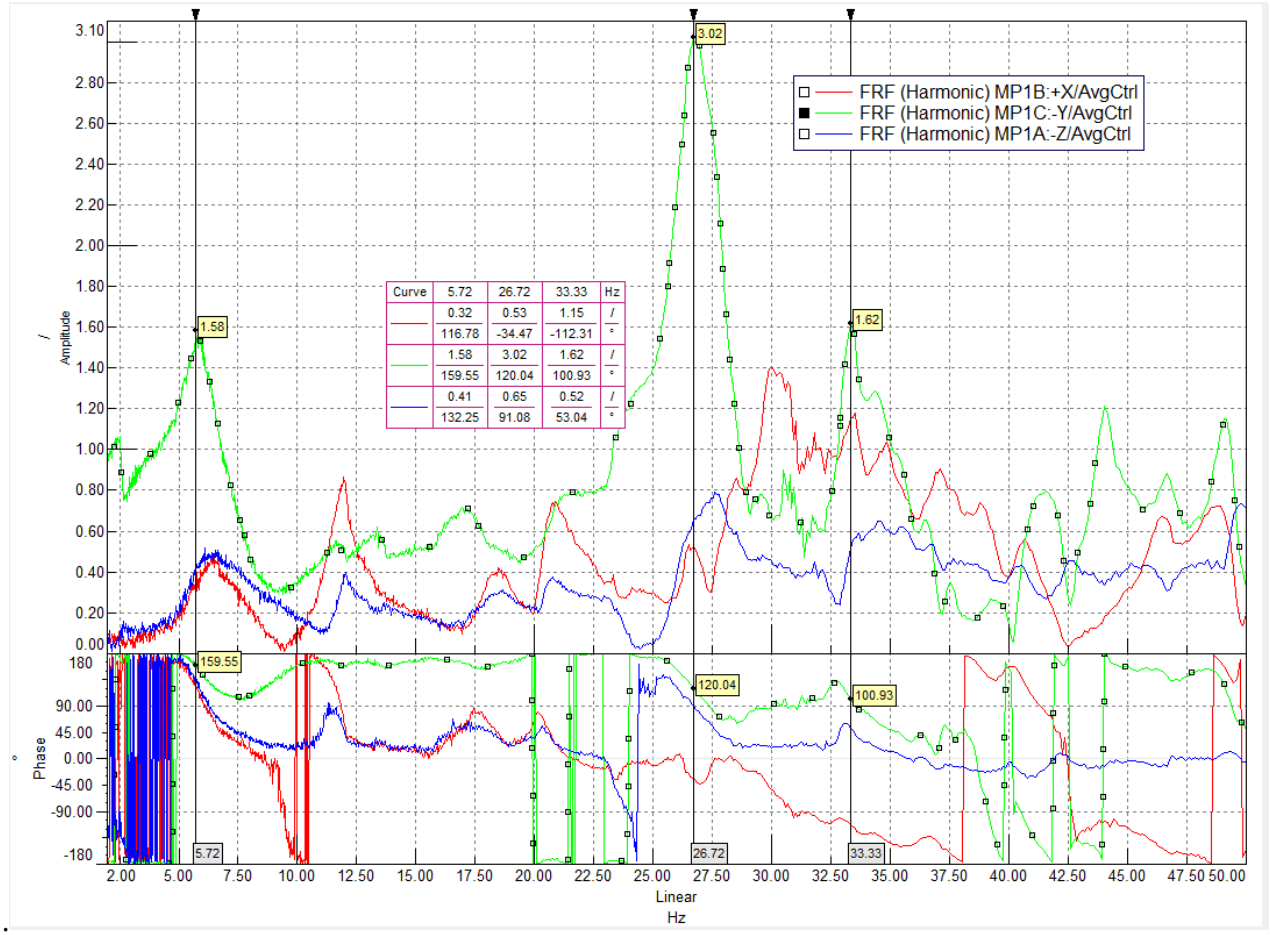


Figure 53 – Y Axis – RUN07, MP1: Diagram of initial vibration response investigation – Sweep Up

Project: MTL-ELE23-053
Section: Y Axis – RUN07
Test: Initial vibration response investigation
Date: 14/11/2023
Id: MP2
Reference point: CP1
Sweep direction: Up
Sweep rate: 1 Oct/min

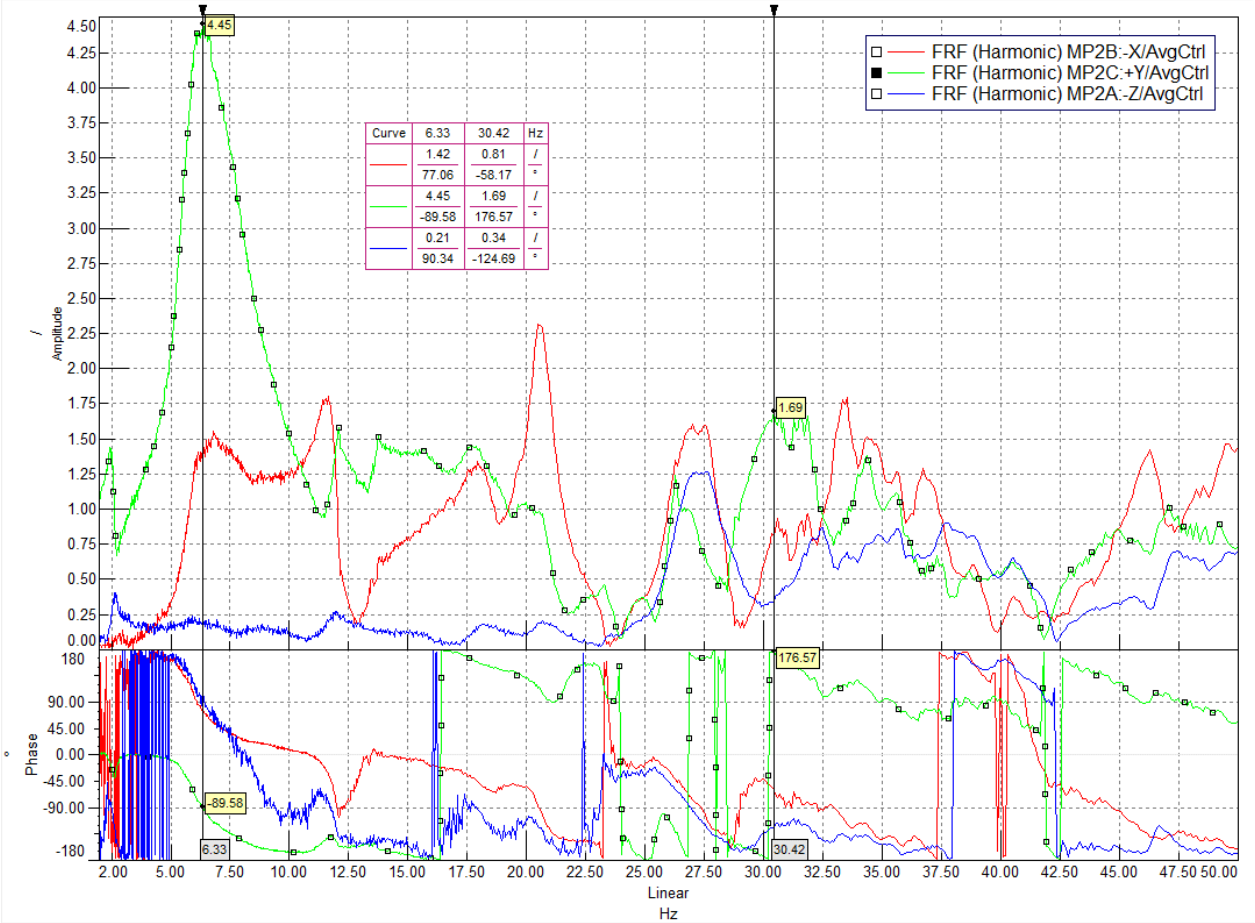


Figure 54 – Y Axis – RUN07, MP2: Diagram of initial vibration response investigation – Sweep Up

Project: MTL-ELE23-053
Section: Y Axis – RUN07
Test: Initial vibration response investigation
Date: 14/11/2023
Id: MP3
Reference point: AvgCtrl (of CP1)
Sweep rate: 1 Oct/min
Sweep direction: down and up

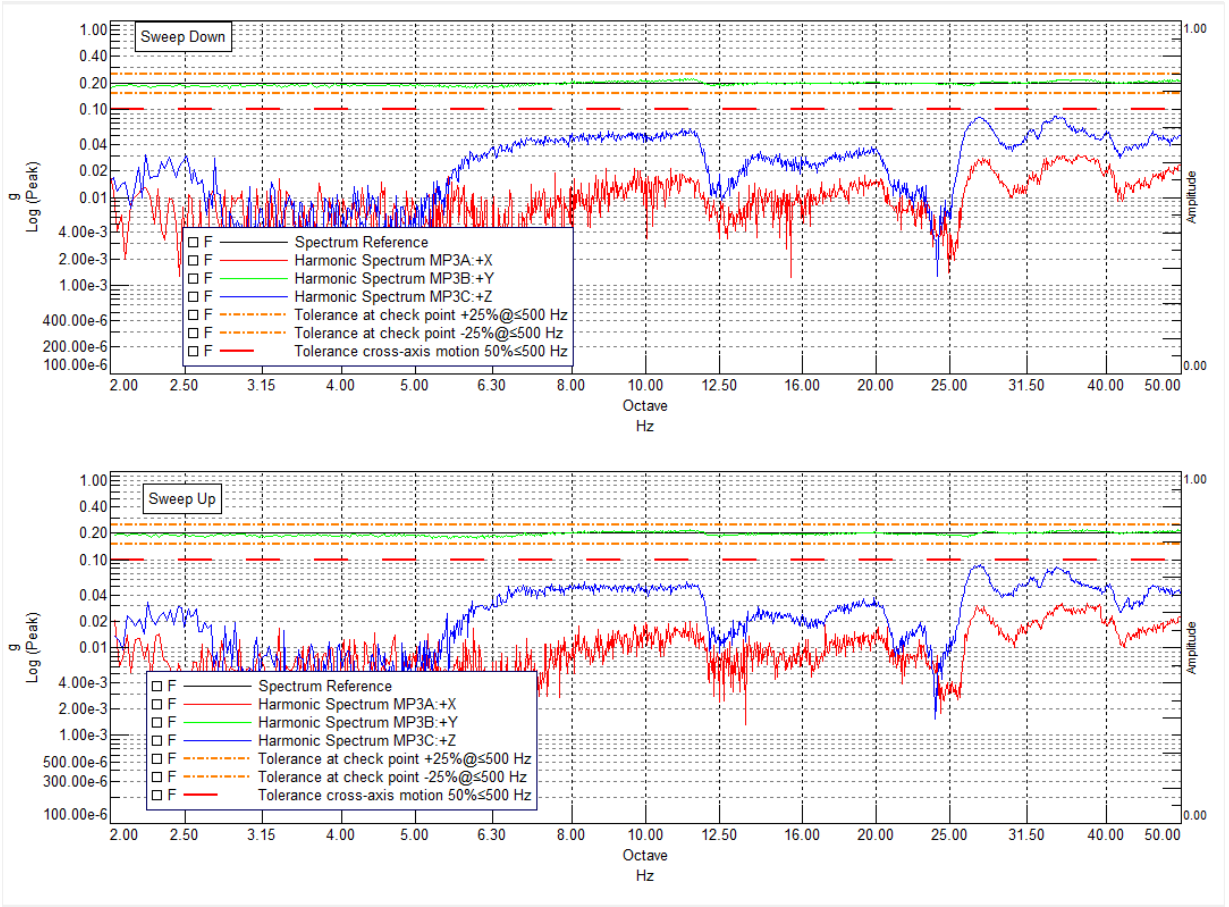


Figure 55 – Y Axis – RUN07, MP3: Diagram of initial vibration response investigation - Tolerances - Sweep down and up

Project: MTL-ELE23-053
Section: Y Axis – RUN08
Test: Time-history test - seismic load test
Date: 14/11/2023
Id: CP1
ZPA: 1,60 g

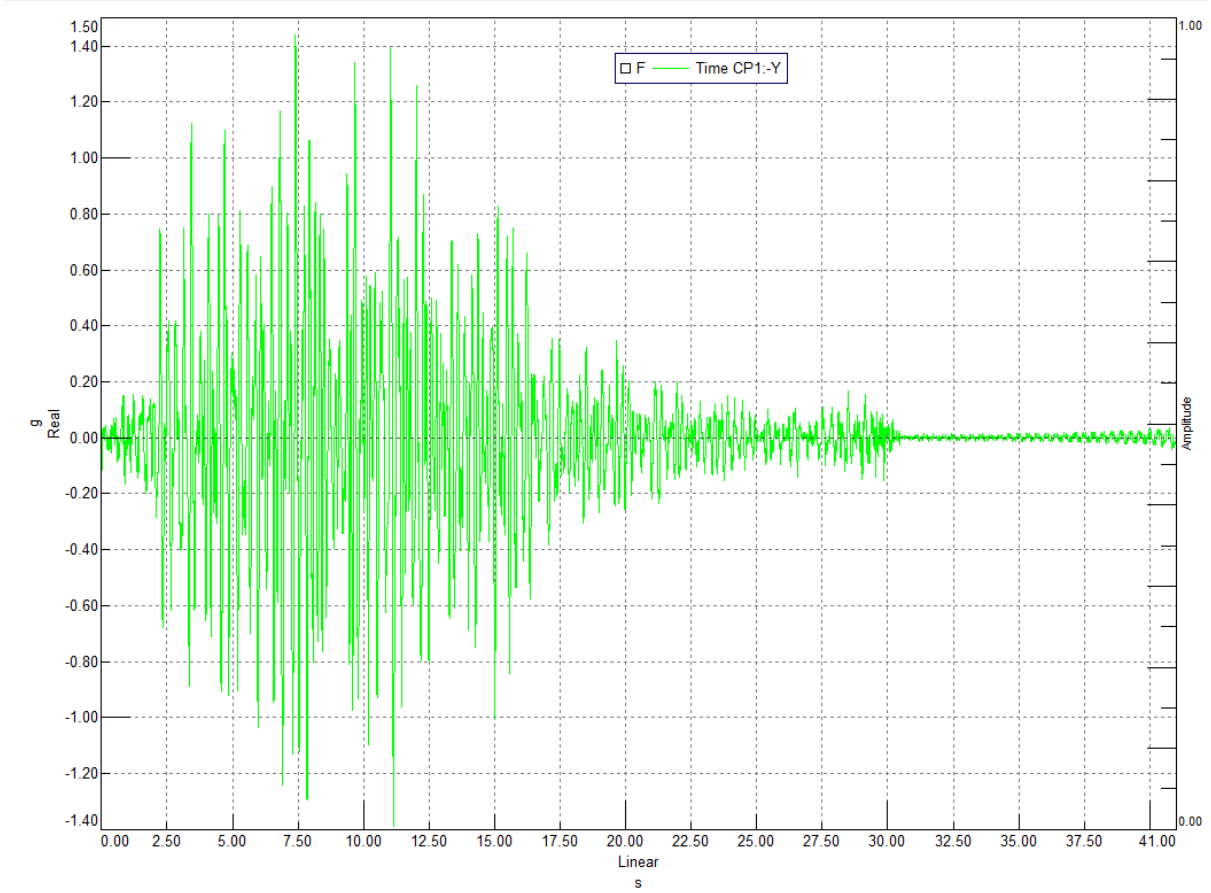


Figure 56 – Y Axis – RUN08, CP1: Diagram of Seismic Test

Project: MTL-ELE23-053
Section: Y Axis – RUN08
Test: Time-history test - seismic load test
Date: 14/11/2023
Id: MP1
ZPA: 1,60 g

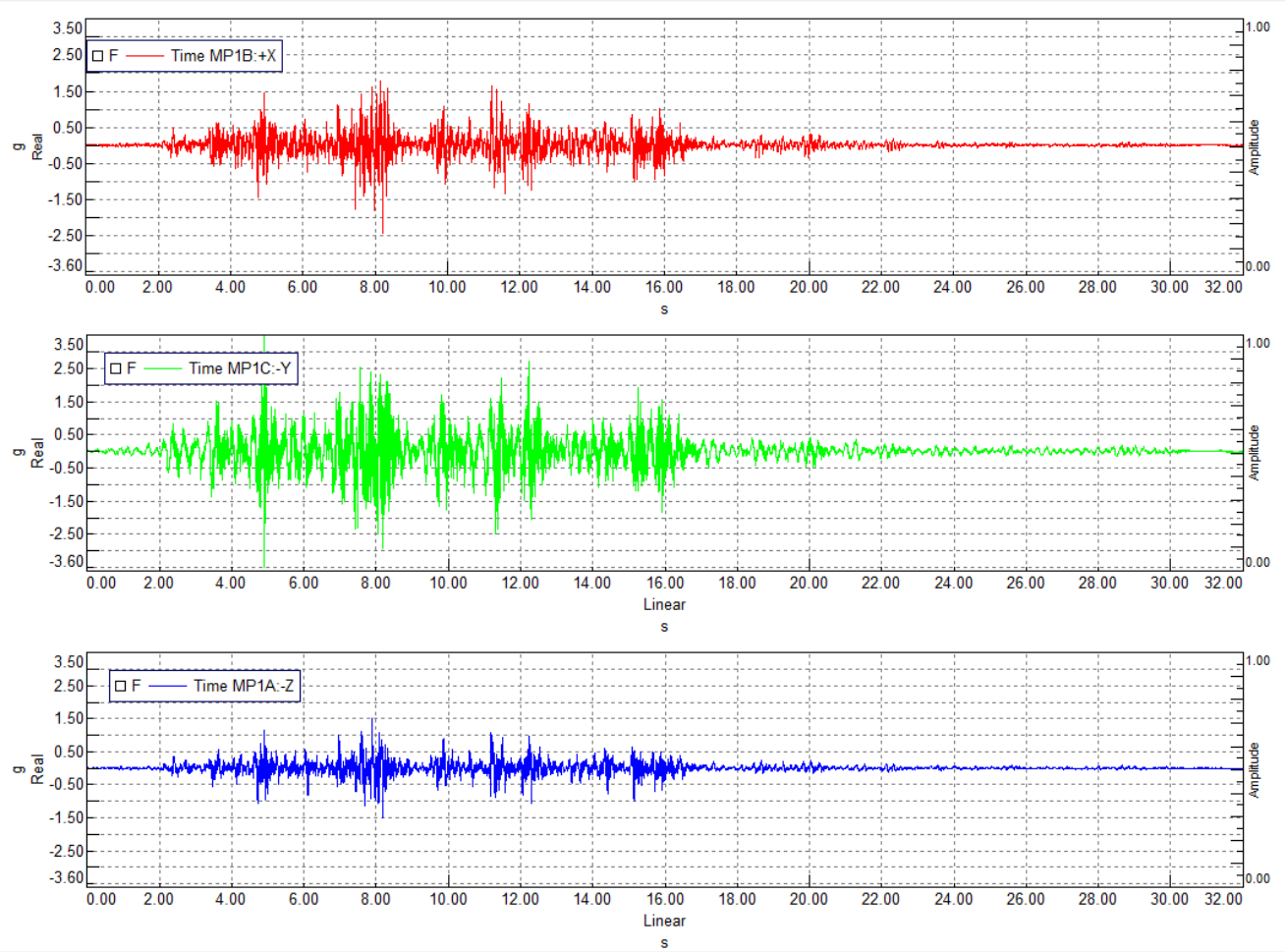


Figure 57 – Y Axis – RUN08, MP1: Diagram of Seismic Test

Project: MTL-ELE23-053
Section: Y Axis – RUN08
Test: Time-history test - seismic load test
Date: 14/11/2023
Id: MP2
ZPA: 1,60 g

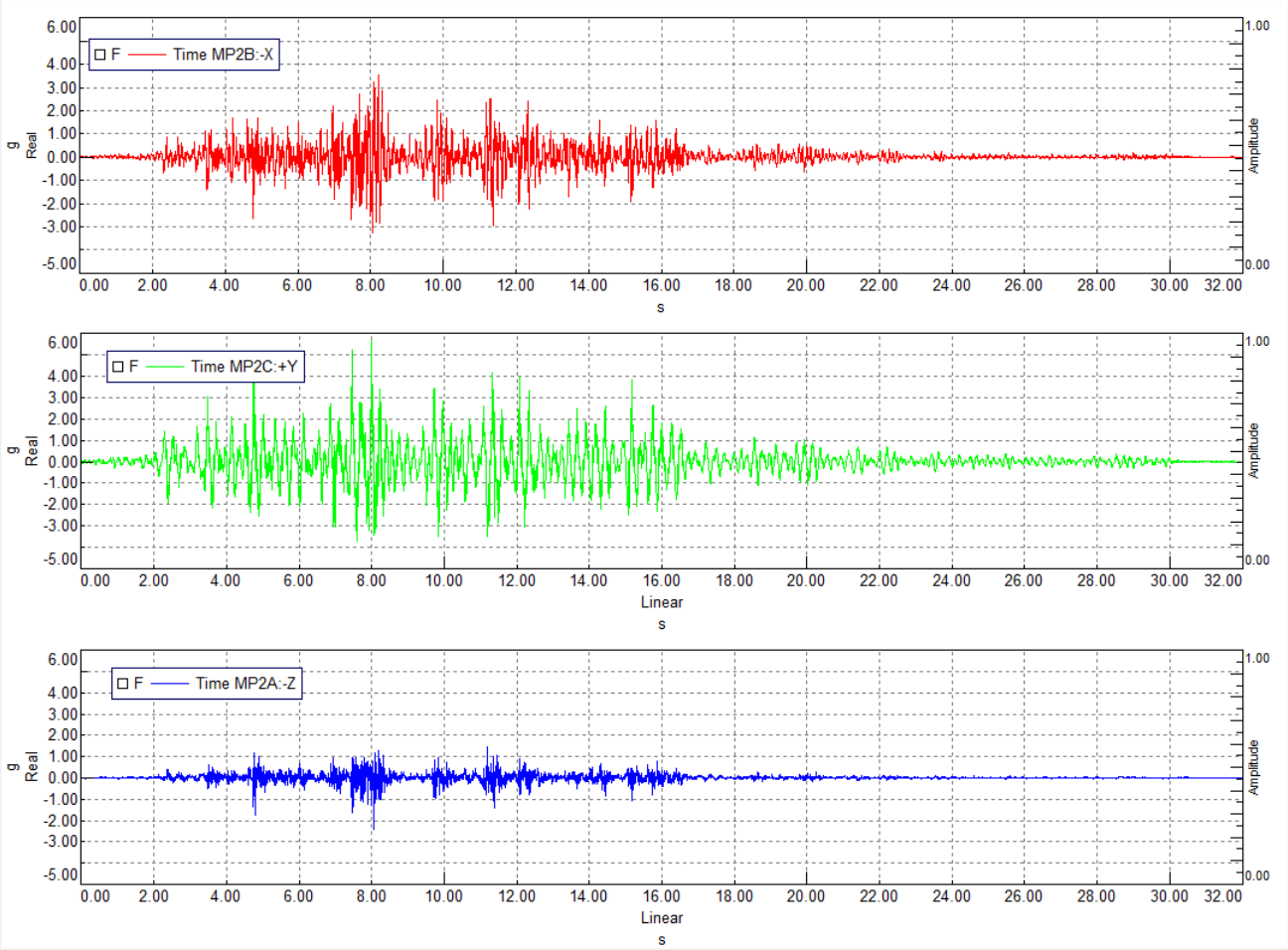


Figure 58 – Y Axis – RUN08, MP2: Diagram of Seismic Test

Project: MTL-ELE23-053
Section: Y Axis – RUN08
Test: Time-history test - seismic load test
Date: 14/11/2023
Id: MP3
ZPA: 1,60 g

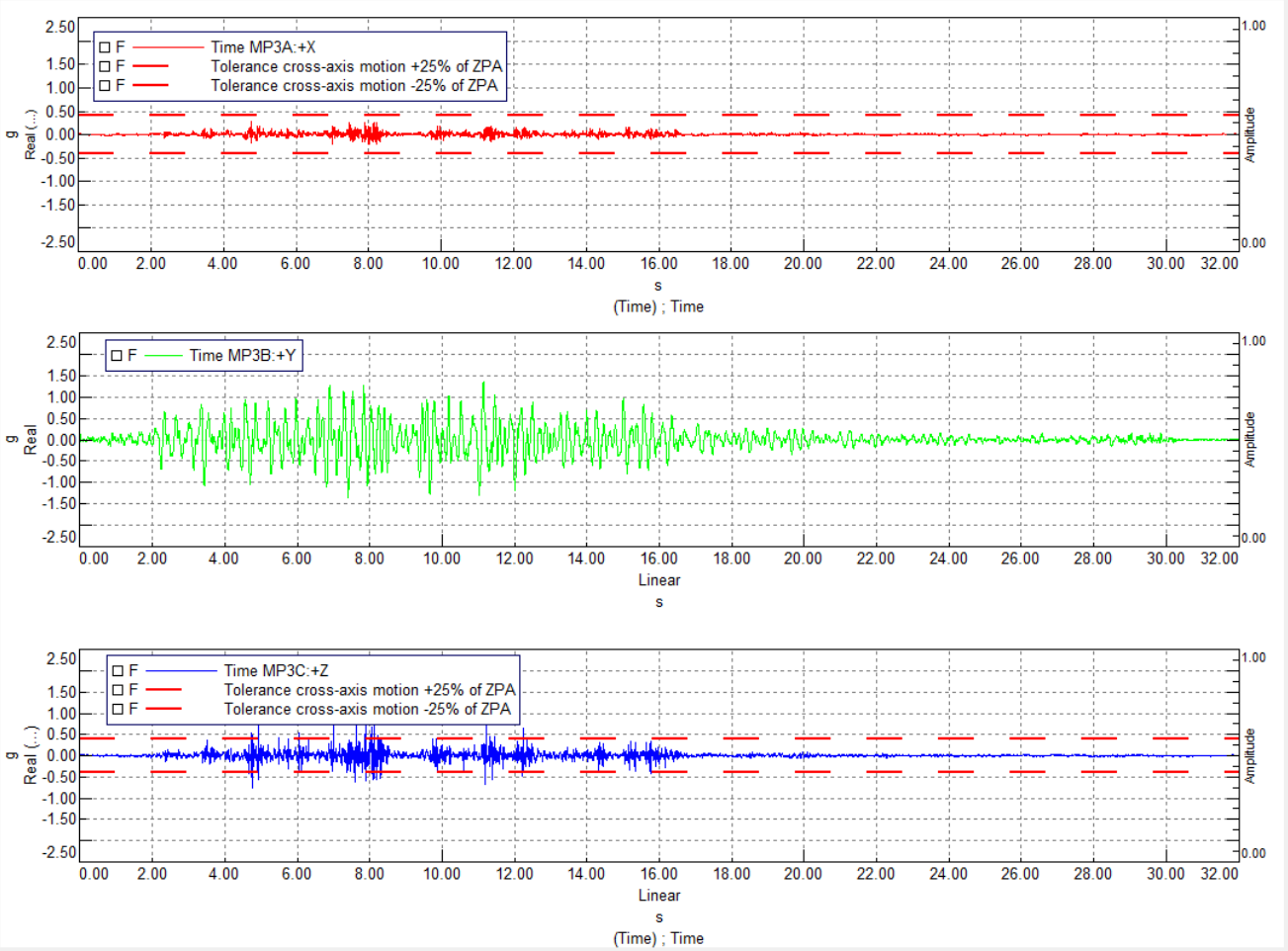


Figure 59 – Y Axis – RUN08, MP3: Diagram of Seismic Test - Tolerances

Project: MTL-ELE23-053
Section: Y Axis – RUN08
Test: Time-history test - seismic load test
Date: 14/11/2023
Id: AvgCtrl (of CP1)
ZPA: 1,60 g

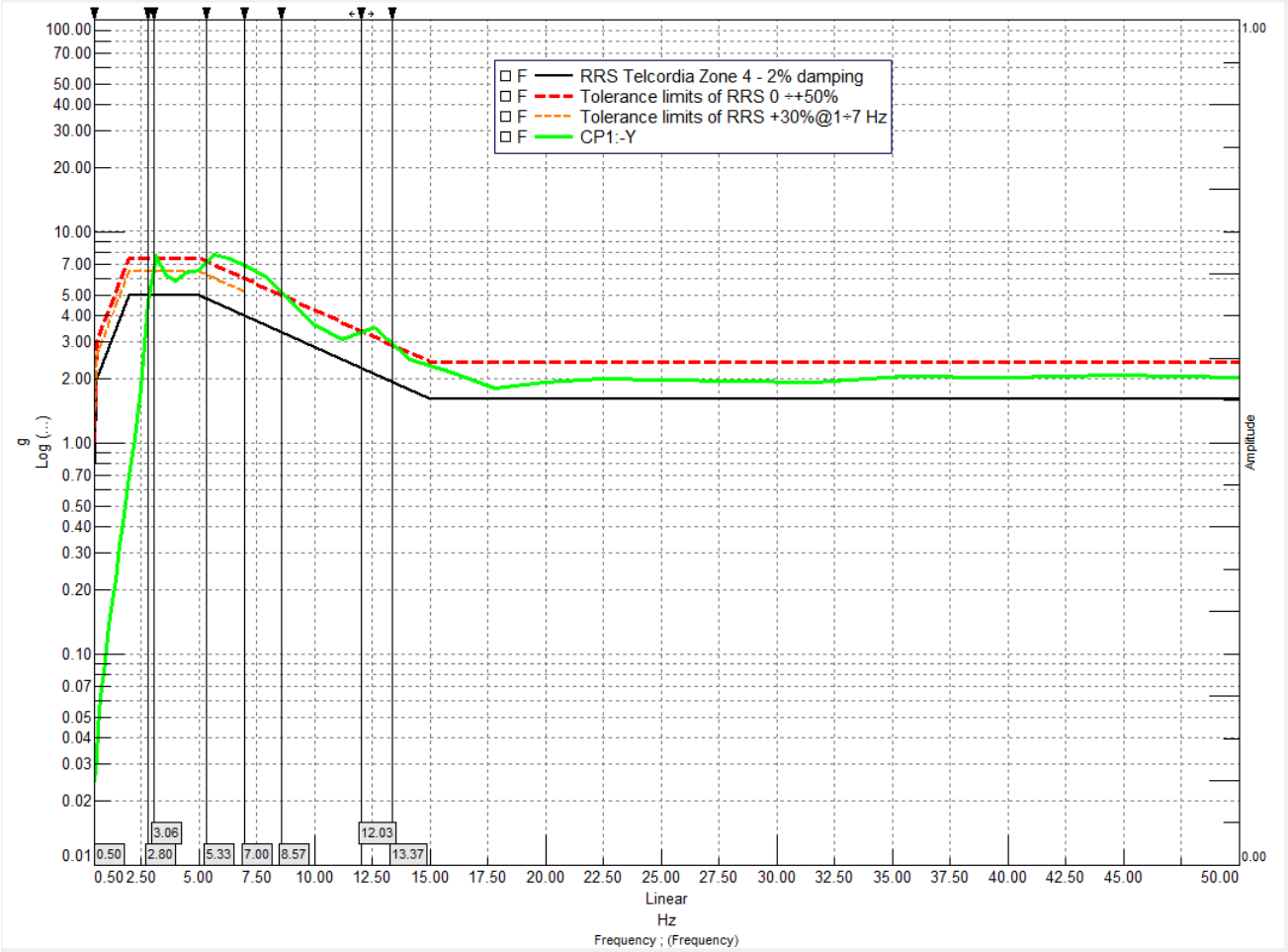


Figure 60 – Y Axis – RUN08, AvgCtrl: Diagram of Test Response Spectrum

Project: MTL-ELE23-053
Section: Y Axis – RUN08
Test: Earthquake test method
Date: 14/11/2023
Id: MP2 – MP3
ZPA: 1,60 g

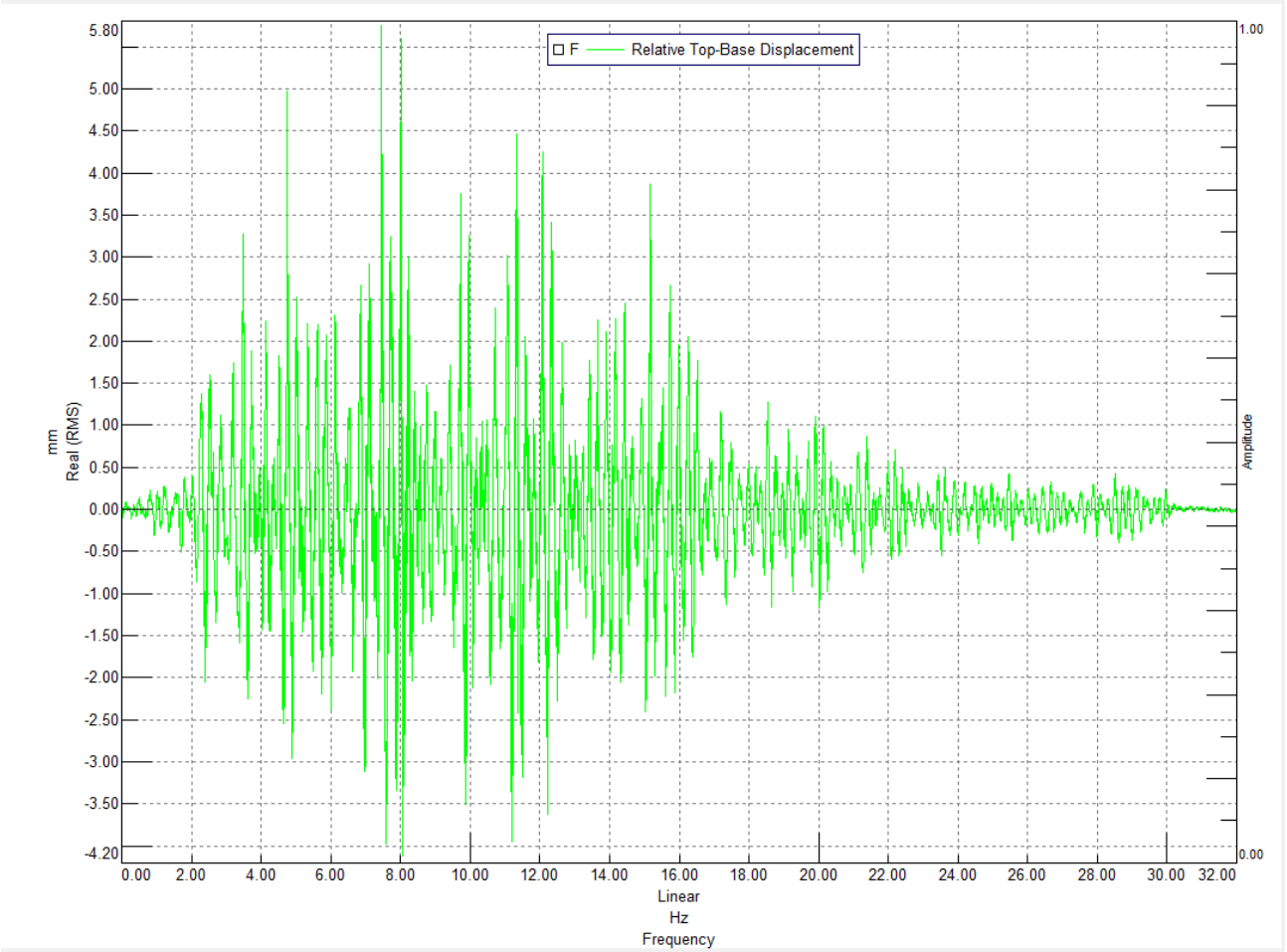


Figure 61 – Y Axis – RUN08, MP2-MP3: Diagram of Seismic test: Time-history of the relative displacement between the frame top and base of the UUT

Project: MTL-ELE23-053
Section: Y Axis – RUN09
Test: Final vibration response investigation
Date: 14/11/2023
Id: AvgCtrl (of CP1)
Sweep rate: 1 Oct/min
Sweep direction: down and up

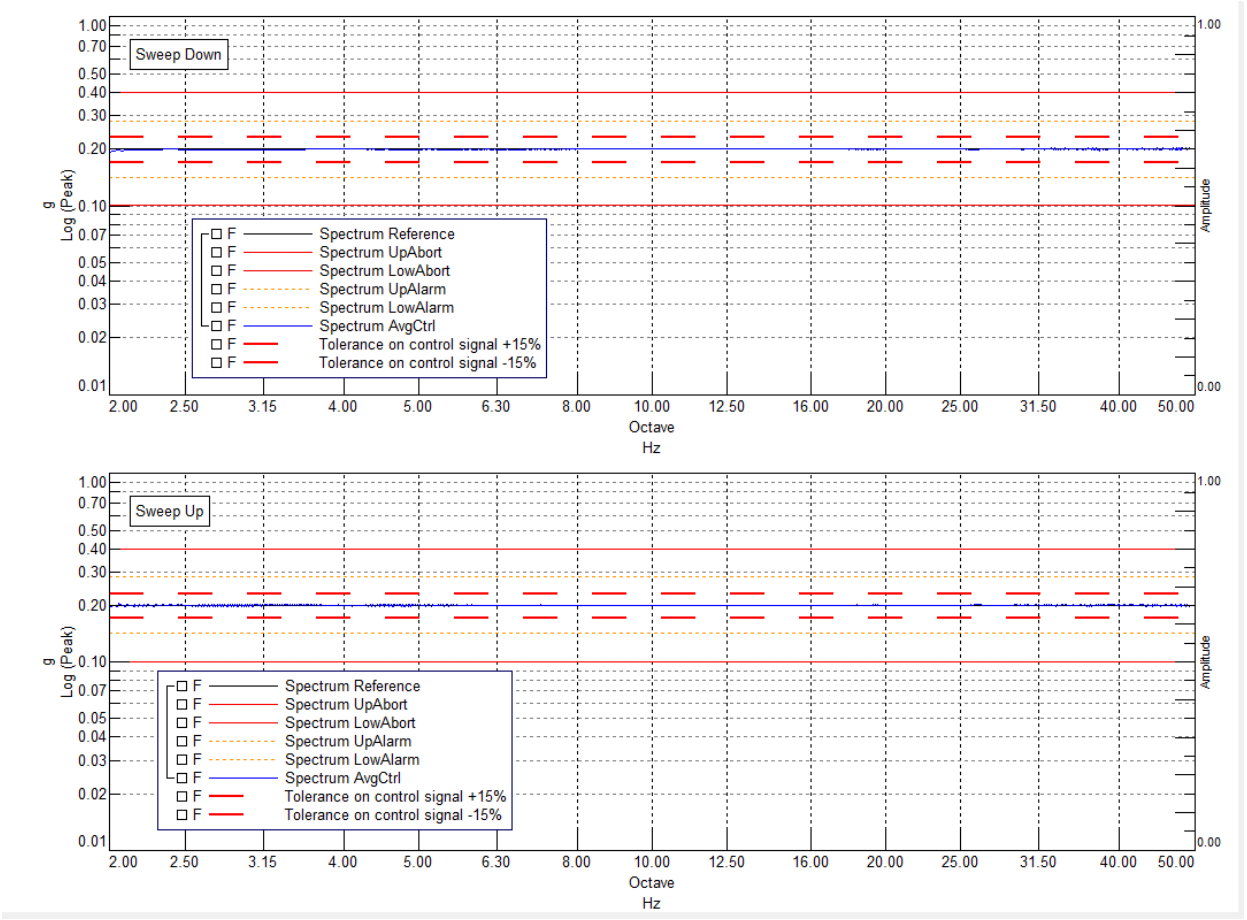


Figure 62 – Y Axis – RUN09, AvgCtrl: Diagram of final vibration response investigation – Sweep down and up

Project: MTL-ELE23-053
Section: Y Axis – RUN09
Test: Final vibration response investigation
Date: 14/11/2023
Id: MP1
Reference point: CP1
Sweep direction: Down
Sweep rate: 1 Oct/min

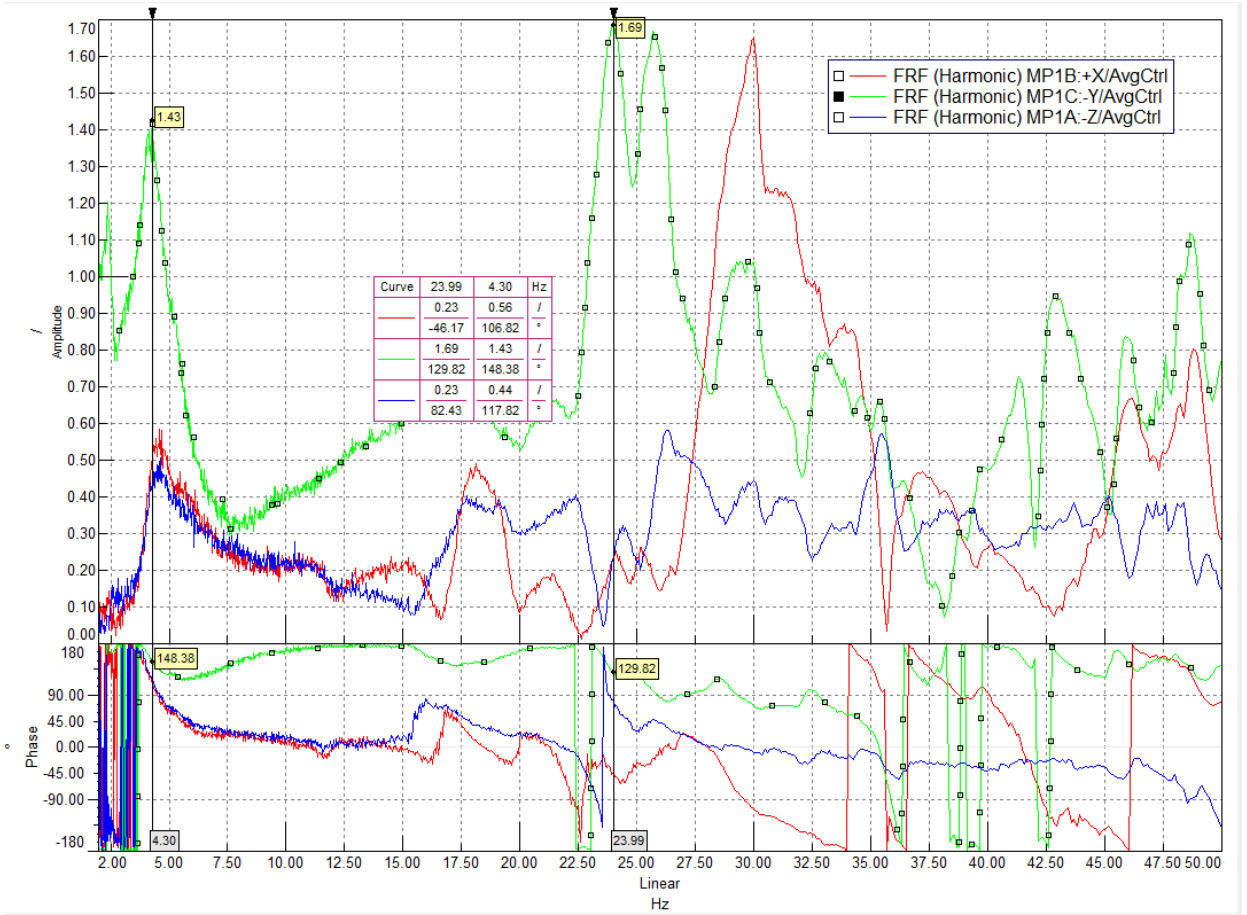


Figure 63 – Y Axis – RUN09, MP1: Diagram of final vibration response investigation – Sweep Down

Project: MTL-ELE23-053
Section: Y Axis – RUN09
Test: Final vibration response investigation
Date: 14/11/2023
Id: MP2
Reference point: CP1
Sweep direction: Down
Sweep rate: 1 Oct/min

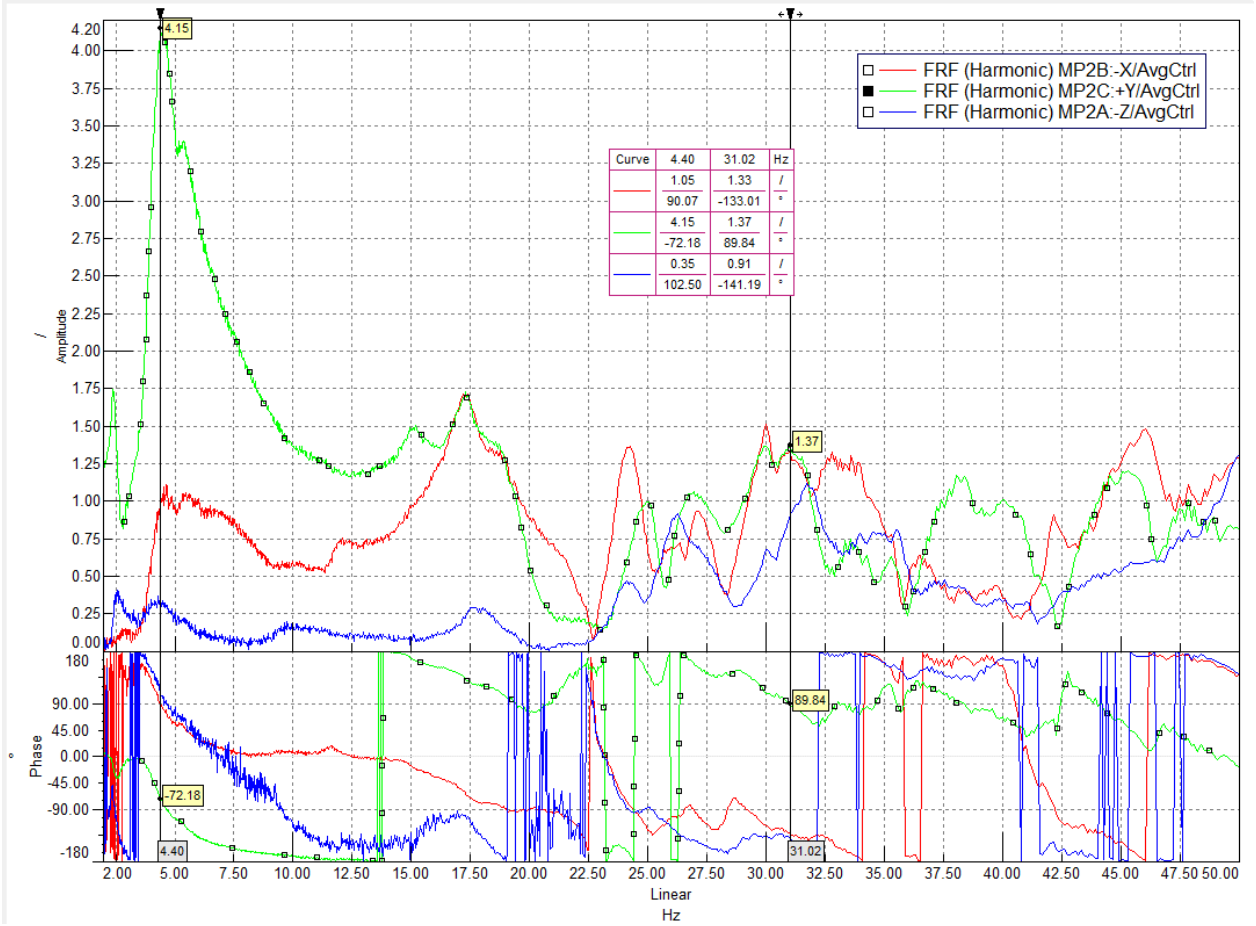


Figure 64 – Y Axis – RUN09, MP2: Diagram of final vibration response investigation – Sweep Down

Project: MTL-ELE23-053
Section: Y Axis – RUN09
Test: Final vibration response investigation
Date: 14/11/2023
Id: MP1
Reference point: CP1
Sweep direction: Up
Sweep rate: 1 Oct/min

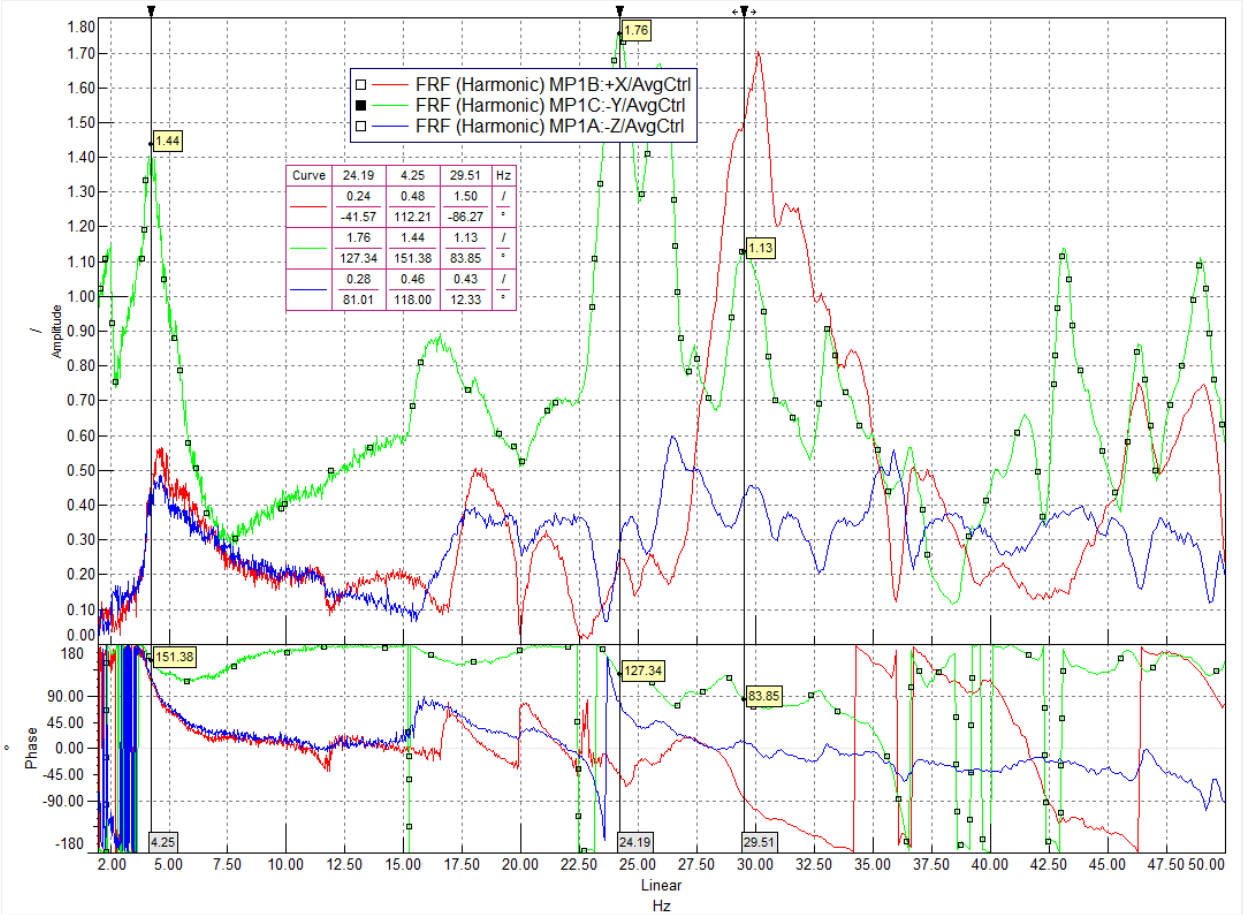


Figure 65 – Y Axis – RUN09, MP1: Diagram of final vibration response investigation – Sweep Up

Project: MTL-ELE23-053
Section: Y Axis – RUN09
Test: Final vibration response investigation
Date: 14/11/2023
Id: MP2
Reference point: CP1
Sweep direction: Up
Sweep rate: 1 Oct/min

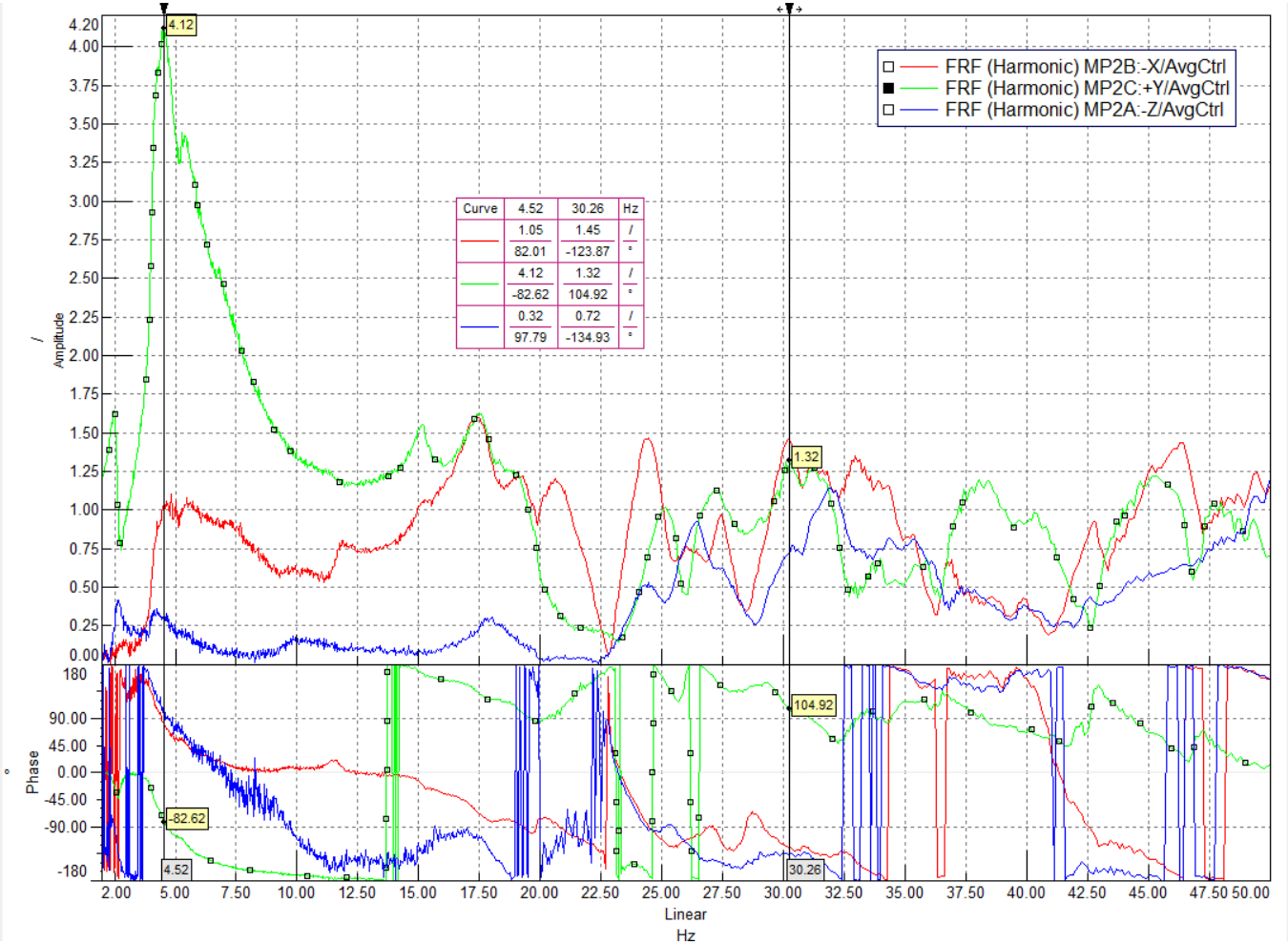


Figure 66 – Y Axis – RUN09, MP2: Diagram of final vibration response investigation – Sweep Up

Project: MTL-ELE23-053
Section: Y Axis – RUN09
Test: Final vibration response investigation
Date: 14/11/2023
Id: MP3
Reference point: AvgCtrl (of CP1)
Sweep rate: 1 Oct/min
Sweep direction: down and up

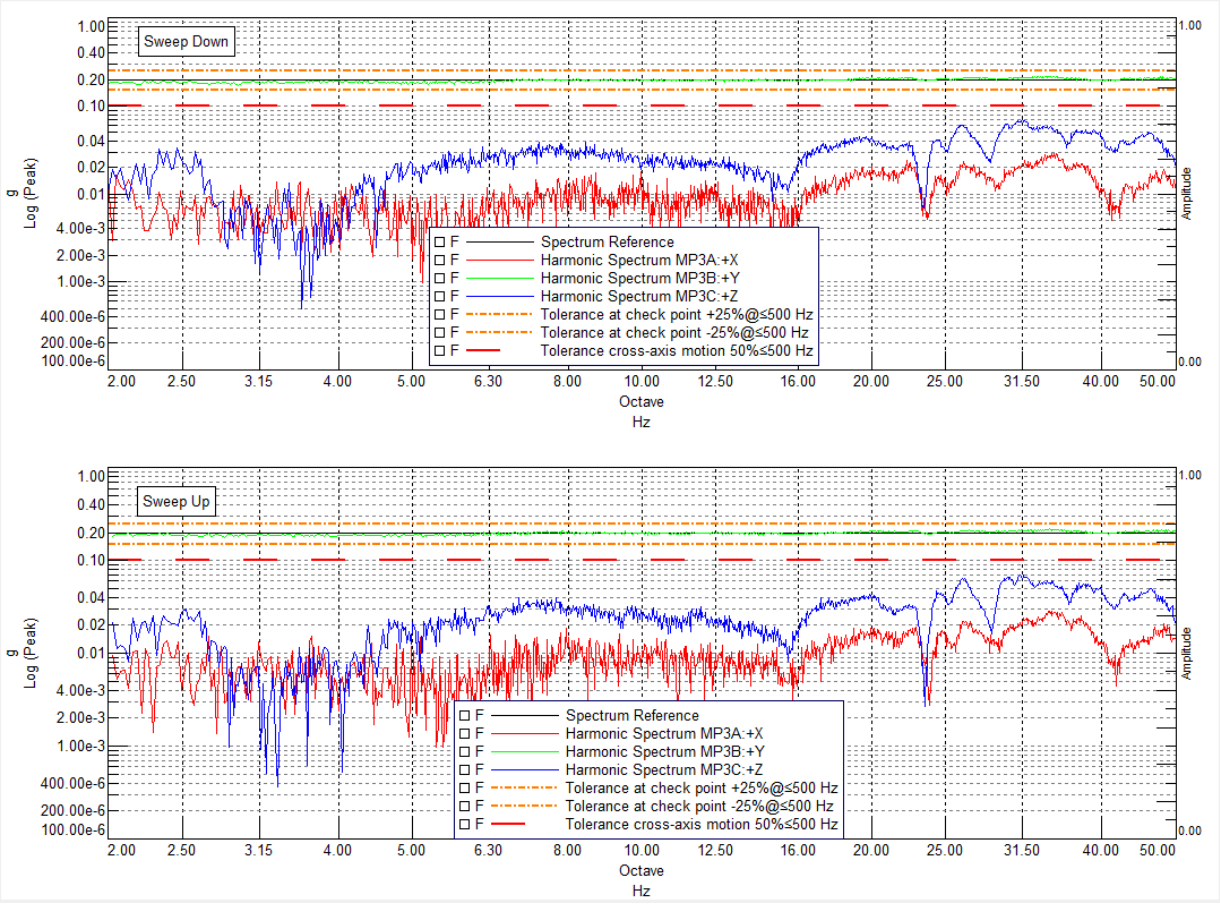


Figure 67 – Y Axis – RUN09, MP3: Diagram of final vibration response investigation - Tolerances - Sweep down and up

| End of test report |