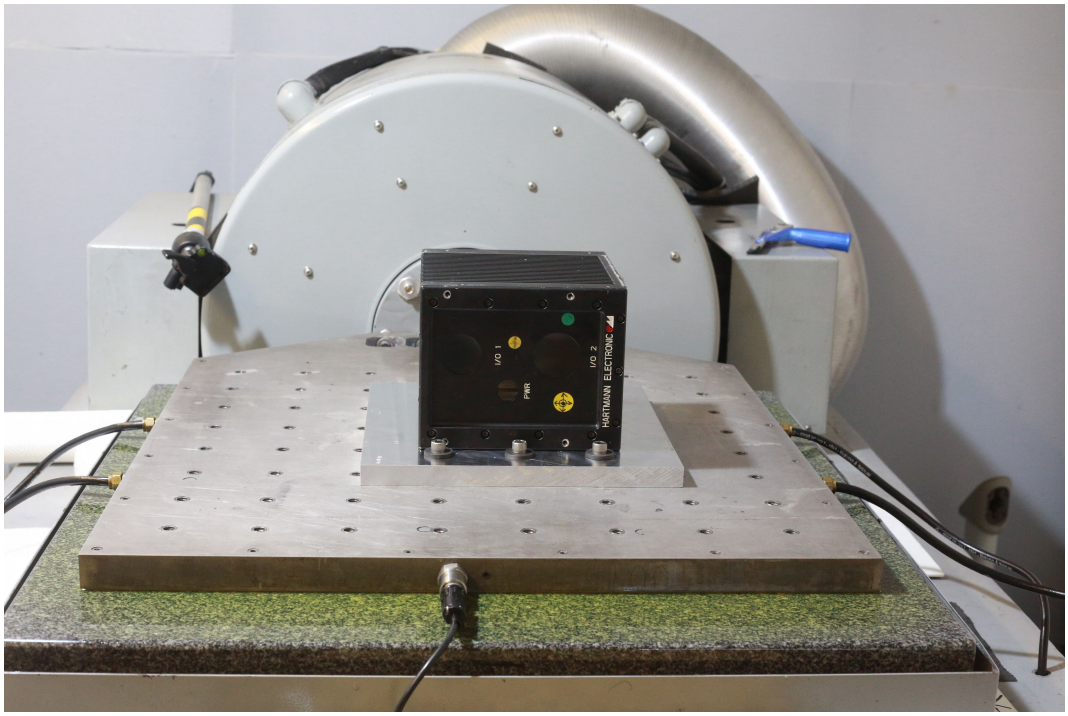
D575-0090D VPX Power Supply 3HE_600W



Mechanical Test report

Unit/s under test (UUT):	D575-0090D VPX Power Supply 3HE_600W
Serial number:	Prototype

Document number:	Hartmann Electronic-D575-0090D VPX-Test.en/Rev.0/07.2019
Date of issue:	2019-07-15

Customer:	Hartmann Electronic GmbH
Test Laboratory	hummel electronic
Summary of results	The visual inspection reveals no obvious defects, leaks or cracks, no missing pieces of equipment etc.

Revision Index

Revision	Date	Changes	Author
0	2019-07-15	First draft	AN

Table of Contents

List of Images

List of Diagrams

List of Tables

1 General information

1.1 Unit under test and type

The unit under test was a *D575-0090D VPX Power Supply 3HE_600W*. The UUT is a prototype without serial number.

1.1.1 Technical data Unit under test

Not available.

1.2 Original language

This test report was originally written in English.

1.3 Customer personnel

Surname and Title	First Name	Company
Mr. Mahjoub, Project Manager / Sales	Wajih	Hartmann Electronic GmbH

Table 1 Customer personnel

1.4 Test attendant

Surname and Title	First Name	Company
Mr. Hummel, Senior Test Engineer	Peter	hummel electronic, Fellbach
Dr. Nguemning	André	hummel electronic, Fellbach

Table 2 Test attendant

1.5 Author test report

Surname and Title	First Name	Company
Dr. Nguemning	André	hummel electronic, Fellbach

Table 3 Author Test report

1.6 Environmental conditions

- Temperature (average value): 24 °C
- Relative humidity (average value): 54 %
- Atmospheric Pressure (average value): 1012,8 hPa

1.7 Time Schedule

- Delivery of UUT: 2019-06-19
- Start of test: 2019-06-19
- End of test: 2019-07-03

1.8 Electronic signature

This document was signed electronically. The available signatures can be see in section *6.2 Electronic signature.*

2 Abbreviations

The following abbreviations are used in this test report:

Abbreviations	Signification
ASD	Acceleration Spectral Density
DIN	German Institute for Standardisation (DIN, Deutsches Institut für Normung)
EN	European Norm
EUT	Equipment Under Test
F_c	Critical frequencies
g	Acceleration due to gravity
PSD	Power Spectral Density
SD PUMA	Spectral Dynamic, Digital vibration control
SM	Shock Test Machine
ST	Slip Table
UDC	Unholtz Dickie Corporation
UUT	Unit Under Test
VCS	Vibration Control Systems

Table 4 Abbreviations

3 Test specifications and test program

3.1 Test specifications

- MIL-STD-810G, Method 516.6, Procedure I: Functional Shock: 40 g 11 ms, terminal peak saw tooth pulse, 2 shock/axis in both direction for all 3 axis, total of 12 hit/shock.
- MIL-STD-810E, Method 514.4, Procedure I, Category 8 Table 514.4-AXVI: Transportation Vibration: 270 mins/axis for 3 axis, (Equiment installed in wheeled vehicles, trailers, and tracked vehicles)

3.2 Test program

3.2.1 Vibration

equipment on the sponsons of the M113 armored personnel carrier.

Test duration per axis: 270 minutes per 6000 miles

Test Phase	5-500 Hz Floor Level (g²/Hz)	No. Sweeps	Narrowband 1 Bw (Hz)	Narrowband 1 Ampl (g²/Hz)	Narrowband 1 Sweep BW (Hz)	Narrowband 2 BW (Hz)	Narrowband 2 Ampl (g²/Hz)	Narrowband 2 Sweep BW (Hz)	Narrowband 3 BW (Hz)	Narrowband 3 Ampl (g²/Hz)	Narrowband 3 Sweep BW (Hz)	Narrowband 4 BW (Hz)	Narrowband 4 Ampl (g²/Hz)	Narrowband 4 Sweep BW (Hz)	Narrowband 5 BW (Hz)	Narrowband 5 Ampl (g²/Hz)	Narrowband 5 Sweep BW (Hz)
VERTICAL AXIS (45 minutes per test phase)																	
VO1	0.0056	4	24-30	0.1523	3	48-60	0.0844	6	72-90	0.1025	9	96-120	0.0226	12	120-150	0.0123	15
VO2	0.0120	4	36-42	0.3098	3	72-80	0.5120	6	108-126	0.0938	9	144-168	0.0736	12	180-210	0.0908	15
VO3	0.0132	2	48-60	2.9623	6	96-120	0.2508	12	144-180	0.1737	18	192-240	0.1615	24	240-300	0.1143	30
VO4	0.0110	2	67-68	2.4820	6	132-156	0.1573	12	198-234	0.1719	18	264-312	0.0613	24	330-390	0.0549	30
VO5	0.0180	2	84-102	2.4861	9	168-204	0.5375	18	252-306	0.3000	27	336-408	0.1212	36	420-500	0.1134	45
VO6	0.0208	3	108-120	6.7305	6	216-240	1.1798	12	324-360	0.6259	18	432-480	0.2177	24	-------	------	--
TRANSVERSE AXIS (45 minutes per test phase)																	
TO1	0.0075	4	24-30	0.0238	3	48-60	0.1397	6	72-90	0.2698	9	96-120	0.0601	12	120-150	0.0358	15
TO2	0.0149	4	36-42	0.2406	3	72-84	1.2746	6	108-126	1.0559	9	144-168	0.2446	12	180-210	0.1039	15
TO3	0.0152	2	48-60	4.2320	6	96-120	1.0347	12	144-180	0.4844	18	192-240	0.1891	24	240-300	0.1900	30
TO4	0.0124	4	66-72	2.9725	3	132-144	0.3121	6	198-216	0.1896	9	264-288	0.0858	12	330-360	0.0498	15
TO5	0.0098	2	84-102	10.4347	9	168-204	0.3376	18	252-306	0.4768	27	336-408	0.0833	36	420-500	0.0386	45
TO6	0.0234	3	108-120	18.7124	6	216-240	0.6378	12	324-360	0.6412	18	432-480	0.1028	24	-------	------	--
LONGITUDINAL AXIS (45 minutes per test phase)																	
LO1	0.0010	4	24-30	0.0568	3	48-60	0.0174	6	72-90	0.0098	9	96-120	0.0016	12	120-150	0.0030	15
LO2	0.0020	4	36-42	0.1525	3	72-084	0.0643	6	108-126	0.0064	9	144-168	0.0149	12	180-210	0.0039	15
LO3	0.0041	2	48-60	0.1122	6	96-120	0.0289	12	144-180	0.0765	18	192-240	0.0176	24	240-300	0.0109	30
LO4	0.0041	2	66-78	0.1661	6	132-156	0.0118	12	198-234	0.0129	18	264-312	0.0074	24	330-390	0.0057	30
LO5	0.0073	2	84-102	0.5564	9	168-204	0.0788	18	252-306	0.0344	27	336-408	0.0127	36	420-500	0.0063	45
LO6	0.0074	3	108-120	0.5482	6	216-240	0.0316	12	324-360	0.0316	18	432-480	0.0086	24	-------	------	--

METHOD 514.4

Image 3.1: Test program vertical, transverse and longitudinal axis

- UUT: Not operating
- Frequency range: 5 Hz – 500 Hz
- Amplitude in g^2/Hz: See *Image 3.1: Test program vertical, transverse and longitudinal axis*
- Test duration: 270 minutes per axis
- Number of axes: 3

3.2.2 Shock

- UUT: In operation
- Test under half load: 12 V / 9 A; 5 V / 9 A; 3.3 V / 9 A
- Acceleration: 40 g
- Pulse width: 11 ms
- Shock form: Saw tooth
- Number of shocks: 4 per axis (Total: 12 Shocks)
- Orientations of Shocks: X_+, X_-, Y_+, Y_-, Z_+, Z_-

4 Test equipment used

Equipment	Type	Serial number	Manufacturer
Accelerator	627A01 (sensitivity: 105 mV/g)	18457	IMI
Shaker	T208	286	Unholtz Dickie
Oscilloscope	UTD2052 CEL	2100006799	UNI-T
Shaker	T102	286	UNHOLTZ-DICKIE
Shaker	4818	1412721/1308243	Brüel & Kjaer
Power Amplifier	2707	1716026	Brüel & Kjaer
Generator	114	96187	WAVETEK

Table 5 Test equipment used

Notice: The measuring equipment is calibrated regularly according to the calibration instructions of the manufacturer. All calibrations are traced back to national and international standards. hummel electronic periodically checked the measurement accuracy and reliability of the devices, depending on usage and the environment.

5 Test realization

The mechanical tests were carried out according to the test program specified in section *3.2 Test program*.

5.1 Visual inspection

Before and after each single test, the UUT was examined visually for mechanical damages and any other alterations.

5.2 Failure criteria

- Mechanical or functional damages or any other alterations.

5.3 Fastening of the UUT during tests

The UUT was mounted to an aluminum fixture. The fixture with the UUT was directly mounted in the respective axis in the vibration table, see picture in section *7.1 Photo documentation*.

6 Test results

The UUT was subject to the tests listed in detail in Chapter *3 Test specifications and test program* of this report. The test results refer exclusively to the UUT described in section *1.1 Unit under test and type* and the test period in section *1.7 Time Schedule*.

6.1 Measurement results

The visual inspection reveals no obvious, defects, leaks or cracks, no missing pieces of equipment etc. The further evaluation will be done by the customer.

6.2 Electronic signature

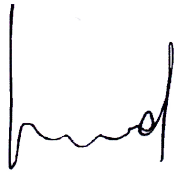
Date: 2019-07-15	**Signature**: Hummel, Peter (Senior Test Engineer) 

Table 6 Electronic signature Senior Test Engineer

Date: 2019-07-15	 **Signature**: Dr. Nguemning, André (Technical Writer)

Table 7 Electronic signature Technical Writer

7 Photo and diagram documentation

Images and diagram are shown below.

7.1 Photo documentation

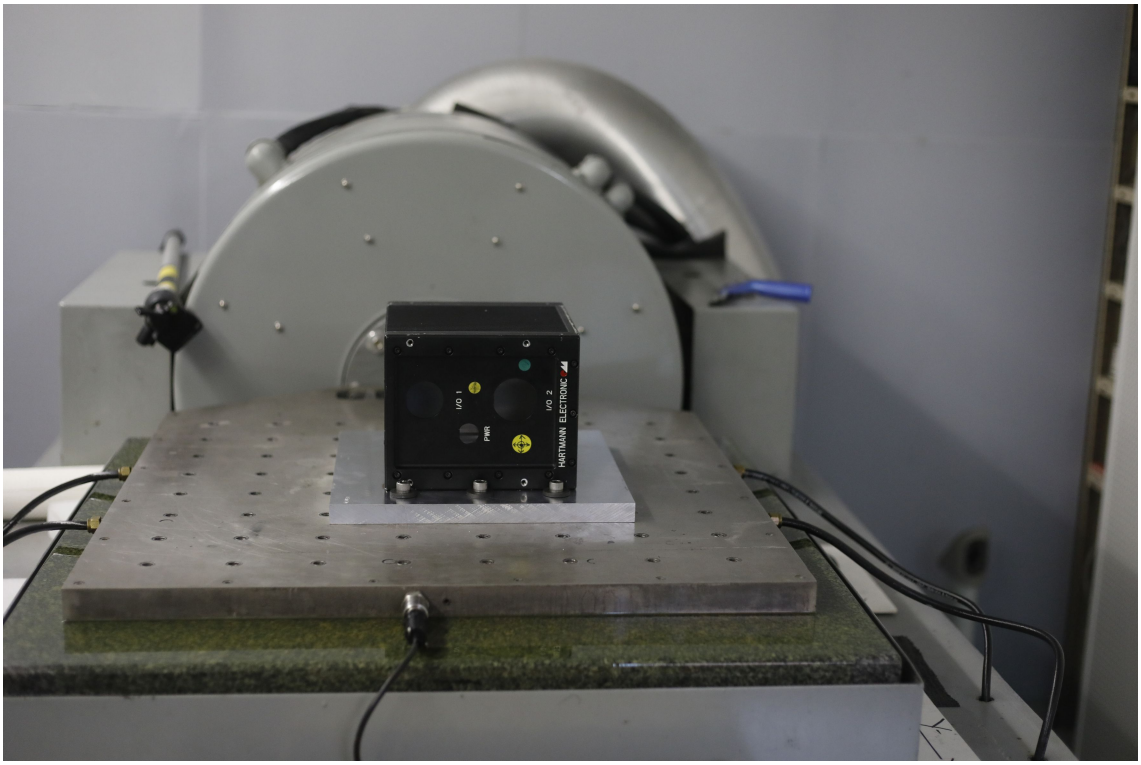


Image 7.1: UUT during vibration test in Z-axis

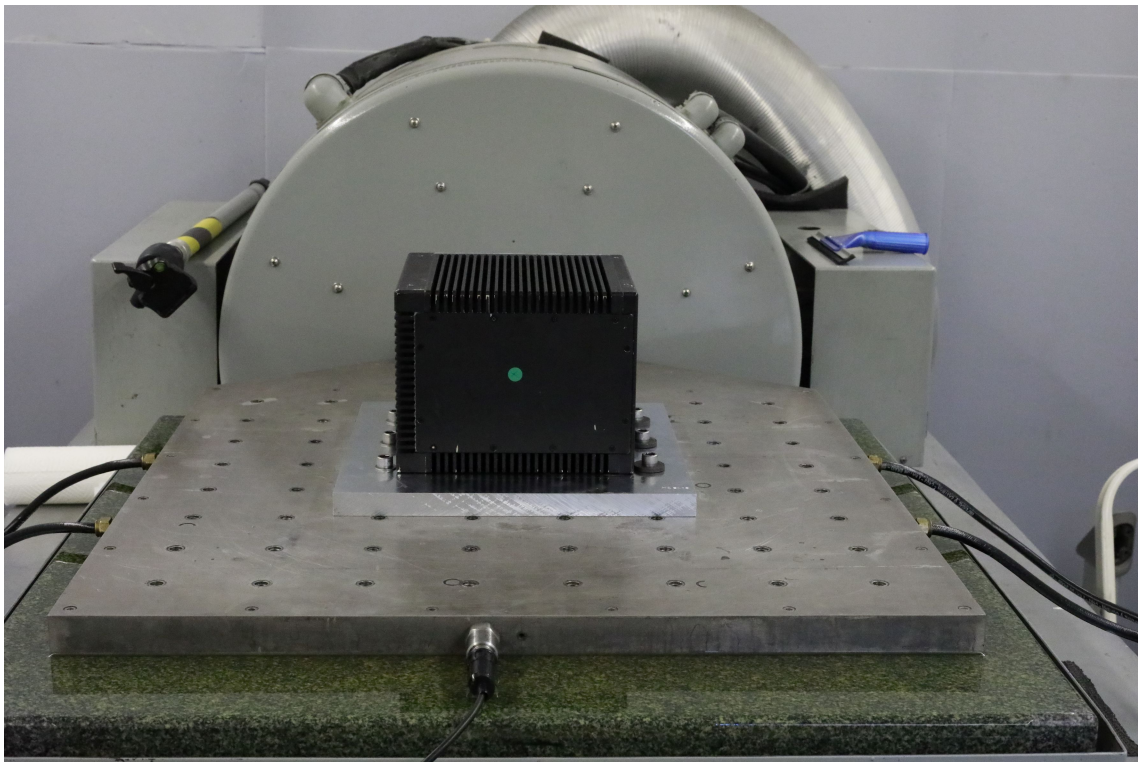


Image 7.2: UUT during vibration test in X-axis

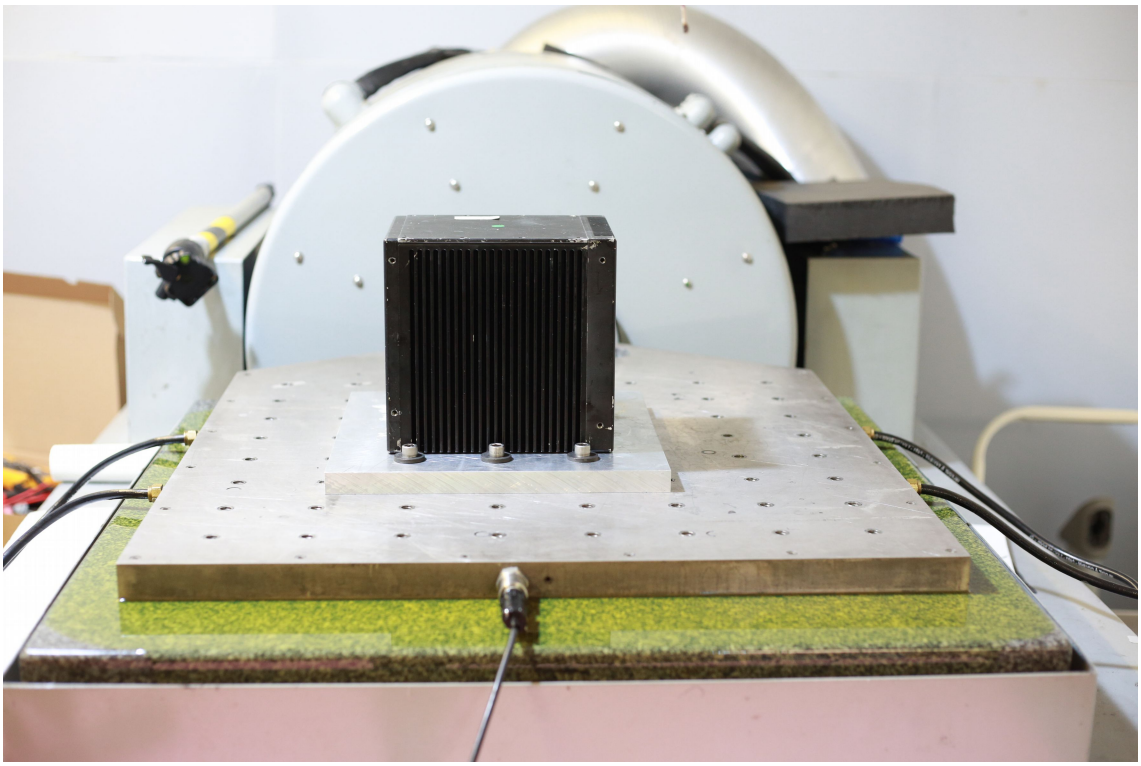


Image 7.3: UUT during vibration test in Y-axis

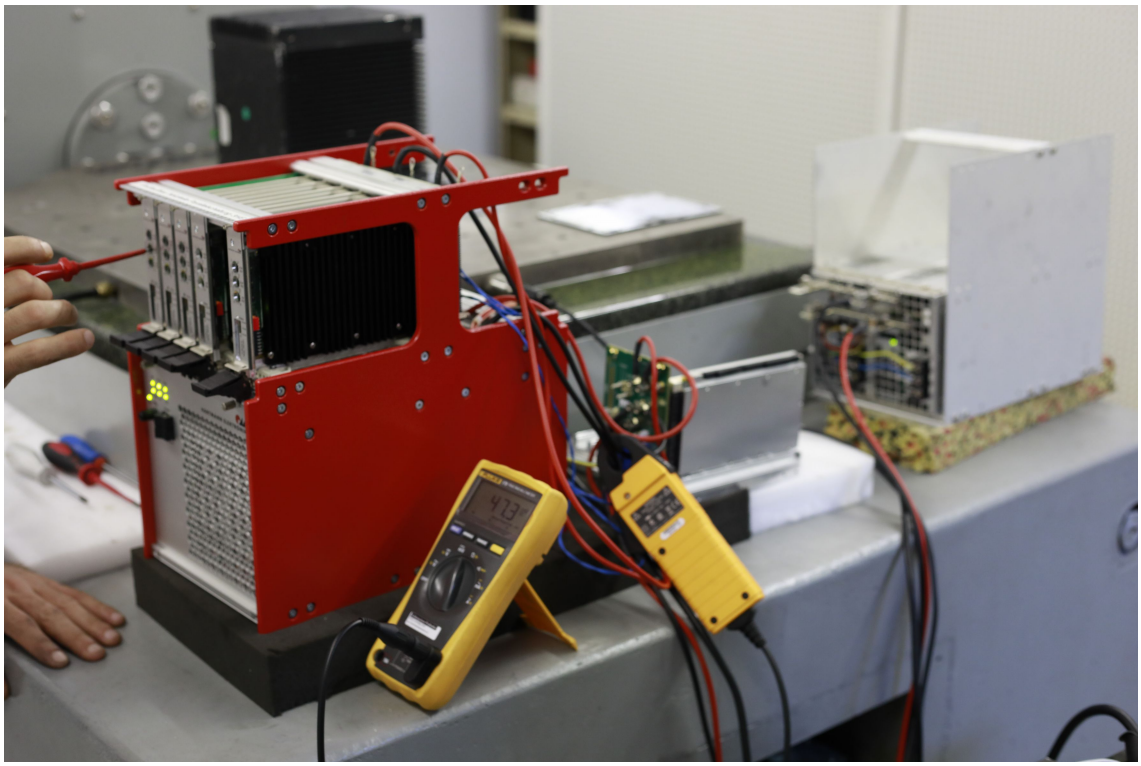


Image 7.4: Functional test after vibration test

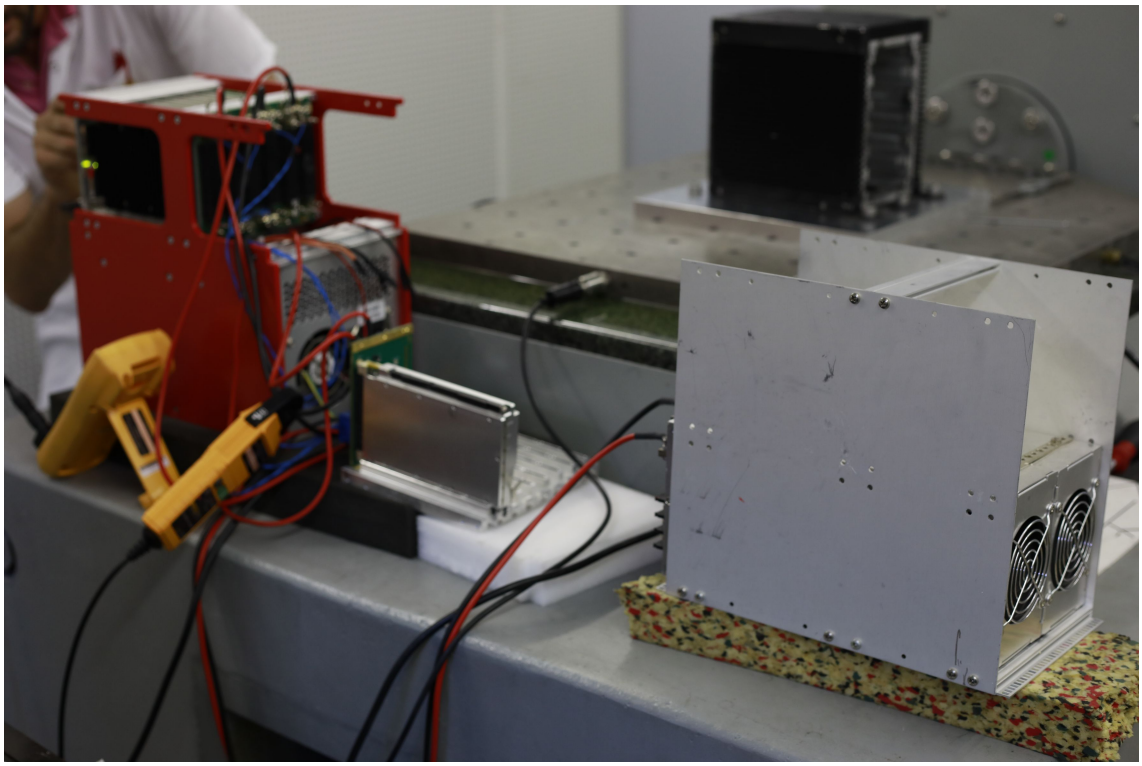


Image 7.5: Functional test after vibration test

Image 7.6: Functional test after vibration test

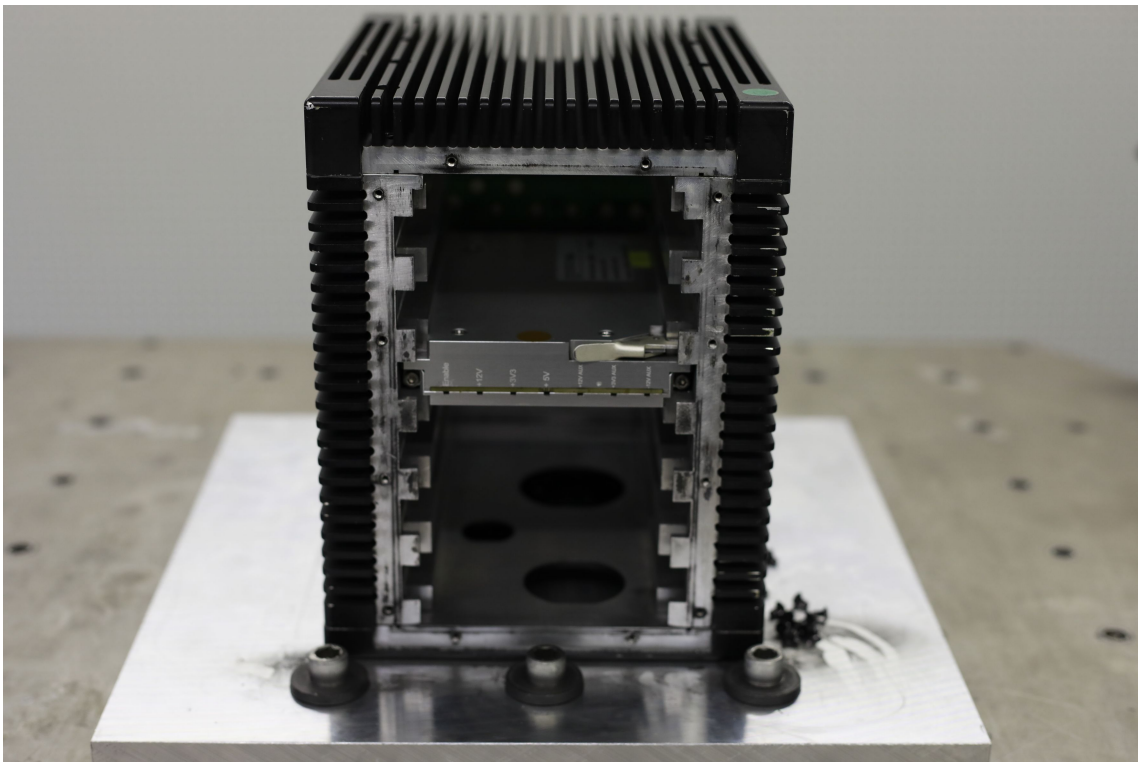


Image 7.7: Functional test after vibration test

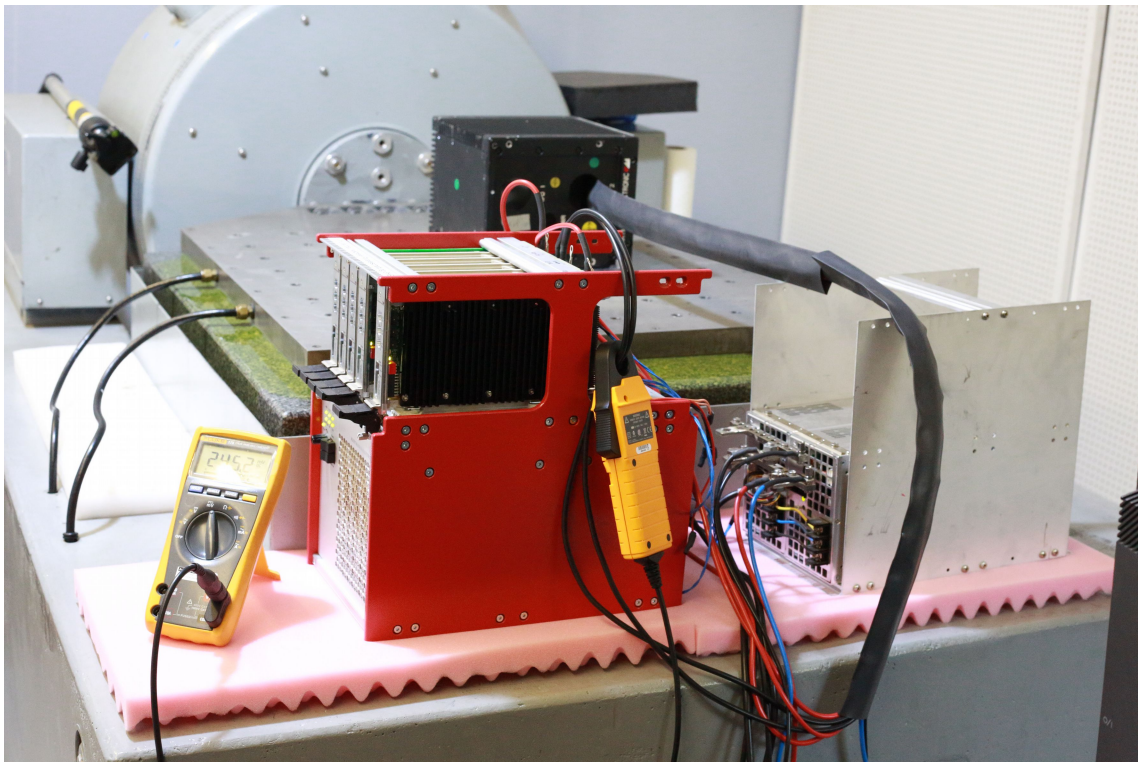


Image 7.8: UUT during shock test in Z-axis

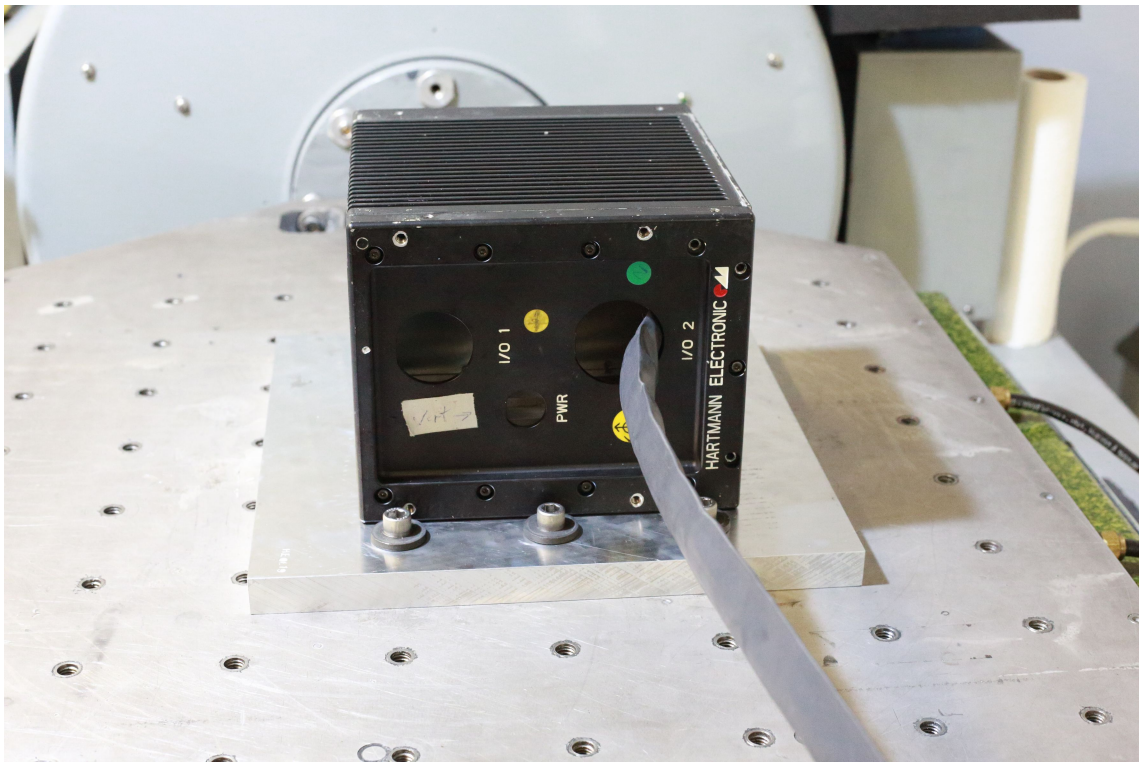


Image 7.9: UUT during shock test in Z-axis

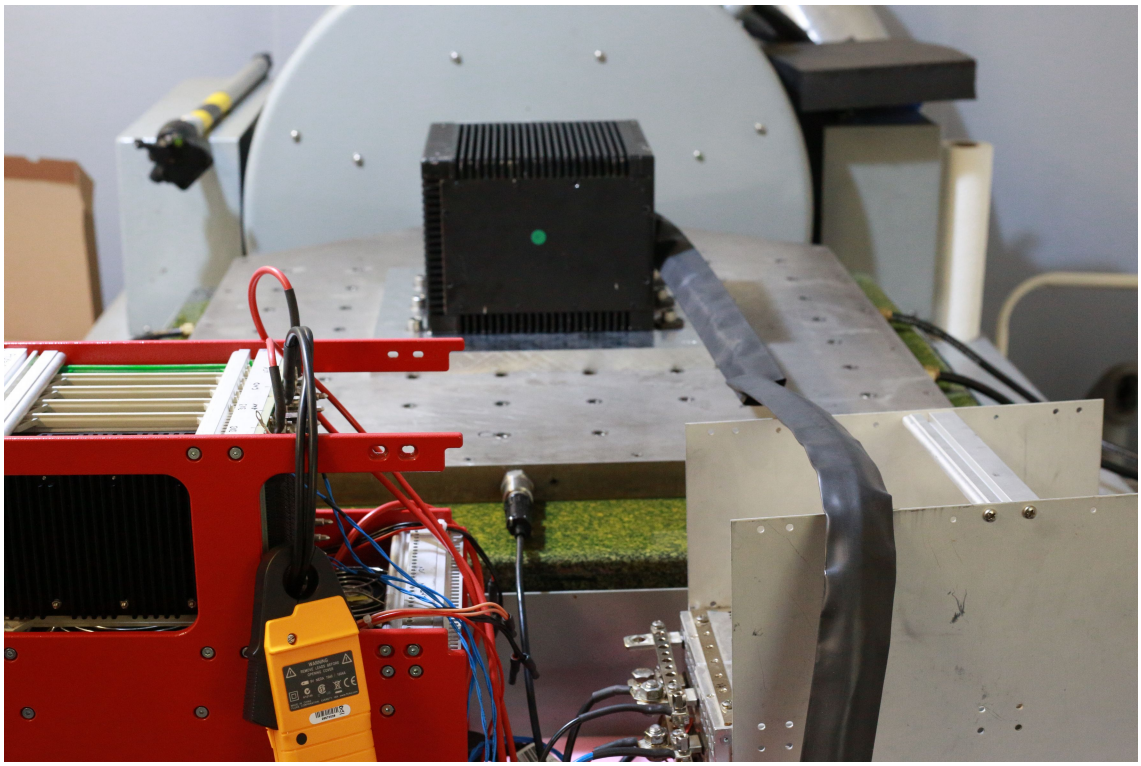


Image 7.10: UUT during shock test in X-axis

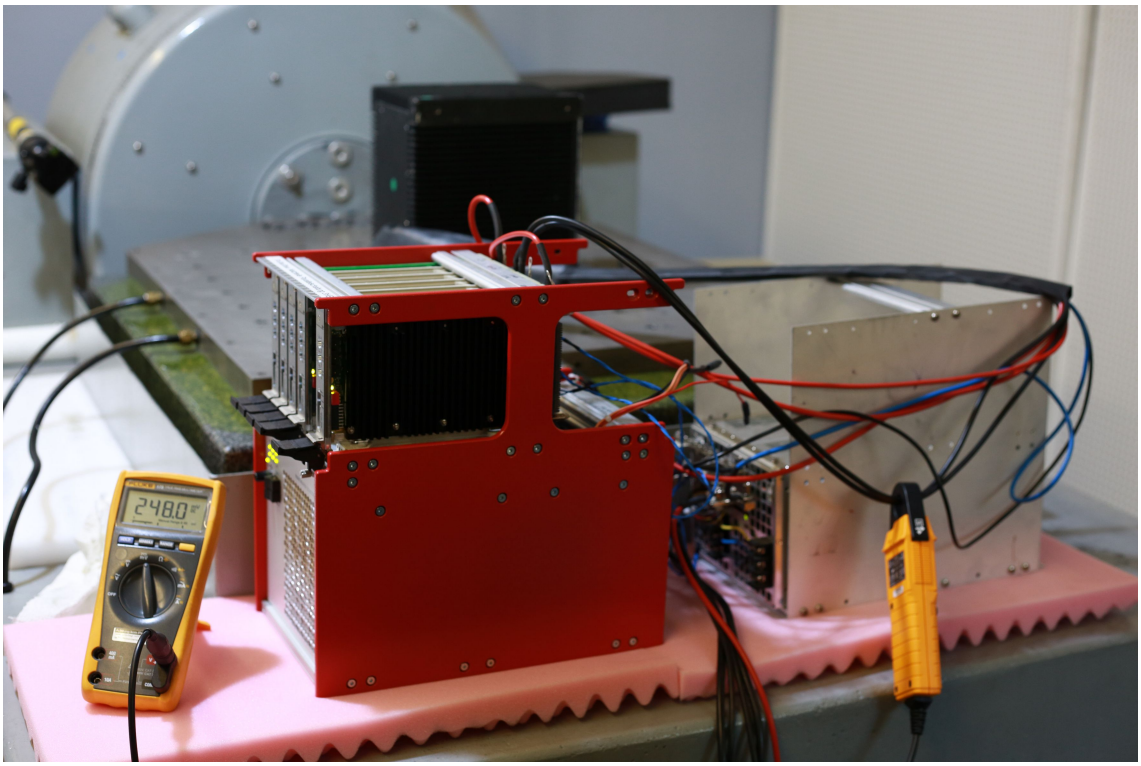


Image 7.11: UUT during shock test in Y-axis

7.2 Transportation Vibration test

- MIL-STD-810E, Method 514.4, Procedure I, Category 8 Table 514.4-AXVI: Transportation Vibration: 270 mins/axis for 3 axis, (Equiment installed in wheeled vehicles, trailers, and tracked vehicles).
- UUT: Not operating
- Frequency range: 5 Hz – 500 Hz
- Amplitude in g^2/Hz: See *Image 3.1: Test program vertical, transverse and longitudinal axis*
- Test duration: 270 minutes per axis
- Number of axes: 3

7.2.1 Verticale

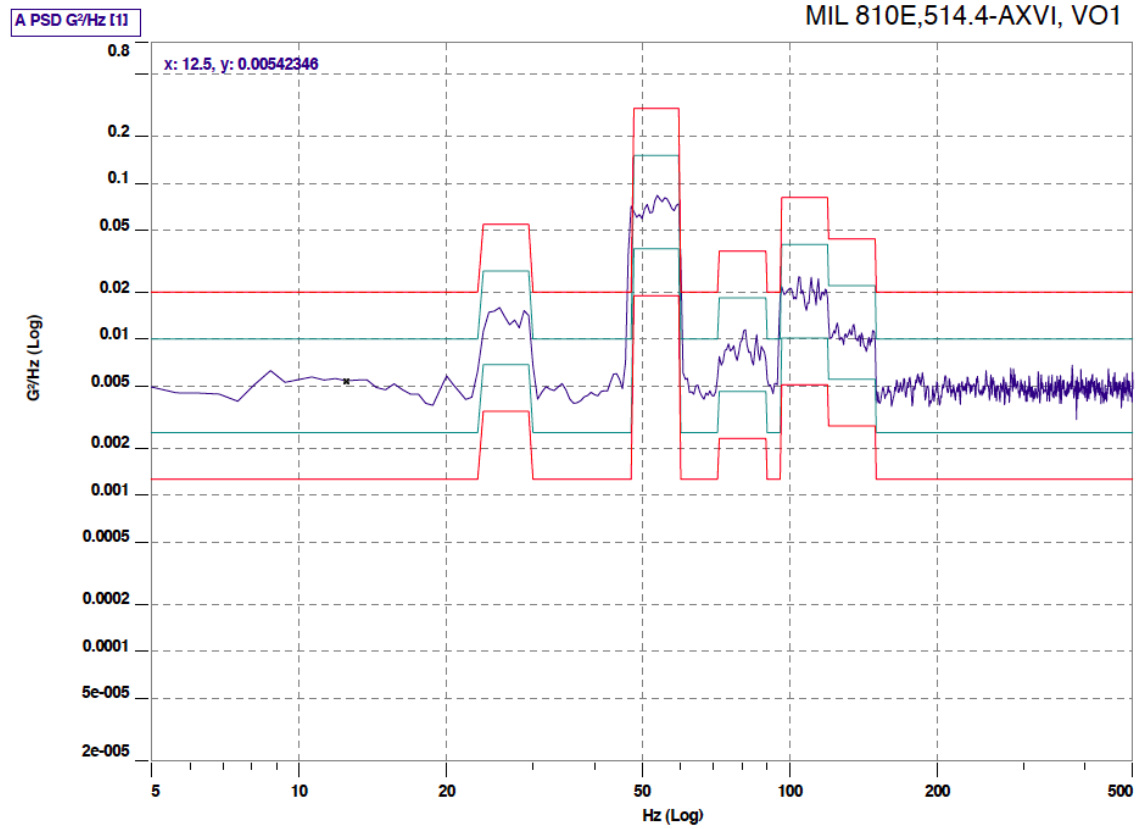


Diagram 1: MIL-STD-810E, Method 514.4 Procedure I, Category 8 Table 514.4-AXVI, VO1

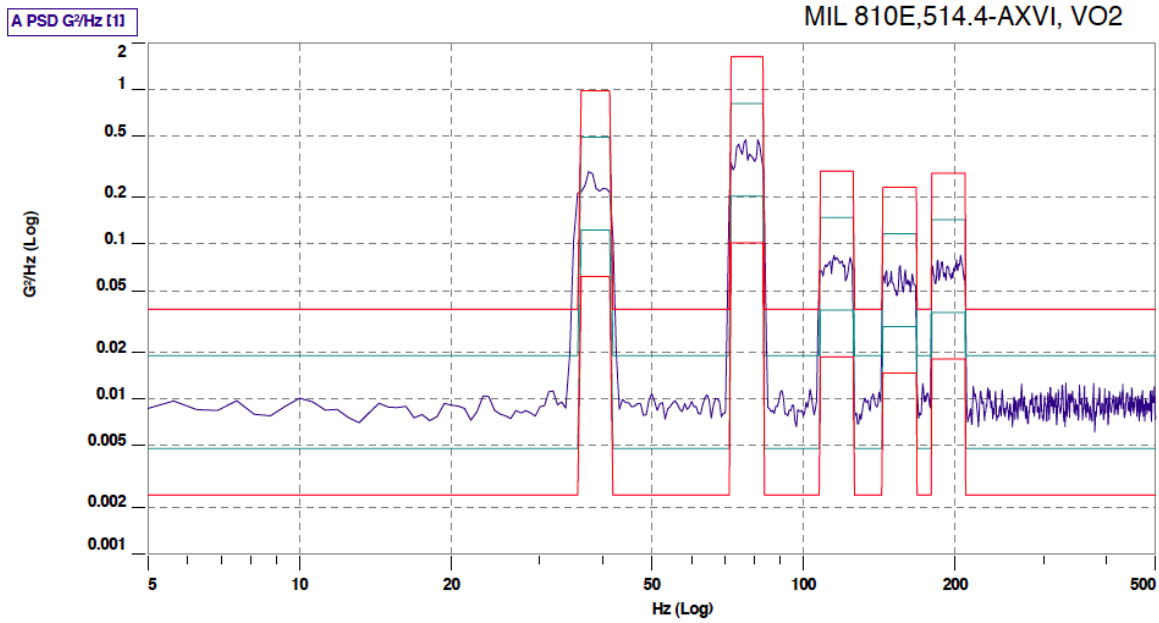


Diagram 2: MIL-STD-810E, Method 514.4 Procedure I, Category 8 Table 514.4-AXVI, VO2

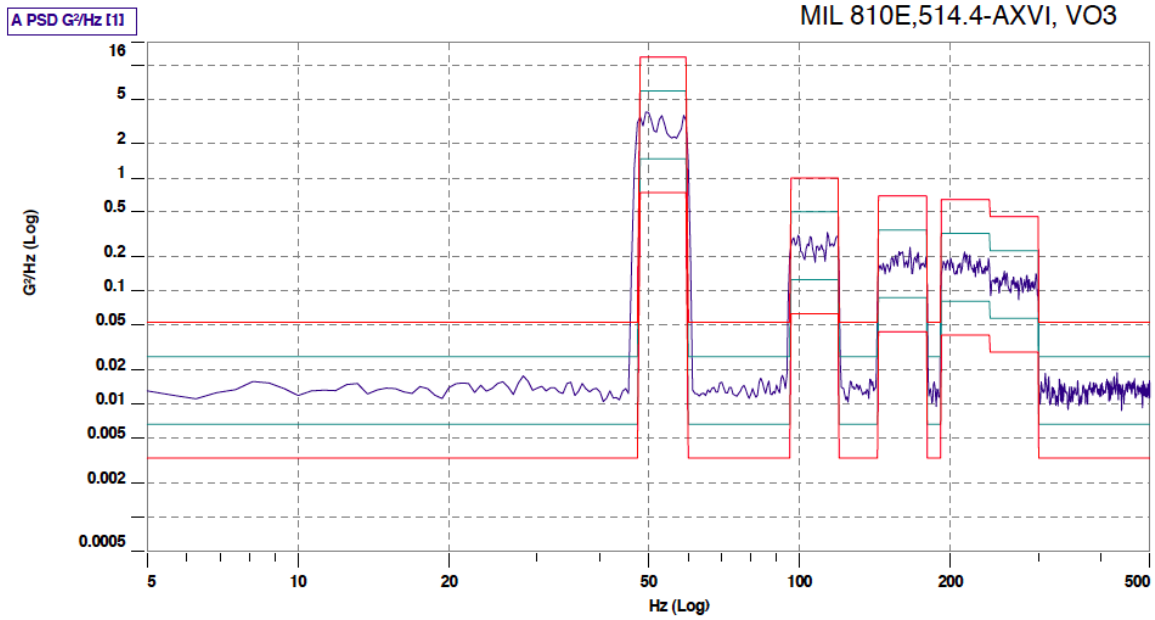


Diagram 3: MIL-STD-810E, Method 514.4 Procedure I, Category 8 Table 514.4-AXVI, VO3

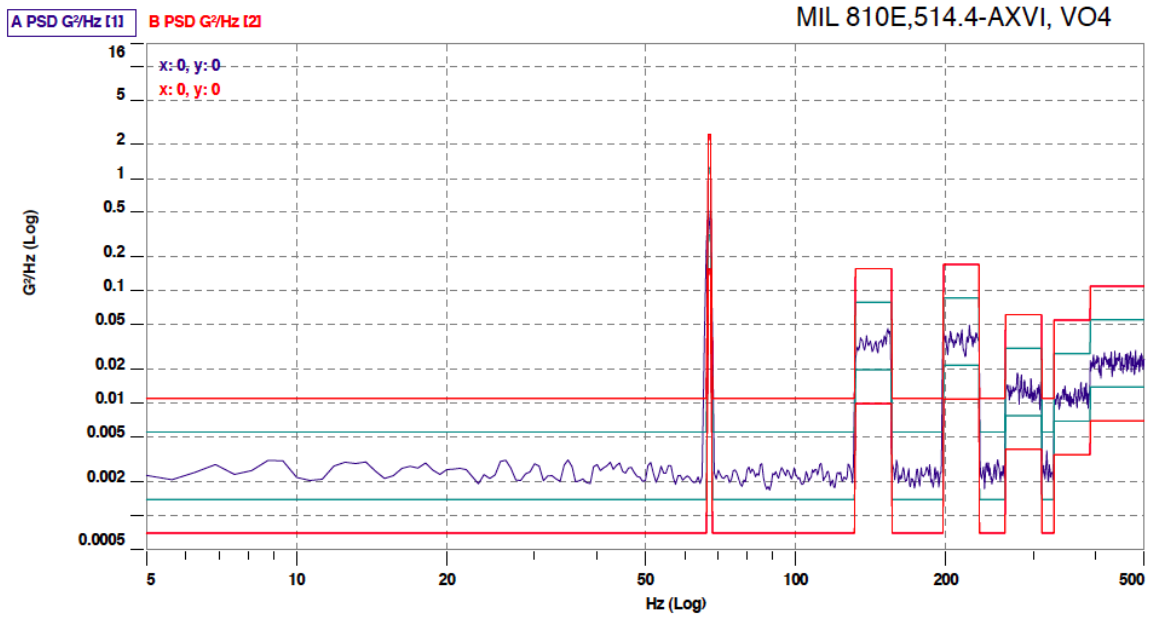


Diagram 4: MIL-STD-810E, Method 514.4 Procedure I, Category 8 Table 514.4-AXVI, VO4

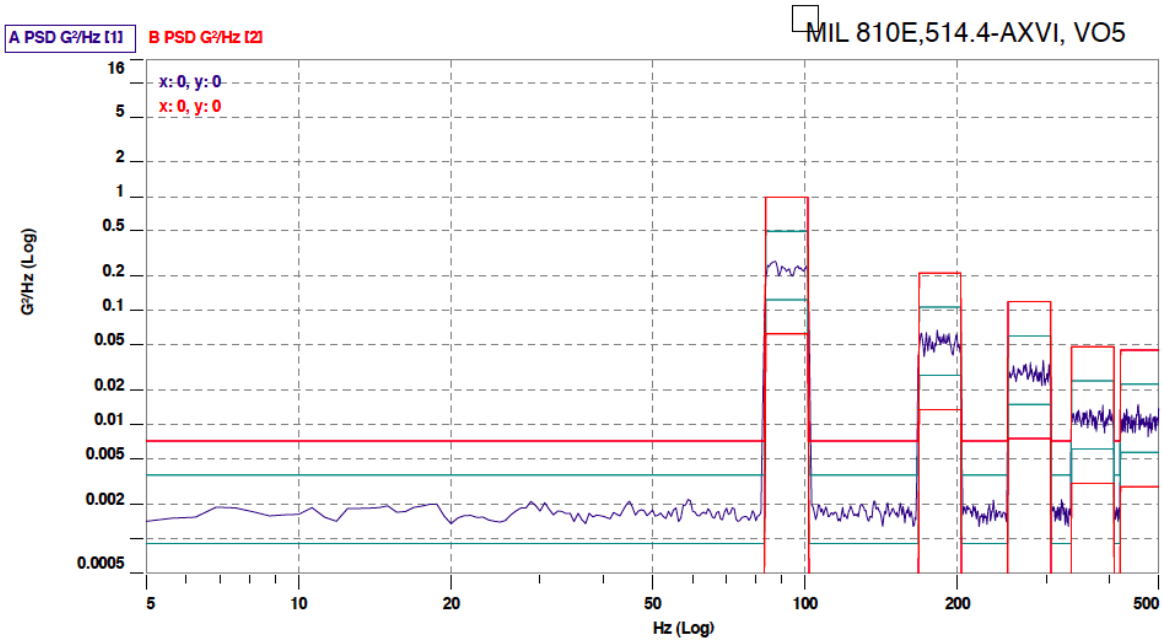


Diagram 5: MIL-STD-810E, Method 514.4 Procedure I, Category 8 Table 514.4-AXVI, VO5

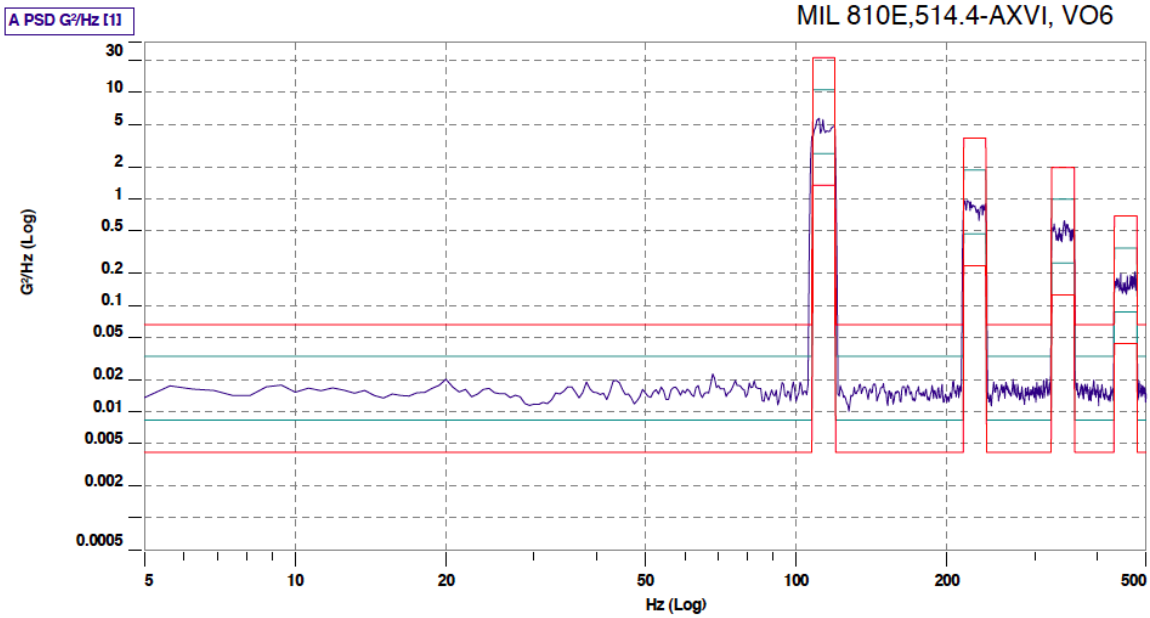


Diagram 6: MIL-STD-810E, Method 514.4 Procedure I, Category 8 Table 514.4-AXVI, VO6

7.2.2 Transverse

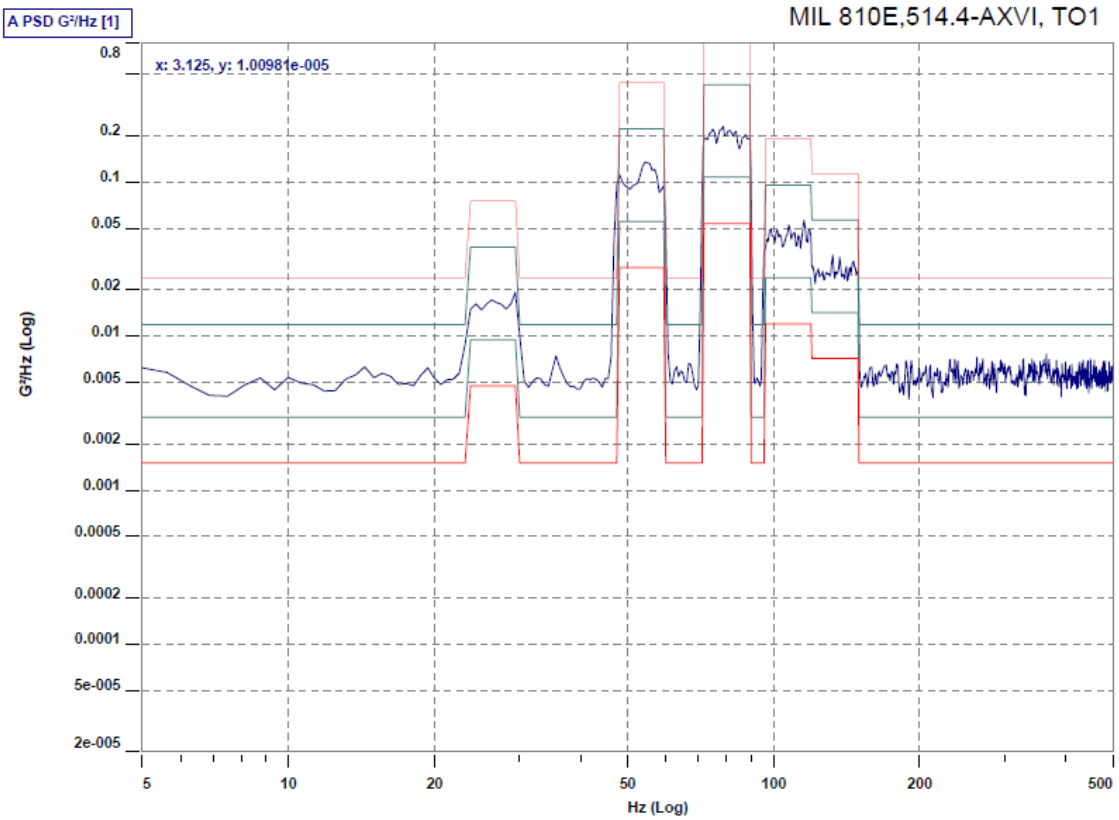


Diagram 7: MIL-STD-810E, Method 514.4 Procedure I, Category 8 Table 514.4-AXVI, TO1

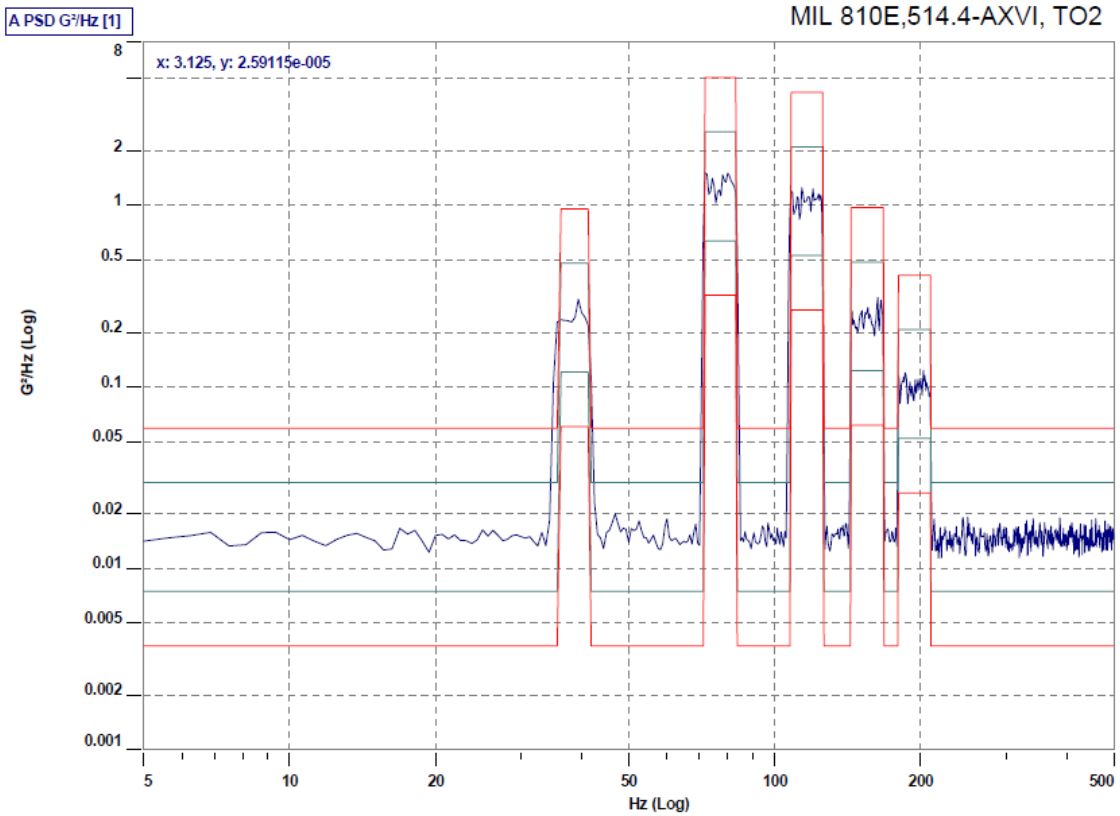


Diagram 8: MIL-STD-810E, Method 514.4 Procedure I, Category 8 Table 514.4-AXVI, TO2

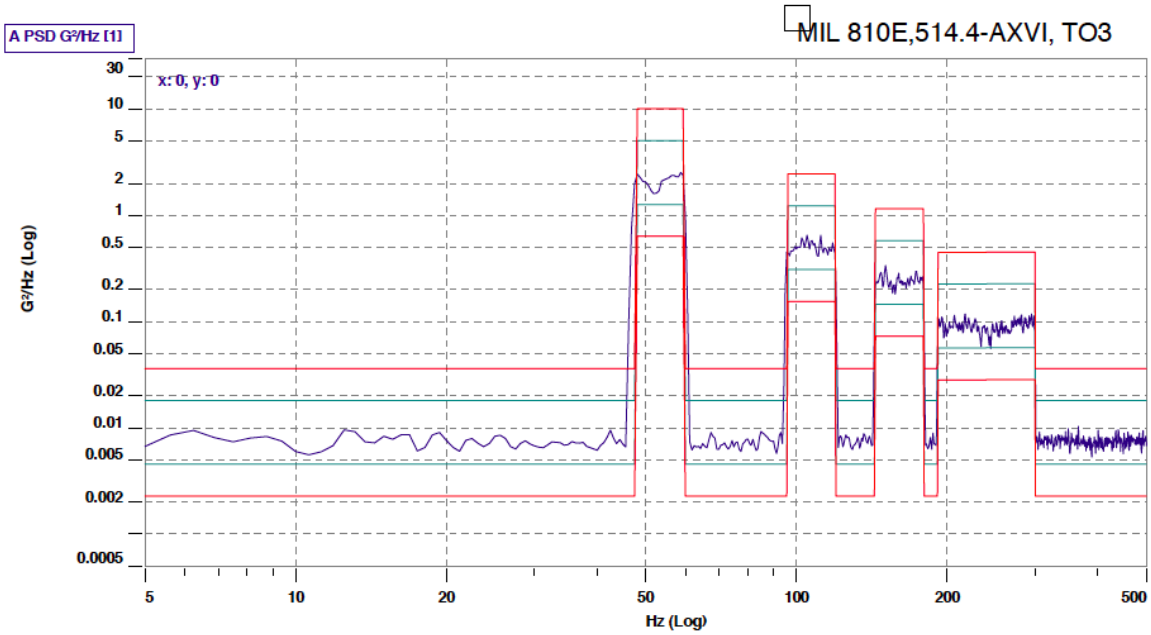


Diagram 9: MIL-STD-810E, Method 514.4 Procedure I, Category 8 Table 514.4-AXVI, TO3

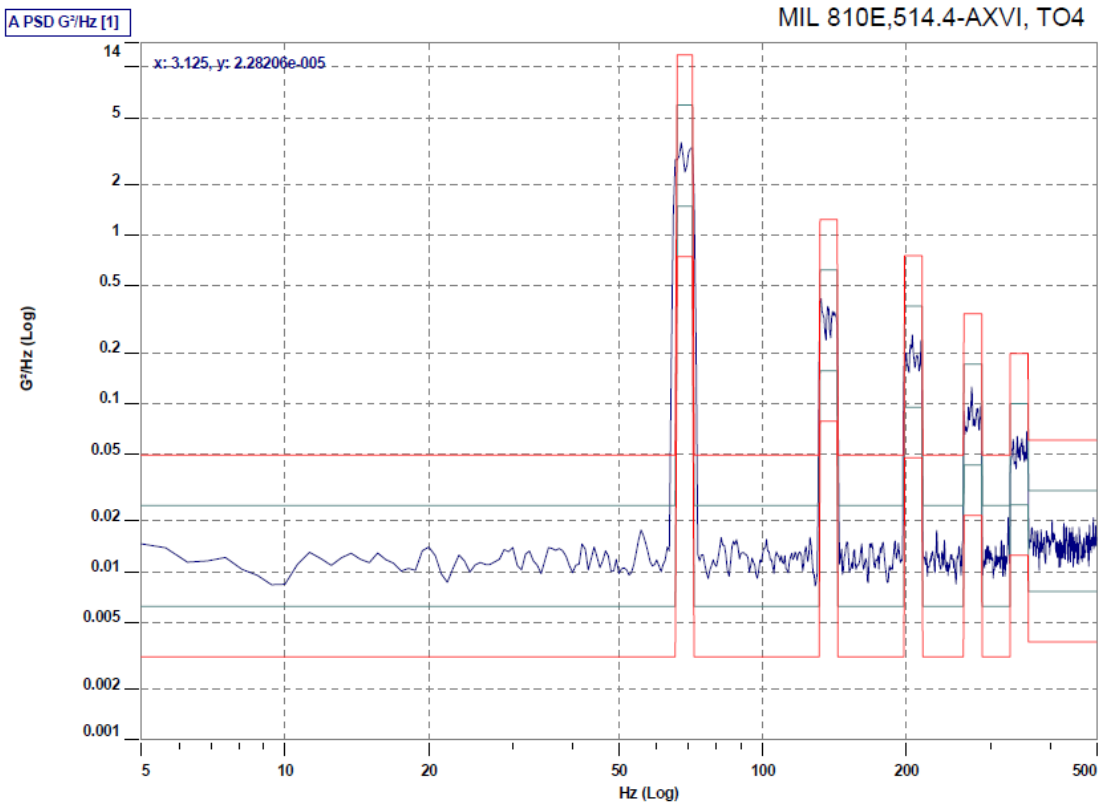


Diagram 10: MIL-STD-810E, Method 514.4 Procedure I, Category 8 Table 514.4-AXVI, TO4

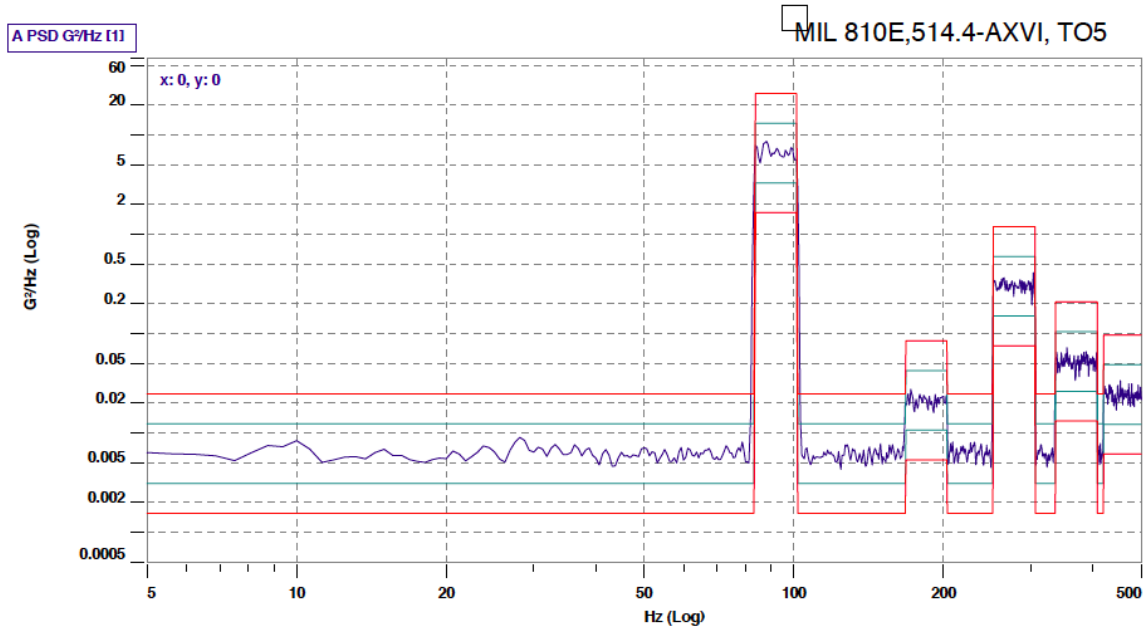


Diagram 11: MIL-STD-810E, Method 514.4 Procedure I, Category 8 Table 514.4-AXVI, TO5

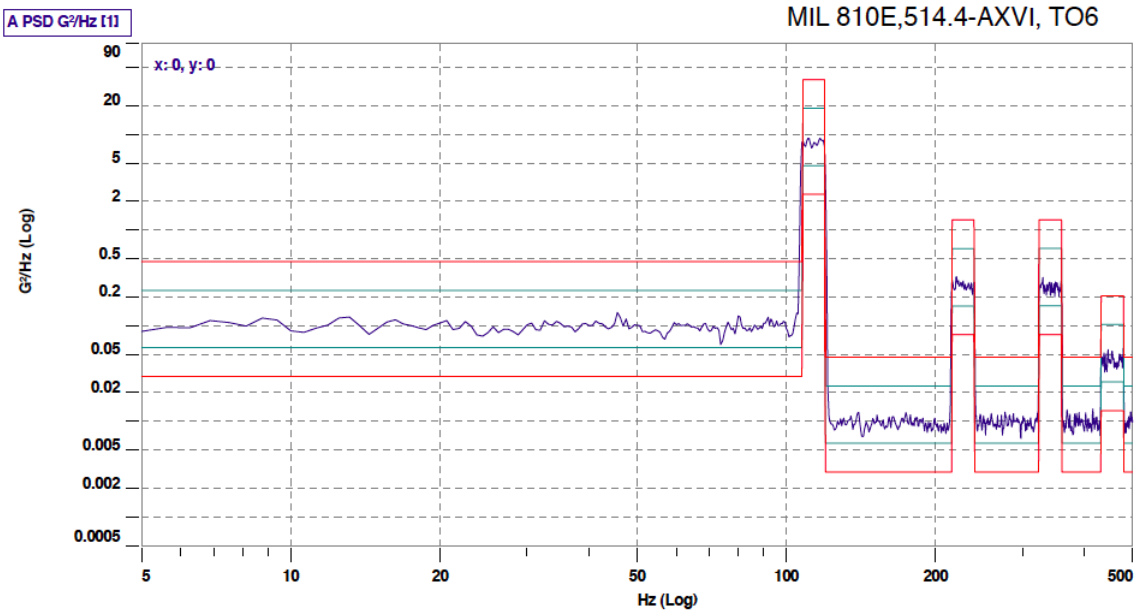


Diagram 12: MIL-STD-810E, Method 514.4 Procedure I, Category 8 Table 514.4-AXVI, TO6

7.2.3 Longitudinale

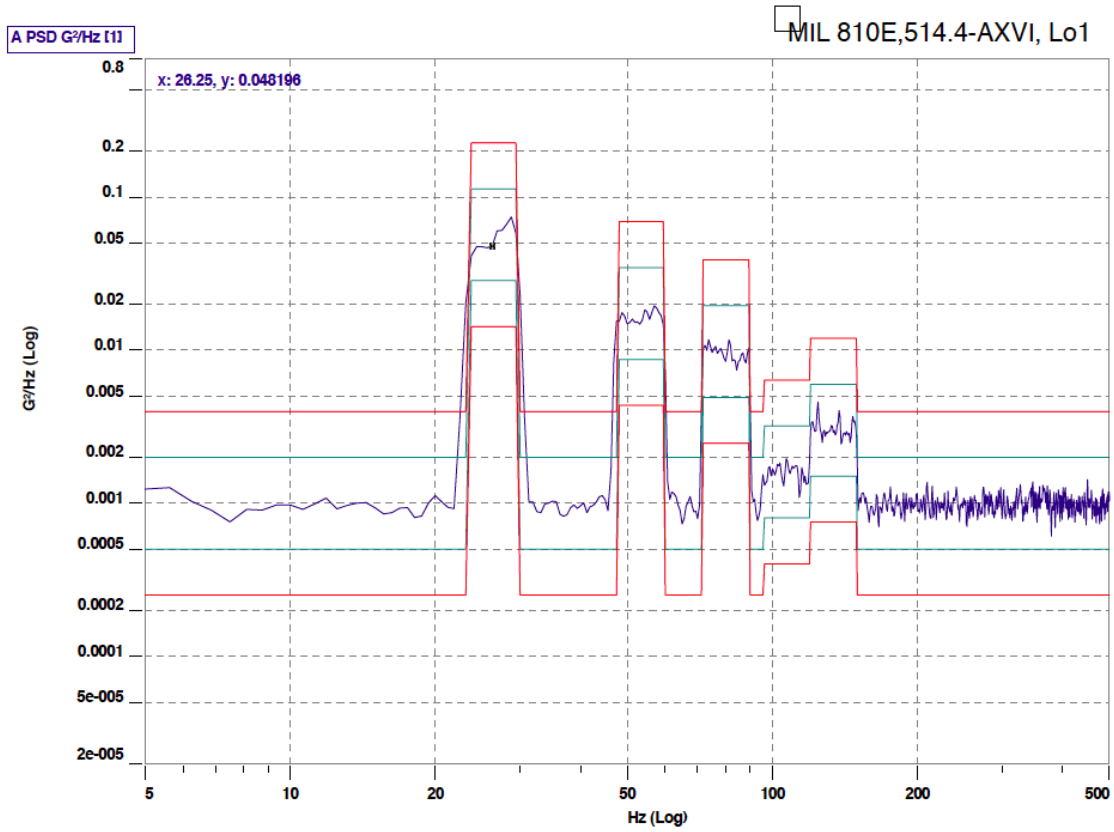


Diagram 13: MIL-STD-810E, Method 514.4 Procedure I, Category 8 Table 514.4-AXVI, LO1

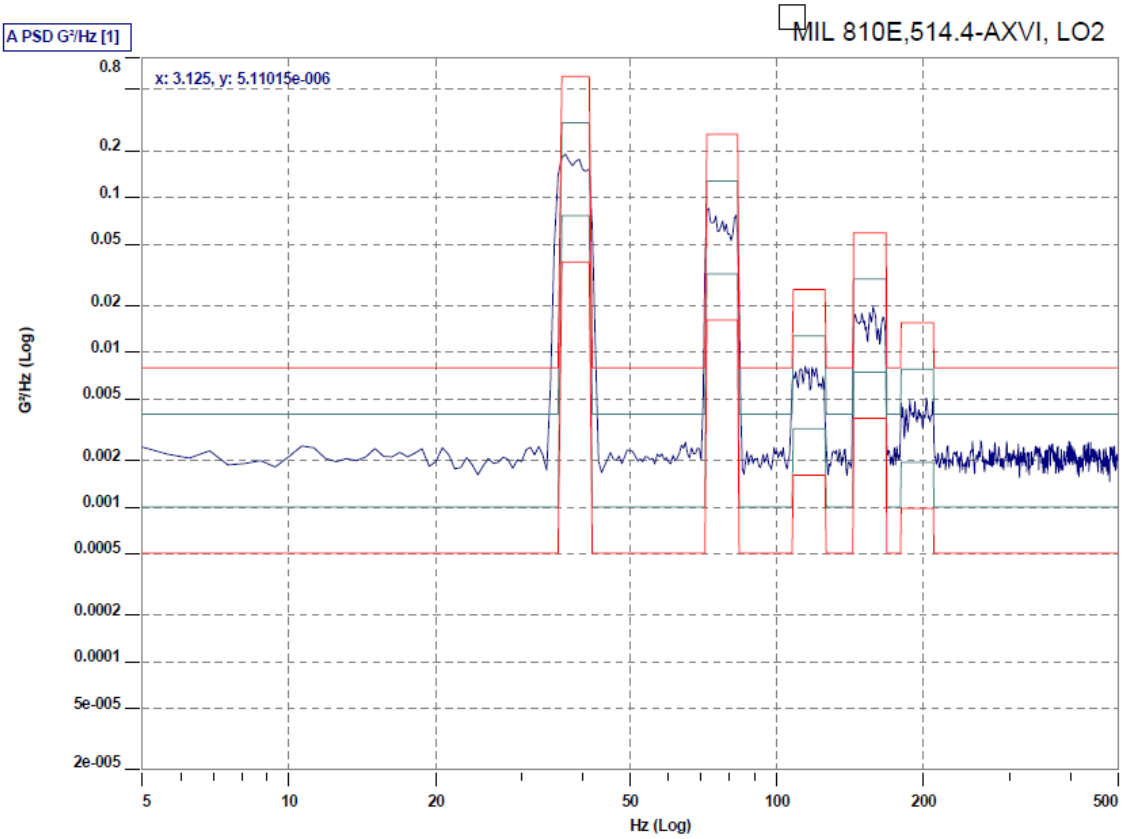


Diagram 14: MIL-STD-810E, Method 514.4 Procedure I, Category 8 Table 514.4-AXVI, LO2

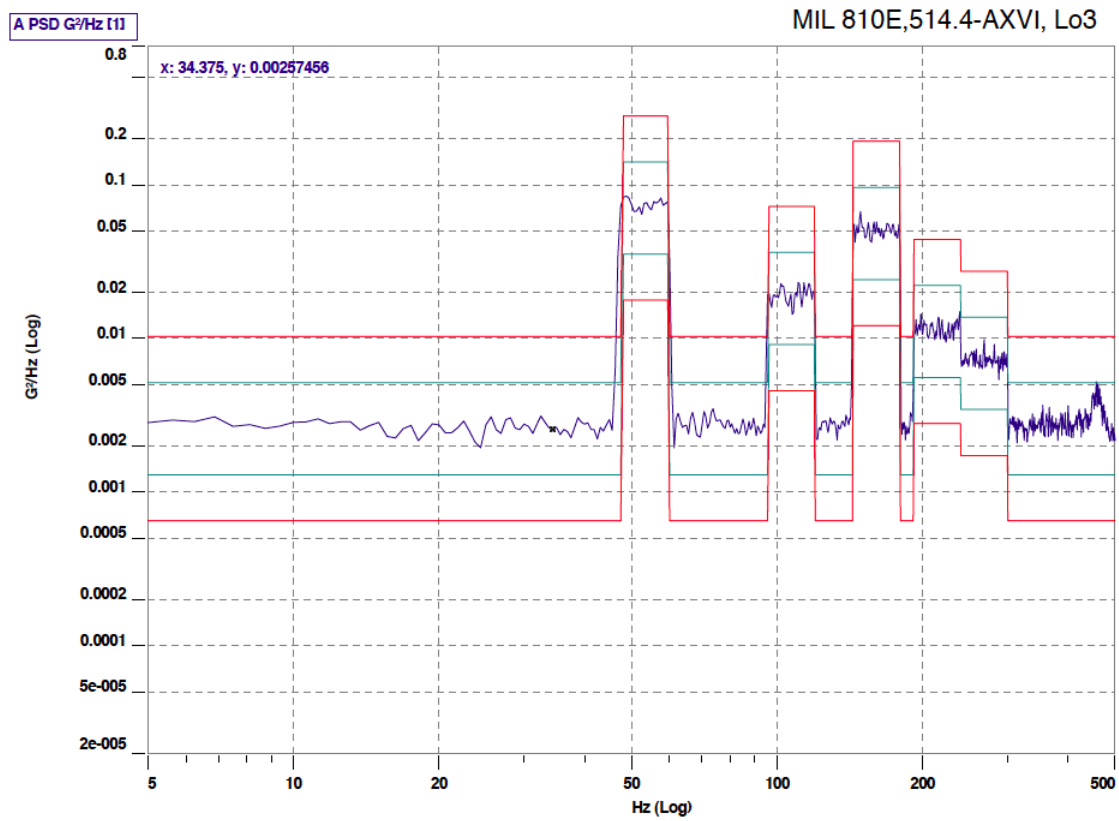


Diagram 15: MIL-STD-810E, Method 514.4 Procedure I, Category 8 Table 514.4-AXVI, LO3

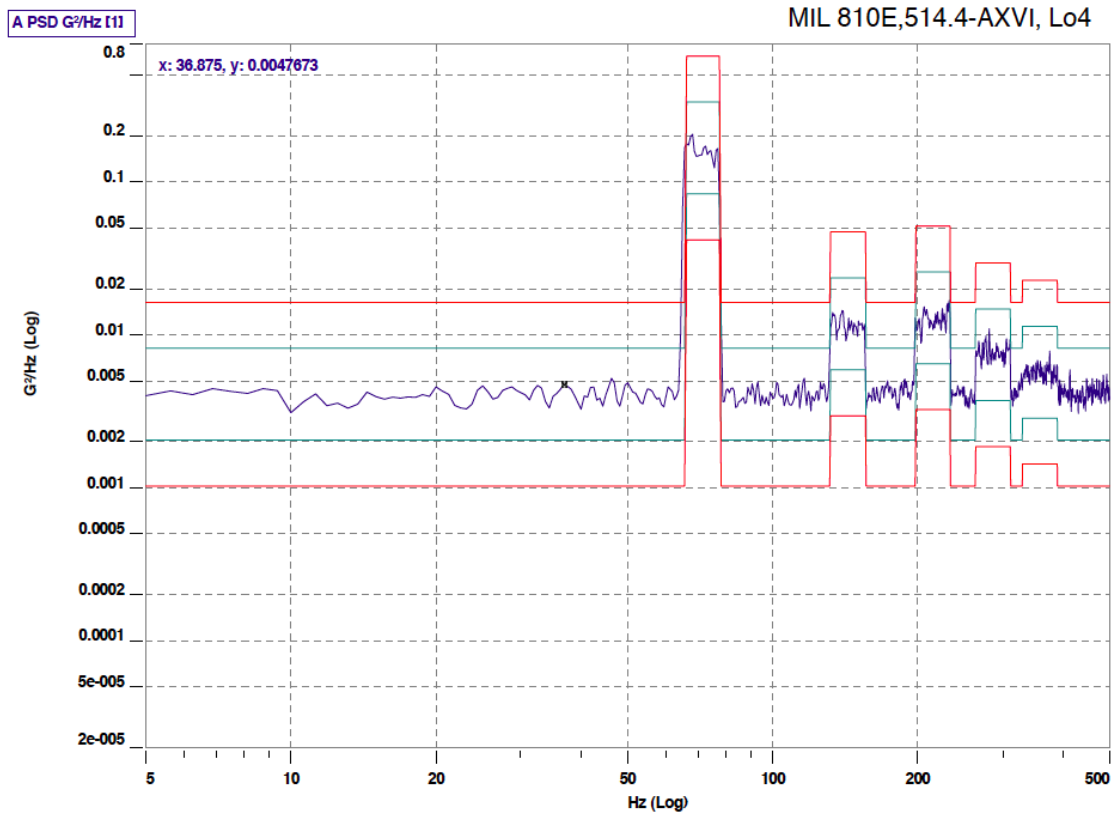


Diagram 16: MIL-STD-810E, Method 514.4 Procedure I, Category 8 Table 514.4-AXVI, LO4

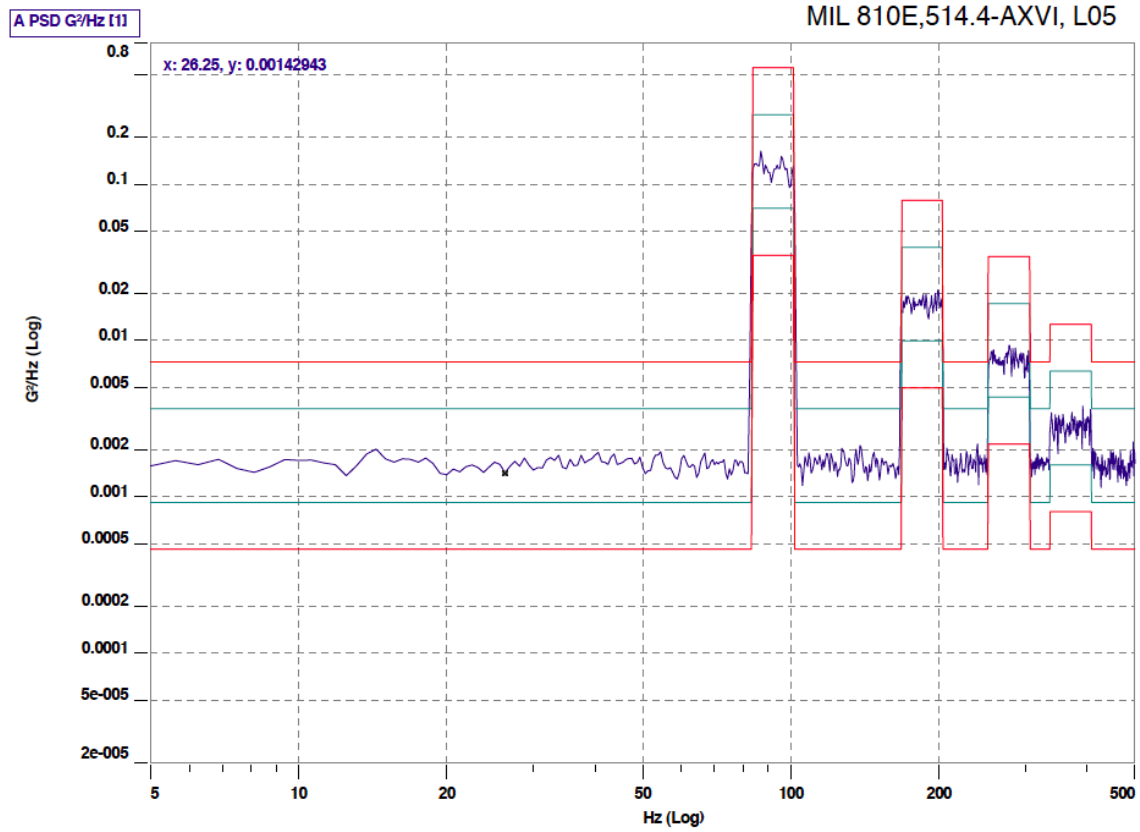


Diagram 17: MIL-STD-810E, Method 514.4 Procedure I, Category 8 Table 514.4-AXVI, LO5

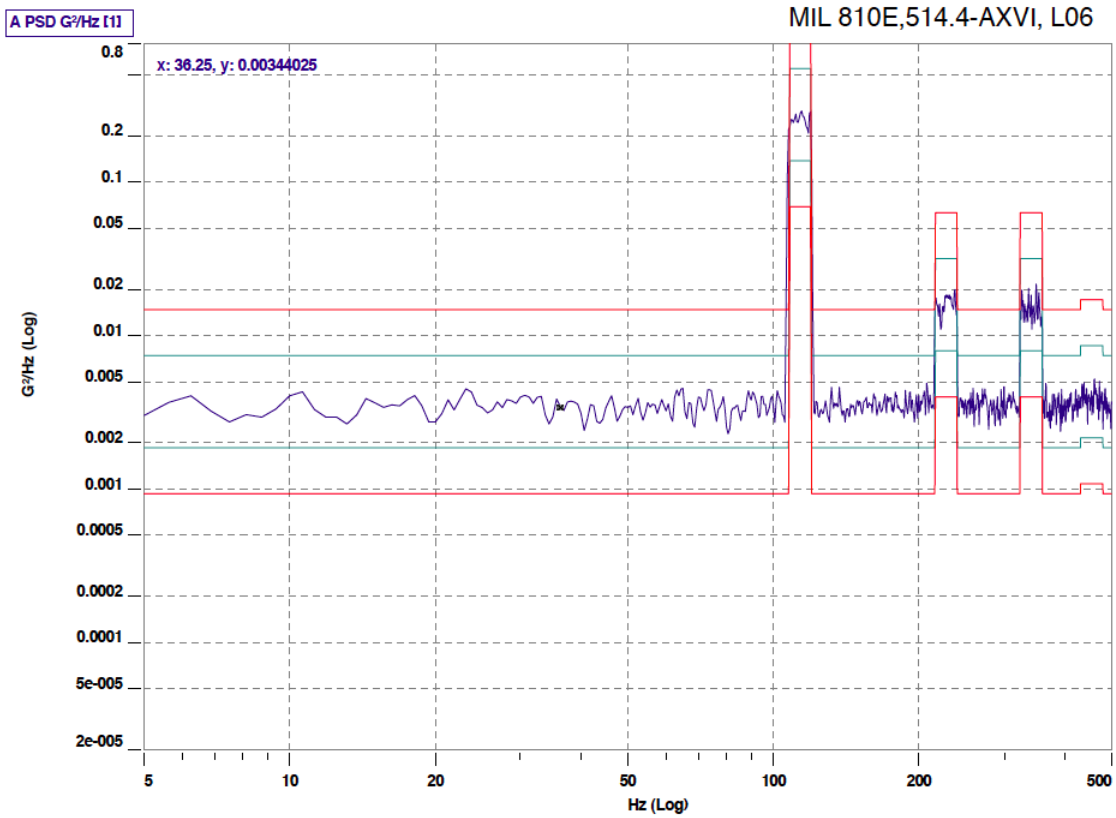


Diagram 18: MIL-STD-810E, Method 514.4 Procedure I, Category 8 Table 514.4-AXVI, LO6

7.3 Functional Shock test

- MIL-STD-810G, Method 516.6, Procedure I: Functional Shock: 40 g 11 ms, terminal peak saw tooth pulse, 2 shock/axis in both direction for all 3 axis, total of 12 hit/shock.
- UUT: In operation
- Test under half load: 12 V / 9 A; 5 V / 9 A; 3.3 V / 9 A
- Acceleration: 40 g
- Pulse width: 11 ms
- Shock form: Saw tooth
- Number of shocks: 4 per axis (Total: 12 Shocks)
- Orientations of Shocks: X_{+}, X_{-}, Y_{+}, Y_{-}, Z_{+}, Z_{-}

7.3.1 Diagram functional shock

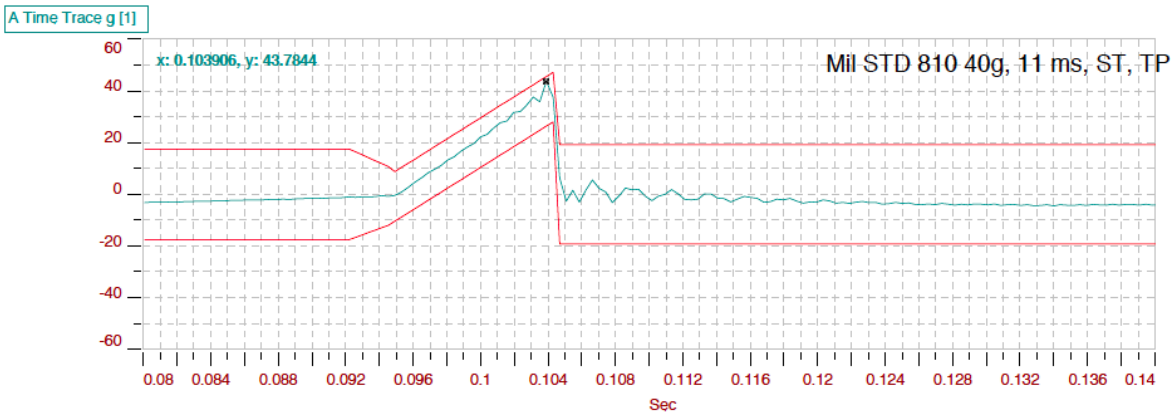


Diagram 19: MIL-STD-810G, Method 516.6, Procedure I

Diagram 20: MIL-STD-810G, Method 516.6, Procedure I

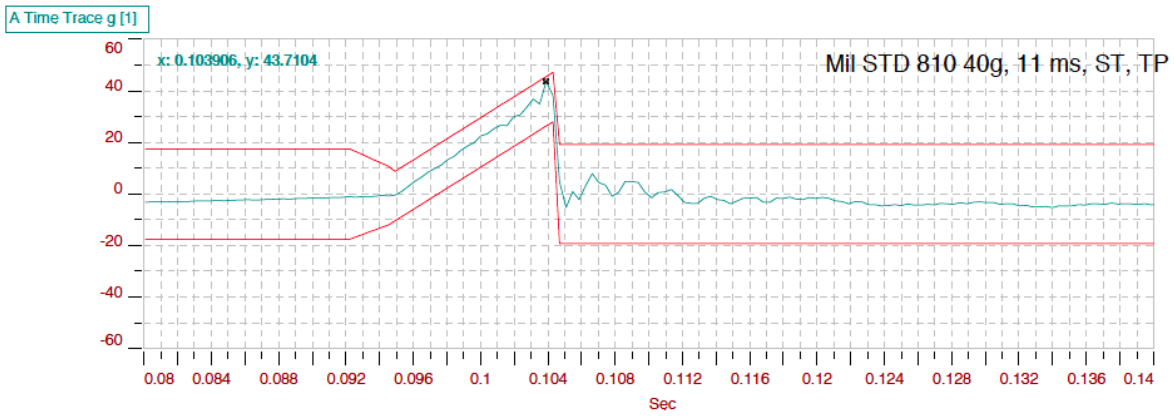


Diagram 21: MIL-STD-810G, Method 516.6, Procedure I

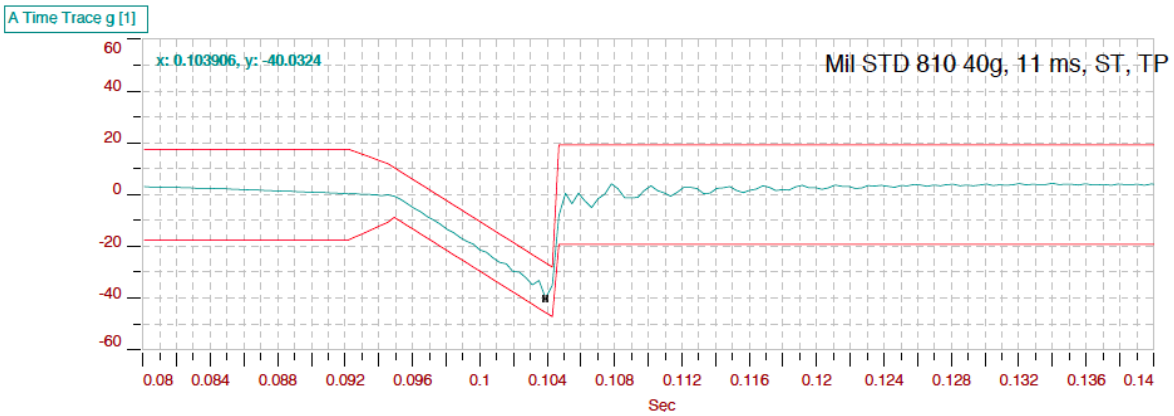


Diagram 22: MIL-STD-810G, Method 516.6, Procedure I

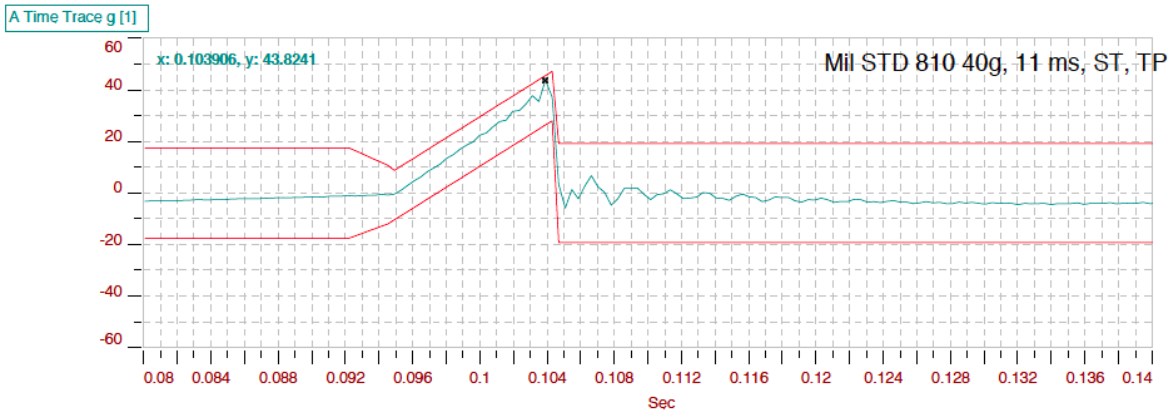


Diagram 23: MIL-STD-810G, Method 516.6, Procedure I

Diagram 24: MIL-STD-810G, Method 516.6, Procedure I