SGS Germany GmbH

Test Report No.: M22G0003

Order No.: M22G **Pages:** 23

Client:	DIRAK GmbH
Equipment Under Test:	Test housing with selected DIRAK articles
Manufacturer:	DIRAK GmbH
Task:	Earthquake test acc. to Telcordia Technologies Generic Requirements GR-63-CORE, Zone 4
Test Specification(s): [covered by accreditation]	Telcordia Technologies Generic Requirements GR-63-CORE Issue 4, April 2012
Test Specification(s): [not covered by accreditation]	Functional tests are not covered by the accreditation.
Result:	The EUT complies with all applicable requirements and objectives.

The results relate only to the items tested as described in this test report.

approved by:	**Date**	**Signature**
Metzger Lab Manager eMobility	May 09, 2018	

This document was signed electronically.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 Summary

Testing was performed to determine if the EUT

test housing with selected DIRAK articles

meets the requirements of Telcordia Technologies Generic Requirements GR-63-CORE, Issue 4, April 2012

The following Summary of Test Results table contains these columns of information:

- **Section** column gives the Section numbers from GR-63-CORE.
- **Section Name** column gives the Section name from GR-63-CORE.
- **Criteria** column gives the local number of the requirement (e.g., R3-1) from GR-63-CORE and the absolute number of the requirement (e.g., [2]).
- **Results** column gives the results of the evaluation (Compliant, Non-compliant, etc.).
- **Compliant:** The Equipment Under Test met the requirements of the corresponding criteria.
- **Non-compliant:** The Equipment Under Test did not meet the requirements of the corresponding criteria.
- **NA:** The criteria were Not Applicable to the Equipment Under Test.
- **ENR:** An Evaluation, to these criteria, was Not Requested by the customer.
  For additional details, go to the page listed in this report.
- **Page** column gives the page number, in this report, for the corresponding criteria.

Table 1 Earthquake Summary of Test Results

Section	Section Name	Criteria	Results	Comments
4.4	**Earthquake, Office Vibration, and Transportation Vibration**	-	-	
4.4.1	Earthquake Environment and Criteria	-	-	
4.4.1.2	Physical Performance Criteria	R4-83 [110]	Compliant	
		R4-84 [111]	NA	EUT is shelf level equipment
		R4-85 [112]	NA	EUT is shelf level equipment
		O4-86 [113]	NA	EUT is shelf level equipment
4.4.1.3	Functional Performance	R4-87 [114]	Compliant	
		O4-88 [115]	Compliant	

2 References

2.1 Specifications

[1] **GR-63-CORE**
Issue 4, April 2012
Telcordia Technologies Generic Requirements
NEBS Requirements: Physical Protection

2.2 Glossary of Terms

EUT Equipment Under Test
RND Random vibration
RRS Required Response Spectrum
TRS Test Response Spectrum

3 General Information

3.1 Identification of Client

DIRAK GmbH
Königsfelder Straße 1
58256 Ennepetal

3.2 Test Laboratory

SGS Germany GmbH
Hofmannstraße 50
81379 München

3.3 Time Schedule

Delivery of EUT: Feb 22, 2018
Start of test: Mar 05, 2018
End of test: Mar 07, 2018

3.4 Participants

Name	Function
Werner Tanz	Editor

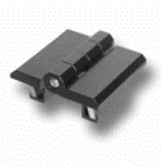
4 Equipment Under Test

The Equipment Under Test was a test case prepared with the following modules:

Module	Product system	Product labeling
	6-045.01	Cage Nuts
	6-045.02	Cage Nuts
	6-045.03	Cage Nuts
	6-045	Cage Nuts
	7-071	Compression Latch with spring loaded flap
	1-075	Compression Latch Pr22.1 with flap
	3-211/ 3-215	Compression Rod Latch with re-direction

	Customer article	COMP.LATCH W. CLIP RH SIGNAL
	Customer article	CAM WITH PLUG AS A.H VARIABLE
	1-043DST	Fastener 30 x 14 SNAP-LINE
	1-020	PA Fastener 9.5 and 12.7 SNAP-LINE
	1-034.01 DST	Captive Flex-Fastener 9.5 SNAP-LINE
	1-034 DST	Captive Flex-Fastener 9.5 SNAP-LINE
	1-035 DST	Captive Fastener 9.5 SNAP-LINE
	1-041.02 DST	Captive Fastener 12.7 SNAP-LINE
	1-041.06 DST	Captive Fastener 9.5 SNAP-LINE

	2-077 DST	Swinghandle RS PrC SNAP-LINE
	6-502	Compression Latch PHZ with Lock Cover
	2-126.01	Dual Cylinder Swinghandle RS 105, RC2
	2-102	Swinghandle RS 105, RC2
	2-103	Swinghandle RS 105 mechanical /electr. mechanical ELMESS 1102, RC2
	7-079	Compression Latch Pr20.1
	7-077.01	Catch for standard cams Pr20.1 (with 7-079)

	7-077	Height adjustable cam L45 SNAP-LINE (with 7-079)
	4-125 DST	Concealed hinge Pr03 SNAP-LINE 130°
	6-1200.01 DST	Finger pull handle SNAP-LINE
	6-1200.02 DST	Finger pull handle SNAP-LINE
	6-1300 DST	Finger pull handle SNAP-LINE
	4-249.01 DST	Hinge Pr01 SNAP-LINE 180°
	4-260 DST	Hinge Pr01 SNAP-LINE 180°
	6-060	Wire Cach SNAP-LINE
	6-061	Cable Management Device 12.7 SNAP-LINE

	6-167	Trigger Latch
	E-LINE	Swinghandle MLE 1102

The EUT as built and provided by the customer is shown in the figures below.

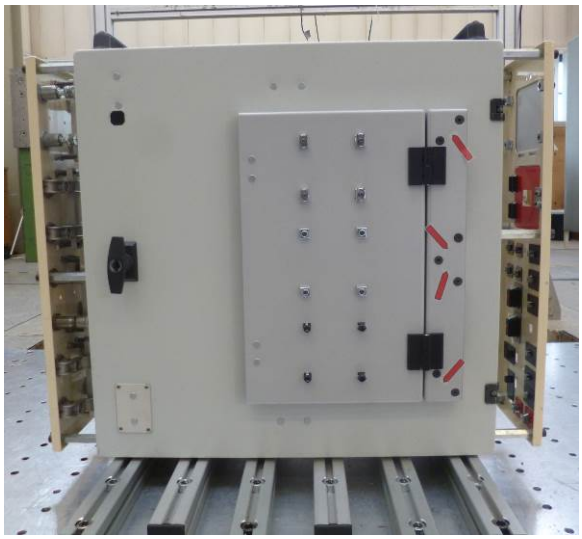


Fig. 1 EUT front

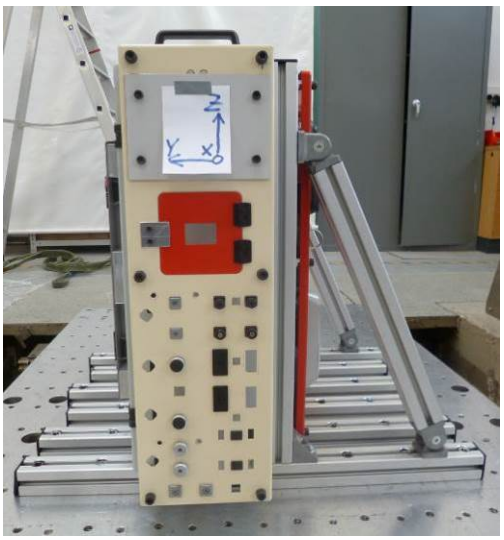


Fig. 2 EUT sides

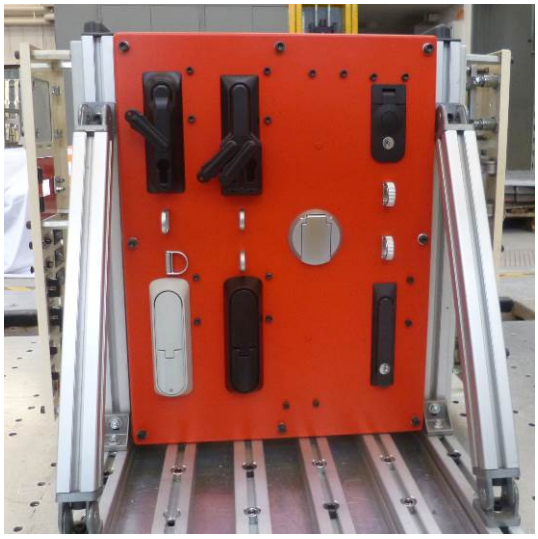


Fig. 3 EUT back

5 Test Equipment

5.1 Test Facility

The measurements were carried out by SGS Germany GmbH, Transportation/eMobility, Hofmannstraße 50, 81379 München, Germany.

5.2 Measuring Equipment

ID. No.	Equipment	Manufacturer	Status	Last Cal.	Next Cal.
S0353	Earthquake Test System	MTS	cnn		
S0896	Control System for Earthquake		cnn		
S5317	Accelerometer	Sensotec	cal	Jul 25, 2017	Jul 2019
S5398	Accelerometer	Endevco	cal	Aug 02, 2017	Aug 2019
S5482	Power Supply	TET Electronic	ind		
S5841	3 CH DC Signal Conditioner	PCB	cal	Jul 19, 2016	Jul 2018
S5844	Accelerometer	Honeywell	cal	Jul 31, 2017	Jul 2019

cal = Calibration, car = Calibration restricted use, chk = Check, chr = Check restricted use, cpu = Check prior to use, calchk = Calibration and check, ind = for indication only, cnn = Calibration not necessary, man = Maintenance

6 Test Specifications and Results

The test results in the report refer exclusively to the test object described in section 4 and the test period in section 3.3.

6.1 Test Specification

Test	Parameter		Test severity	Reference	Method
Earthquake Time History	RRS		Table 5	GR-63-CORE Issue 4	Waveform testing
	Frequency Range	[Hz]	0.3 – 50		
	Duration	[sec]	30		
	Axes		3		
	Damping ratio	[%]	2		

Table 2: Acceleration Coordinates for the RRS zone 4

Co-ordinate Point	Frequency (Hz)	Ground Acceleration (g)
1	0.3	0.2
2	0.6	2.0
3	3.0	5.0
4	5.0	5.0
5	15.0	1.6
6	50.0	1.6

Test Sequence acc. to GR-63-CORE

1. Perform a swept sine survey with an acceleration amplitude of 0.2 g from 1 to 50 Hz at a sweep rate of 1.0 octave per minute. (Higher sweep rates are permitted to reduce equipment stress.)
2. Verify equipment functionality and physical condition.
3. Subject the equipment to the VERTEQII waveform. Verify the TRS meets or exceeds the RRS in the frequency range from 1.0 to 50 Hz. If the TRS is below the RRS at any point, use the last drive signal and table acceleration to update the transfer function. Apply it to the Telcordia waveform to generate a new drive signal, and retest the equipment. Repeat this step as necessary.
   The TRS should not exceed the RRS by more than 30% in the frequency range of 1 to 7 Hz. A test may be invalid if an equipment failure occurs when the TRS exceeds the RRS by more than 30% in this frequency range.
4. Record the displacement and acceleration data during the shaking.
5. Thoroughly inspect the equipment and note all changes to its physical condition.
6. Record any reductions in anchor or fastener torques.
7. Reverify equipment functionality.

6.2 Earthquake Environment and Criteria [GR-63-CORE, ch. 4.4.1]

Physical Performance Criteria (4.4.1.2)

During this test, only the equipment shelf's physical performance is considered. Permanent structural or mechanical damage of the framework or its fastening hardware would not constitute a failure, but may invalidate the test.

Permanent structural damage is defined as deformation of any load-bearing element of the equipment being tested, or any connection failure. Typical examples of permanent structural damage are bent or buckled uprights, deformed bases, cracks, and failed anchors or fastening hardware.

Mechanical damage is defined as any dislocation or separation of components. Examples of mechanical damage are disengaged cards and modules, and opened (ajar) doors, drawers, or covers.

R4-83 [110] All equipment shall be constructed to sustain the waveform testing of Section 5.4.1, "Earthquake Test Methods," without permanent structural or mechanical damage.

During frame-level testing, the physical performance of the equipment shelves, framework, and fastening hardware are considered. Permanent structural or mechanical damage of any of these elements constitutes a test failure. During shelf- level and wall-mounted testing, only the equipment shelf's physical performance is considered. (Permanent structural or mechanical damage of the framework or its fastening hardware would not constitute a failure, but may invalidate the test.) Repairs or replacements that can be made without interrupting service are acceptable. An example of such a repair is an anchor that has loosened, but can be retightened.

R4-84 [111] Frame-level equipment shall be constructed so that during the waveform testing of Section 5.4.1, the maximum single-amplitude deflection at the top of the framework, relative to the base, does not exceed 75 mm *(3 in).*

R4-85 [112] Frame-level equipment shall have a natural mechanical frequency greater than 2.0 Hz as determined by the swept sine survey of Section 5.4.1

O4-86 [113] Frame-level equipment should have a natural mechanical frequency greater than 6.0 Hz as determined by the swept sine survey of Section 5.4.1

Functional Performance (4.4.1.3)

The criterion for assessing functionality depends on the service provided by the equipment being tested. The criteria are determined by applying appropriate Telcordia generic requirements or, if none exist, by reviewing the supplier's or purchaser's own performance specifications.

R4-87 [114] All equipment shall be constructed to meet applicable functionality requirements **immediately before and after** each axis of waveform testing of Section 5.4.1. The equipment shall sustain operation without replacement of components, manual rebooting, or human intervention.

O4-88 [115] All equipment should be constructed to meet applicable functionality requirements continuously during waveform testing of Section 5.4.1. These functionality criteria shall demonstrate that the equipment has sustained operation without loss of service during the testing.

6.3 Test Performance

The waveform testing was performed on a MTS seismic table.

The entire built-up is shown in figures 4 - 6. For the y-axis test, the EUT is rotated about 90 °. For z-axis test, a vertically oriented piston underneath the table is used.

The test was performed in 3 mutually perpendicular axes.

Deviations from prescribed Test Sequence

Because of limitation of the MTS seismic table the tested frequency range was 1 – 50 [Hz]. A sine sweep test was not required because the EUT is shelf level.

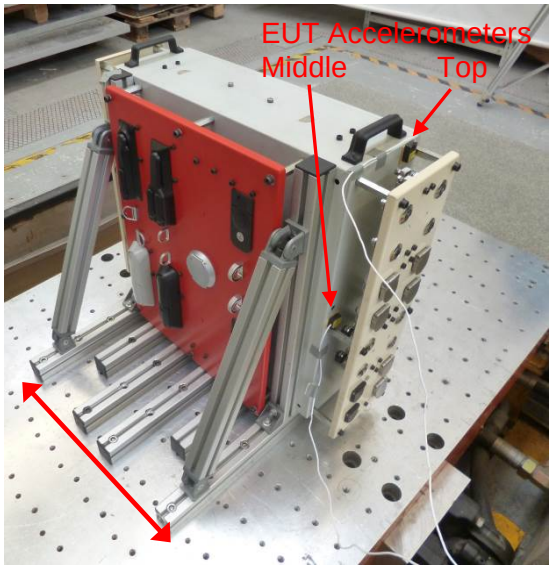


Fig. 4 EUT mounted on shaker (x-axis)

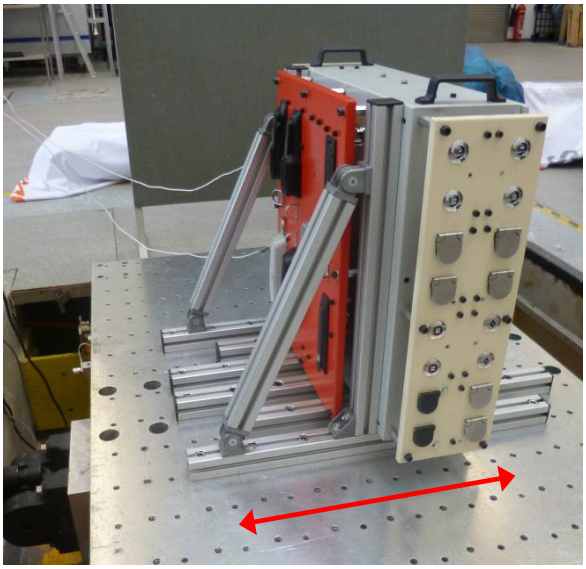


Fig. 5 EUT mounted on shaker (y-axis)

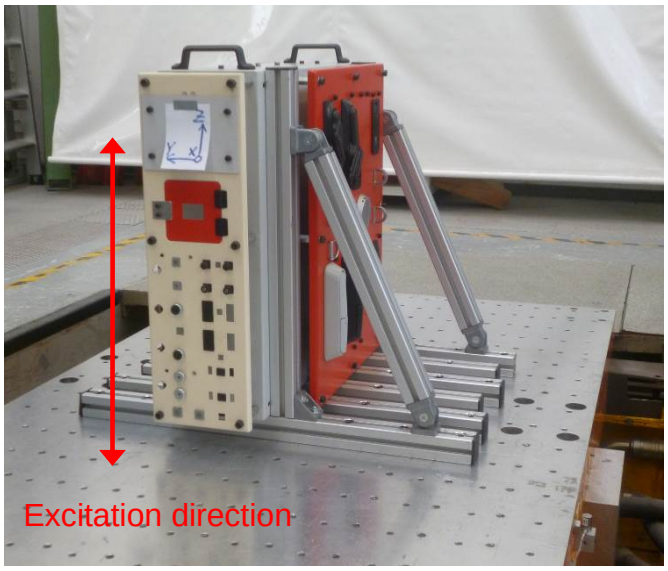


Fig. 6 EUT mounted on shaker (z-axis)

6.4 Test Result

The following diagrams show the acceleration values recorded for the three axes of the earthquake test.

Excitation in direction of X-axis

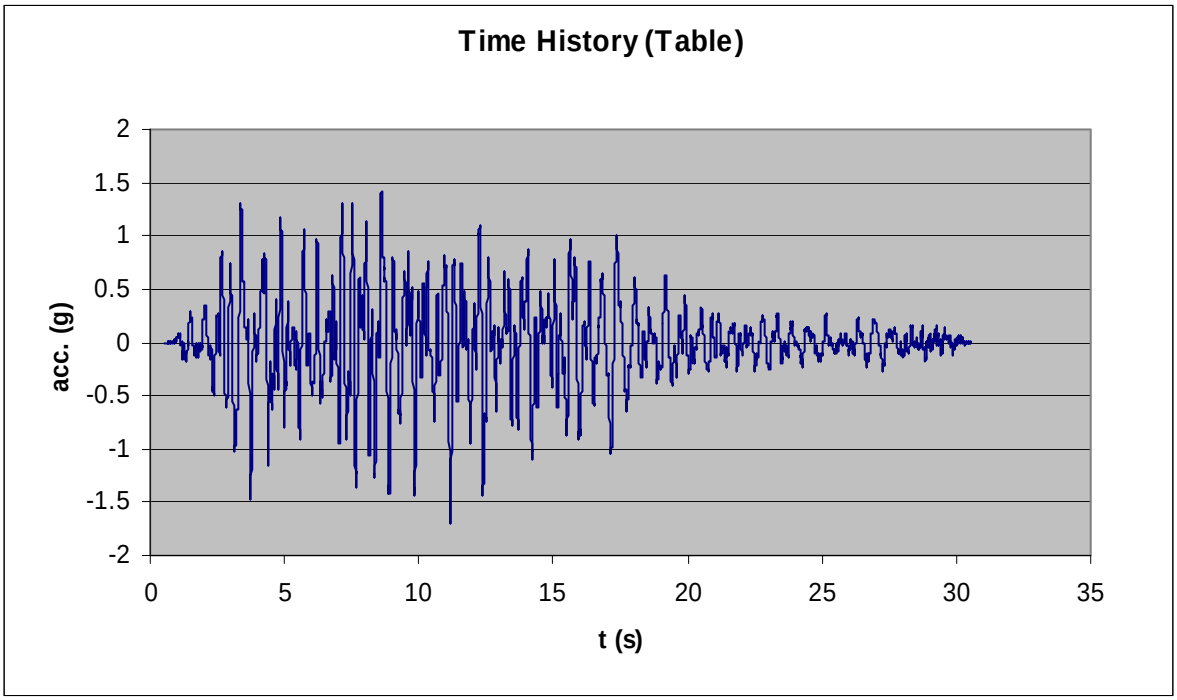


Fig. 7 Earthquake: Time history signal table, x-axis

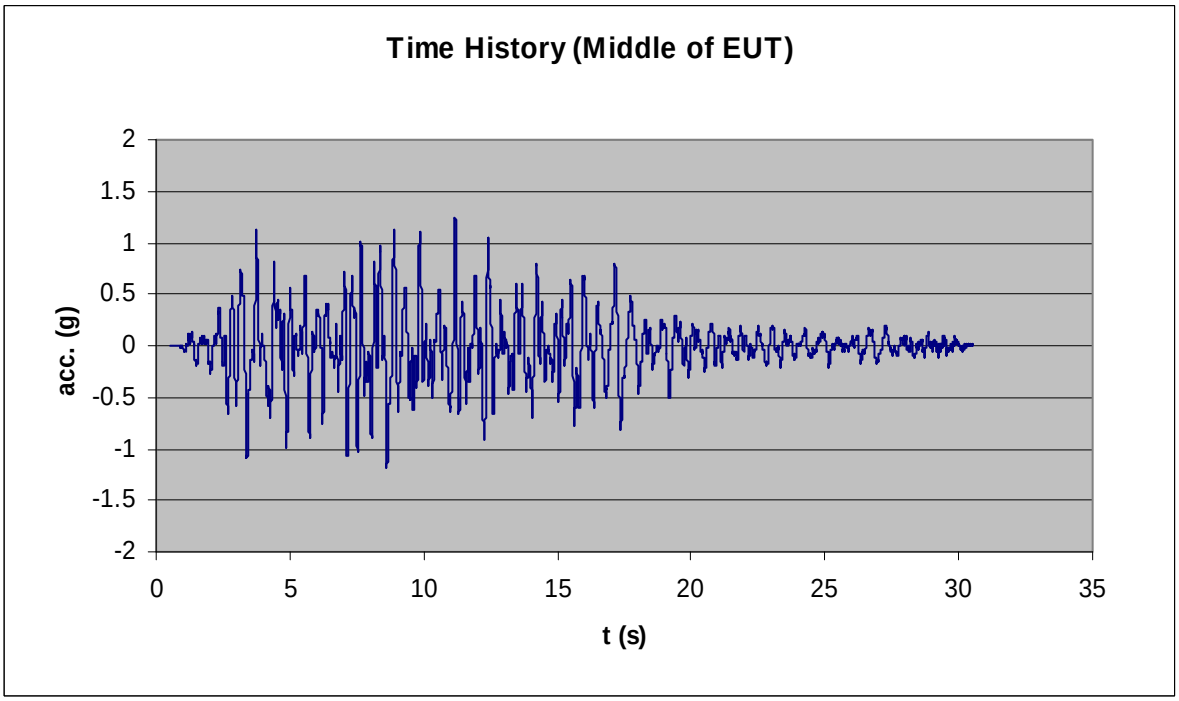


Fig. 8 Earthquake: Time history signal middle of EUT, x-axis

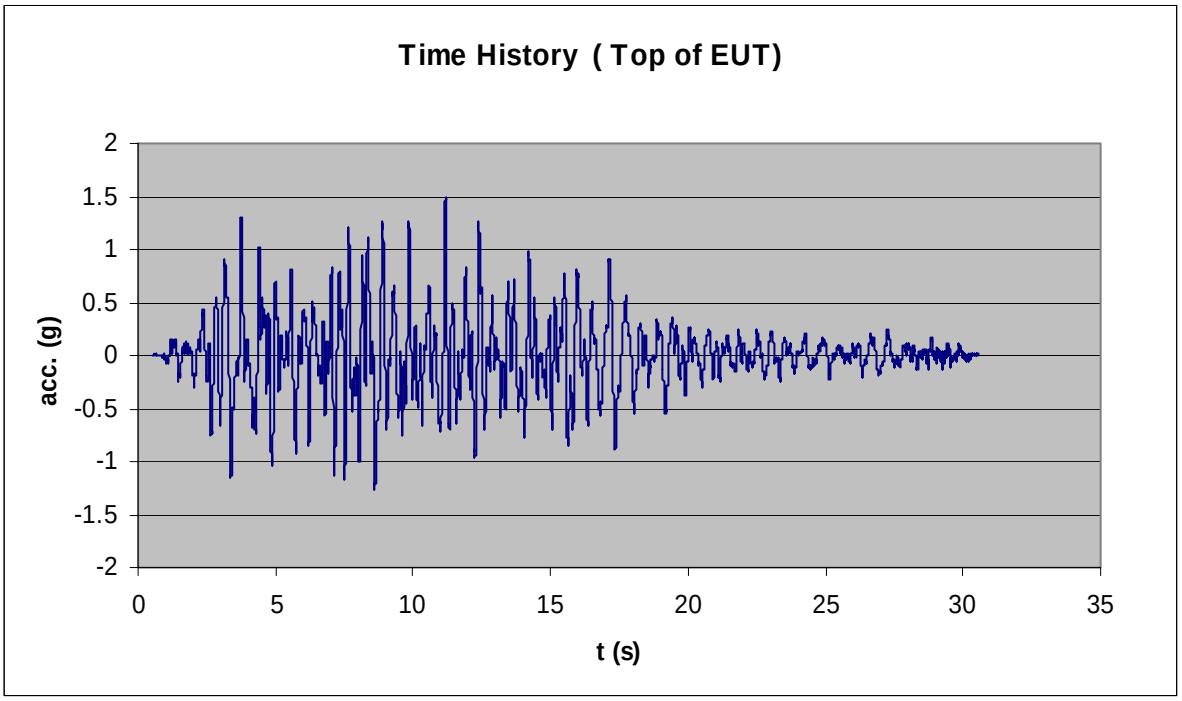


Fig. 9 Earthquake: Time history signal top of EUT x-axis

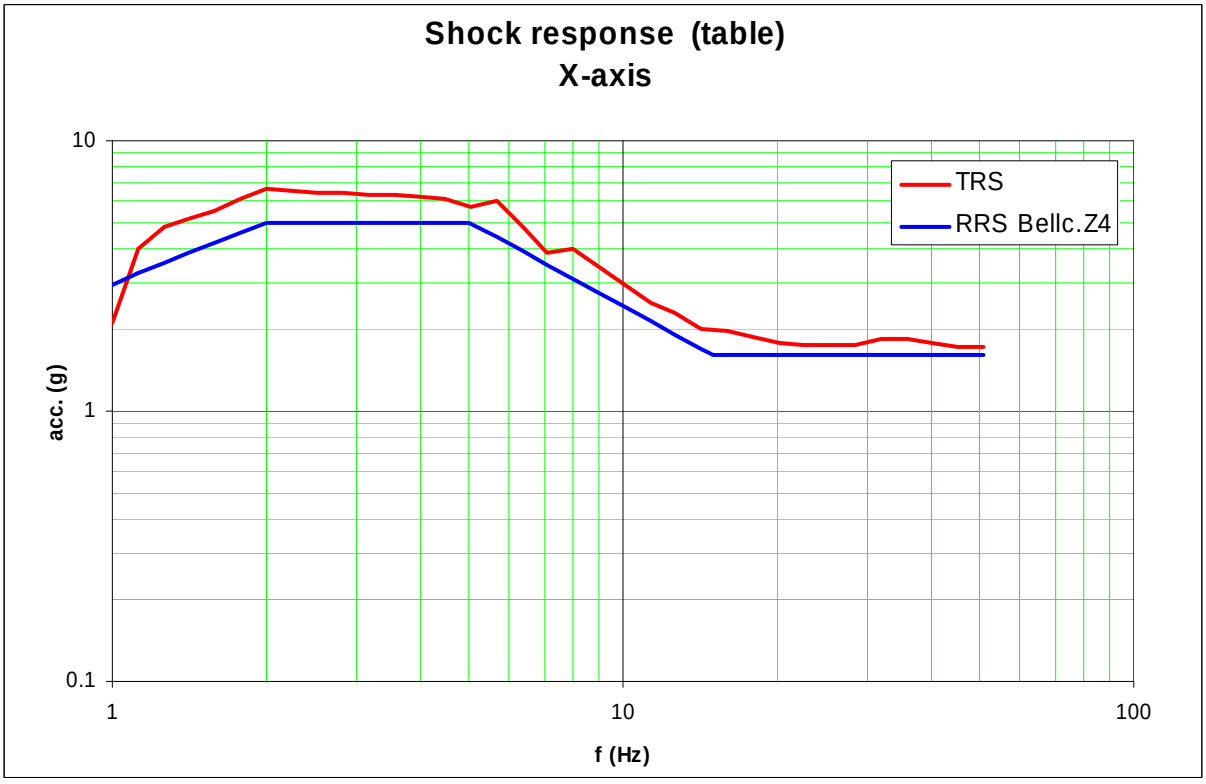


Fig. 10 Earthquake: TRS vs. RRS ETSI, x-axis

Excitation in direction of Y-axis

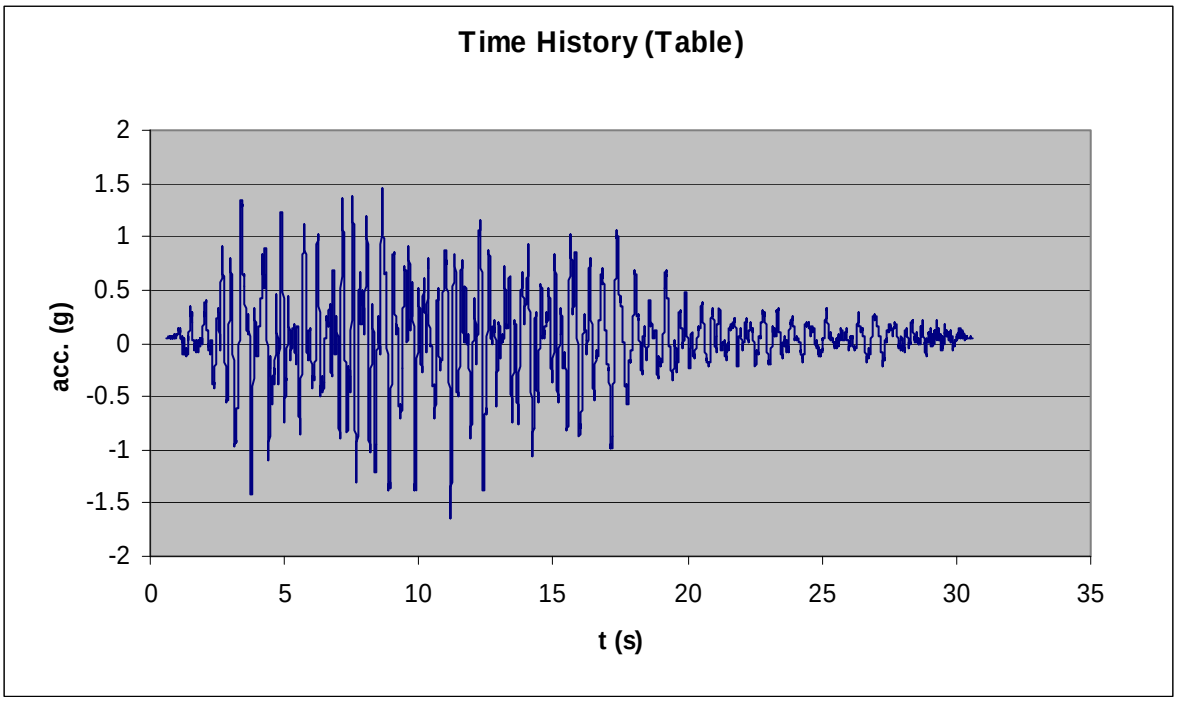


Fig. 11 Earthquake: Time history signal table, y-axis

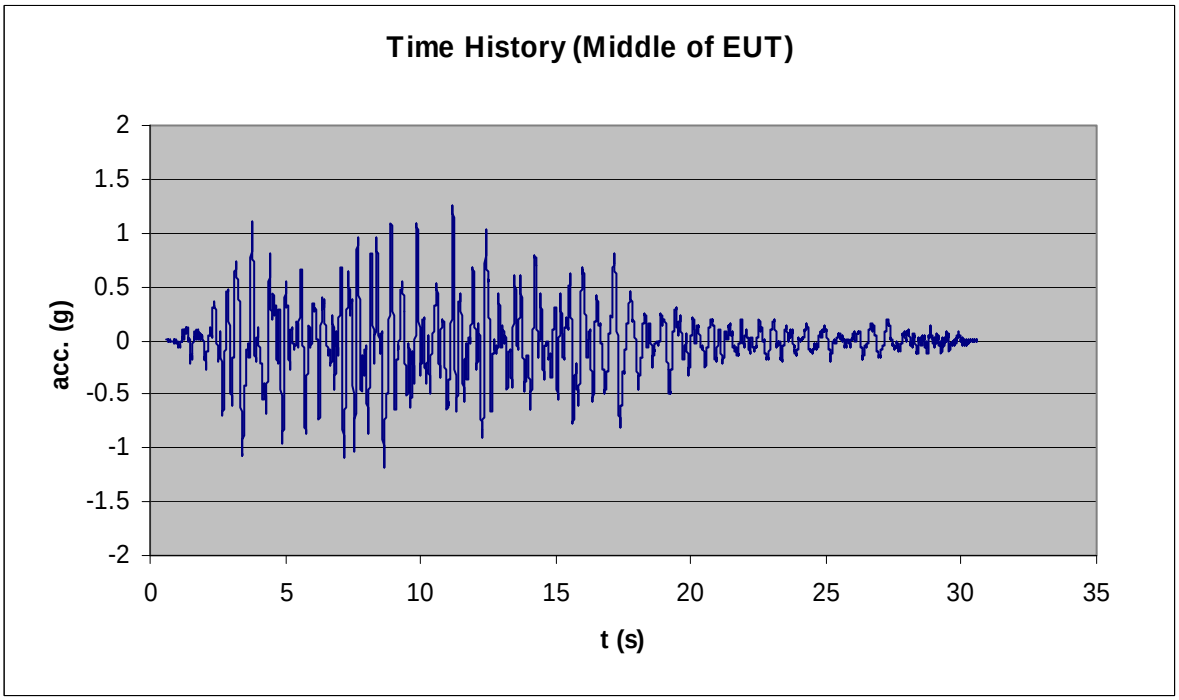


Fig. 12 Earthquake: Time history signal middle of EUT, y-axis

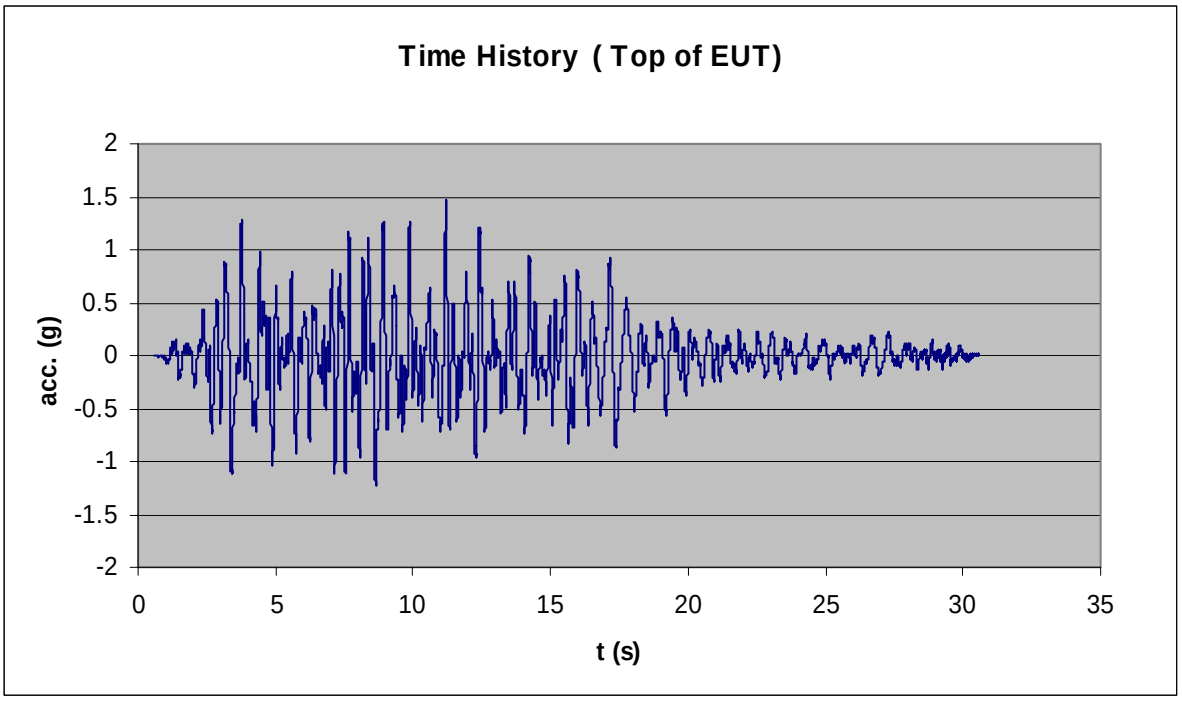


Fig. 13 Earthquake: Time history signal top of EUT y-axis

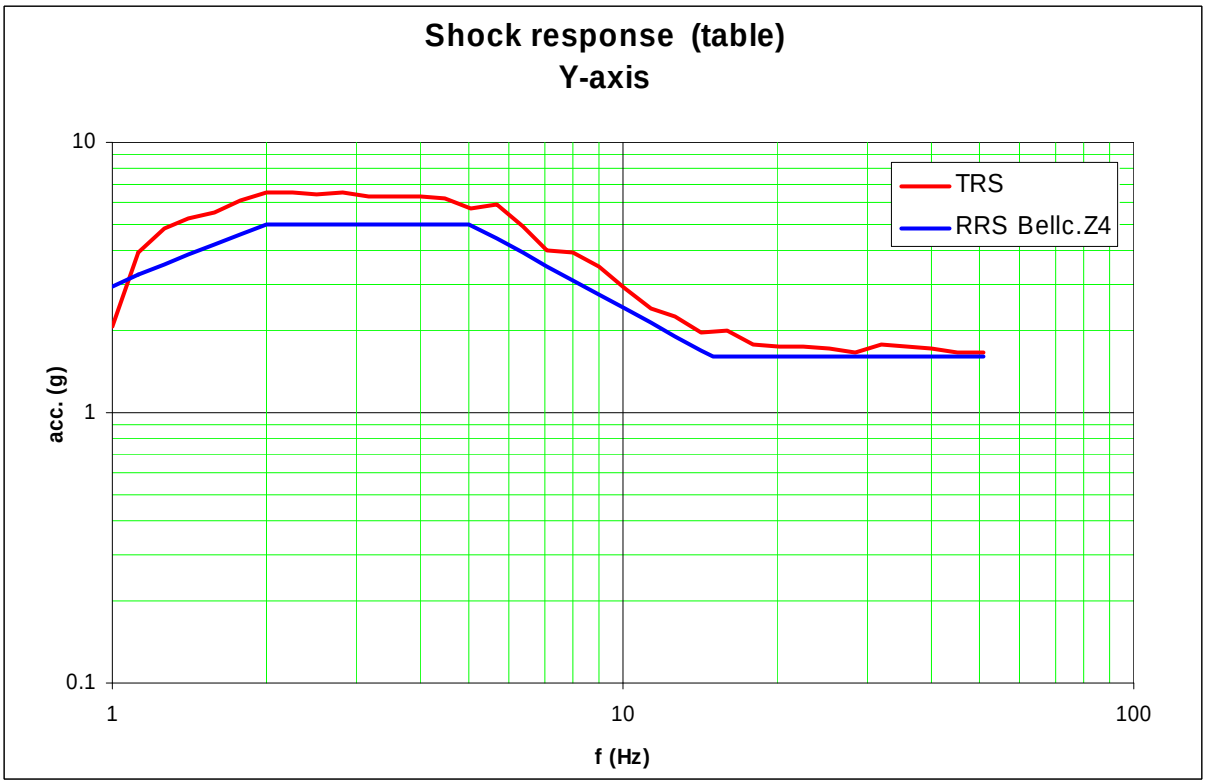


Fig. 14 Earthquake: TRS vs. RRS ETSI, y-axis

Excitation in direction of Z-axis

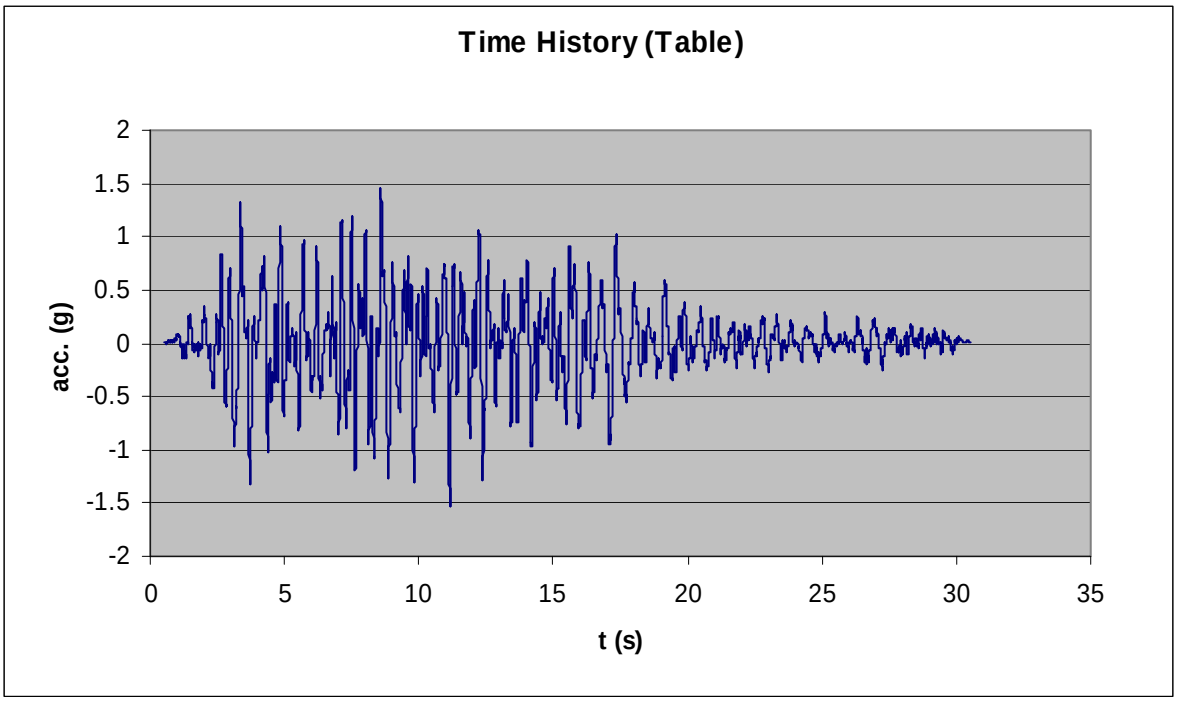


Fig. 15 Earthquake: Time history signal table, z-axis

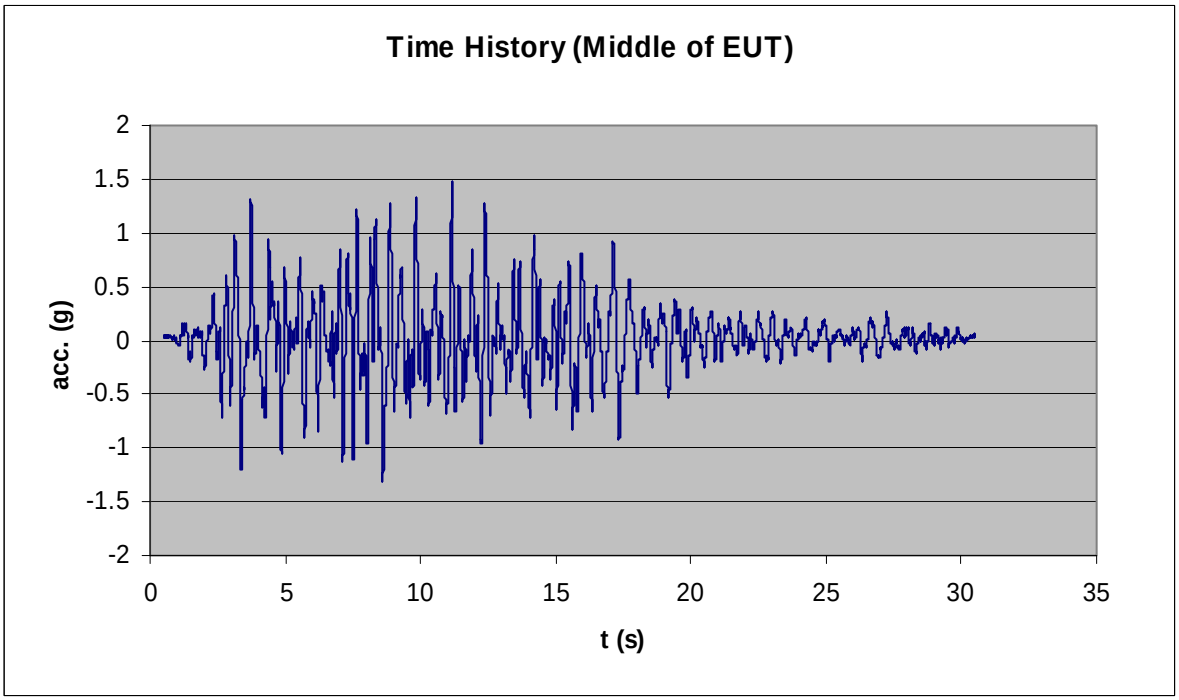


Fig. 16 Earthquake: Time history signal middle of EUT, z-axis

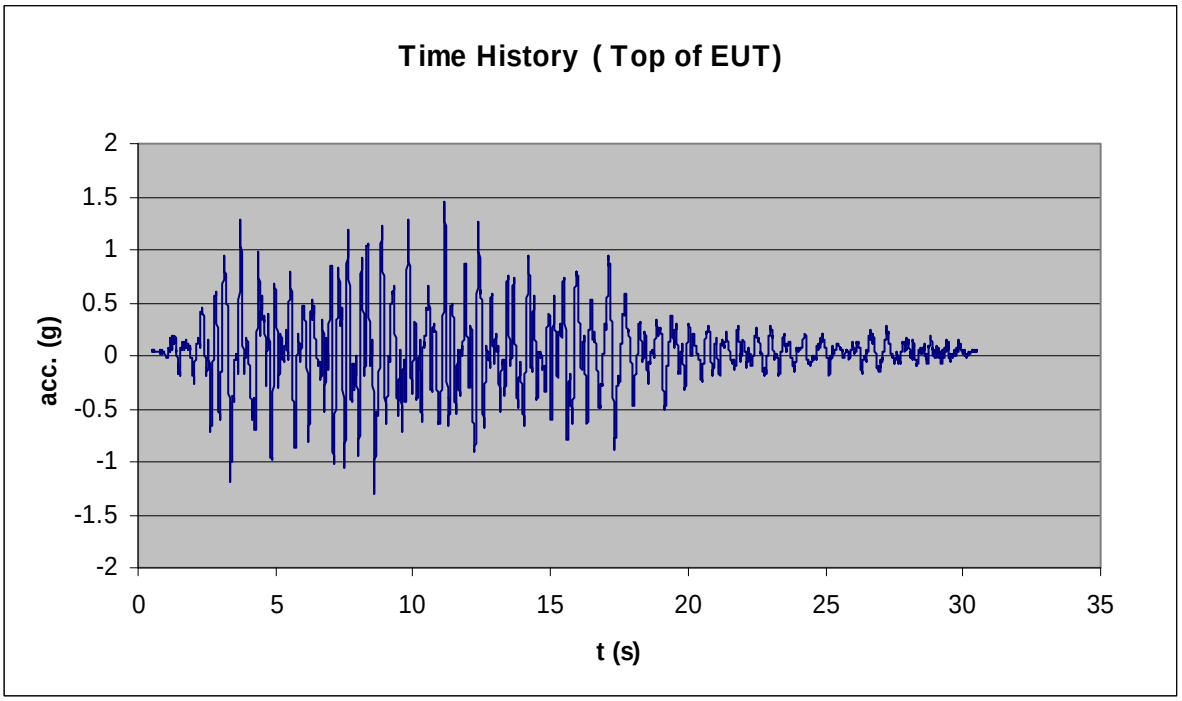


Fig. 17 Earthquake: Time history signal top of EUT z-axis

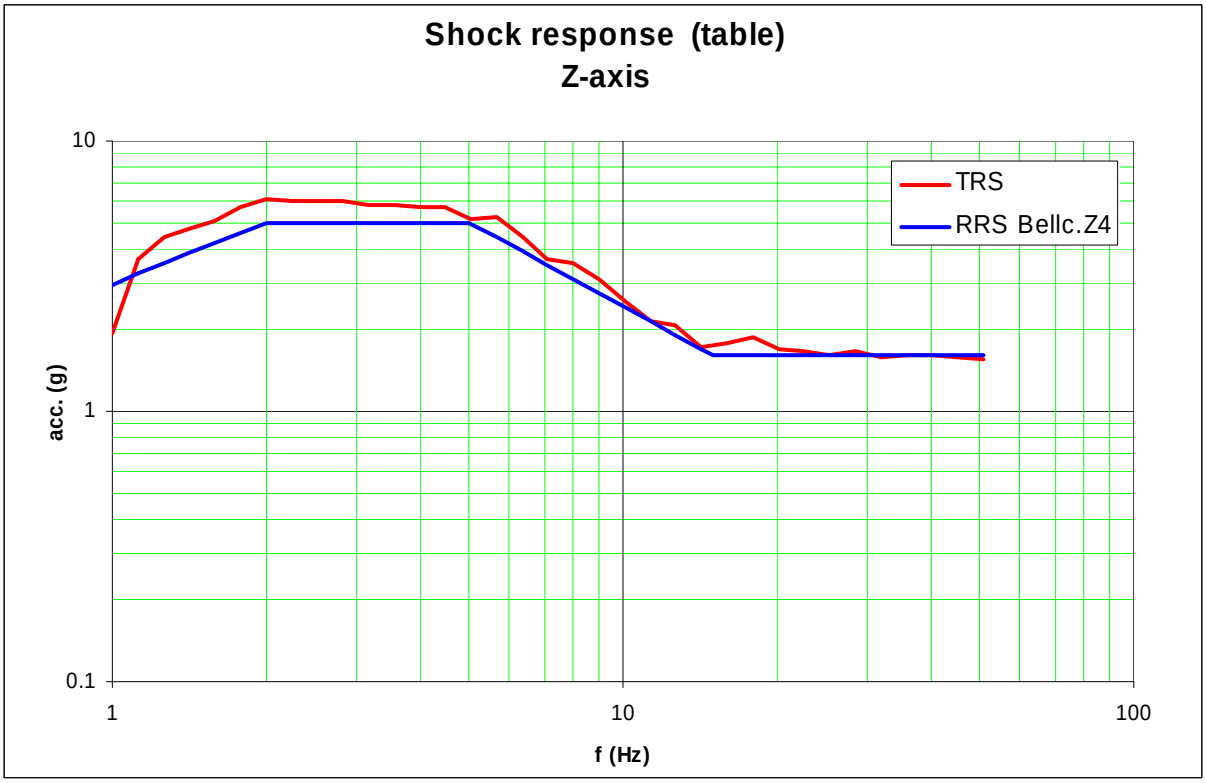


Fig. 18 Earthquake: TRS vs. RRS ETSI, z-axis

Functional checks of the modules listed in chapter 4 were performed after the tests and showed no functional limitations or damages.

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