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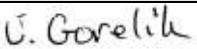
SUBJECT:

ENVIRONMENTAL TEST REPORT
ON
SMART FIBRES SMARTSCAN AERO INTEROGATOR UNIT

	Name	Job Title	Date	Signature
Prepared by	V.G.	IAI, Environmental Lab Manager	10.7.13	
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1. PURPOSE

The purpose of the environmental tests was to determine the ability of the SmartScan Aero device S/N 137514 manufectured by SMART FIBRES Ltd. UK. to withstand the environmental conditions described herein, without any failure, malfunction, or out-of-tolerance issues as a result of these tests. Visual inspection and operational checkout of the UUT was performed both during and after the tests.

2. APPLICABLE DOCUMENTS

2.1 MIL-STD-810F : Environmental Test Methods and Engineering Guidelines

3. DESCRIPTION OF THE UNIT UNDER TEST

3.1 The UUT is defined as:

SmartScan Aero S/N 137514 manuf. by Smart Fibres

4. SCOPE

4.1 The UUT was subjected to the following environmental tests:

Date	Test
20.06.13	VIBRATION & SHOCK TEST
25.06.13	TEMPERATURE-ALTITUDE TEST Phase I
08.07.13	TEMPERATURE-ALTITUDE TEST Phase II

4.2 Environmental Test Laboratory of Engineering Division, IAI Ltd. personnel were responsible for the operation of test facilities used to control the environmental conditions.

4.3 Advanced Structural Technologies Dept. of Engineering Division representatives were responsible for the visual examination and operational checkout of the UUT.

5. VIBRATION & SHOCK TEST

5.1 Test Equipment

The equipment used for Vibration & Shock Test:

DESCRIPTION	MANUFACTURE	MODEL/S.N.	RANGE	ACCURACY	CALIBRATION DUE
Control Accelerometer	Endevco	2226C/16707	0-500 g 5-2000Hz	± 5 % of reading	1.11.13
Conditioning Amplifier	Bruel&Kjaer	Nexus/2051886	-20 to +80 db	± 1 % of reading	26.7.13
Data Acquisition System	m+p VXI	Ver. 2.10 E1429	-	-	28.6.13
Vibration Shaker	TIRA	TIRAVib 59349	-	-	-

Table 1: Vibration and Shock Test Equipment

5.2 Test Procedure

5.2.1 The UUT was fastened to the test fixture by its normal mounting means, which was in turn secured to the Vibration Shaker. The vibration and shock input was measured by an accelerometer mounted on the fixture close as possible to the test item . The test setup is shown in Photographs 1 to 3.

5.2.2 Random Vibration, along 3 axes, in accordance with MIL-STD-810F, Method 514.5, Procedure I, over the appropriate frequency range of 5-2000 Hz for period of 4 hours per axis was applied, according to the random profile per Figure 1.

5.2.3 The shock test along 3 axes in accordance with MIL-STD-810F, Method 516.5, Procedure I, Figure 516.5 – 10 (Saw Tooth), 20g Peak Value and 11msec duration.

5.2.4 Operational checkout was performed both during and at the conclusion of each test.

5.3 Test Results

5.3.1 Test records of the vibration and shocks tests are shown in Figures 5 to 13.

5.3.2 The visual examination of the external surfaces of the test items, at the conclusion of the tests, revealed no apparent damage as a result of these tests.

5.3.3 The UUT successfully passed the vibration and shock test conditions.

6. TEMPERATURE-ALTITUDE TEST

6.1 Test Equipment

The equipment used for Temperature-Altitude Test:

DESCRIPTION	MANUFACTURE	MODEL/S.N.	RANGE	ACCURACY	CALIBRATION DUE
Temperature-Altitude Chamber	THERMOTRON	F-64CHVA	-70 ºC +120ºC, 0-70kft	±1ºC, ±1% of pressure value	26.7.13

Table 2: Temperature-Altitude Test Equipment

6.2 Test Procedure

The test setup is shown in Photograph 4.

The test item was exposed to temperature and altitude test conditions according to MIL-STD-810F, Method 520.2, Procedure III.

The test was conducted in two phases: in the first phase 10 environmental cycles were performed as described in Table 3. The unit was collecting data from 3 channels during all operational stages.

In the second phase, an additional 3 cycles, as listed in Table 4, were performed. During this phase the USB was recording data from all 3 channels.

6.3 Test Results

6.3.1 The test records of the temperature-altitude cycles are presented in Figures 3 and 4.

6.3.2 The visual examination of the external surfaces of the test item, at the conclusion of the temperature-altitude test, revealed no apparent damage as a result of this test.

6.3.3 The test item successfully passed the operational checkout performed both during the temperature-altitude test, and at the conclusion of the test.

No.	Temperature (ºC)	Altitude (ft)	Time after Stabilization (hr)	System Operation
1	-10	0	1	On
2	-40	30,000	1	On
3	71	0	2	Off
4	55	0	1	On
5	55	30,000	1	On

Table 3: Temperature-Altitude Cycle Phase I

No.	Temperature (ºC)	Altitude (ft)	Time after Stabilization (hr)	System Operation
1	-40	0	1	On
2	-40	45,000	1	On
3	55	0	1	On
4	30	45,000	1	On

Table 4: Temperature-Altitude Cycle Phase II

7. SUMMARY

The UUT successfully passed the environmental testing. The data acquisition system was operating during all the vibration, shock and temperature/altitude tests as required. A typical histogram of 75,000 samples at 2500Hz, taken during random vibration testing is presented in Figure 1. The optical strain standard deviation for this sample is 0.32με.

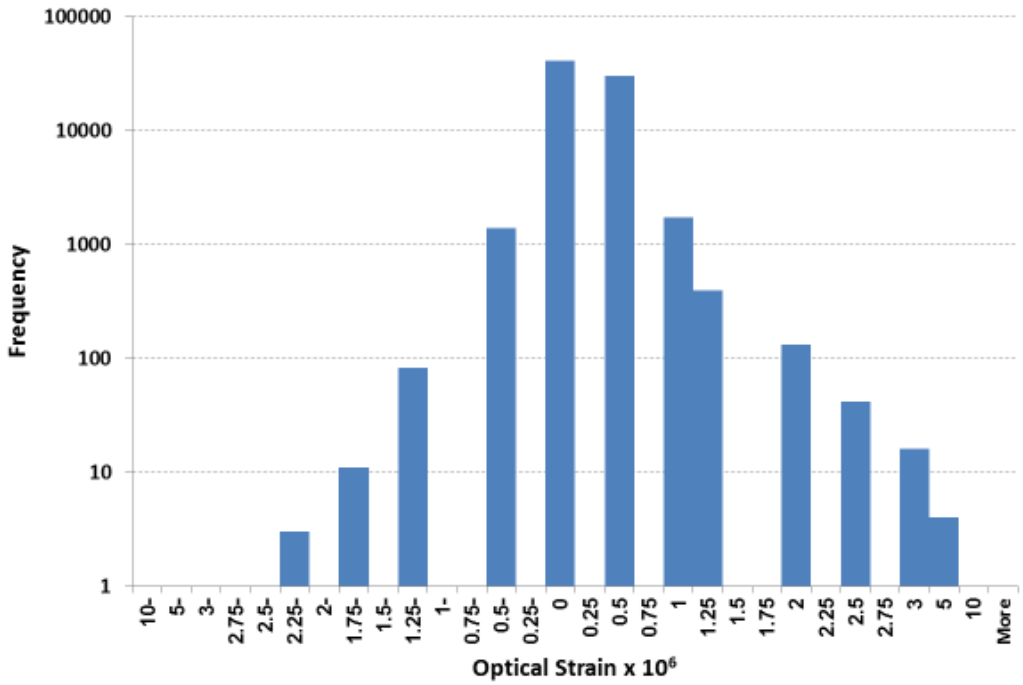
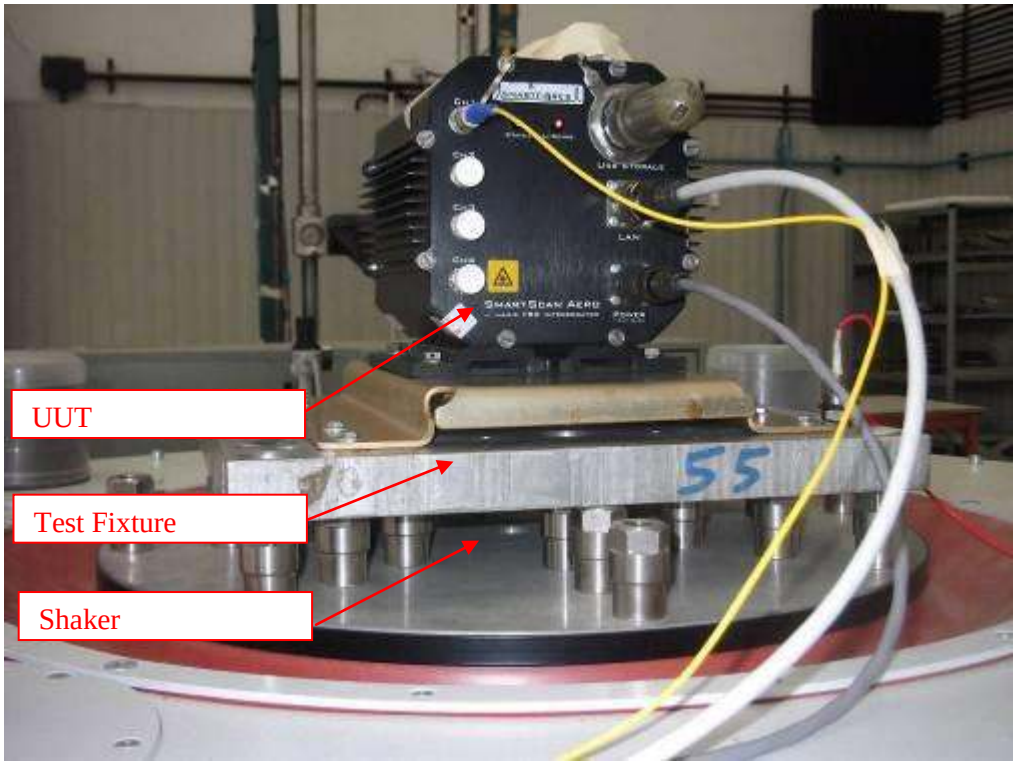
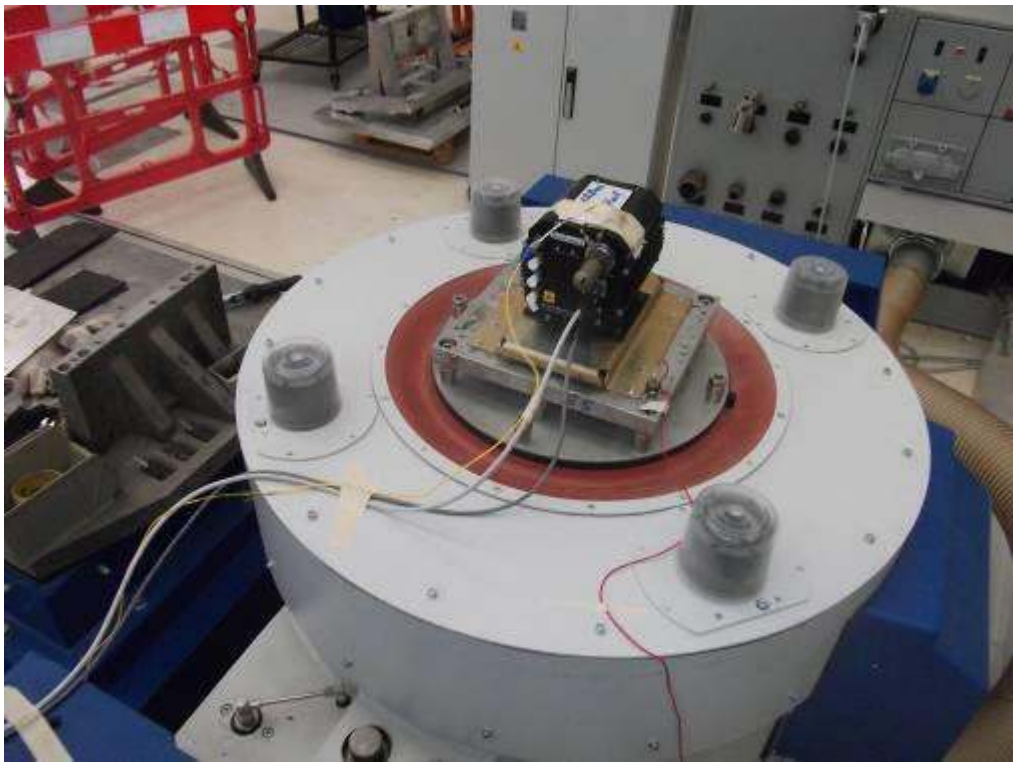


Figure 1: Typical histogram of 75,000 samples at 2500Hz, taken during random vibration test



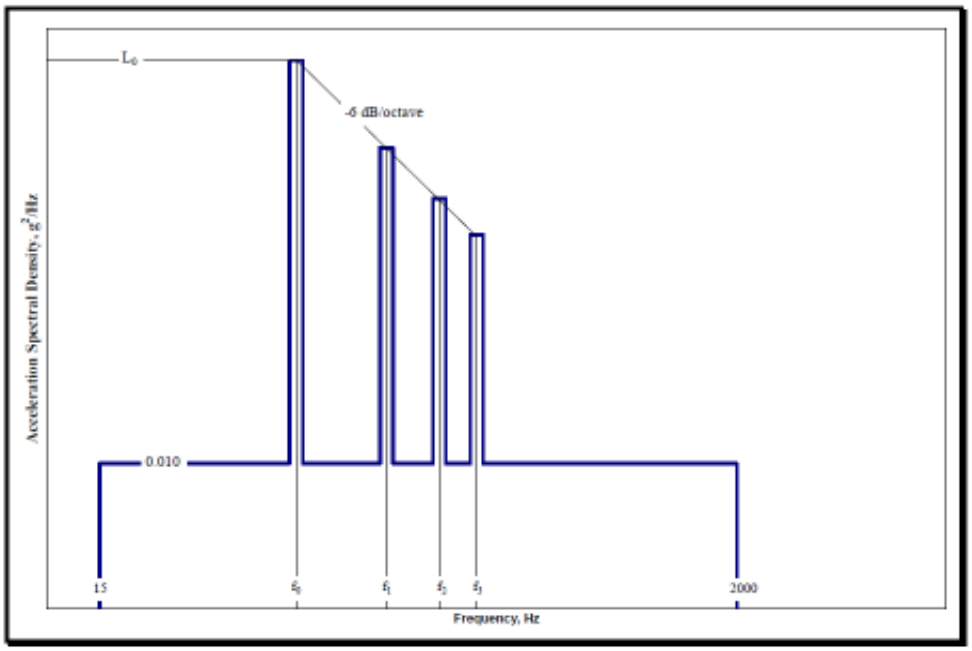


Photograph 1: Vibration and Shock Test setup – Z Axis

Photograph 2: Vibration and Shock Test setup – Y Axis
Data recording of two channels

Photograph 3: Vibration and Shock Test setup – X Axis

Photograph 4: Temperature - Altitude Test setup
Date recording of two channels by USB disk



Parameter	Value
L_0	0.1 g^2/Hz
f_0	83-107 [Hz]
f_1	166-216 [Hz]
f_2	249-324 [Hz]
f_3	332-432 [Hz]

Figure 2: Random Vibration profile

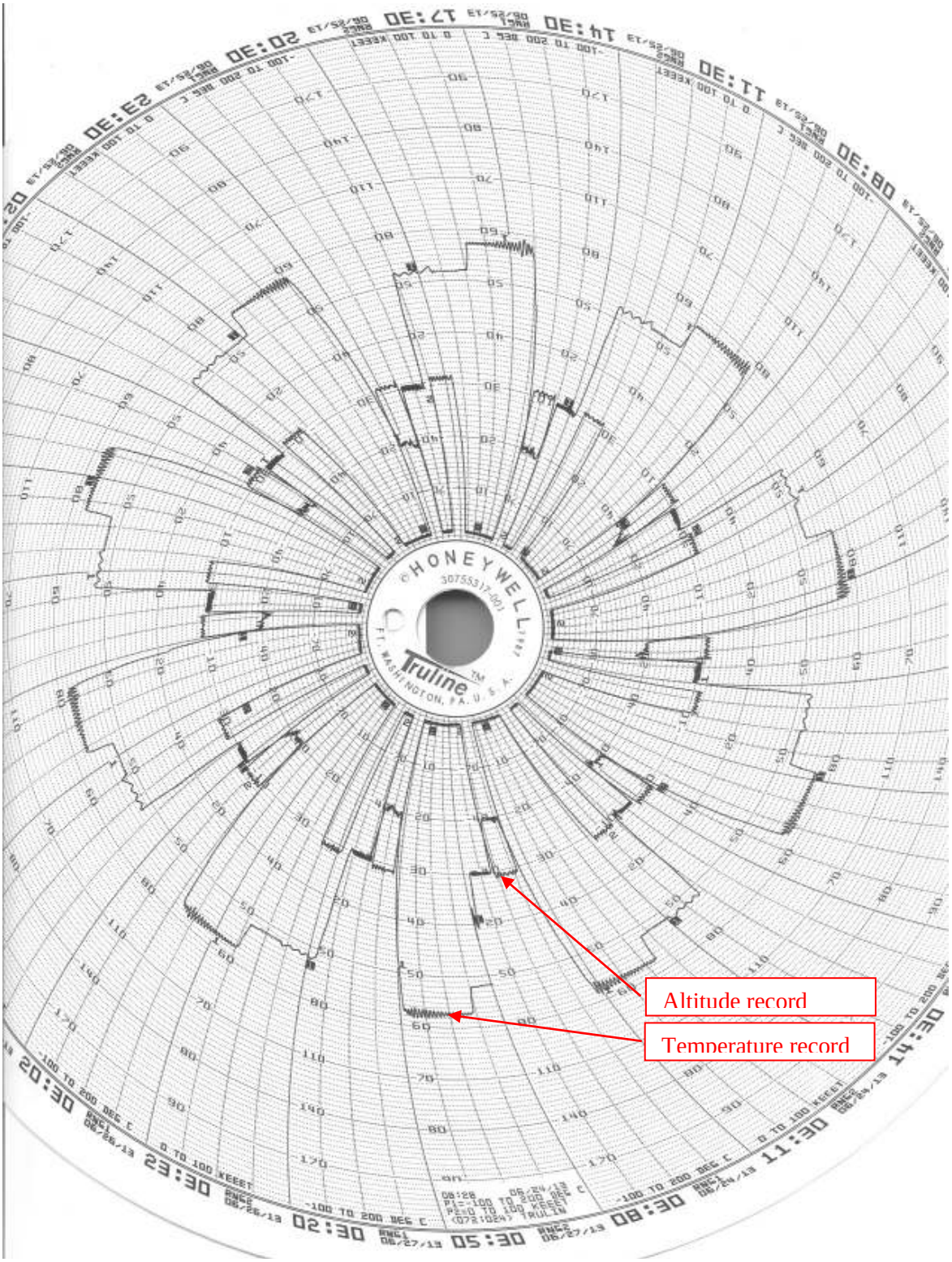


Figure 3 : Temperature-Altitude Test Record (Phase I)

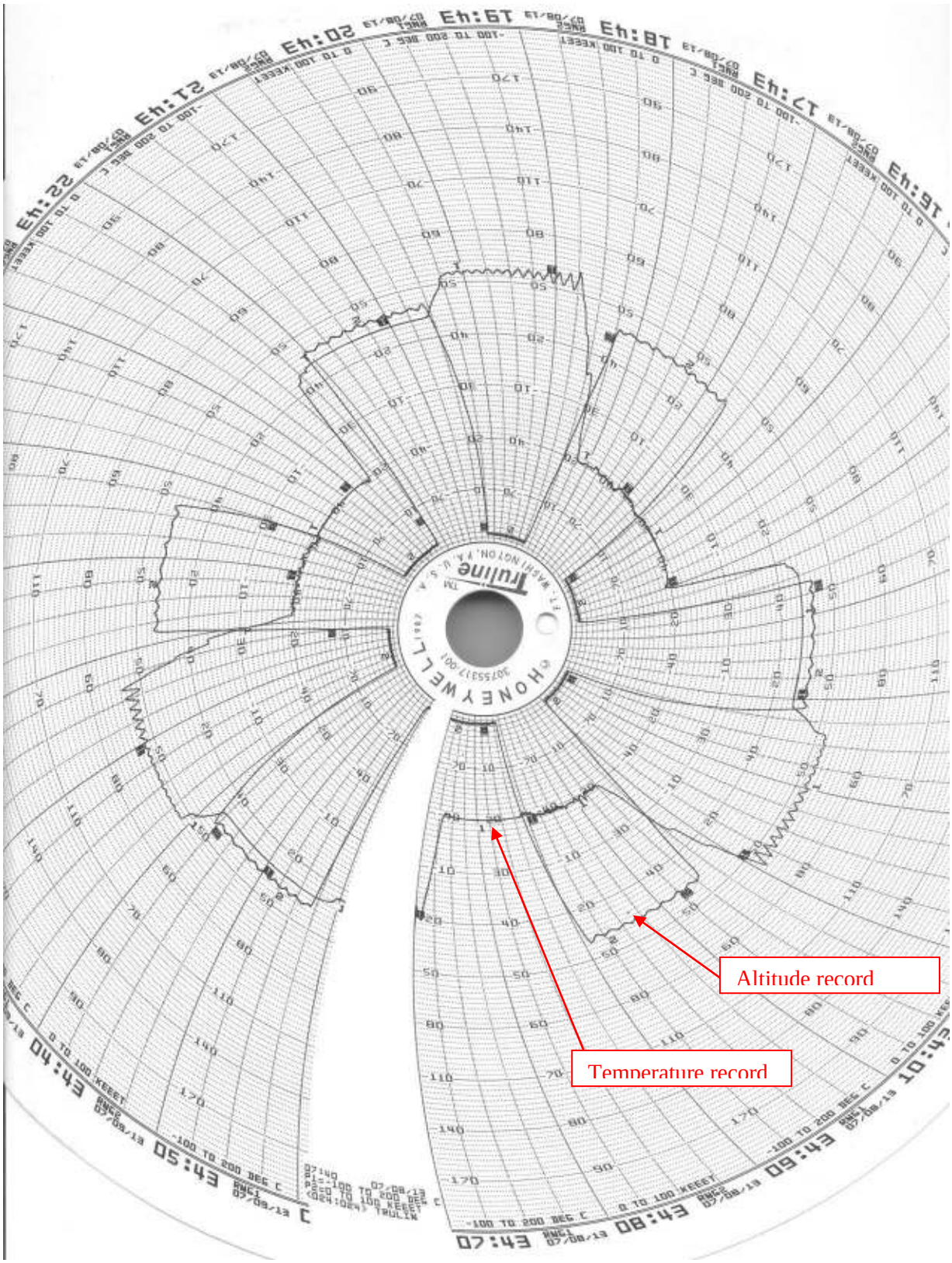


Figure 4: Temperature-Altitude Test Record (Phase II)

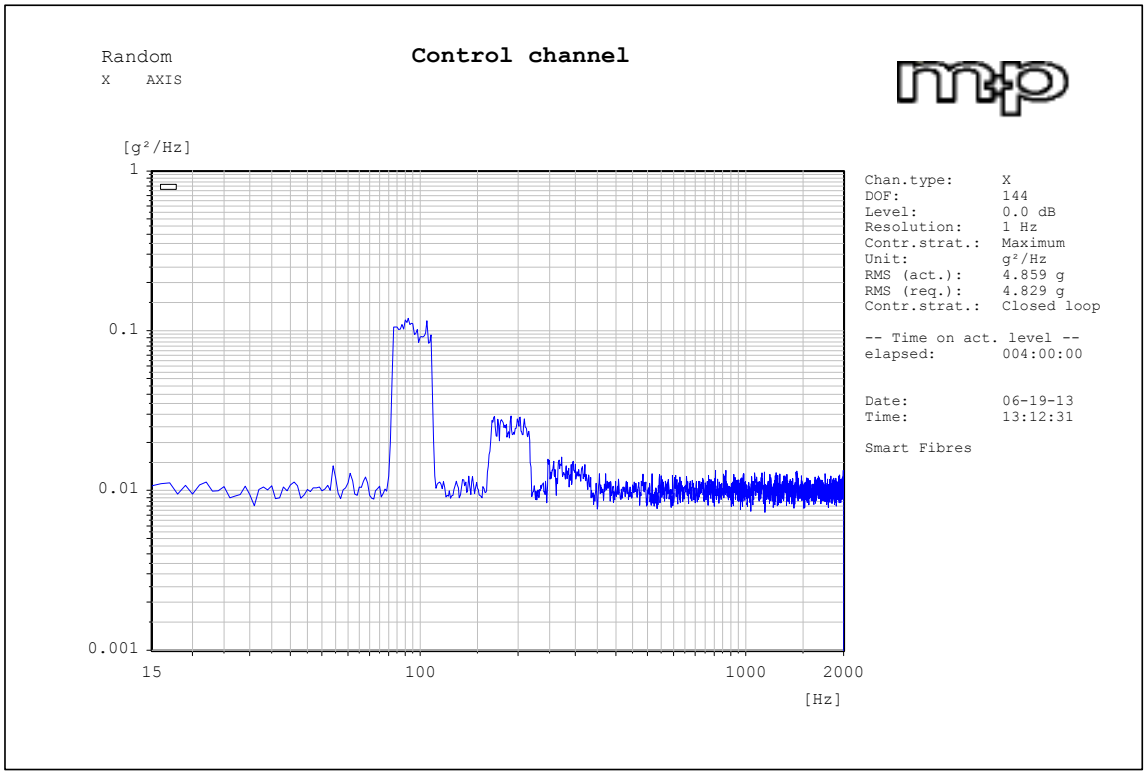


Figure 5: Random Test record –X Axis

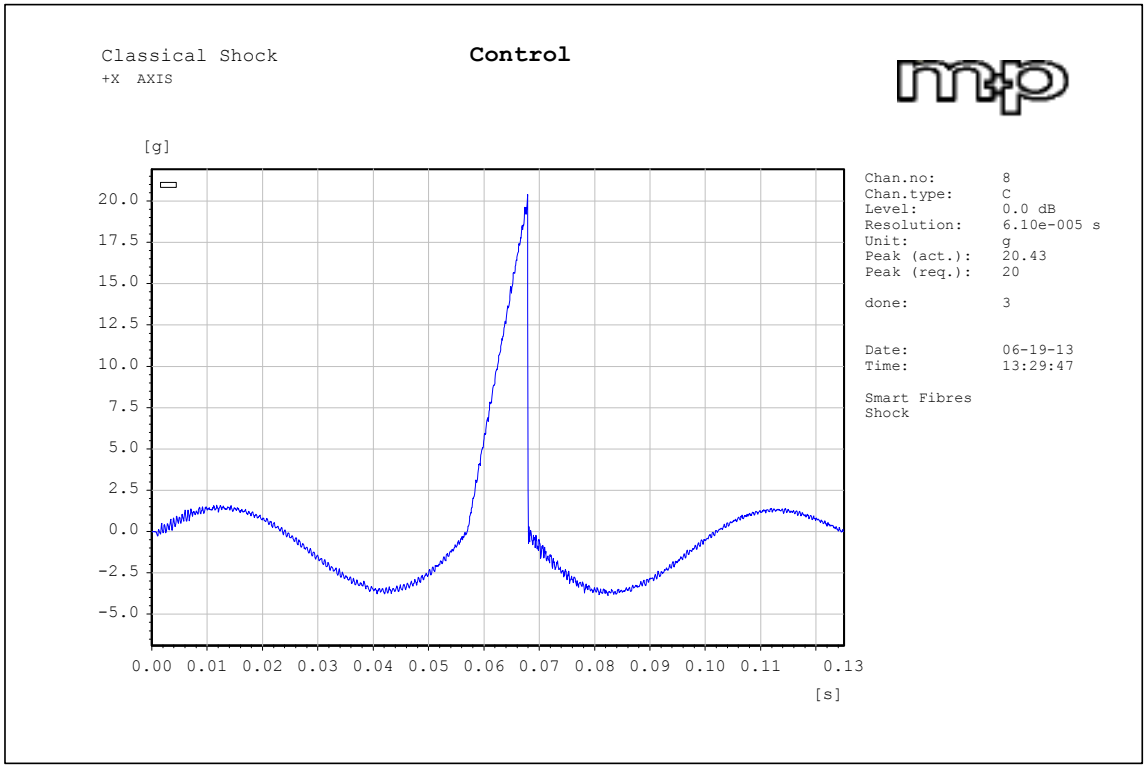


Figure 6: Shock Test record –X Axis-Positive

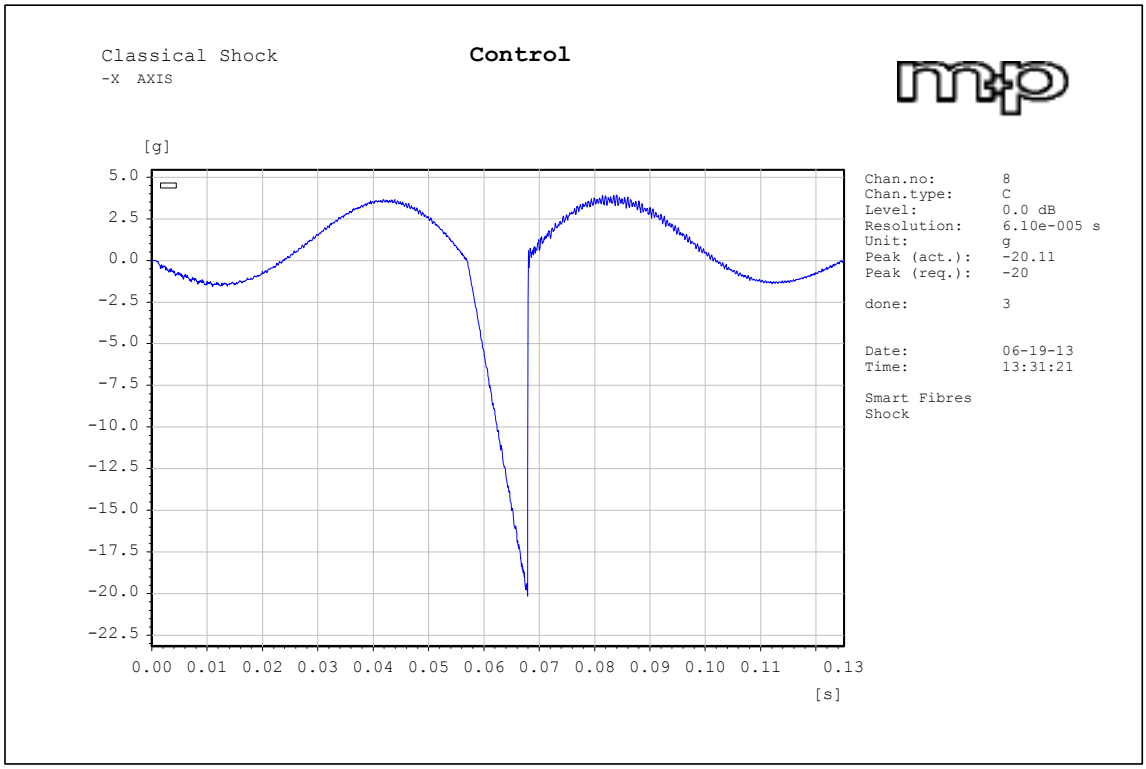


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Figure 7: Shock Test record –X Axis-Negative

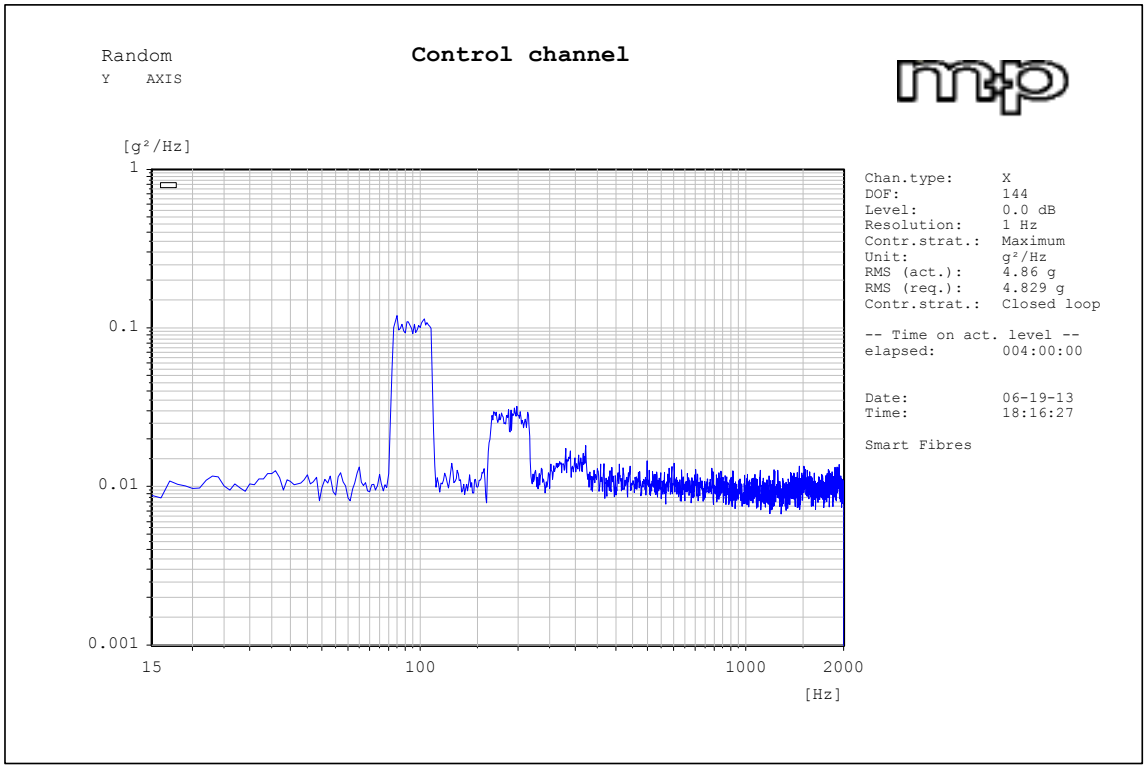

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Figure 8: Random Test record –Y Axis

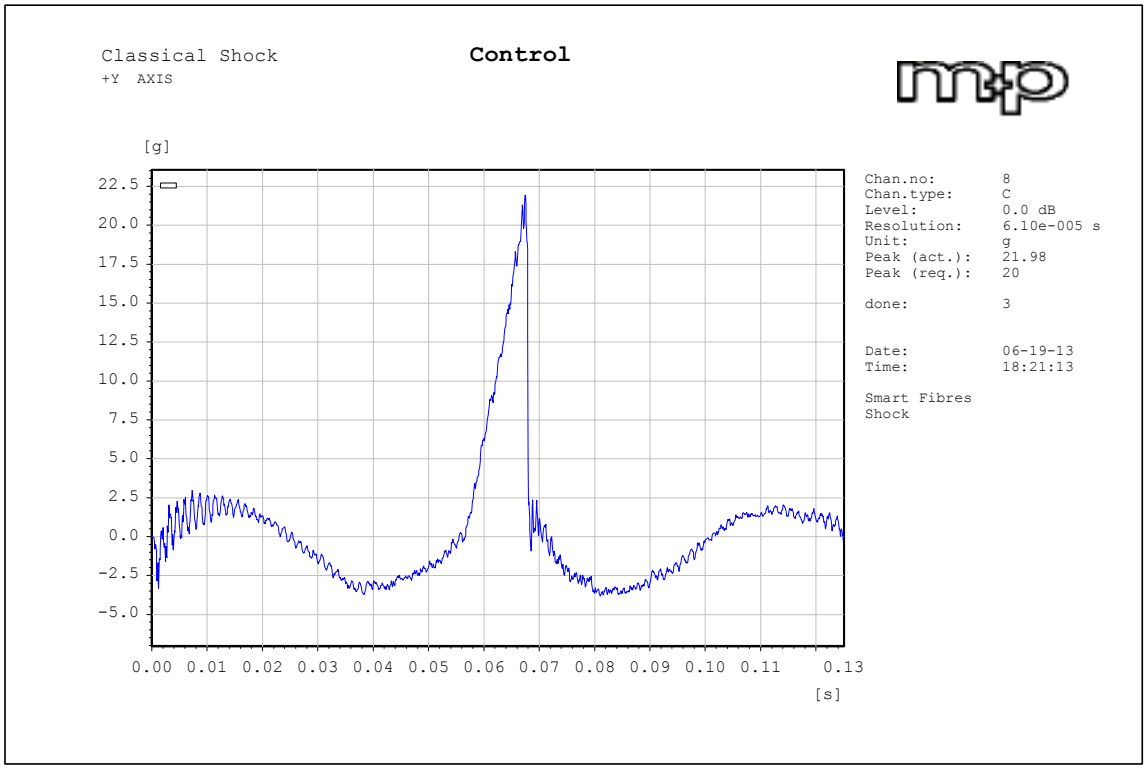


Figure 9: Shock Test record –Y Axis-Positive

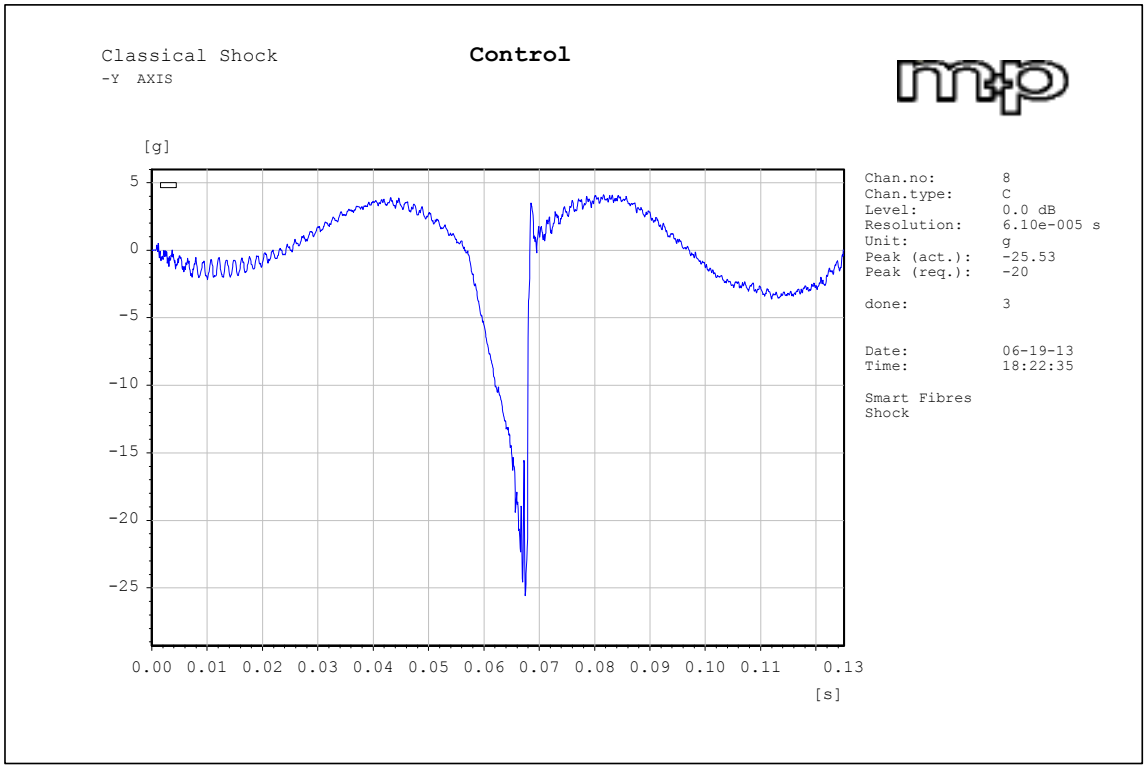
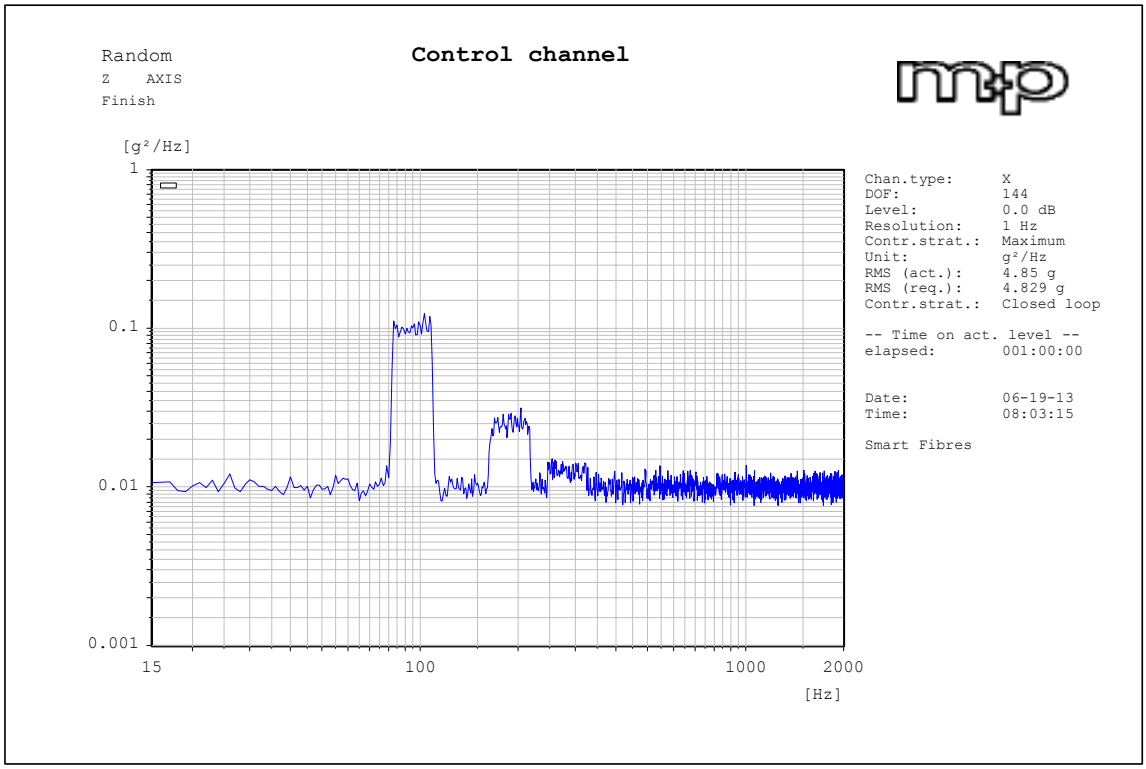


Figure 10: Shock Test record –Y Axis-Negative



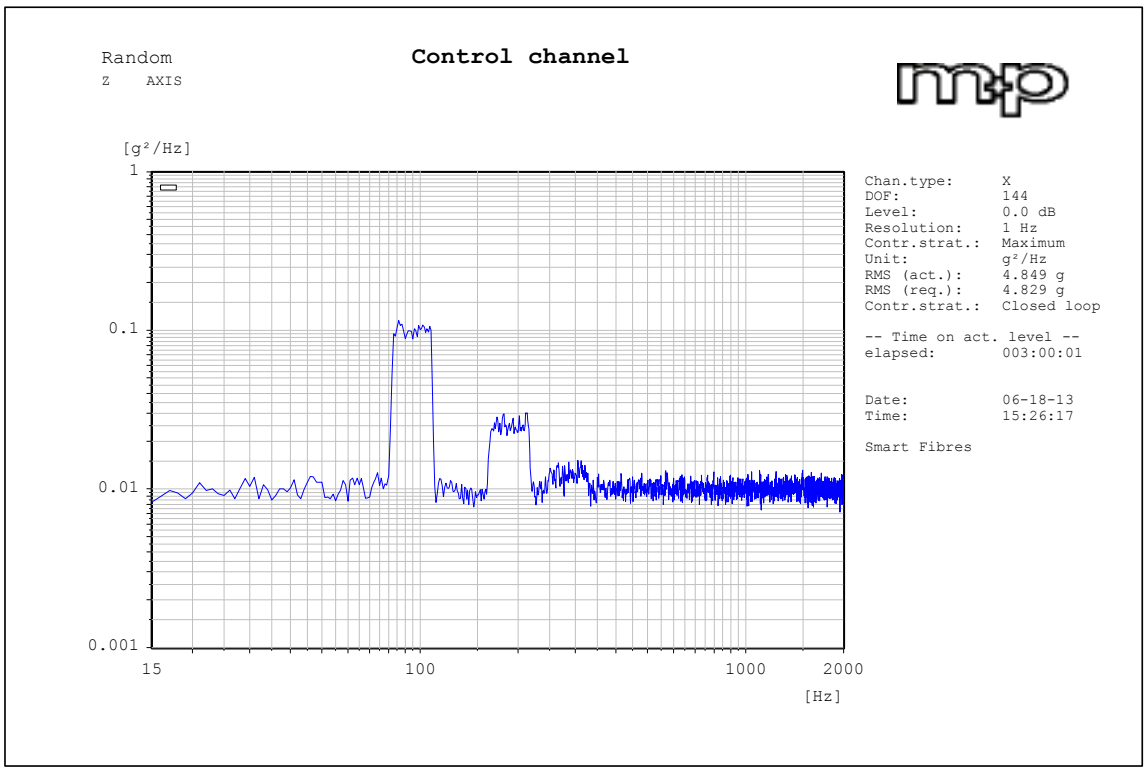


Figure 11: Random Test record –Z Axis

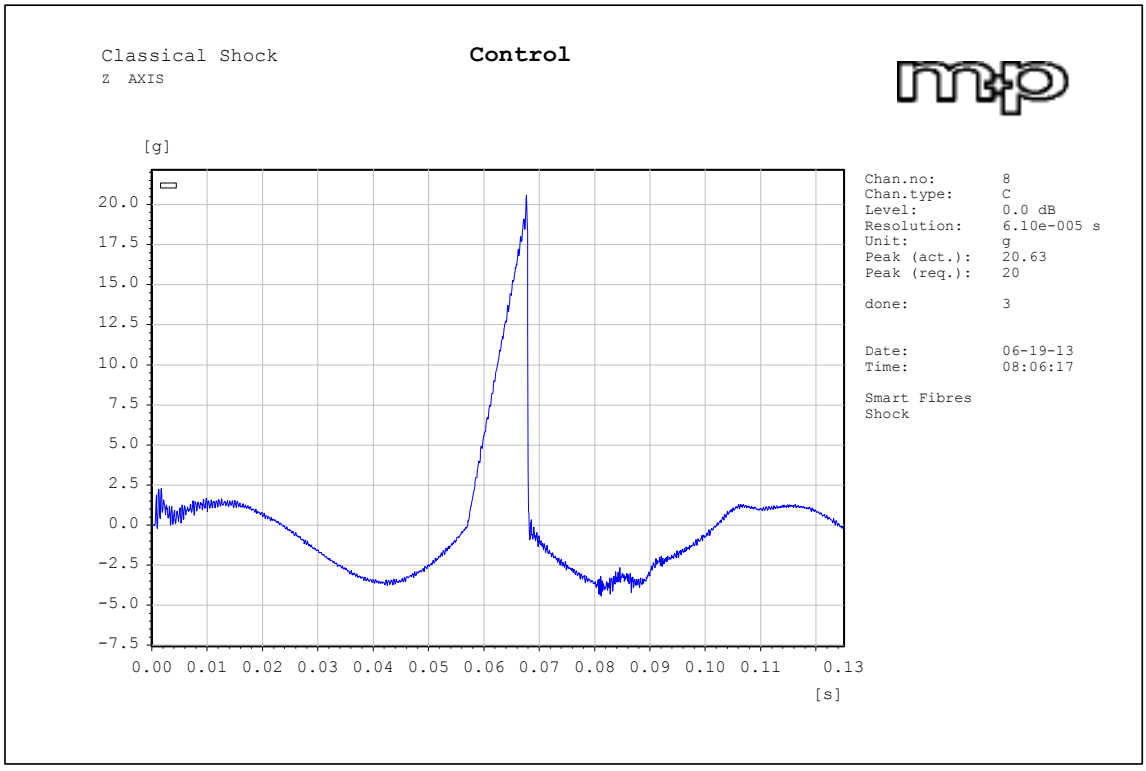


Figure 12: Shock Test record –Z Axis-Positive

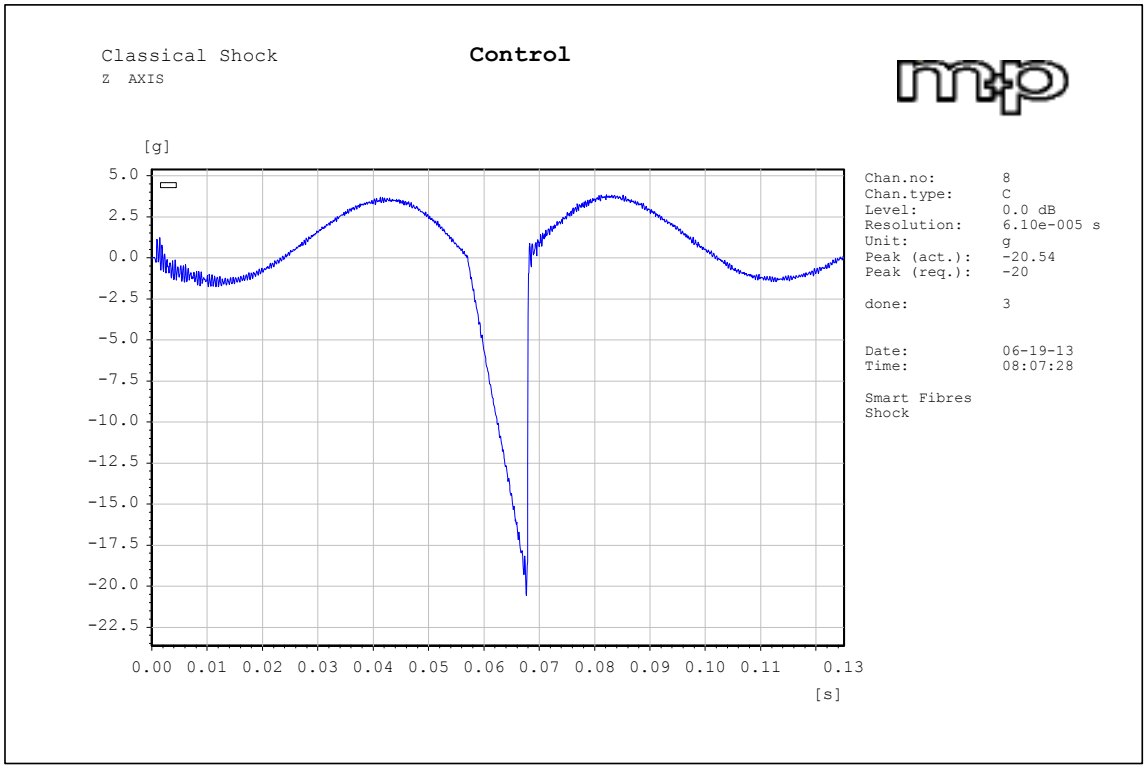


Figure 13: Shock Test record –Z Axis-Negative