VIBRATION TEST REPORT

VIBRPT3_S1100C_19APR2K6.doc
date:19 April 2006
Prot.: 207-06/SERMS srl

Laboratorio per lo Studio degli Effetti delle Radiazioni sui Materiali per lo Spazio
Via Pentima Bassa, 21
05100 TERNI
phone/fax: +39.0744.49.29.13

test performed on

assembly name	manufacturer	part number/serial number
UGPS QM Boards	G&A Engineering	

signature

prepared by :	18 Apr 06	*Dr. Maria Teresa Brunetti*	
	date	*work package responsible*	
controlled by:	19 Apr 06	*Eng. Stefano Lucidi*	
	date	*quality manager*	
approved by:	19 Apr 06	*Dr. Lucia Di Masso*	
	date	*laboratory responsible*	

change record

date	change description	revision
18 Apr 06	First issue	A01

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NOTICE

REPRODUCTION OF THIS REPORT

TEST REPORT DESCRIPTION

This document is generated by the S.E.R.M.S. Laboratory and reports on the setup, the operation and the results of the vibration test performed on the customer Device Under Test (D.U.T.); several sections compose this report: all of them have been integrated and adapted to the specific tests performed on the D.U.T.

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Laboratorio per lo Studio degli Effetti delle Radiazioni sui Materiali per lo Spazio
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GENERAL INFORMATION

Job Number: S1100C
Universal test number: VIBTEST32
Test performed on: UGPS QM Boards (n. 4)
Contractor: G&A Engineering – I.N.F.N. Rome
Contractor responsible: R. BELLAROSA (G&A), A. BARTOLONI (I.N.F.N. Rome)

APPLICABLE LAWS AND RULES

Customer procedure JSC-28792, Rev. D

S.E.R.M.S Lab. - INTERNAL TEST PROCEDURE

D.L. 19 settembre 1994, n.626
Attuazione delle direttive 89/391/CEE, 89/654/CEE, 89/655/CEE, 89/656/CEE, 90/269/CEE, 90/270/CEE, 90/394/CEE e 90/679/CEE riguardanti il miglioramento della sicurezza e della salute dei lavoratori sul luogo di lavoro, e successive modifiche;

MIL-HDBK-831 23 April 1999
Preparation of Test Reports (guidance only);

UNI –10653 – November 1997
Quality product technical documentation (guidance only) ;

UNI CEI EN45001
general criterion for test laboratory operation;

UNI CEI 70001
norm certificate test laboratory terms and definitions;

UNI CEI 70011
guide for test result presentation;

UNI 9513
vibration and shocks : vocabulary.

SERMS FACILITY - QUALITY ASSURANCE INFORMATION

item	description	manufacturer	calibration/maintenance due date
Control System	Spectral Dynamics		**12 February 2007**
Shaker	Ling Electronics		
Slip Tables	Team Corporation		
Sensor	Metra-Mess		**25 February 2007**

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REPORT SUMMARY

For all the configurations, the test was:

- random vibration at Minimum Workmanship Levels (MWL) following the requirements reported below:

All Axes	20 Hz	0.01 g^2/Hz
	20-80 Hz	+3 dB/Octave
	80-500 Hz	0.04 g^2/Hz
	500-2000 Hz	-3 dB/Octave
	2000 Hz	0.01 g^2/Hz
	Overall = 6.8 Grms	

TEST DIARY

Test G&A - UGPS			
	Start time	**End time**	**Notes**
UGPS-MWL-X-QM	16.15	16.25	12/04/06 - 10 min
UGPS-MWL-Y-QM	16.45	16.55	12/04/06 - 10 min
UGPS-MWL-Z-QM	12.00	12.10	12/04/06 - 10 min

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TEST RESULTS

The **UGPS QM Boards** (four) have been tested with

- random vibration

along its three orthogonal axes in April 2006 at S.E.R.M.S. Lab. in Terni.

The planned tests according to the test procedure were executed and the required input levels were verified.

Visual inspections on the D.U.T. have been performed after each sub-test.

FOR ALL THE SUB-TESTS PERFORMED NO DAMAGE HAS BEEN REPORTED AND ALL SUB-TESTS HAVE BEEN NORMALLY COMPLETED.

The planned test according to the test procedure were executed and the functionality of the D.U.T. were verified by G&A and INFN-Rome personnel.

All the functional test on the equipment are reported on the following customer document:

Logbook Vibration Test

The complete set of test data recorded will be provided on customer request; in this report will be summarized only the most significant test data.

REMARKS

None.

X-AXIS SUB-TEST

sub-test description

The general view of the test setup for the X-axis is shown in figure 1. For the X-axis sub-test the **UGPS QM Boards** (four) have been mounted over the fixture matching the X-axis of the DUT with the slip table axis, as shown below. One sensor (channel or CH) has been used during this sub-test. It was fixed on the DUT by cyanoacrilic glue.

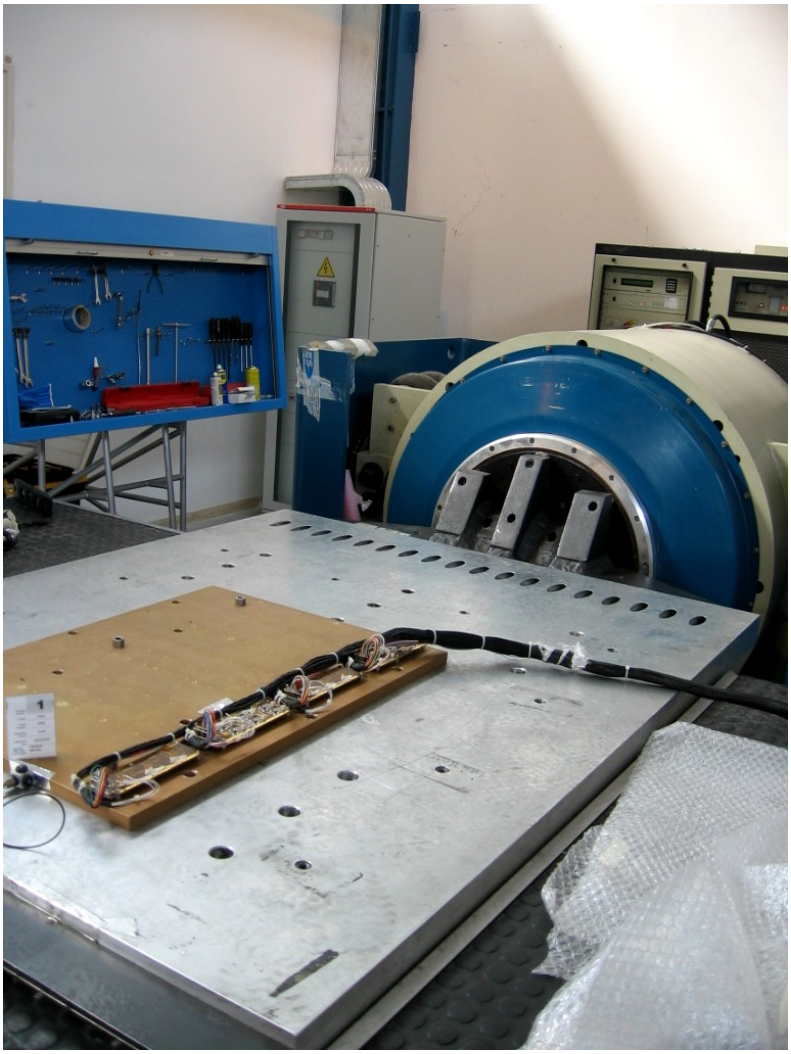

Figure 1. General view of the X-axis test setup.

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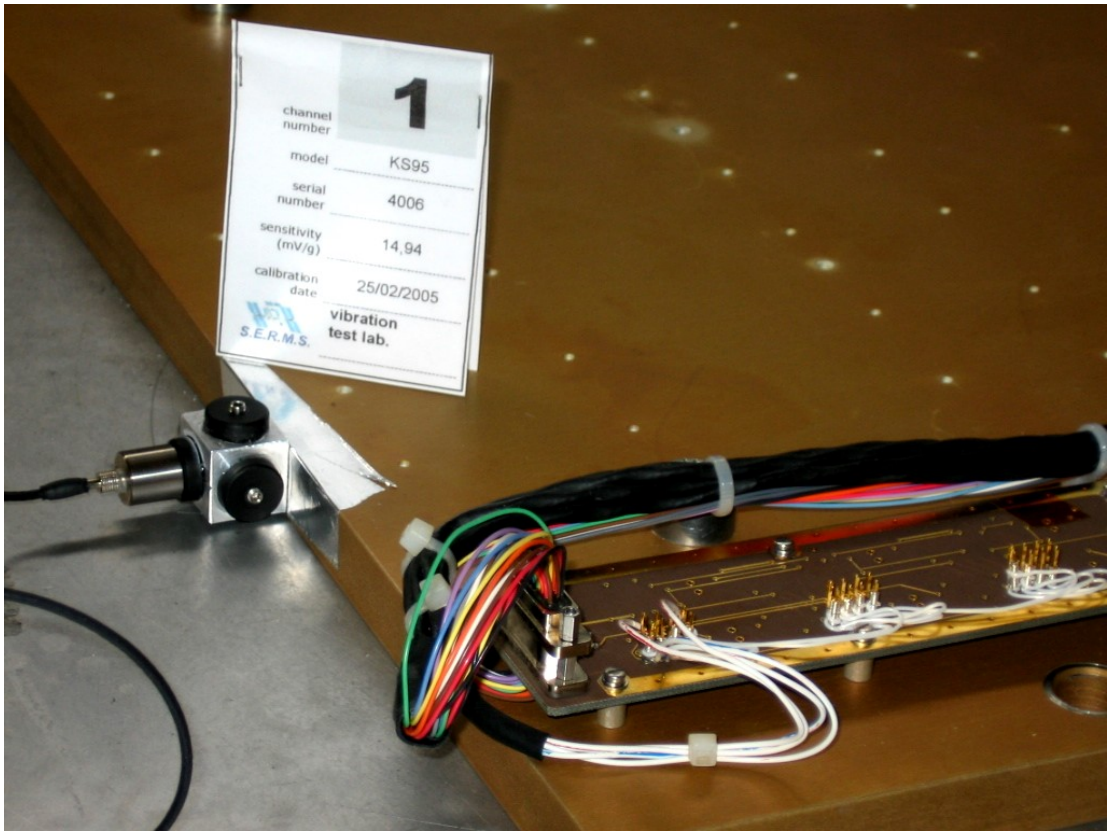

Figure 2. Control channel (CH1) in the X-axis test setup.

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Y-AXIS SUB-TEST

sub-test description

The general view of the test setup for the Y-axis is shown in figure 3. For the Y-axis sub-test the **UGPS QM Boards** (four) have been mounted over the fixture matching the Y-axis of the DUT with the slip table axis, as shown below. One sensor (channel or CH) has been used during this sub-test. It was fixed on the DUT by cyanoacrilic glue.

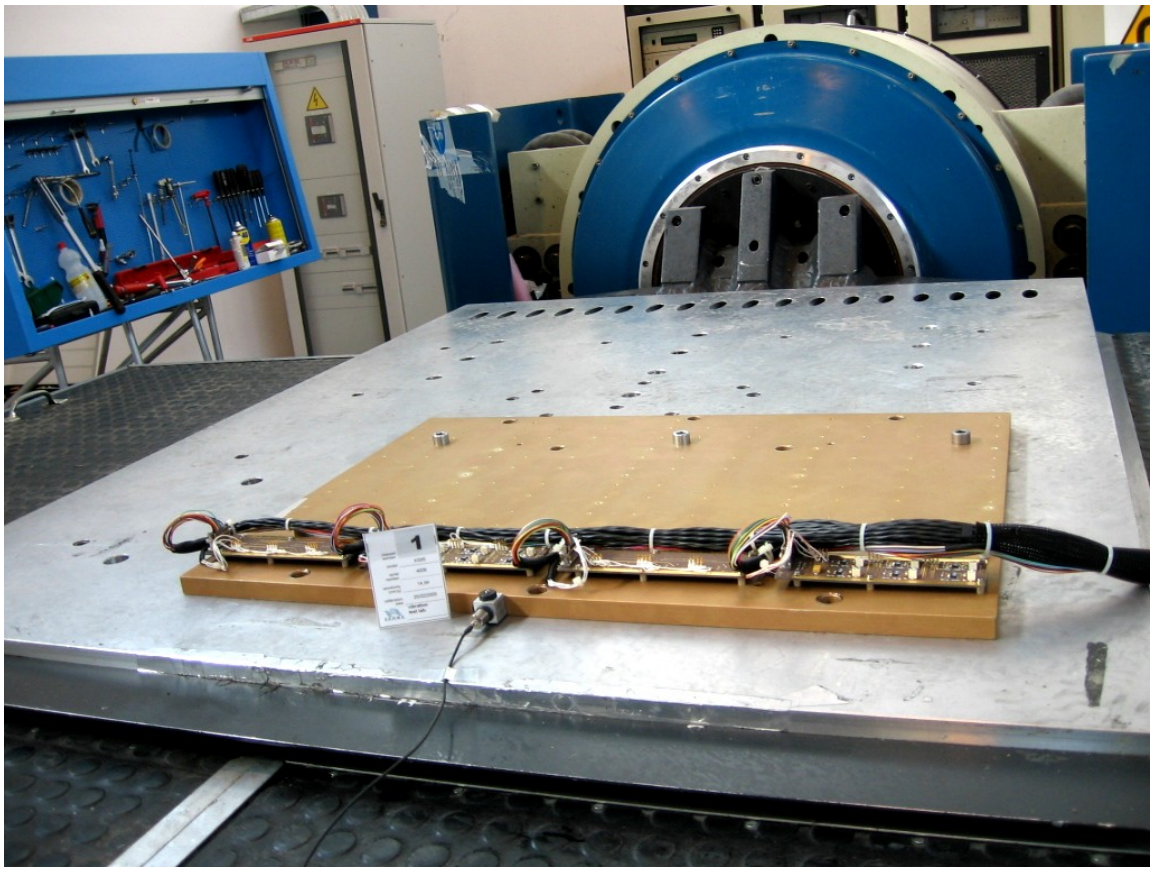

Figure 3. General view of the Y-axis test setup.

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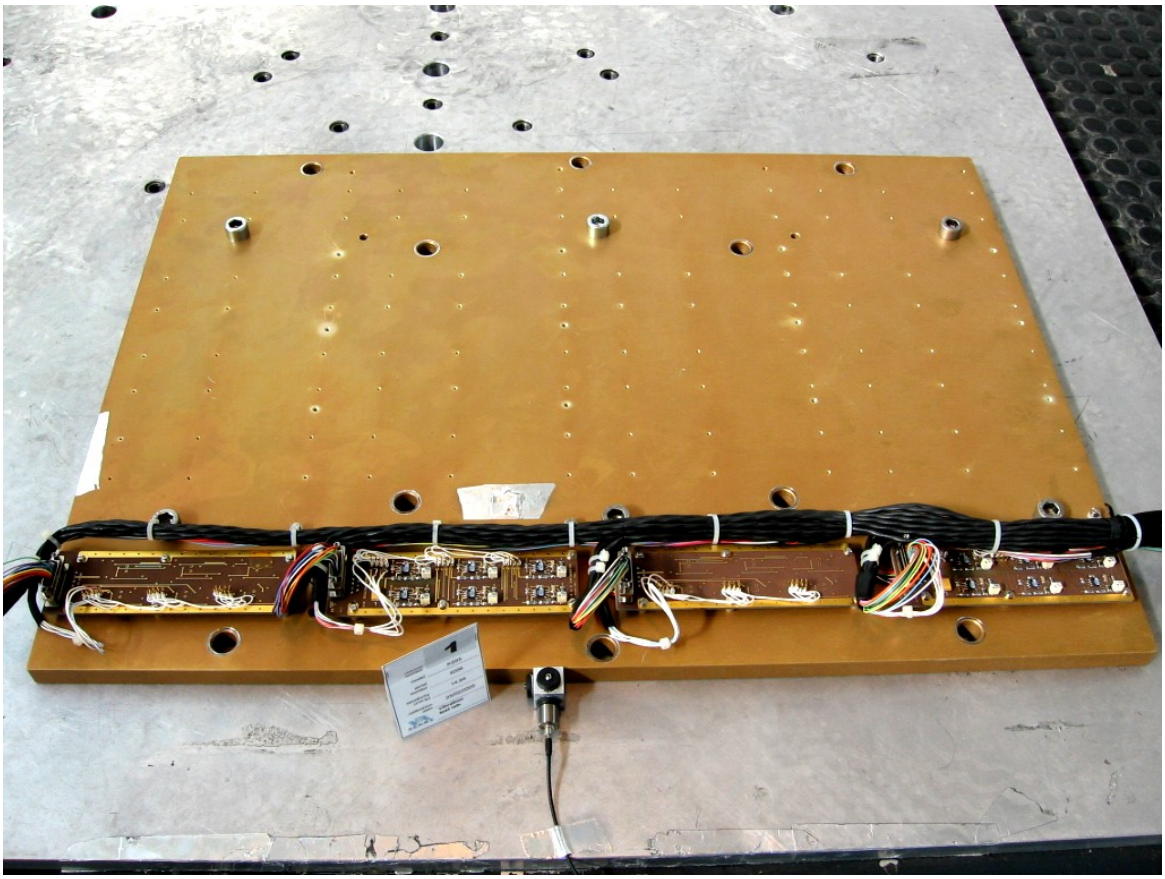

Figure 4. Control channel (CH1) in the Y-axis test setup.

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Z-AXIS SUB-TEST

sub-test description

The general view of the test setup for the Z-axis is shown in figure 5. For the Z-axis sub-test the **UGPS QM Boards** (four) have been mounted over the fixture matching the Z-axis of the DUT with the slip table axis, as shown below. One sensor (channel or CH) has been used during this sub-test. It was fixed on the DUT by cyanoacrilic glue.

Figure 5. General view of the Z-axis test setup.

Figure 6. Control channel (CH1) in the Z-axis test setup.

SUB-TEST GRAPHICS

The S.E.R.M.S. Lab. guarantees that the test set-up and management is done only by authorized and qualified members of the S.E.R.M.S staff according to the customer specifications.

After the input of the test engineer, the control system records the parameters for all the different sub-tests and automatically generates the corresponding printable output files.

The graphs are automatically generated during the test by the control system and directly inserted into this report;

X-axis test graphics

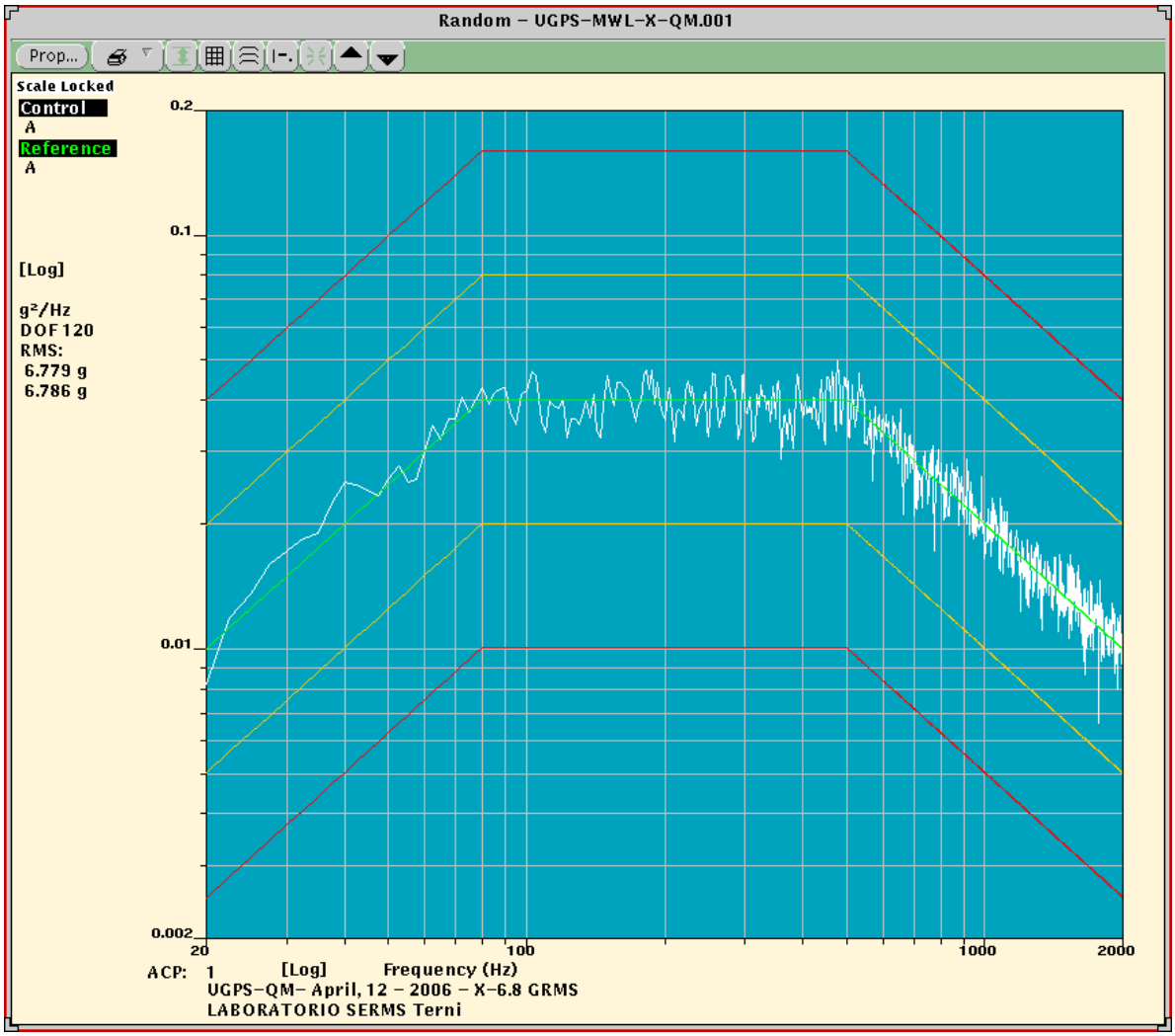

Figure 7. Response of the control channel (CH1) to the random vibration at MWL on X-axis.

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```
Random V2.6.0 Test Summary Listing

Storage File Name:                  UGPS-MWL-X-QM.001
Current Date:                       Wed Apr 19 2006  12:09:47

DOCUMENTATION:
    Title 1: UGPS-QM- April, 12 - 2006 - X-6.8 GRMS
    Title 2: LABORATORIO SERMS Terni
    Title 3:

TEST RESULTS:
    Time at Shutdown:               15:54:26
    Date at Shutdown:               12-Apr-2006
    Reason for Shutdown:            Test Completed Normally
    Initial Test Level:                -9.0 dB
    Elapsed Time at Initial Level   000:00:27
    Elapsed Time at Full Level      000:10:00
    Remaining Time at Full Level    000:00:00
    Maximum Control Error:            -18.8 dB  @  1930.0 Hz
    Table of Alarms                Occurrences  Maximum Value
      Control PSD Tolerance Band:        0
      Control RMS Alarm:                 0
      Maximum Drive:                     0
      Input Overload:                    0


CONTROL STRATEGY:
    Degrees of Freedom:               120
    Control Spectrum:               Average
    Output Window:                  Kaiser-Bessel
    Drive Clipping:                     3.0 Sigma

REFERENCE PARAMETERS:
    TEST BANDWIDTH
        Minimum Frequency:             20.00 Hz
        Maximum Frequency:           2000.00 Hz
        Frequency Lines:              800.00 Lines
        Frequency Resolution:           2.50 Hz
    SPECTRUM DYNAMIC LIMITS
        Overall RMS:                    6.79 g RMS
        Maximum Acceleration (0-pk):   20.36 g
        Maximum Velocity (0-pk):        0.16 m/s
        Maximum Displacement (0-pk):    0.62 mm
    IMPORT REFERENCE
        Import:                       Off

PROFILE PARAMETERS:
    DOF Variance (dB):                1.2
    PROFILE #1
        Label:                      Duplicate of Reference
        Minimum Frequency:             40.00 Hz
        Maximum Frequency:            800.00 Hz
        Overall RMS:                    0.00 g
    PROFILE #2
        Label:                      Duplicate of Reference
        Minimum Frequency:             20.00 Hz
        Maximum Frequency:           1000.00 Hz
        Overall RMS:                    0.00 g

CHANNEL TABLE ACP 1:

Channel Channel     Loop  Sensitivity Input    Transducer  Control Profile RMS Abort Avg
Number  Type        Check (mV/Units)  Coupling Type Units  Weight  Number   (Units)  Rem
   1    Control      Yes     103.40    ICP     Accel g      0.00                      NO
  99    Utility
 100    Drive
(Continued for Labels...)
Channel Channel     Channel Documentation
```

```
Number  Type        Label 1                    Label 2
   1    Control     KD41                       sn 0329
  99    Utility
 100    Drive
 (97 Inactive Channels)


End of Test Summary
```

Y-axis test graphics

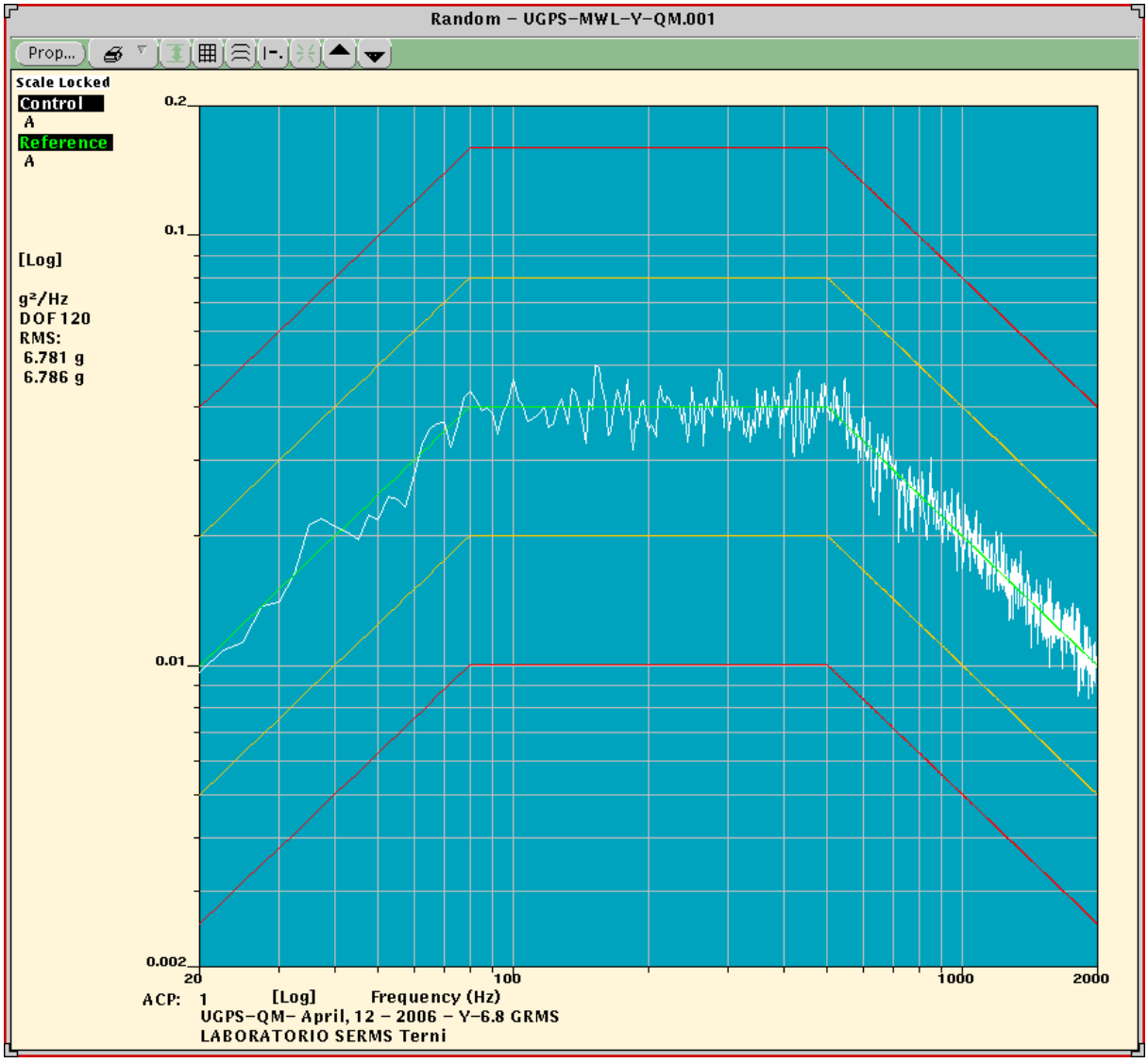

Figure 8. Response of the control channel (CH1) to the random vibration at MWL on Y-axis.

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```
Random V2.6.0 Test Summary Listing

Storage File Name:                  UGPS-MWL-Y-QM.001
Current Date:                       Wed Apr 19 2006  12:14:21

DOCUMENTATION:
    Title 1: UGPS-QM- April, 12 - 2006 - Y-6.8 GRMS
    Title 2: LABORATORIO SERMS Terni
    Title 3:

TEST RESULTS:
    Time at Shutdown:               16:24:43
    Date at Shutdown:               12-Apr-2006
    Reason for Shutdown:            Test Completed Normally
    Initial Test Level:                -9.0 dB
    Elapsed Time at Initial Level   000:00:19
    Elapsed Time at Full Level      000:10:00
    Remaining Time at Full Level    000:00:00
    Maximum Control Error:            -19.0 dB  @  1887.5 Hz
    Table of Alarms                Occurrences  Maximum Value
      Control PSD Tolerance Band:        0
      Control RMS Alarm:                 0
      Maximum Drive:                     0
      Input Overload:                    0


CONTROL STRATEGY:
    Degrees of Freedom:               120
    Control Spectrum:               Average
    Output Window:                  Kaiser-Bessel
    Drive Clipping:                     3.0 Sigma

REFERENCE PARAMETERS:
    TEST BANDWIDTH
        Minimum Frequency:             20.00 Hz
        Maximum Frequency:           2000.00 Hz
        Frequency Lines:              800.00 Lines
        Frequency Resolution:           2.50 Hz
    SPECTRUM DYNAMIC LIMITS
        Overall RMS:                    6.79 g RMS
        Maximum Acceleration (0-pk):   20.36 g
        Maximum Velocity (0-pk):        0.16 m/s
        Maximum Displacement (0-pk):    0.62 mm
    IMPORT REFERENCE
        Import:                       Off

PROFILE PARAMETERS:
    DOF Variance (dB):                1.2
    PROFILE #1
        Label:                      Duplicate of Reference
        Minimum Frequency:             40.00 Hz
        Maximum Frequency:            800.00 Hz
        Overall RMS:                    0.00 g
    PROFILE #2
        Label:                      Duplicate of Reference
        Minimum Frequency:             20.00 Hz
        Maximum Frequency:           1000.00 Hz
        Overall RMS:                    0.00 g

CHANNEL TABLE ACP 1:

Channel Channel     Loop  Sensitivity Input    Transducer  Control Profile RMS Abort Avg
Number  Type        Check (mV/Units)  Coupling Type Units  Weight  Number   (Units)  Rem
   1    Control      Yes     103.40    ICP     Accel g      0.00                      NO
  99    Utility
 100    Drive
(Continued for Labels...)
Channel Channel     Channel Documentation
```

```
Number  Type        Label 1                    Label 2
   1    Control     KD41                       sn 0329
  99    Utility
 100    Drive
 (97 Inactive Channels)


End of Test Summary
```

Z-axis test graphics

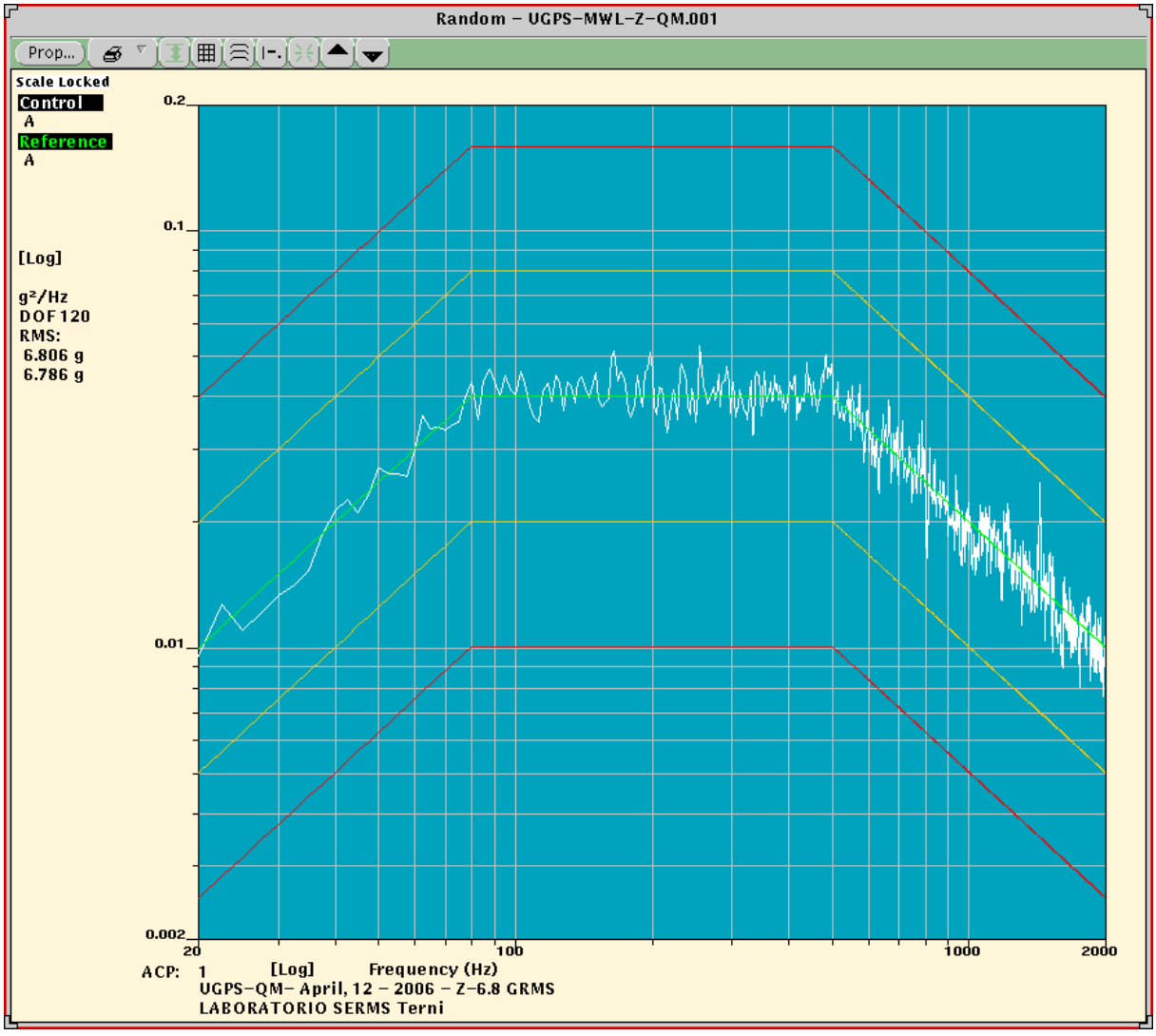

Figure 9. Response of the control channel (CH1) to the random vibration at MWL on Z-axis.

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```
Random V2.6.0 Test Summary Listing

Storage File Name:                  UGPS-MWL-Z-QM.001
Current Date:                       Wed Apr 19 2006  12:16:34

DOCUMENTATION:
    Title 1: UGPS-QM- April, 12 - 2006 - Z-6.8 GRMS
    Title 2: LABORATORIO SERMS Terni
    Title 3:

TEST RESULTS:
    Time at Shutdown:               11:42:06
    Date at Shutdown:               12-Apr-2006
    Reason for Shutdown:            Test Completed Normally
    Initial Test Level:                -9.0 dB
    Elapsed Time at Initial Level   000:00:17
    Elapsed Time at Full Level      000:10:00
    Remaining Time at Full Level    000:00:00
    Maximum Control Error:            -18.9 dB  @  1470.0 Hz
    Table of Alarms                Occurrences  Maximum Value
      Control PSD Tolerance Band:        0
      Control RMS Alarm:                 0
      Maximum Drive:                     0
      Input Overload:                    0


CONTROL STRATEGY:
    Degrees of Freedom:               120
    Control Spectrum:               Average
    Output Window:                  Kaiser-Bessel
    Drive Clipping:                     3.0 Sigma

REFERENCE PARAMETERS:
    TEST BANDWIDTH
        Minimum Frequency:             20.00 Hz
        Maximum Frequency:           2000.00 Hz
        Frequency Lines:              800.00 Lines
        Frequency Resolution:           2.50 Hz
    SPECTRUM DYNAMIC LIMITS
        Overall RMS:                    6.79 g RMS
        Maximum Acceleration (0-pk):   20.36 g
        Maximum Velocity (0-pk):        0.16 m/s
        Maximum Displacement (0-pk):    0.62 mm
    IMPORT REFERENCE
        Import:                       Off

PROFILE PARAMETERS:
    DOF Variance (dB):                  1.2
    PROFILE #1
        Label:                      Duplicate of Reference
        Minimum Frequency:             40.00 Hz
        Maximum Frequency:            800.00 Hz
        Overall RMS:                    0.00 g
    PROFILE #2
        Label:                      Duplicate of Reference
        Minimum Frequency:             20.00 Hz
        Maximum Frequency:           1000.00 Hz
        Overall RMS:                    0.00 g

CHANNEL TABLE ACP 1:

Channel Channel     Loop  Sensitivity Input    Transducer  Control Profile RMS Abort Avg
Number  Type        Check (mV/Units)  Coupling Type Units  Weight  Number   (Units)  Rem
   1    Control      Yes     103.40    ICP     Accel g      0.00                      NO
  99    Utility
 100    Drive
```

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ASSEMBLY NAME **UGPS QM Boards**
MANUFACTURER: **G&A Engineering**

```
(Continued for Labels...)
Channel Channel     Channel Documentation
Number  Type        Label 1                       Label 2
   1    Control     KD41                          sn 0329
  99    Utility
 100    Drive
 (97 Inactive Channels)


End of Test Summary
```