DLS ELECTRONIC SYSTEMS, INC. NVLAP 100276-0

1250 Peterson Dr., Wheeling, IL 60090

Company: Stryker Instruments
Model Tested: 5100-050-000 & 5100-001-000
Report Number: 10207

FCC Rules and Regulations / Intentional Radiators

Operational in the Band 13.553-13.567 MHz

Part 15, Subpart C, Section 15.225

THE FOLLOWING **"MEETS"** THE ABOVE TEST SPECIFICATION

Formal Name:	TPS Console & TPS Irrigation Console
Kind of Equipment:	Medical Electrical Equipment (RFID Tag)
Test Configuration:	The TPS Irrigation Console is connected to the footswitch and handpieces via cables plugged into ports. Formula Shaver with buttons is running and an SE5 with buttons and a Saber Drill is plugged in. Two Corcom Line Filters were tested. (Tested at 120 vac, 60 Hz)
Model Number(s):	5100-001-000 & 5100-050-000
Model(s) Tested:	5100-050-000
Serial Number(s):	NA
Date of Tests:	July 3, 2003
Test Conducted For:	Stryker Instruments 4100 East Milham Kalamazoo, Michigan 49001

1250 Peterson Dr., Wheeling, IL 60090

SIGNATURE PAGE

Report By:

Arnom C. Rowe
Test Engineer
EMC-001375-NE

Reviewed By:

William Stumpf
OATS Manager

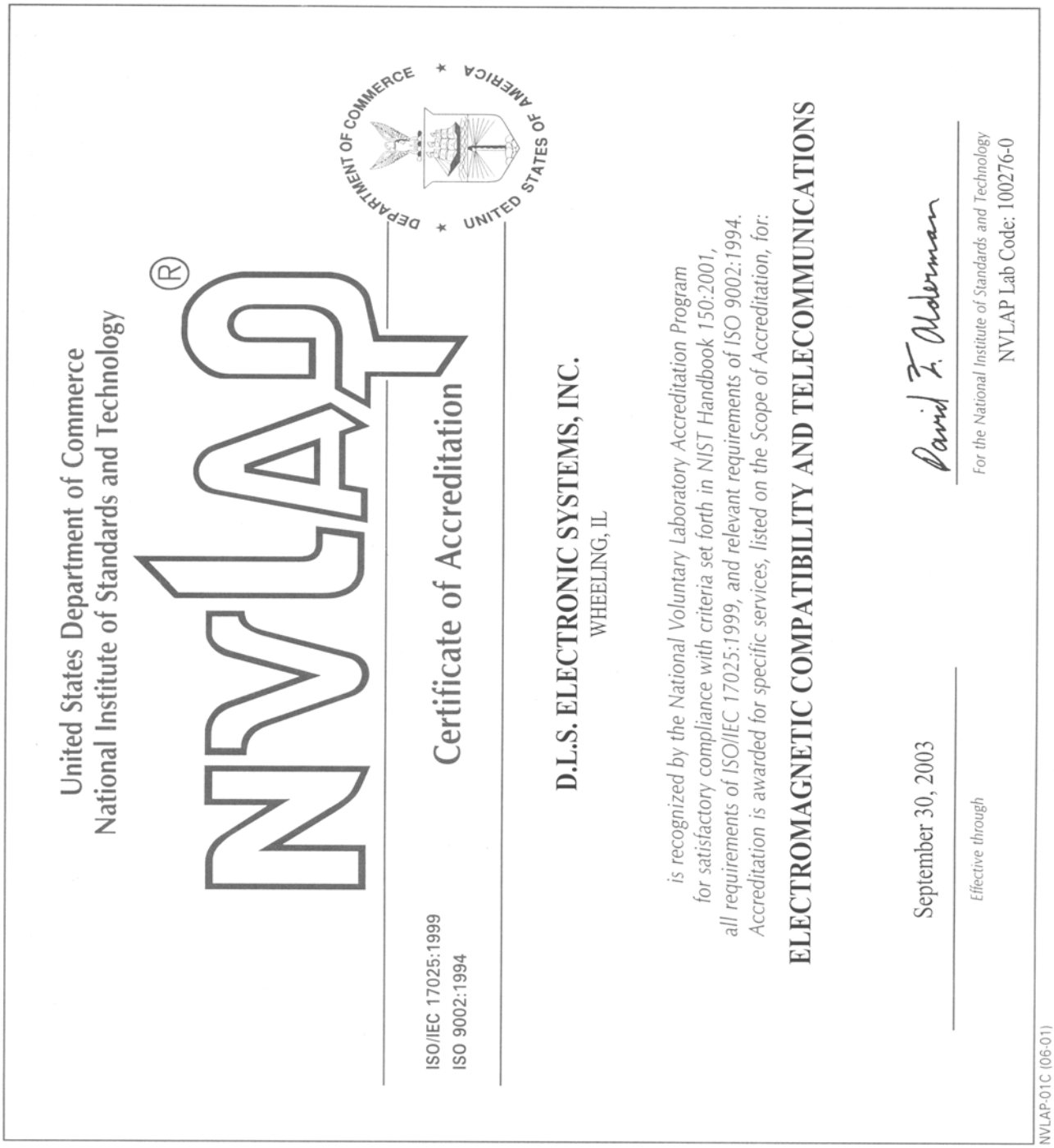
Approved By:

Brian Mattson
General Manager

Company Official:

Stryker Instruments

1250 Peterson Dr., Wheeling, IL 6009



United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation

ISO/IEC 17025:1999
ISO 9002:1994

D.L.S. ELECTRONIC SYSTEMS, INC.
WHEELING, IL

is recognized by the National Voluntary Laboratory Accreditation Program for satisfactory compliance with criteria set forth in NIST Handbook 150:2001, all requirements of ISO/IEC 17025:1999, and relevant requirements of ISO 9002:1994. Accreditation is awarded for specific services, listed on the Scope of Accreditation, for:

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

September 30, 2003
Effective through

David I. Alderman
For the National Institute of Standards and Technology
NVLAP Lab Code: 100276-0

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Scope of Accreditation

Revised Scope 06/04/2003

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

NVLAP LAB CODE 100276-0

D.L.S. ELECTRONIC SYSTEMS, INC.
1250 Peterson Drive
Wheeling, IL 60090-6454
Mr. Brian J. Mattson
Phone: 847-537-6400 Fax: 847-537-6488
E-Mail: bmattson@dlsemc.com
URL: http://www.dlsemc.com

NVLAP Code	*Designation / Description*
Emissions Test Methods:	
12/CIS11	IEC/CISPR 11 (1990) and EN 55011 (1998): Limits and Methods of Measurement of Electromagnetic Disturbance Characteristics of Industrial, Scientific, and Medical Radio-Frequency Equipment
12/CIS14	CISPR 14-1 (March 30, 2000): Limits and methods of measurement of radio interference characteristics of household electrical appliances, portable tools and similar electrical apparatus - Part 1: Emissions
12/CIS14a	EN 55014-1 (1993) with Amendments A1 (1997) & A2 (1999)
12/CIS14b	AS/NZS 1044 (1995)
12/CIS14c	CNS 13783-1
12/CIS22	IEC/CISPR 22 (1997) and EN 55022 (1998): Limits and methods of measurement of radio disturbance characteristics of information technology equipment

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D.L.S. ELECTRONIC SYSTEMS, INC.

NVLAP Code	*Designation / Description*
12/CIS22a	IEC/CISPR 22:1993: Limits and methods of measurement of radio disturbance characteristics of information technology equipment, Amendment 1:1995, and Amendment 2:1996.
12/CIS22b	CNS 13438:1997: Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment
12/F01	ANSI C63.4 (2001) - cited in FCC Method - 47 CFR Part 15 - Digital Devices
12/F01a	Conducted Emissions, Power Lines, 150 KHz to 30 MHz
12/F01b	Radiated Emissions
12/T51	AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment
Immunity Test Methods:	
12/I01	IEC 61000-4-2 (1995) and Amendment 1 (1998): Electrostatic Discharge Immunity Test
12/I02	IEC 61000-4-3 (1995) and Amendment 1 (1998): Radiated, Radio-Frequency Electromagnetic Field Immunity Test
12/I03	IEC 61000-4-4 (1995): Electrical Fast Transient/Burst Immunity Test

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NVLAP LAB CODE 100276-0

D.L.S. ELECTRONIC SYSTEMS, INC.

NVLAP Code	*Designation / Description*
12/I04	IEC 61000-4-5 (1995): Surge Immunity Test
12/I05	IEC 61000-4-6 (1996): Immunity to Conducted Disturbances, Induced Radio-Frequency Fields
12/I06	IEC 61000-4-8 (1993): Power Frequency Magnetic Field Immunity Test
12/I07	IEC 61000-4-11 (1994): Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests
MIL-STD-462 : Conducted Emissions:	
12/A18	MIL-STD-461 Version E Method CE106
MIL-STD-462 : Conducted Susceptibility:	
12/B12	MIL-STD-462 Version D Method CS101
12/B13	MIL-STD-462 Version D Method CS103
12/B25	MIL-STD-461 Version E Method CS114
12/B26	MIL-STD-461 Version E Method CS115
12/B27	MIL-STD-461 Version E Method CS116

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ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

NVLAP LAB CODE 100276-0

D.L.S. ELECTRONIC SYSTEMS, INC.

NVLAP Code	*Designation / Description*
MIL-STD-462 : Radiated Emissions:	
12/D04	MIL-STD-462 Version D Method RE101
12/D05	MIL-STD-462 Version D Method RE102
12/D06	MIL-STD-462 Version D Method RE103
MIL-STD-462 : Radiated Susceptibility:	
12/E08	MIL-STD-462 Version D Method RS101
12/E09	MIL-STD-462 Version D Method RS103

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1.0 SUMMARY OF TEST REPORT

It was found that the TPS Console & TPS Irrigation Console, Model Number(s) 5100-050-000 & 5100-001-000, **"meets"** the radio interference conducted and radiated emission requirements of the FCC "Rules and Regulations", Part 15, Subpart C, Section 15.225 for operational in the 13.553-13.567 MHz Band. It should be noted that the amount of margin was only 2.6 dB at 56.315 MHz, radiated. The normal tolerance of the test equipment is ±3 dB. Due to this tolerance and the variation in normal production, a margin of at least 6 dB is recommended.

This test report relates only to the items tested and contains the following number of pages.

Text:	69
Charts:	13

2.0 INTRODUCTION

On July 3, 2003, a series of radio frequency interference measurements was performed on TPS Console & TPS Irrigation Console, Model Number(s) 5100-050-000 & 5100-001-000, Serial Number: NA. The tests were performed according to the procedures of the FCC as stated in the "Methods of Measurement of Radio-Noise Emissions for Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" found in the American National Standards Institute, ANSI C63.4-2000. Tests were performedby personnel of D.L.S. Electronic Systems, Inc. who are responsible to Donald L. Sweeney, Senior EMC Engineer.

3.0 OBJECT

The purpose of this series of tests was to determine if the test sample could meet the radio frequency interference emission requirements of the FCC "Rules and Regulations", Part 15, Subpart C, Sections 15.209 & 15.225 for Intentional Radiators operating in the Band 13.553-13.567 MHz.

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4.0 TEST SET-UP

All emission tests were performed at D.L.S. Electronic Systems, Inc. and set up according to the American National Standards Institute, ANSI C63.4-2000, Section 8, (Figures 11a and 11b).

All emissions tests were performed with the test item placed on a 80 cm high rotating non-conductive table, located in the test room. Equipment normally operated on the floor was placed on a metal covered turntable which is flush with the surrounding conducting ground plane. The ground plane has an electrical isolation layer over its surface approximately 7 mm thick. The EUT is separated from the turntable ground plane by a non-conductive layer. The equipment under test was set up according to ANSI C63.4-2000, Sections 6, 7 and 8.

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5.0 TEST EQUIPMENT (Bandwidths and Detector Function)

All preliminary data was taken using Peak Detector Functions as required. This information was then used to determine the frequencies of maximum emissions. Above 1000 MHz, final data was taken using the Peak Detector.

Below 1000 MHz, final data was taken using the ESI 26/ESI 40 Rohde & Schwarz Receivers. These plots were made using the Peak Detector functions, with manual measurements performed on the questionable frequencies using the Average Detector Function of the Rohde & Schwarz Receivers as required.

The bandwidths shown below are specified by ANSI C63.4-2000, Section 4.2.

Frequency Range	Bandwidth (-6 dB)
10 to 150 kHz	200 Hz
150 kHz to 30 MHz	9 kHz
30 MHz to 1 GHz	120 kHz
Above 1 GHz	1 MHz

A list of the equipment used can be found in Table 1. All primary equipment was calibrated against known reference standards with a verified traceable path to NIST.

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6.0 DESCRIPTION OF TEST SAMPLE: (See also Paragraph 7.0)

6.1 Description:

The TPS Irrigation Console 5100-050-000 was the unit used during testing since it is the worst case scenerio. The standard TPS Console 5100-001-000 is identical to the TPS Irrigation Console 5100-050-000 minus the irrigation pump.

The TPS System is used for drilling, cutting and shaping bone for surgical procedures. The handpieces may be controlled via handswitch or foot operated footswitch control. The handpiece motor speeds are user selectable via a touch screen on the TPS Console Display and they vary from 6,000 rpm to 75,000 rpm. The system also incorporates an irrigation pump which operates in one of two modes. On demand when the handpiece is activated or in Flush Mode which is a continuous run operation. The TPS System also has the capability of recognizing which cutters are placed into the handpieces via RF.

This application is for identifying what kind of tool is being used by a surgeon to prevent mis-use, because the settings are automatically select such. rpm's and speed .

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6.0 DESCRIPTION OF TEST SAMPLE: (CON'T)

6.2 PHYSICAL DIMENSIONS OF EQUIPMENT UNDER TEST

.98' long x .75' wide x .5' high

6.3 LINE FILTER USED:

Corcom Filter 6ED4C or
Corcom Filter 6ED8C

6.4 INTERNAL CLOCK FREQUENCIES:

Switching Power Supply Frequencies:

100 kHz

Clock Frequencies:

24 MHz, 13.56 MHz, 12 MHz, 6 MHz, & .285 MHz

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6.0 DESCRIPTION OF TEST SAMPLE: (CON'T)

6.5 DESCRIPTION OF ALL CIRCUIT BOARDS:

1. TPS + Control Board Assembly PN: 5100-002-161 Rev 10
2. LCD Screen Interface Assembly PN: 5100-002-162 Rev 3
3. TPS Irrigation Pump Board Assembly PN: 5100-001-327 Rev B
4. Universal 400 Watt Power Supply PN: 5100-002-345 Rev 9

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7.0 ADDITIONAL DESCRIPTION OF TEST SAMPLE:
(See also Paragraph 6.0)

1: There were no changes made at D.L.S. Electronic Systems, Inc.

I certify that the above, as described in paragraph 8.0, describes the equipment tested and will be manufactured as stated.

By: _____ _____
Signature Title

For: _____ _____
Company Date

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8.0 PHOTO INFORMATION AND TEST SET-UP

Item 0 TPS Irrigation Console
Model Number: 5100-050-000, Serial Number: NA

Item 1 Stryker Endoscopy SE5/TPS

Item 2 Stryker Formula Shaver

Item 3 Stryker Saber Drill
Model Number 5100-120, SN: 0310600363

Item 4 Non-shielded AC Power Line Cord. 2m

Item 5 Stryker TPS Footswitch
Model Number 5100-8, SN: 99102653

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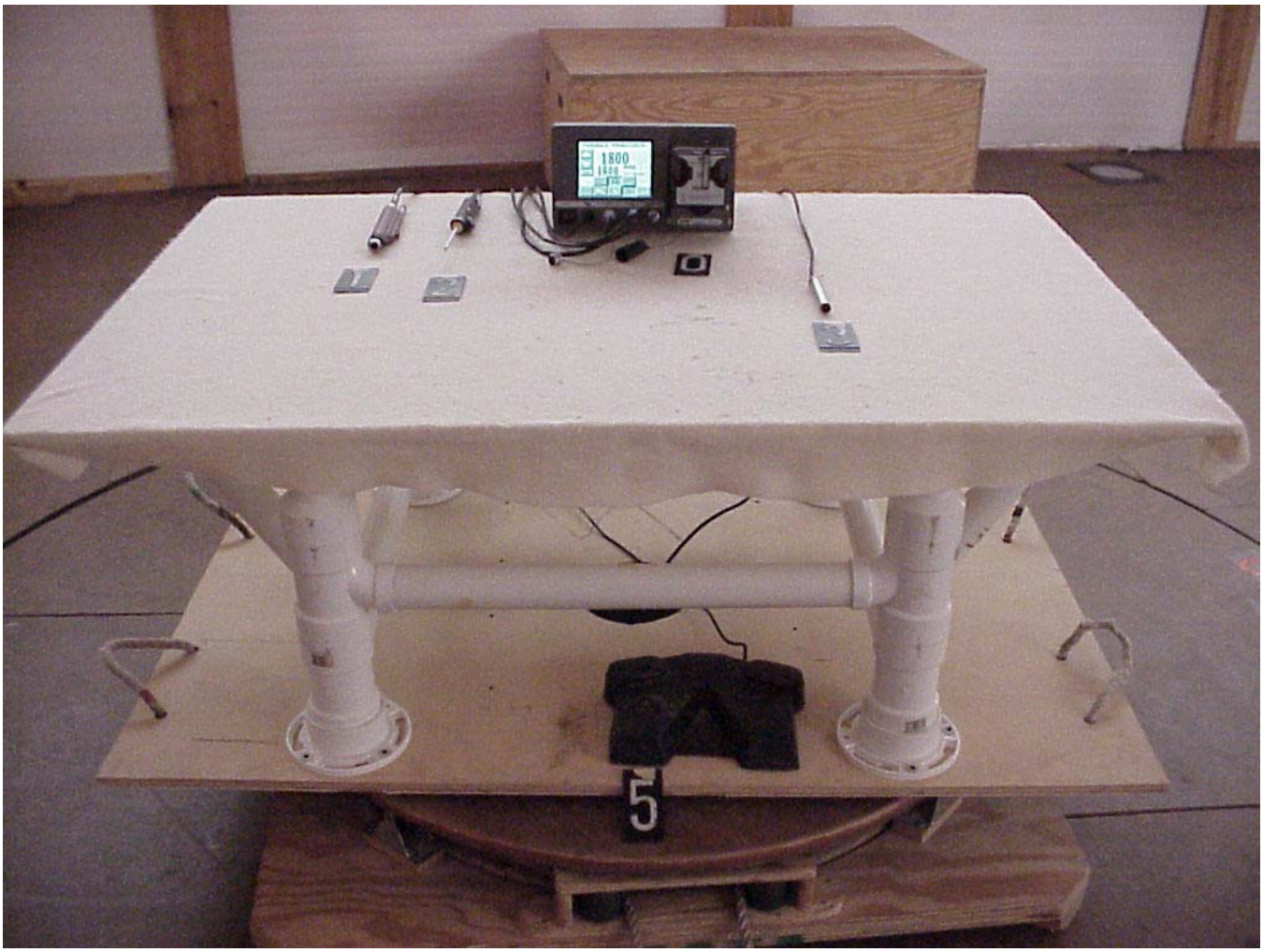
9.0 RADIATED PHOTOS TAKEN DURING TESTING



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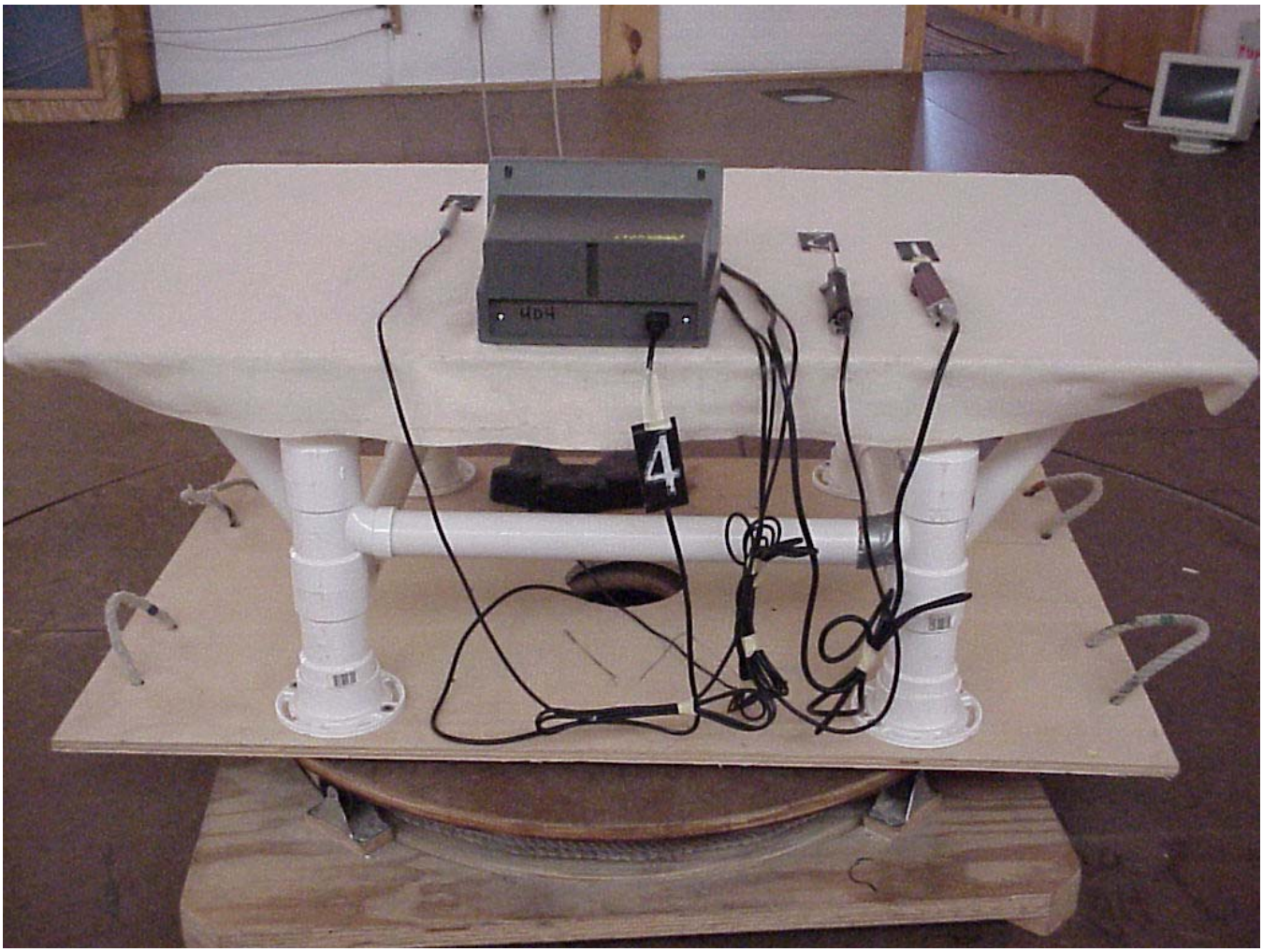
9.0 RADIATED PHOTOS TAKEN DURING TESTING (CON'T)



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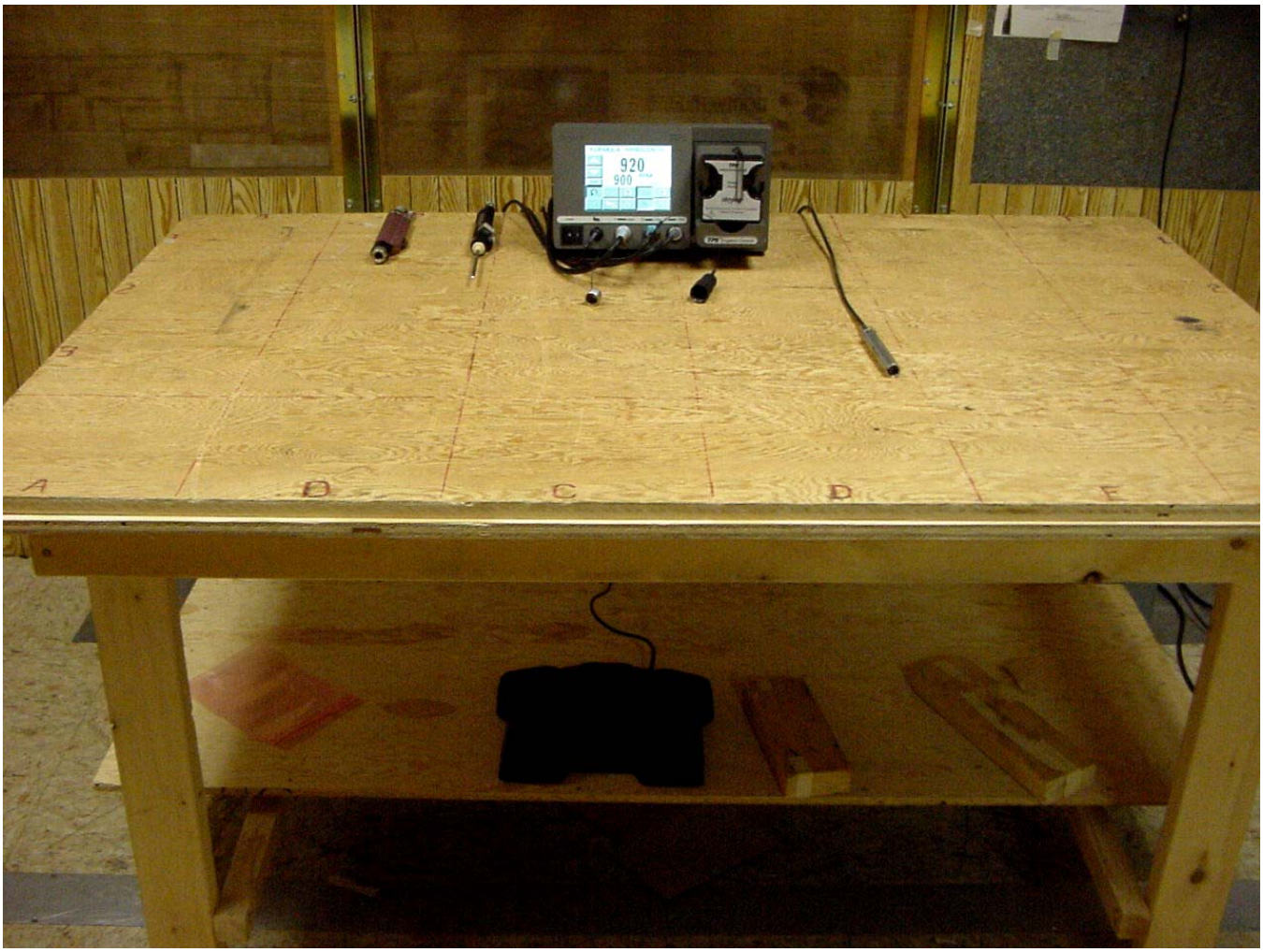
9.0 CONDUCTED PHOTOS TAKEN DURING TESTING



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10.0 RESULTS OF TESTS

The radio interference emission charts results can be seen on the pages at the end of this report. Data sheets indicating the test measurements taken during testing can also be found at the end of this report. Those points on the emission charts shown with a yellow mark are background frequencies which were verified during testing.

11.0 CONCLUSION

It was found that the TPS Console & TPS Irrigation Console, Model Number(s) 5100-001-000 & 5100-050-000 **"meets"** the radio interference conducted and radiated emission requirements of the FCC "Rules and Regulations", Part 15, Subpart C, Section 15.225 for operational in the 13.553-13.567 MHz Band. It should be noted that the amount of margin was only 2.6 dB at 56.315 MHz, radiated. The normal tolerance of the test equipment is ±3 dB. Due to this tolerance and the variation in normal production, a margin of at least 6 dB is recommended.

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TABLE 1 – EQUIPMENT LIST

Test Equipment	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Due Dates
Spectrum Analyzer	Hewlett/ Packard	8566B	2240A002041	100 Hz – 22 GHz	10/03
Quasi-Peak Adapter	Hewlett/ Packard	85650A	2043A00121	10 kHz – 1 GHz	10/03
Spectrum Analyzer	Hewlett/ Packard	8566B	2421A00452	100 Hz – 22 GHz	2/04
Quasi-Peak Adapter	Hewlett/ Packard	85650A	2043A00450	10 kHz – 1 GHz	2/04
Spectrum Analyzer	Hewlett/ Packard	8591A	3009A00700	9 kHz – 1.8 GHz	3/04
Receiver	Electrometrics	EMC-30	44168	10 kHz – 1 GHz	9/03
Receiver	Rohde & Schwarz	ESI 26	837491/010	20 Hz – 26 GHz	11/03
Receiver	Rohde & Schwarz	ESI 40	837808/006	20 Hz – 40 GHz	12/03
Receiver	Rohde & Schwarz	ESI 40	837808/005	20 Hz – 40 GHz	12/03
Antenna	EMCO	3104C	00054891	20 MHz – 200 MHz	2/04
Antenna	Electrometrics	LPA-25	1114	200 MHz – 1 GHz	3/04
Antenna	EMCO	3104C	00054892	20 MHz – 200 MHz	3/04

All primary equipment is calibrated against known reference standards with a verified traceable path to NIST.

ELECTRONIC SYSTEMS, INC.
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TABLE 1 – EQUIPMENT LIST

Test Equipment	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Due Dates
Antenna	Electrometrics	3146	1205	200 MHz – 1 GHz	3/04
Antenna	EMCO	3104C	97014785	20 MHz – 200 MHz	2/04
Antenna	EMCO	3146	97024895	200 MHz – 1 GHz	3/04
Antenna	EMCO	3115	2479	1 GHz – 18 GHz	8/03
Antenna	EMCO	3115	99035731	1 GHz – 18 GHz	4/04
Antenna	Rohde & Schwarz	HUF-Z1	829381001	20 MHz – 1 GHz	2/04
Antenna	Rohde & Schwarz	HUF-Z1	829381005	20 MHz – 1 GHz	8/03
LISN	Solar	8012-50-R-24-BNC	8305116	10 MHz – 30 MHz	8/03
LISN	Solar	8012-50-R-24-BNC	814548	10 MHz – 30 MHz	8/03
LISN	Solar	9252-50-R-24-BNC	961019	10 MHz – 30 MHz	12/03
LISN	Solar	9252-50-R-24-BNC	971612	10 MHz – 30 MHz	10/03
LISN	Solar	9252-50-R-24-BNC	92710620	10 MHz – 30 MHz	7/03

All primary equipment is calibrated against known reference standards with a verified traceable path to NIST.

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APPENDIX A

TEST PROCEDURE

Part 15, Subpart C, Section 15.225a-c

OPERATION WITHIN THE BAND 13.553-13.567 MHz

ELECTRONIC SYSTEMS, INC.
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1.0 CONDUCTED EMISSION MEASUREMENTS

The conducted emissions were measured over the frequency range from .45 MHz to 30 MHz in accordance with the power line measurements, as specified in FCC Part 15, Subpart C, Section 15.207 and ANSI C63.4-1992. Since the device is operated from the public utility lines, the 120 Vac, 60 Hz power leads, high and low sides were measured by connecting the measuring equipment to the appropriate meter terminal of the LISN. All signals were then recorded. During the test, the cables were placed and items moved (when appropriate) to maximize emissions. The allowed levels for Intentional Radiators shall not exceed 250 uV (47.96 dBuV) at any frequency between 450 kHz and 30 MHz, as stated in Section 15.207a.

All test measurements were made at a screen room temperature of **73°F** at **48%** relative humidity

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CONDUCTED DATA

AND

CHARTS TAKEN DURING TESTING

USING CORCOM FILTER 6ED4C

PART 15.207

FCC Part 15 Class B

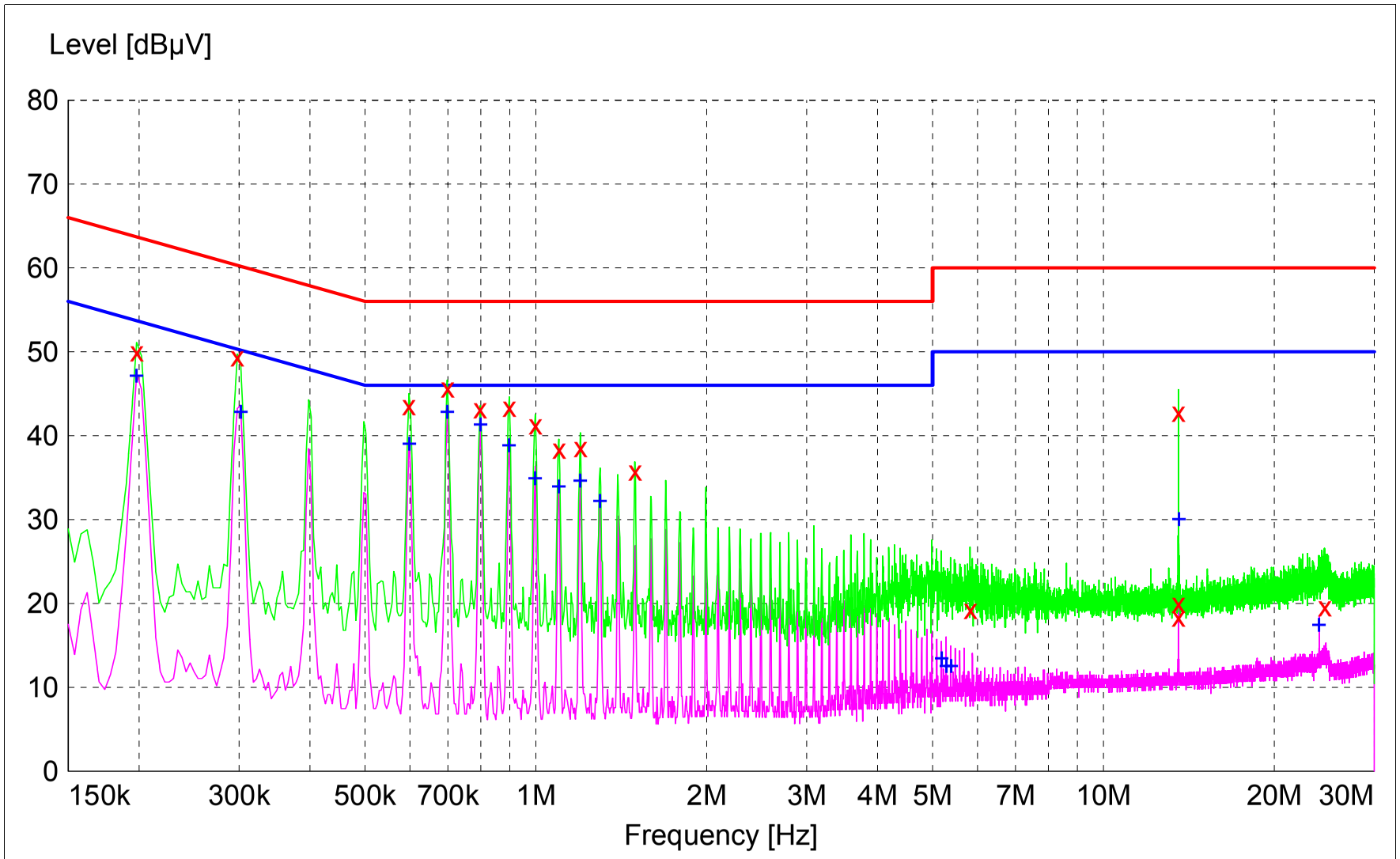
Voltage Mains Test

EUT:	TPS Plus (with CORCOM 6ED4C)
Manufacturer:	Stryker Instruments
Operating Condition:	70 deg. F, 59% R.H.
Test Site:	DLS OF Screen Room
Operator:	Craig Brandt
Test Specification:	120 VAC, 60 Hz Line 1
Comment:	Formula Shaver
	Date: 07-18-03

SCAN TABLE: "FCC ClassB Voltage"

Short Description: FCC Class B Voltage

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	30.0 MHz	4.0 kHz	MaxPeak Average	10.0 ms	9 kHz	LISN 971612



x x : MES 718TPSL1FCC_fin QP
+ + : MES 718TPSL1FCC_fin AV
MES 718TPSL1FCC_pre PK
MES 718TPSL1FCC_pre AV
LIM FCC ClassB V QP New Voltage Amplitude QP Limit
LIM FCC ClassB V AV New Voltage Amplitude AVG Limit

MEASUREMENT RESULT: "718TPSL1FCC_fin QP"

7/18/2003 9:56AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.198000	50.00	10.2	64	13.7	1	---
0.298000	49.40	10.2	60	10.9	1	---
0.598000	43.60	10.1	56	12.4	1	---
0.698000	45.70	10.1	56	10.3	1	---
0.798000	43.20	10.1	56	12.8	1	---
0.898000	43.40	10.1	56	12.6	1	---
0.998000	41.30	10.2	56	14.7	1	---
1.098000	38.40	10.2	56	17.6	1	---
1.198000	38.60	10.2	56	17.4	1	---
1.494000	35.80	10.3	56	20.2	1	---
5.822000	19.30	11.0	60	40.7	1	---
13.546000	20.00	11.7	60	40.0	1	---
13.562000	42.80	11.7	60	17.2	1	---
13.578000	18.40	11.7	60	41.6	1	---
24.522000	19.60	12.3	60	40.4	1	---

MEASUREMENT RESULT: "718TPSL1FCC_fin AV"

7/18/2003 9:56AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.198000	47.10	10.2	54	6.6	1	---
0.302000	42.80	10.2	50	7.4	1	---
0.598000	39.00	10.1	46	7.0	1	---
0.698000	42.80	10.1	46	3.2	1	---
0.798000	41.30	10.1	46	4.7	1	---
0.898000	38.80	10.1	46	7.2	1	---
0.998000	34.90	10.2	46	11.1	1	---
1.098000	33.90	10.2	46	12.1	1	---
1.198000	34.60	10.2	46	11.4	1	---
1.298000	32.20	10.2	46	13.8	1	---
5.182000	13.40	10.9	50	36.6	1	---
5.282000	12.50	11.0	50	37.5	1	---
5.382000	12.50	11.0	50	37.5	1	---
13.562000	30.00	11.7	50	20.0	1	---
24.002000	17.40	12.3	50	32.6	1	---

FCC Part 15 Class B

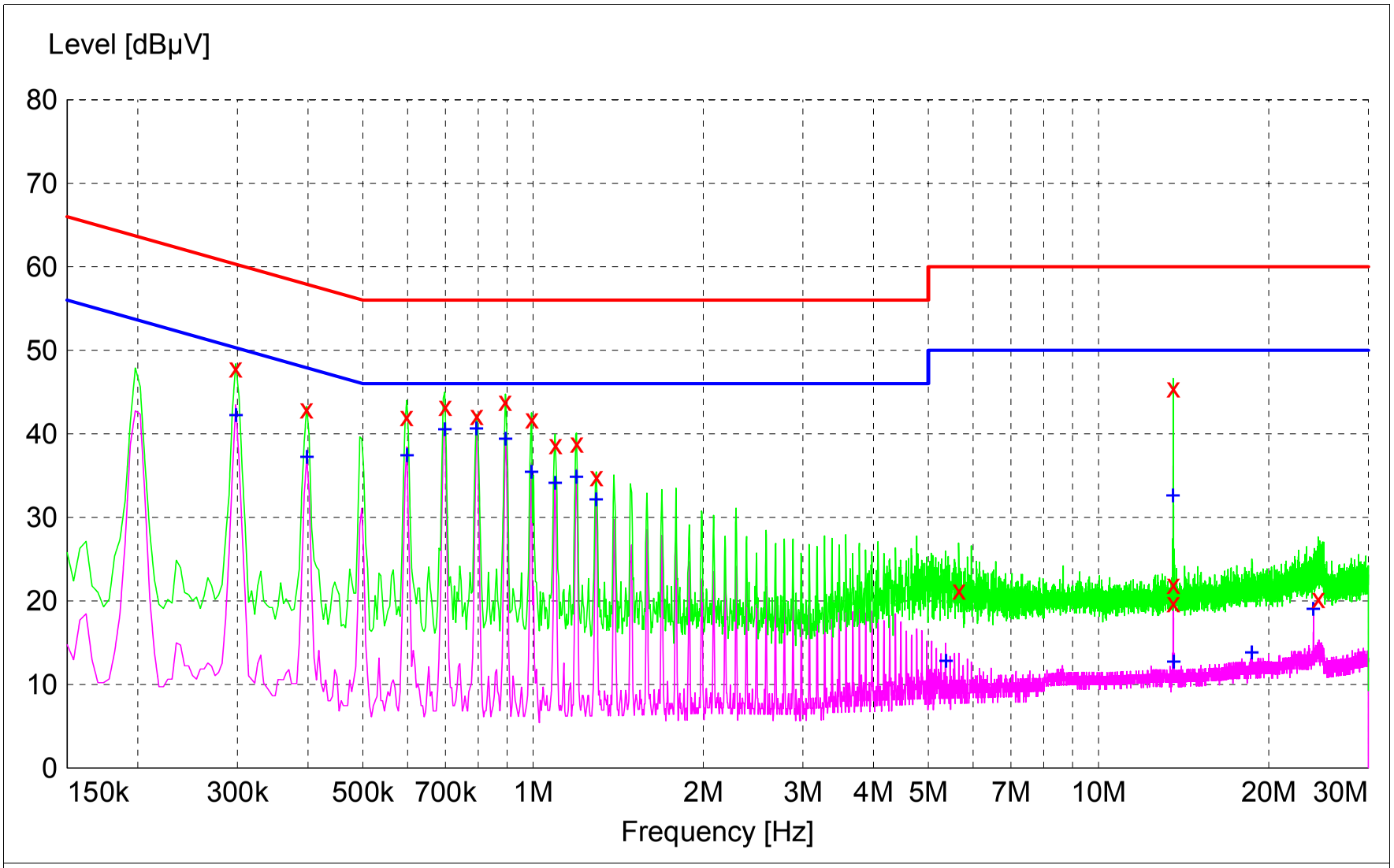
Voltage Mains Test

EUT:	TPS Plus (with CORCOM 6ED4C)
Manufacturer:	Stryker Instruments
Operating Condition:	70 deg. F, 59% R.H.
Test Site:	DLS OF Screen Room
Operator:	Craig Brandt
Test Specification:	120 VAC, 60 Hz Line 2
Comment:	Formula Shaver
	Date: 07-18-03

SCAN TABLE: "FCC ClassB Voltage"

Short Description: FCC Class B Voltage

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	30.0 MHz	4.0 kHz	MaxPeak Average	10.0 ms	9 kHz	LISN 971612



x x : MES 718TPSL2FCC_fin QP
+ + · MES 718TPSL2FCC_fin AV
MES 718TPSL2FCC_pre PK
MES 718TPSL2FCC_pre AV
LIM FCC ClassB V QP New Voltage Amplitude QP Limit
LIM FCC ClassB V AV New Voltage Amplitude AVG Limit

MEASUREMENT RESULT: "718TPSL2FCC_fin QP"

7/18/2003 10:05AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.298000	47.90	10.2	60	12.3	1	---
0.398000	43.00	10.1	58	14.9	1	---
0.598000	42.10	10.1	56	13.9	1	---
0.698000	43.30	10.1	56	12.7	1	---
0.794000	42.20	10.1	56	13.8	1	---
0.894000	43.90	10.1	56	12.1	1	---
0.994000	41.80	10.2	56	14.2	1	---
1.094000	38.70	10.2	56	17.3	1	---
1.194000	38.90	10.2	56	17.1	1	---
1.294000	34.90	10.2	56	21.1	1	---
5.658000	21.30	11.0	60	38.7	1	---
13.534000	19.80	11.7	60	40.2	1	---
13.558000	45.50	11.7	60	14.5	1	---
13.574000	22.00	11.7	60	38.0	1	---
24.470000	20.30	12.3	60	39.7	1	---

MEASUREMENT RESULT: "718TPSL2FCC_fin AV"

7/18/2003 10:05AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.298000	42.20	10.2	50	8.0	1	---
0.398000	37.20	10.1	48	10.7	1	---
0.598000	37.40	10.1	46	8.6	1	---
0.698000	40.50	10.1	46	5.5	1	---
0.794000	40.60	10.1	46	5.4	1	---
0.894000	39.40	10.1	46	6.6	1	---
0.994000	35.40	10.2	46	10.6	1	---
1.094000	34.10	10.2	46	11.9	1	---
1.194000	34.80	10.2	46	11.2	1	---
1.294000	32.10	10.2	46	13.9	1	---
5.366000	12.80	11.0	50	37.2	1	---
13.558000	32.60	11.7	50	17.4	1	---
13.574000	12.70	11.7	50	37.3	1	---
18.674000	13.80	12.2	50	36.2	1	---
24.002000	19.00	12.3	50	31.0	1	---

1250 Peterson Dr., Wheeling, IL 60090

CONDUCTED DATA

AND

CHARTS TAKEN DURING TESTING

USING CORCOM FILTER 6ED8C

PART 15.207

FCC Part 15 Class B

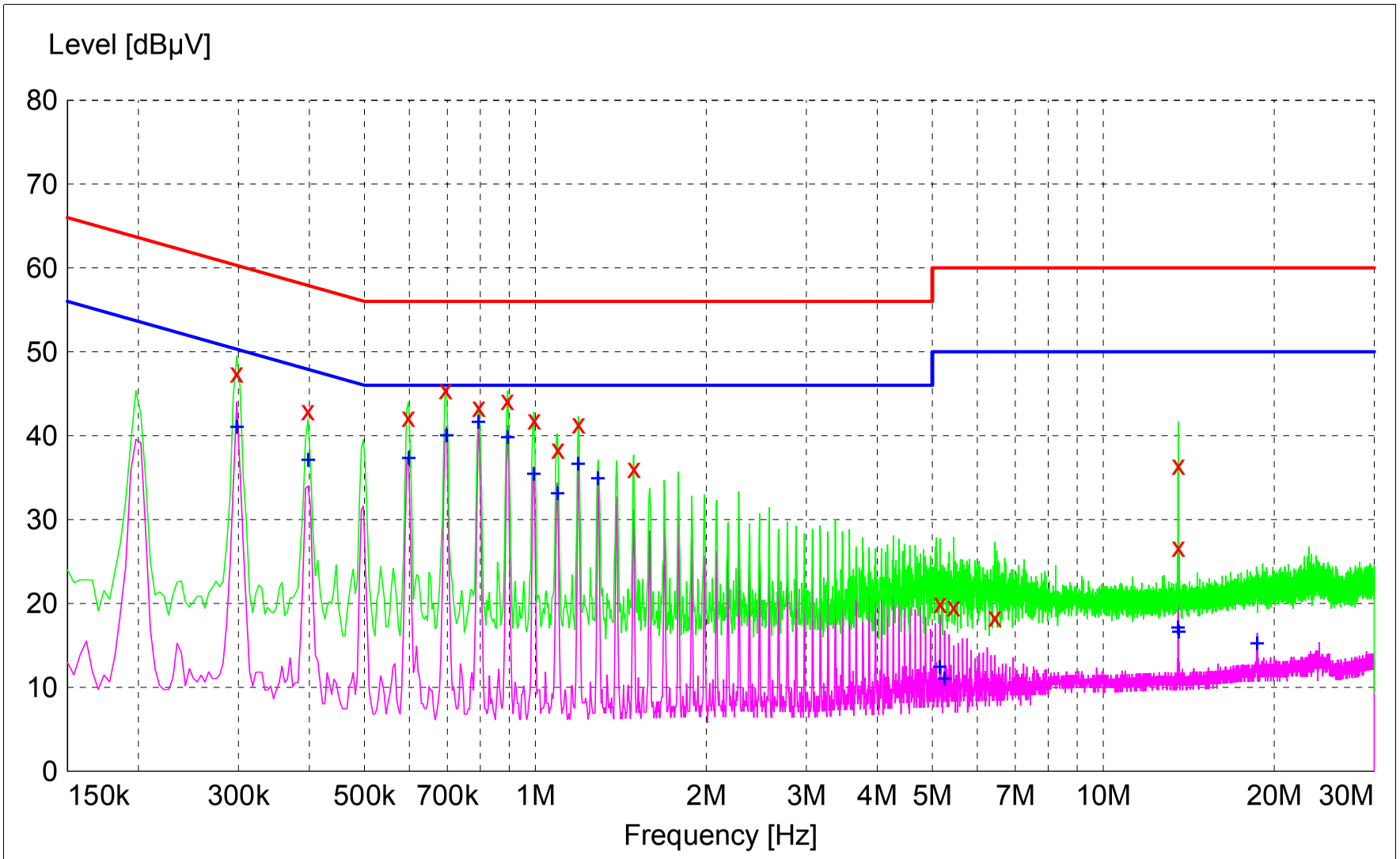
Voltage Mains Test

EUT:	TPS Plus (with CORCOM 6ED8C)
Manufacturer:	Stryker Instruments
Operating Condition:	70 deg. F, 59% R.H.
Test Site:	DLS OF Screen Room
Operator:	Craig Brandt
Test Specification:	120 VAC, 60 Hz Line 1
Comment:	Formula Shaver
	Date: 07-18-03

SCAN TABLE: "FCC ClassB Voltage"

Short Description: FCC Class B Voltage

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	30.0 MHz	4.0 kHz	MaxPeak Average	10.0 ms	9 kHz	LISN 971612



x x : MES 718TPSL1FCC2_fin QP
\+ + · MES 718TPSL1FCC2_fin AV
MES 718TPSL1FCC2_pre PK
MES 718TPSL1FCC2_pre AV
LIM FCC ClassB V QP New Voltage Amplitude QP Limit
LIM FCC ClassB V AV New Voltage Amplitude AVG Limit

MEASUREMENT RESULT: "718TPSL1FCC2_fin QP"

7/18/2003 10:49AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.298000	47.50	10.2	60	12.8	1	---
0.398000	43.00	10.1	58	14.9	1	---
0.598000	42.20	10.1	56	13.8	1	---
0.694000	45.50	10.1	56	10.5	1	---
0.794000	43.40	10.1	56	12.6	1	---
0.894000	44.20	10.1	56	11.8	1	---
0.994000	41.90	10.2	56	14.1	1	---
1.094000	38.40	10.2	56	17.6	1	---
1.190000	41.40	10.2	56	14.6	1	---
1.490000	36.10	10.3	56	19.9	1	---
5.158000	20.00	10.9	60	40.0	1	---
5.454000	19.60	11.0	60	40.4	1	---
6.446000	18.40	11.1	60	41.6	1	---
13.550000	26.70	11.7	60	33.3	1	---
13.566000	36.50	11.7	60	23.5	1	---

MEASUREMENT RESULT: "718TPSL1FCC2_fin AV"

7/18/2003 10:49AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.298000	41.00	10.2	50	9.3	1	---
0.398000	37.10	10.1	48	10.8	1	---
0.598000	37.30	10.1	46	8.7	1	---
0.698000	40.00	10.1	46	6.0	1	---
0.794000	41.60	10.1	46	4.4	1	---
0.894000	39.80	10.1	46	6.2	1	---
0.994000	35.40	10.2	46	10.6	1	---
1.094000	33.10	10.2	46	12.9	1	---
1.190000	36.60	10.2	46	9.4	1	---
1.290000	34.90	10.2	46	11.1	1	---
5.158000	12.40	10.9	50	37.6	1	---
5.258000	11.00	11.0	50	39.0	1	---
13.550000	17.10	11.7	50	32.9	1	---
13.570000	16.60	11.7	50	33.4	1	---
18.674000	15.20	12.2	50	34.8	1	---

FCC Part 15 Class B

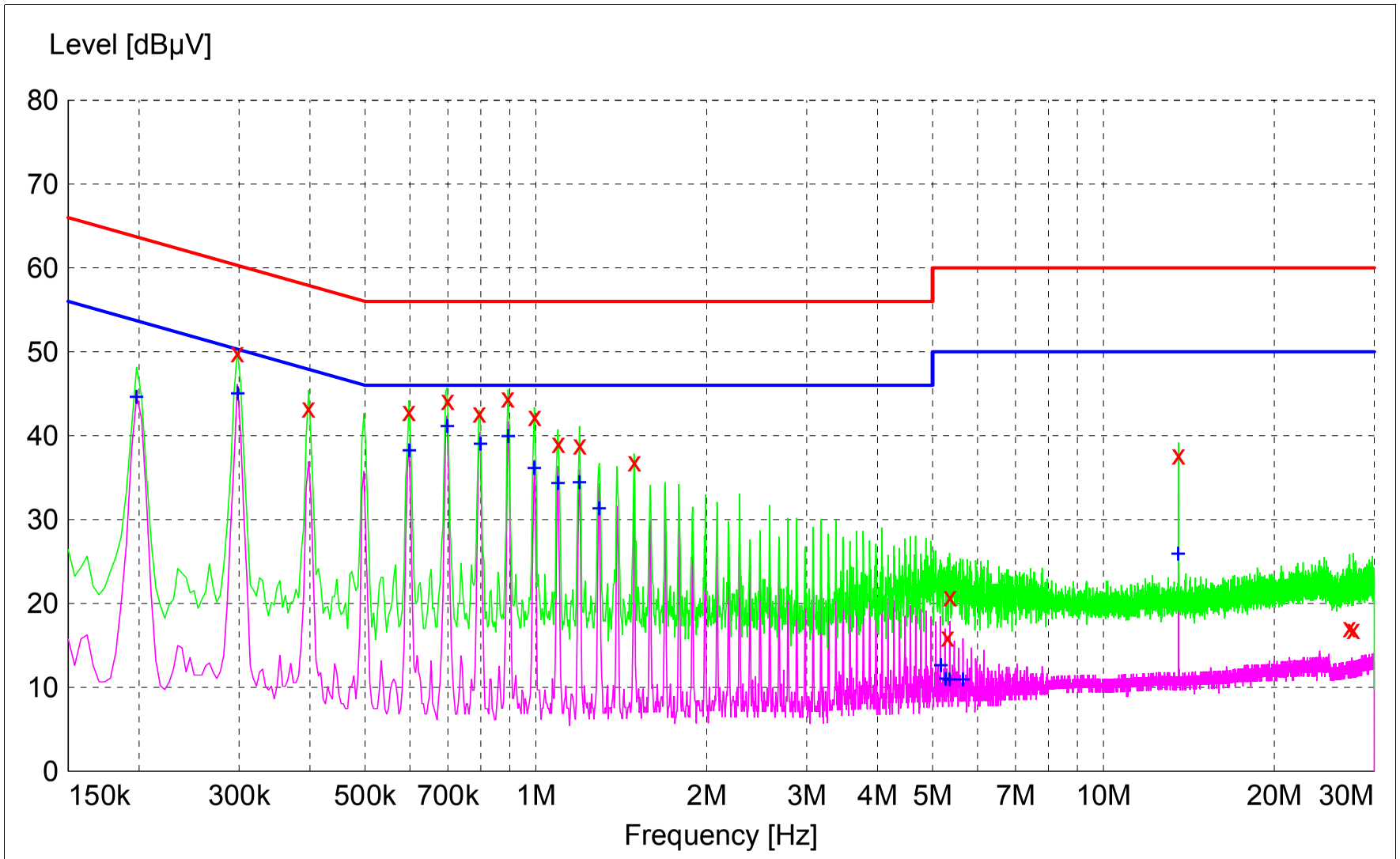
Voltage Mains Test

EUT:	TPS Plus (with CORCOM 6ED8C)
Manufacturer:	Stryker Instruments
Operating Condition:	70 deg. F, 59% R.H.
Test Site:	DLS OF Screen Room
Operator:	Craig Brandt
Test Specification:	120 VAC, 60 Hz Line 2
Comment:	Formula Shaver
	Date: 07-18-03

SCAN TABLE: "FCC ClassB Voltage"

Short Description: FCC Class B Voltage

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	30.0 MHz	4.0 kHz	MaxPeak Average	10.0 ms	9 kHz	LISN 971612



x x : MES 718TPSL2FCC2_fin QP
+ + · MES 718TPSL2FCC2_fin AV
MES 718TPSL2FCC2_pre PK
MES 718TPSL2FCC2_pre AV
LIM FCC ClassB V QP New Voltage Amplitude QP Limit
LIM FCC ClassB V AV New Voltage Amplitude AVG Limit

MEASUREMENT RESULT: "718TPSL2FCC2_fin QP"

7/18/2003 10:39AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.298000	49.90	10.2	60	10.4	1	---
0.398000	43.30	10.1	58	14.6	1	---
0.598000	42.90	10.1	56	13.1	1	---
0.698000	44.20	10.1	56	11.8	1	---
0.794000	42.70	10.1	56	13.3	1	---
0.894000	44.50	10.1	56	11.5	1	---
0.994000	42.30	10.2	56	13.7	1	---
1.094000	39.10	10.2	56	16.9	1	---
1.194000	38.90	10.2	56	17.1	1	---
1.490000	36.90	10.3	56	19.1	1	---
5.322000	16.00	11.0	60	44.0	1	---
5.358000	20.80	11.0	60	39.2	1	---
13.562000	37.70	11.7	60	22.3	1	---
27.150000	17.10	12.6	60	42.9	1	---
27.578000	16.90	12.7	60	43.1	1	---

MEASUREMENT RESULT: "718TPSL2FCC2_fin AV"

7/18/2003 10:39AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.198000	44.60	10.2	54	9.0	1	---
0.298000	45.00	10.2	50	5.3	1	---
0.598000	38.20	10.1	46	7.8	1	---
0.698000	41.10	10.1	46	4.9	1	---
0.798000	39.00	10.1	46	7.0	1	---
0.894000	39.90	10.1	46	6.1	1	---
0.994000	36.10	10.2	46	9.9	1	---
1.094000	34.30	10.2	46	11.7	1	---
1.194000	34.40	10.2	46	11.6	1	---
1.294000	31.30	10.2	46	14.7	1	---
5.162000	12.60	10.9	50	37.4	1	---
5.262000	11.00	11.0	50	39.0	1	---
5.362000	10.90	11.0	50	39.1	1	---
5.658000	10.90	11.0	50	39.1	1	---
13.558000	25.90	11.7	50	24.1	1	---

1250 Peterson Dr., Wheeling, IL 60090

2.0 BAND EDGE AND RESTRICT BAND COMPLIANCE

The field strength of any emissions appearing outside the 13.553 to 13.567 MHz band shall not exceed the general radiated emissions limits as stated Section 15.209. The fundamental from the TPS Irrigation Console transmitter shall not be inside the restrict band 13.36 TO 13.41 MHZ.

NOTE:
See the following page (s) for the graph (s) made showing compliance for Band Edge and Restrict Band:

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GRAPH (s) TAKEN SHOWING THE BAND EDGE AND RESTRICT BAND COMPLIANCE

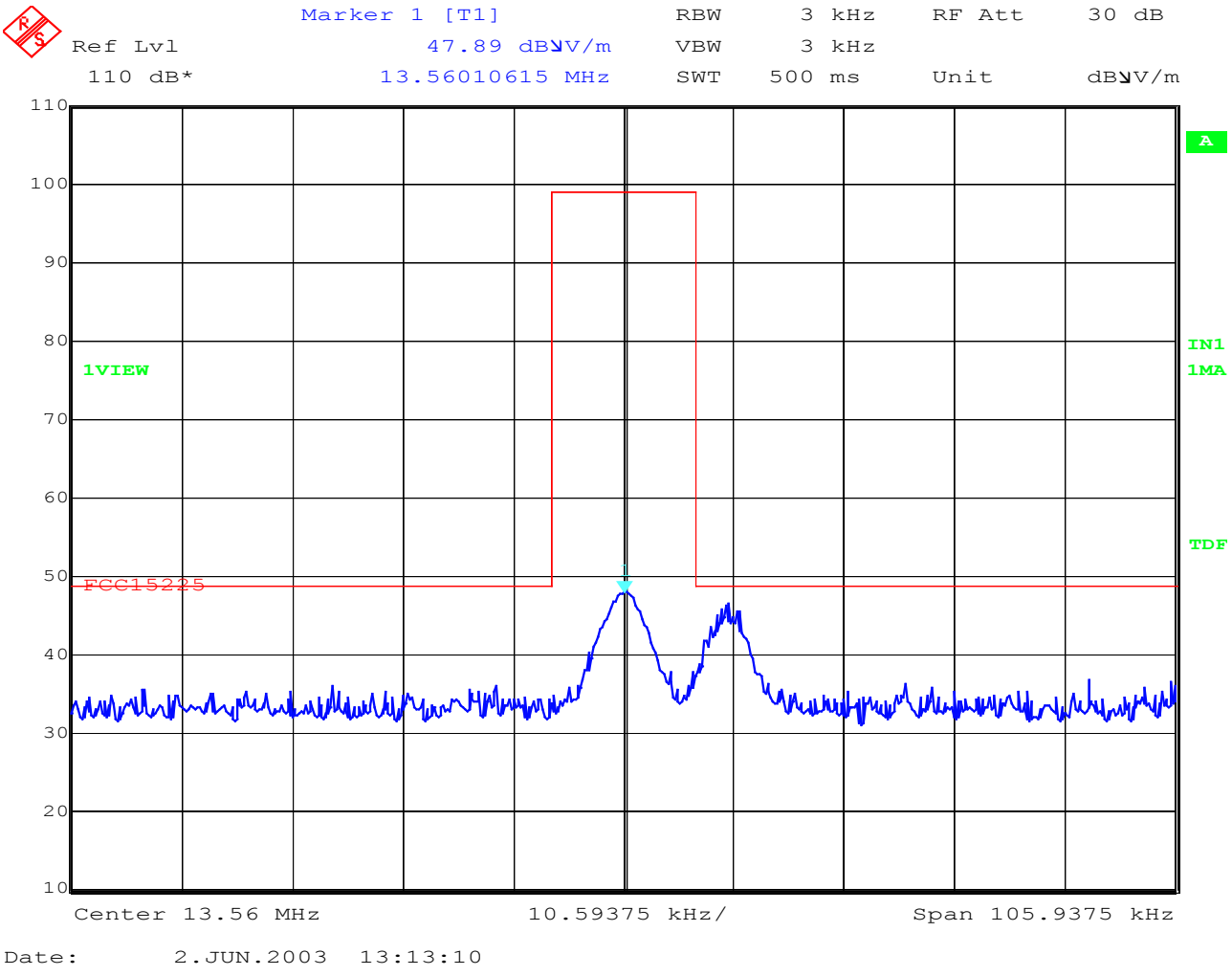
PART 15.225 (b)

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

FCC Part 15.225
Output Power / Band Edges
Test Distance: 10 meters

Company: Stryker Instruments
Model: TPS Plus
Date: 06-02-03



Output Power = 47.89 dBuV/m at 10 meters.
Limit = 99 dBuV/m at 10 meters.
Margin = 51.11 dB

1250 Peterson Dr., Wheeling, IL 60090

3.0 FIELD STRENGTH OF SPURIOUS EMISSION MEASUREMENTS SECTION 15.225 (a & b)

The radiated measurements made at D.L.S. Electronic Systems, Inc., for the TPS Irrigation Console, Model Number: 5100-050-000, are shown in tabulated and graph form. Preliminary radiation measurements were performed at a 3 meter test distance with the limits adjusted linearly when required. The frequency range from 9 kHz to over 960 MHz, depending upon the fundamental frequency as stated in Part 15.33a, was automatically scanned and plotted at various angles.

Measurements for the TPS Irrigation Console were made up to 1000 MHz, in accordance with Section 15.33a for Intentional Radiators with a fundamental frequency of 13.56 MHz. For intentional radiators, the frequency range to be investigated is determined by the lowest radio frequency generated by the device without going below 9 kHz, up to at least the tenth harmonic of the highest fundamental frequency or 1000 MHz, whichever is lower. At those frequencies where significant signals were detected, measurements were made at an open field test site, located at Genoa City, Wisconsin, FCC file number **31040/SIT**, to determine the actual radiation levels.

All signals in the frequency range of 9 kHz to 30 MHz were measured with a low frequency Loop Antenna as a pickup device. From 30 to 200 MHz, a Biconical Antenna or tuned dipoles were used and from 200 MHz to 1000 MHz, a Log Periodic or Tuned Dipoles were used. During the test the EUT, peripheral equipment and cables were configured to meet the conditions in ANSI C63.4-2000, Clauses 6 & 8. The equipment under test was rotated and the antenna was raised and lowered from 1 meter to 4 meters to find the maximum level. In order to find maximum emissions, the cables were moved through all the positions the equipment would be expected to experience in the field. Tests were made in the vertical polarization with the Loop Antenna, rotated 360º around its vertical axis. Tests were also made in both the horizontal and vertical planes of polarization with the Biconical and Log Periodic. In each case, the table was rotated to find the maximum emissions.

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3.0 FIELD STRENGTH OF SPURIOUS EMISSION MEASUREMENTS (CON'T)

When the equipment is out of limit at 3 meters, and the signals from the equipment at 30 meters cannot be recorded due to the background, a representative sample of these frequencies were re-measured at various distances such as 4, 5, 6, 8, 15 meters and the greatest distance that can be measured to demonstrate graphically that the emissions are dropping off and will be under the limit at the specified distance. All signals were then recorded. The allowed levels for Intentional Radiators operating in the 13.553 MHz to 13.567 MHz band shall not exceed 10,000 uV measured at 30 meters as specified in FCC, Part 15, Section 15.225(a). The field strength of any emissions appearing outside of this band shall not exceed the general radiated emissions limits shown in Section 15.209.

NOTE:

All radiated emissions measurements were made at a test room temperature of **72°F** at **56%** relative humidity.

ELECTRONIC SYSTEMS, INC.
1250 Peterson Dr., Wheeling, IL 60090

RADIATED DATA

AND CHARTS TAKEN OF

FUNDAMENTAL SPURIOUS EMISSIONS

PART 15.209

FCC 15.225

Radiated Emissions

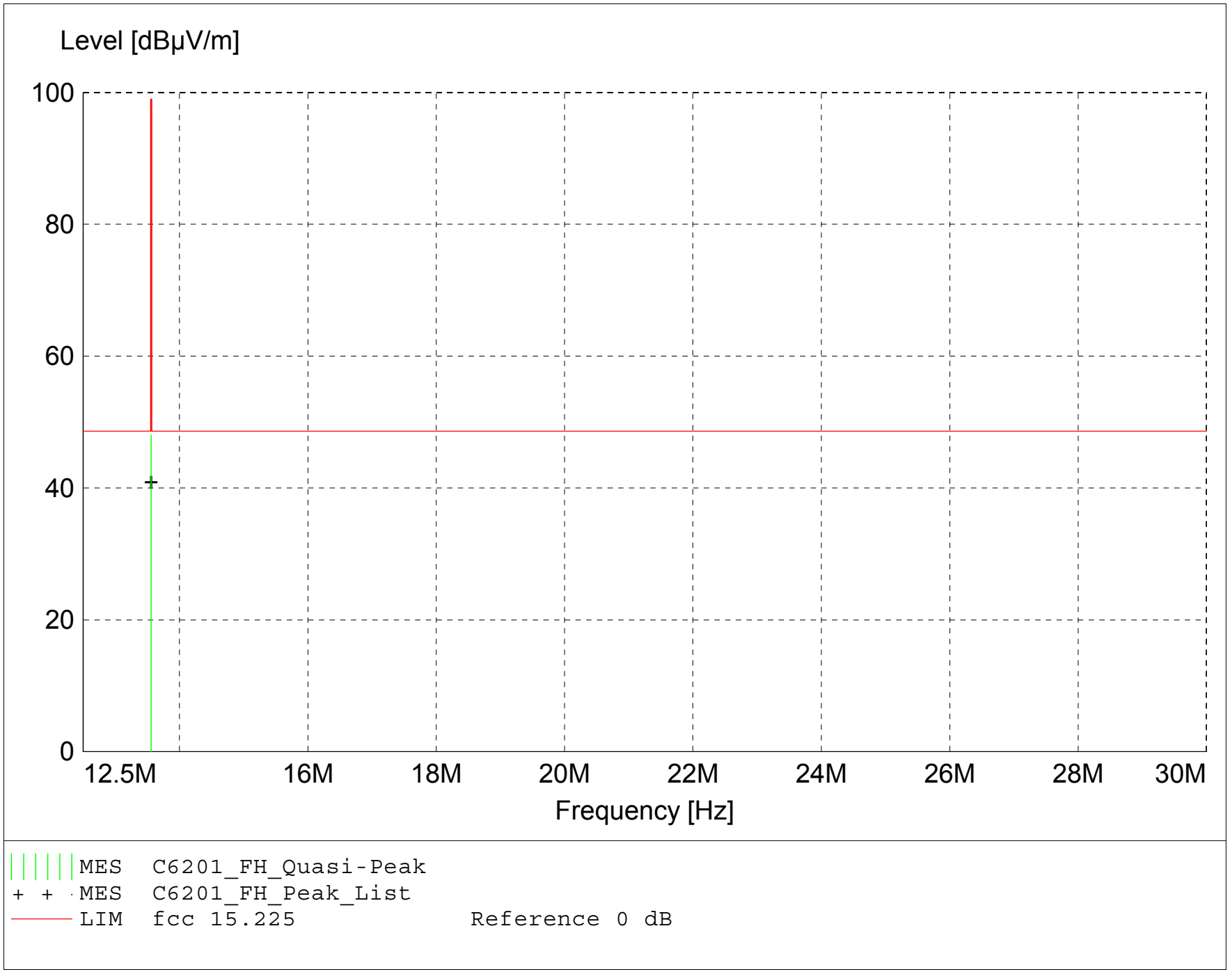
EUT: TPS Plus
Manufacturer: Stryker Instruments
Operating Condition: 70 deg F; 40% R.H.
Test Site: Site 3
Operator: Craig Brandt
Test Specification: 120 V; 60 Hz
Comment: continuous transmit
Date: 6/2/2003

TEXT: "Site 3 LowH 10M"

Short Description: Test Set-up 10kHz to 30MHz H
TEST EQUIPMENT: Receiver --- Rohde&Schwarz ESI40 SN: 837808/006

Antennas --- Electro-Metrics ALR-25 SN: 557

TEST SET-UP: EuT Measured at 10 Meters with H-FIELD Antenna


Level [dBµV/m]
100
80
60
40
20
0
12.5M
16M
18M
20M
22M
24M
26M
28M
30M
Frequency [Hz]
MES C6201_FH_Quasi-Peak
MES C6201_FH_Peak_List
LIM fcc 15.225 Reference 0 dB

MEASUREMENT RESULT: "C6201_FH_Final"

6/26/2003 2:39PM

Frequency	Level	Antenna Factor	System Loss	Total Level	Limit	Margin	Height Ant.	EuT Angle	Final Detector	Comment
MHz	dBµV	dBµV/m	dB	dBµV/m	dBµV/m	dB	m	deg		
13.560000	36.86	36.34	-25.2	48.0	99.0	51.0	1.00	315	QUASI-PEAK	Fundamental

DLS ELECTRONIC SYSTEMS, INC.
1250 Peterson Dr., Wheeling, IL 60090

RADIATED DATA

AND CHARTS TAKEN FOR

FIELD STRENGTH

SPURIOUS EMISSION MEASUREMENTS

USING CORCOM FILTERS 6ED4C & 6ED8C

PART 15.209

FCC Part 15 Class B

Electric Field Strength

```
EUT:                 TPS Plus
Manufacturer:        Stryker Instruments
Operating Condition: 73 degF; 59%R.H.
Test Site:           DLS OF Site 3
Operator:            Craig Brandt
Test Specification:  120 V  60 Hz
Comment:             Formula Shaver,  CORCOM 6ED8C and CORCOM 6ED4C
                     Date: 07/17/2003
```

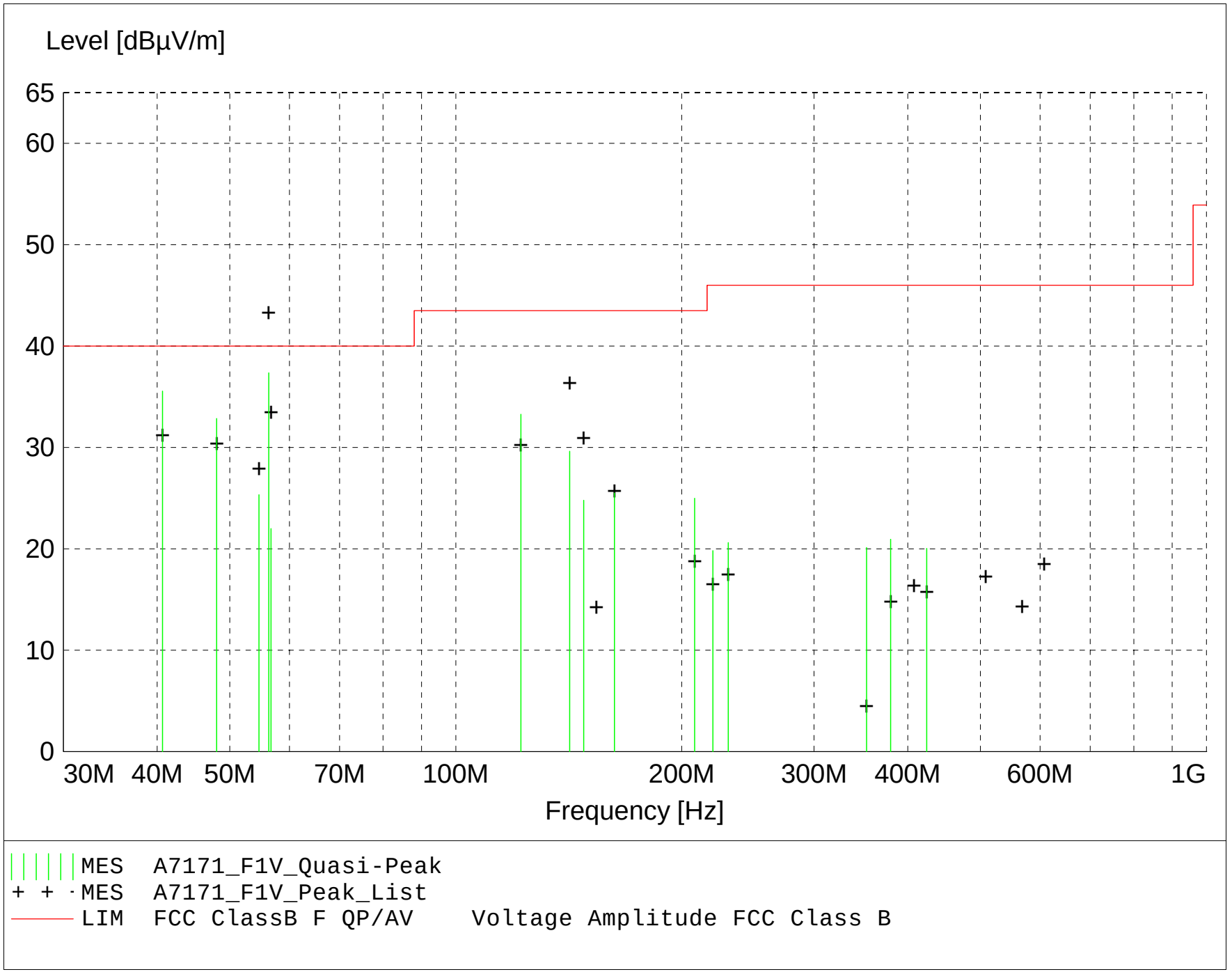
TEXT: "Site 3 MidV 3M"

```
  Short Description:            Test Set-up Vert30-1000MHz
TEST EQUIPMENT: Receiver --- Rohde&Schwarz ESI 26 SN: 837491/010

                Antennas ---
                Biconical    -- EMCO 3104C SN: 9701-4785
                Log Periodic -- EMCO 3146  SN: 9702-4895

                Pre-Amp  --- Rohde&Schwarz TS-PR10 SN: 032001/005

TEST SET-UP:    EuT Measured at 3 Meters with VERTICAL Antenna Polarisation
```


Level [dBµV/m]
65
60
50
40
30
20
10
0
30M
40M
50M
70M
100M
200M
300M
400M
600M
1G
Frequency [Hz]
MES A7171_F1V_Quasi-Peak
MES A7171_F1V_Peak_List
LIM FCC ClassB F QP/AV Voltage Amplitude FCC Class B

MEASUREMENT RESULT: "A7171_F1V_Final"

7/17/2003 12:43PM

Frequency	Level	Antenna Factor	System Loss	Total Level	Limit	Margin	Height Ant.	EuT Angle	Final Detector	Comment
MHz	dBµV	dBµV/m	dB	dBµV/m	dBµV/m	dB	m	deg		
0.000000	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0		
56.315000	51.05	10.38	-24.1	37.4	40.0	2.6	1.00	180	QUASI-PEAK	6ED8C filter
40.670000	48.53	11.39	-24.4	35.6	40.0	4.4	1.00	135	QUASI-PEAK	None
48.025000	45.40	11.67	-24.2	32.9	40.0	7.1	1.00	180	QUASI-PEAK	None
122.055000	43.68	12.80	-23.2	33.3	43.5	10.2	1.00	270	QUASI-PEAK	None
141.785000	40.83	11.84	-23.0	29.6	43.5	13.9	1.00	45	QUASI-PEAK	6ED8C filter
54.675000	38.55	10.87	-24.1	25.3	40.0	14.7	1.00	315	QUASI-PEAK	None
162.705000	34.74	13.57	-22.8	25.5	43.5	18.0	1.00	0	QUASI-PEAK	None
56.740000	35.80	10.26	-24.1	22.0	40.0	18.0	1.00	0	QUASI-PEAK	None
208.010000	35.72	11.62	-22.4	25.0	43.5	18.5	1.00	270	QUASI-PEAK	None
147.980000	35.76	12.02	-23.0	24.8	43.5	18.7	1.00	200	QUASI-PEAK	None
379.680000	26.86	15.31	-21.2	21.0	46.0	25.0	1.00	315	QUASI-PEAK	None
230.680000	31.06	11.80	-22.2	20.6	46.0	25.4	1.00	270	QUASI-PEAK	None
352.560000	26.75	14.97	-21.6	20.1	46.0	25.9	1.00	180	QUASI-PEAK	None
424.010000	25.25	15.97	-21.2	20.0	46.0	26.0	1.00	225	QUASI-PEAK	None
219.990000	30.54	11.54	-22.3	19.8	46.0	26.2	1.00	0	QUASI-PEAK	None

FCC Part 15 Class B

Electric Field Strength

```
EUT:                 TPS Plus
Manufacturer:        Stryker Instruments
Operating Condition: 73 degF; 59%R.H.
Test Site:           DLS OF Site 3
Operator:            Craig Brandt
Test Specification:  120 V  60 Hz
Comment:             Formula Shaver,  CORCOM 6ED8C and CORCOM 6ED4C
                     Date: 07/17/2003
```

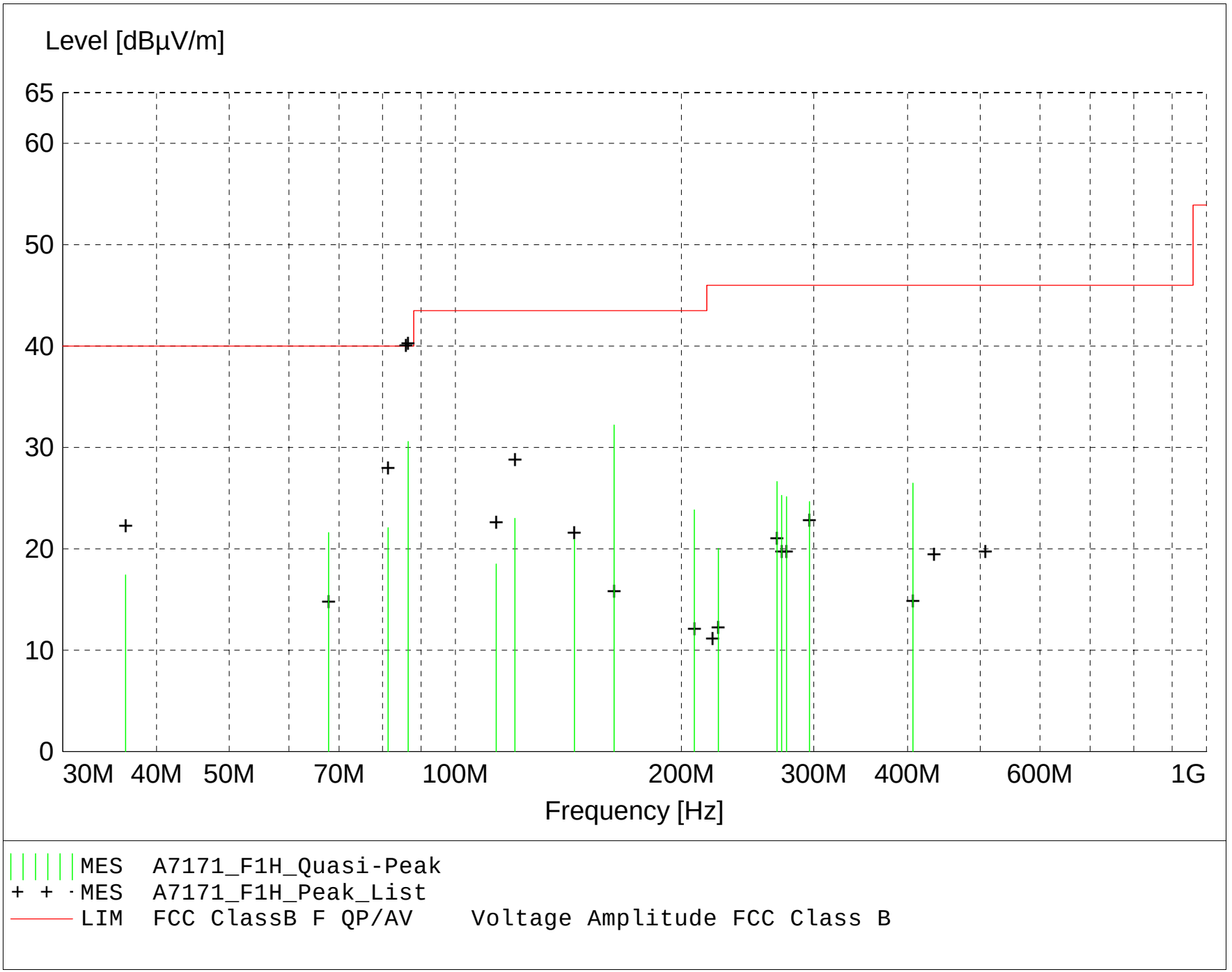
TEXT: "Site 3 MidH 3M"

```
  Short Description:            Test Set-up Horz30-1000MHz
TEST EQUIPMENT: Receiver --- Rohde&Schwarz ESI 40 SN: 837808/006

                Antennas ---
                Biconical    -- EMCO 3104C SN: 9701-4785
                Log Periodic -- EMCO 3146  SN: 9702-4895

                Pre-Amp  --- Rohde&Schwarz TS-PR10 SN: 032001/005

TEST SET-UP:    EuT Measured at 3 Meters with HORIZONTAL Antenna Polarisation
```


Level [dBµV/m]
65
60
50
40
30
20
10
0
30M
40M
50M
70M
100M
200M
300M
400M
600M
1G
Frequency [Hz]
MES A7171_F1H_Quasi-Peak
MES A7171_F1H_Peak_List
LIM FCC ClassB F QP/AV Voltage Amplitude FCC Class B

MEASUREMENT RESULT: "A7171_F1H_Final"

7/17/2003 12:39PM

Frequency	Level	Antenna Factor	System Loss	Total Level	Limit	Margin	Height Ant.	EuT Angle	Final Detector	Comment
MHz	dBµV	dBµV/m	dB	dBµV/m	dBµV/m	dB	m	deg		
0.000000	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0		
86.500000	45.63	8.54	-23.6	30.6	40.0	9.4	2.00	135	QUASI-PEAK	None
162.720000	41.44	13.58	-22.8	32.2	43.5	11.3	2.20	90	QUASI-PEAK	None
81.335000	38.91	6.90	-23.7	22.1	40.0	17.9	3.00	315	QUASI-PEAK	None
67.795000	38.26	7.31	-24.0	21.6	40.0	18.4	3.50	270	QUASI-PEAK	None
268.010000	35.35	13.30	-22.0	26.6	46.0	19.4	1.00	90	QUASI-PEAK	None
406.800000	31.86	15.86	-21.2	26.5	46.0	19.5	1.00	135	QUASI-PEAK	None
208.010000	34.59	11.62	-22.4	23.8	43.5	19.7	2.00	225	QUASI-PEAK	None
120.025000	33.57	12.68	-23.2	23.0	43.5	20.5	2.00	315	QUASI-PEAK	None
272.010000	33.83	13.42	-22.0	25.3	46.0	20.7	1.00	135	QUASI-PEAK	None
276.000000	33.48	13.60	-21.9	25.1	46.0	20.9	1.00	180	QUASI-PEAK	None
295.990000	31.49	15.00	-21.8	24.7	46.0	21.3	1.60	270	QUASI-PEAK	None
144.020000	32.13	11.81	-23.0	20.9	43.5	22.6	2.00	45	QUASI-PEAK	None
36.390000	30.40	11.48	-24.5	17.4	40.0	22.6	4.00	180	QUASI-PEAK	None
113.325000	29.06	12.71	-23.3	18.5	43.5	25.0	2.50	315	QUASI-PEAK	None
223.990000	30.75	11.53	-22.3	20.0	46.0	26.0	1.30	225	QUASI-PEAK	None

1250 Peterson Dr., Wheeling, IL 60090

4.0 FREQUENCY STABILITY - PART 2.1055a **(Temperature)**

The frequency stability was measured from -30° to +50° centigrade at intervals of 10° centigrade throughout the range. Prior to each frequency measurement, the equipment was left alone for a sufficient period of time (approximately 30 minutes or more) to allow the components of the TPS Irrigation Console oscillator circuitry to stabilize. The following information was taken:

FREQUENCY STABILITY FOR TEMPERATURE VARIATION IN MHz:

-20°	13.56009288
-10°	13.56011942
0°	13.56019903
+10°	13.56022557
+20°	13.56014596
+30°	13.56011942
+40°	13.56011942
+50°	13.56017249

Worst Case Variance:

13560225.57 Hz

As stated in Part 15, Section 15.225 (c), the Frequency Tolerance and Margin for this range are as follows:

Ambient Frequency: = **13560145.96 Hz**

Frequency Tolerance: = **0.0001**

13560145.96 * 0.0001 = **1356 Hz**

This is well within the specified limits.

1250 Peterson Dr., Wheeling, IL 60090

GRAPHS TAKEN FOR FREQUENCY

STABILITY WHEN VARYING THE

TEMPERATURE

PART 2.1055A

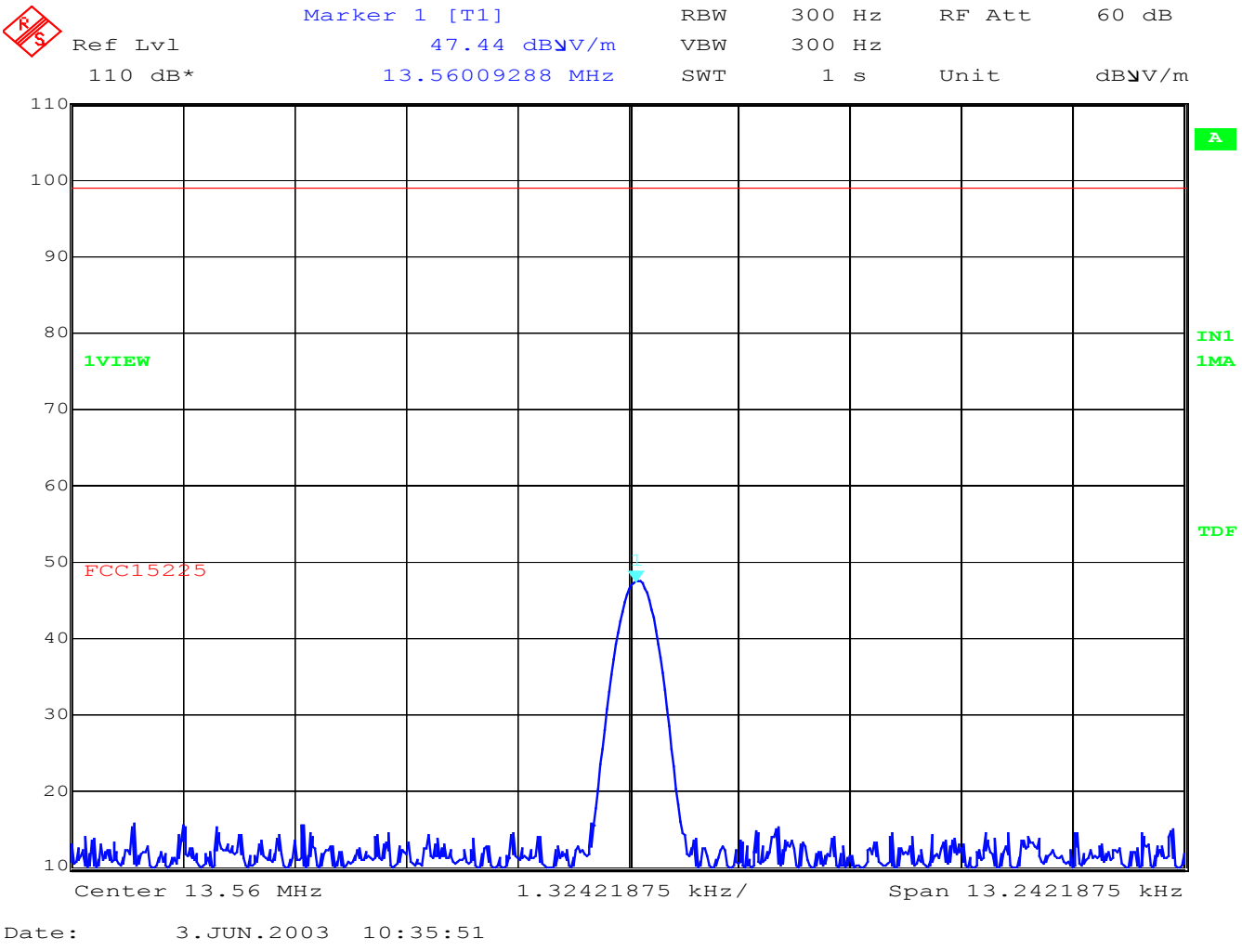
This is well within the specified limits.

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

FCC Part 15.225
Frequency Stability – Temperature
With test fixture, in temperature chamber

Company: Stryker Instruments
Model: TPS Plus
Date: 06-03-03



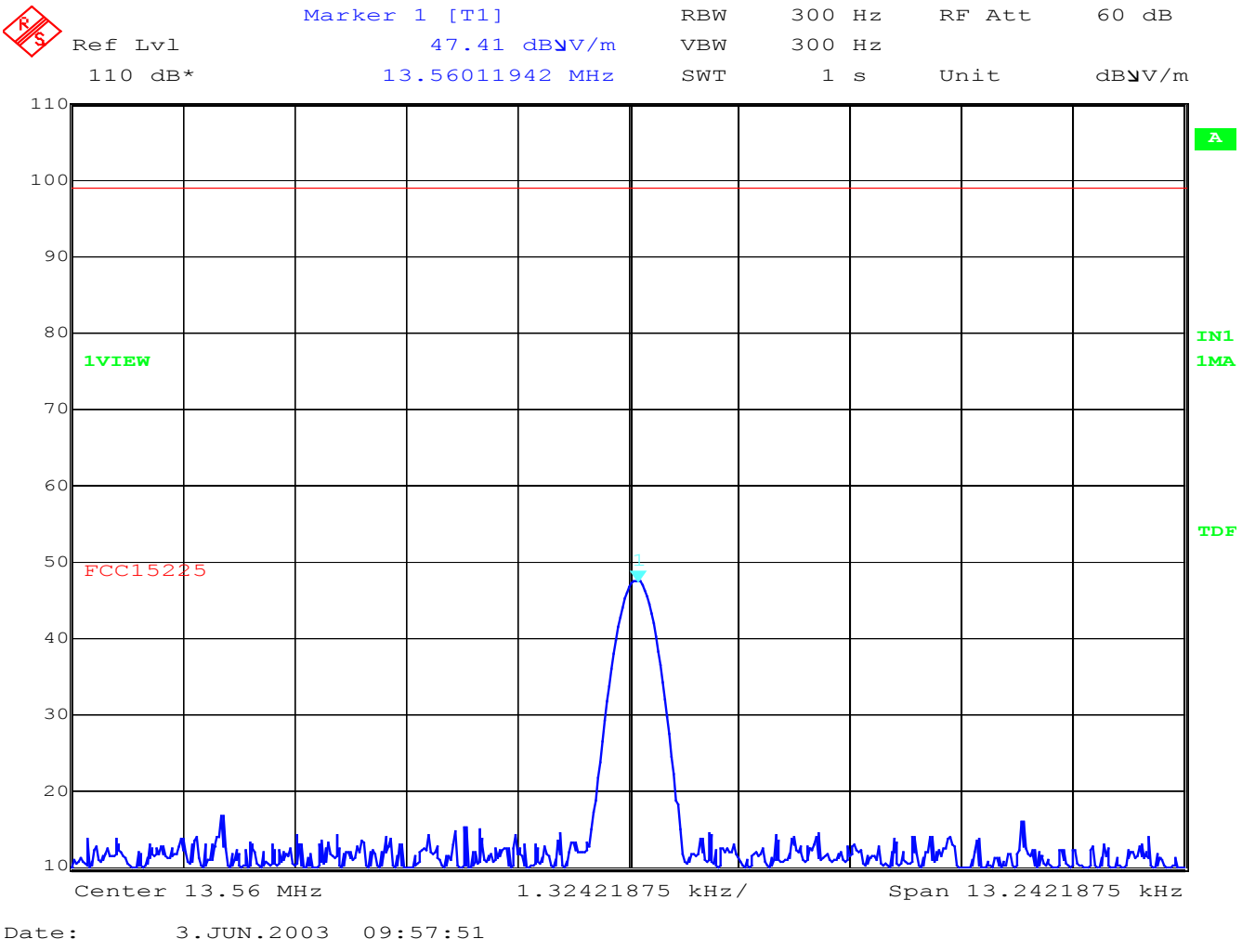
Temperature = -20 deg. C

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

FCC Part 15.225
Frequency Stability – Temperature
With test fixture, in temperature chamber

Company: Stryker Instruments
Model: TPS Plus
Date: 06-03-03



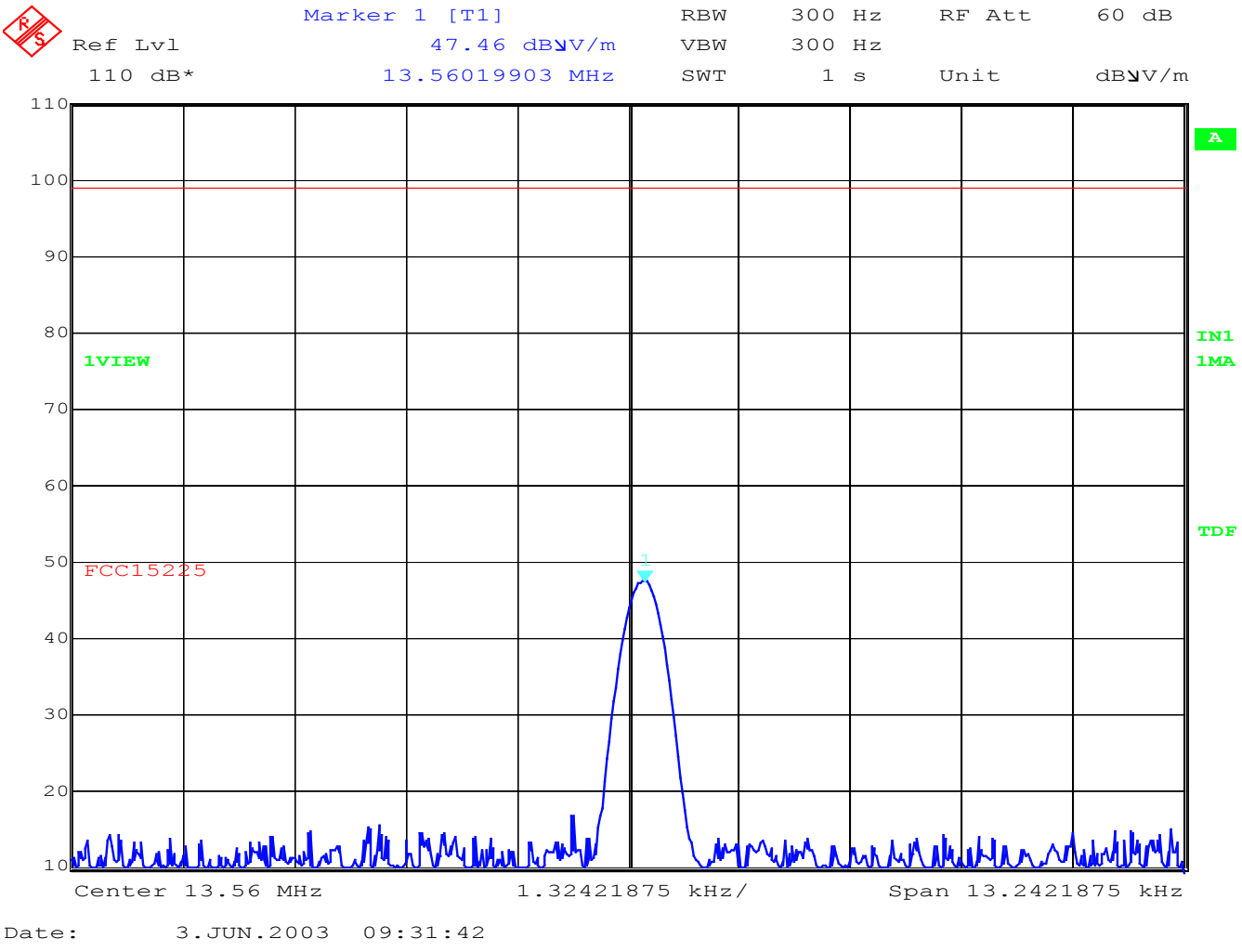
Temperature = -10 deg. C

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

FCC Part 15.225
Frequency Stability – Temperature
With test fixture, in temperature chamber

Company: Stryker Instruments
Model: TPS Plus
Date: 06-03-03



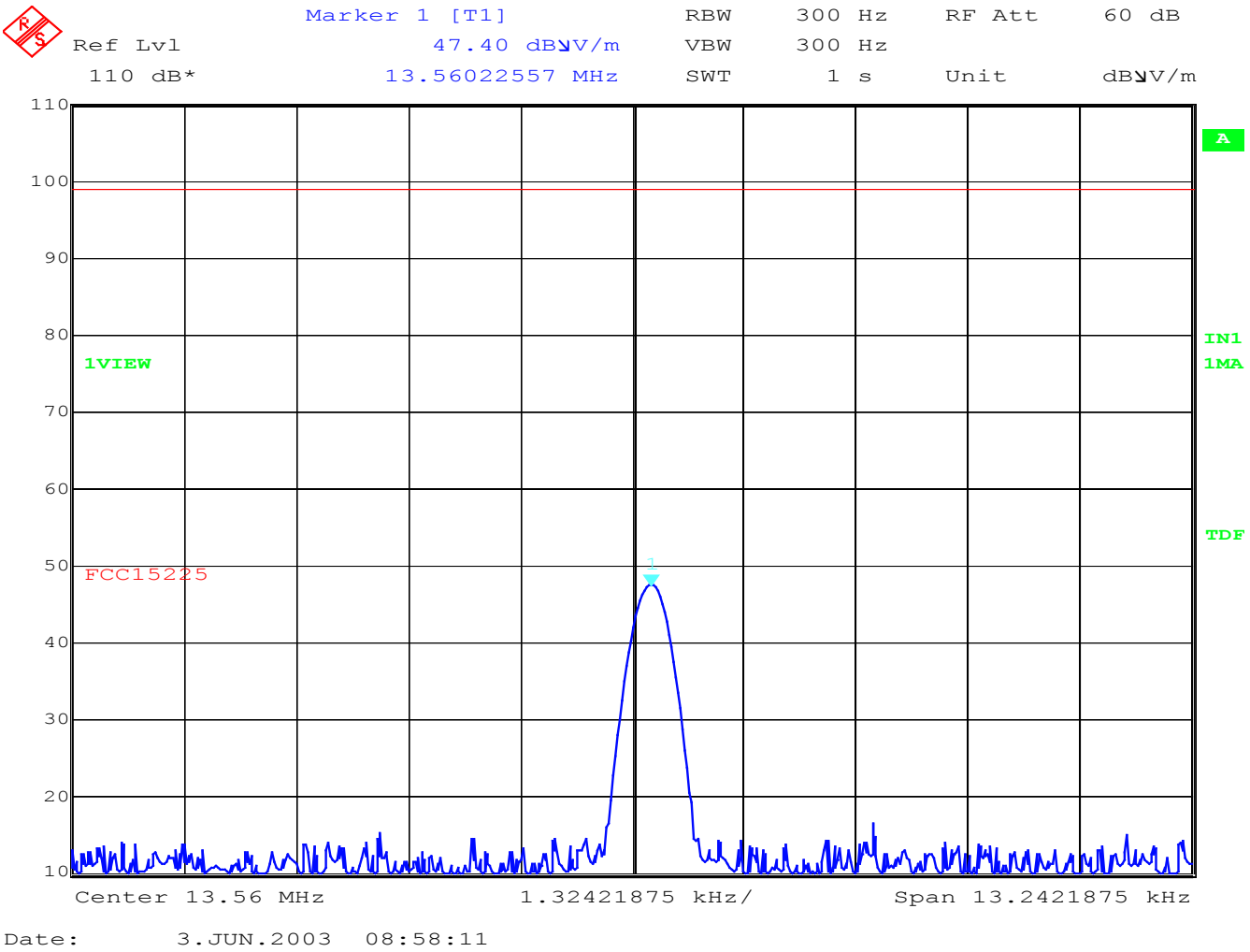
Temperature = 0 deg. C

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

FCC Part 15.225
Frequency Stability – Temperature
With test fixture, in temperature chamber

Company: Stryker Instruments
Model: TPS Plus
Date: 06-03-03



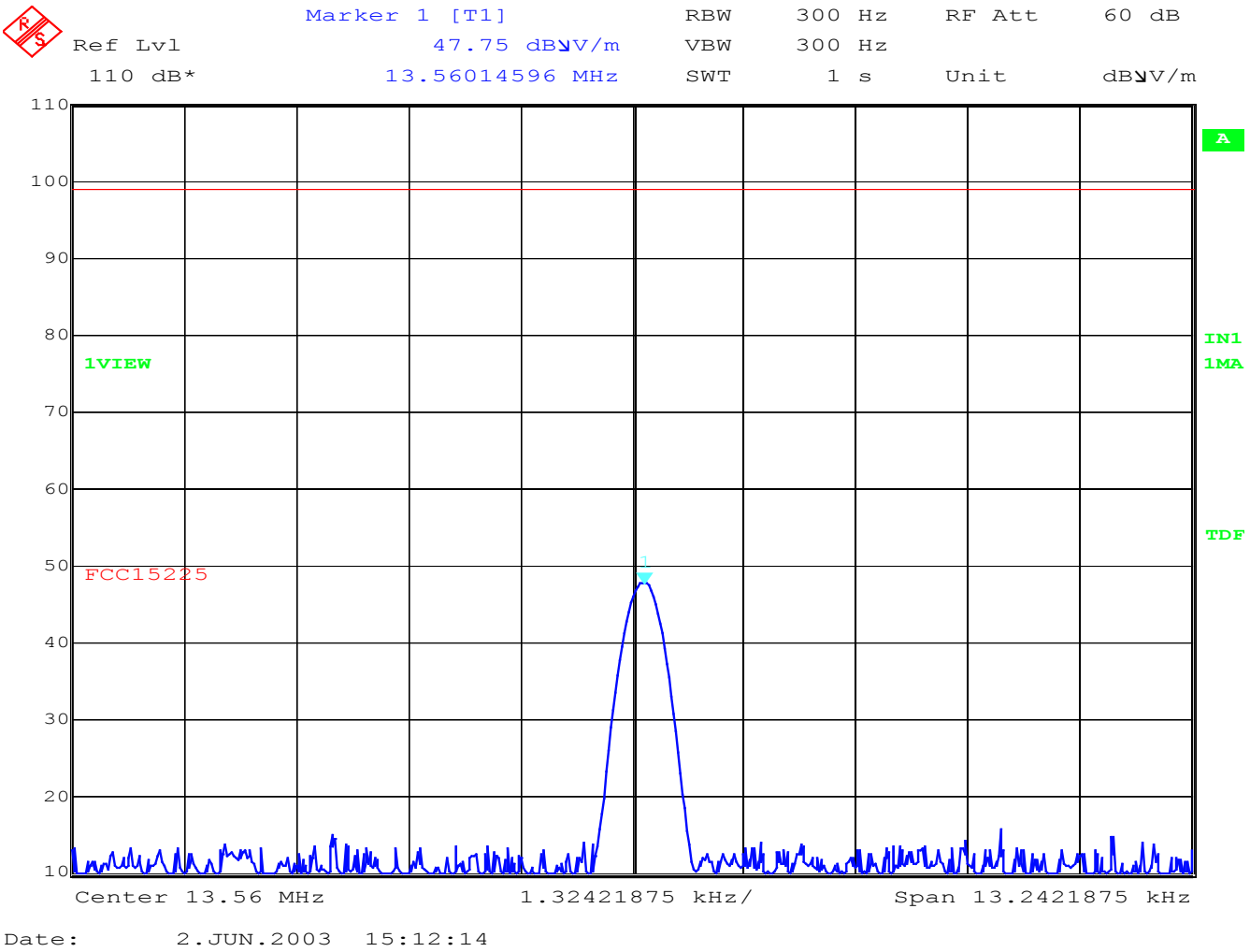
Temperature = +10 deg. C

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

FCC Part 15.225
Frequency Stability – Temperature
With test fixture, in temperature chamber

Company: Stryker Instruments
Model: TPS Plus
Date: 06-02-03



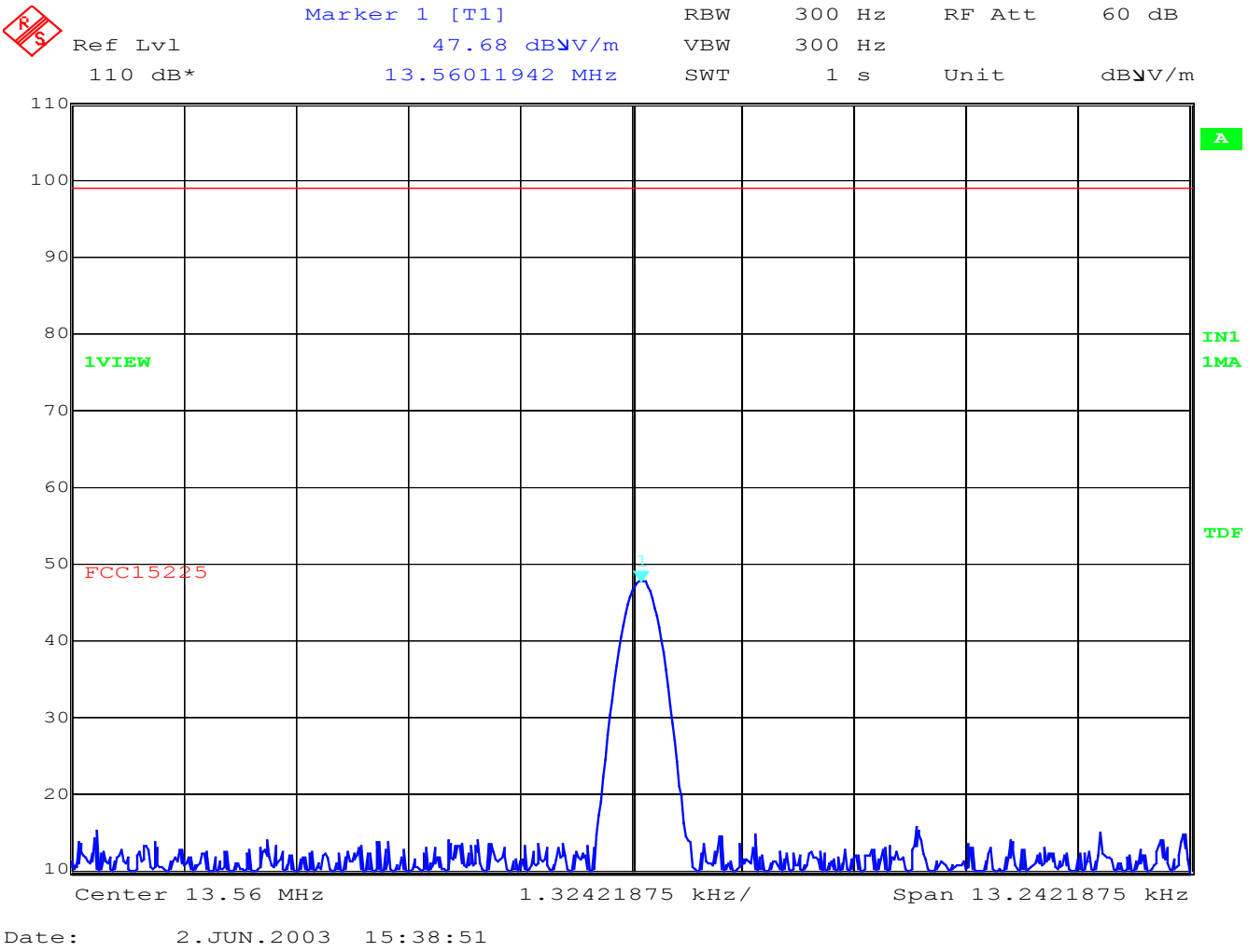
Temperature = +20 deg. C

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

FCC Part 15.225
Frequency Stability – Temperature
With test fixture, in temperature chamber

Company: Stryker Instruments
Model: TPS Plus
Date: 06-02-03



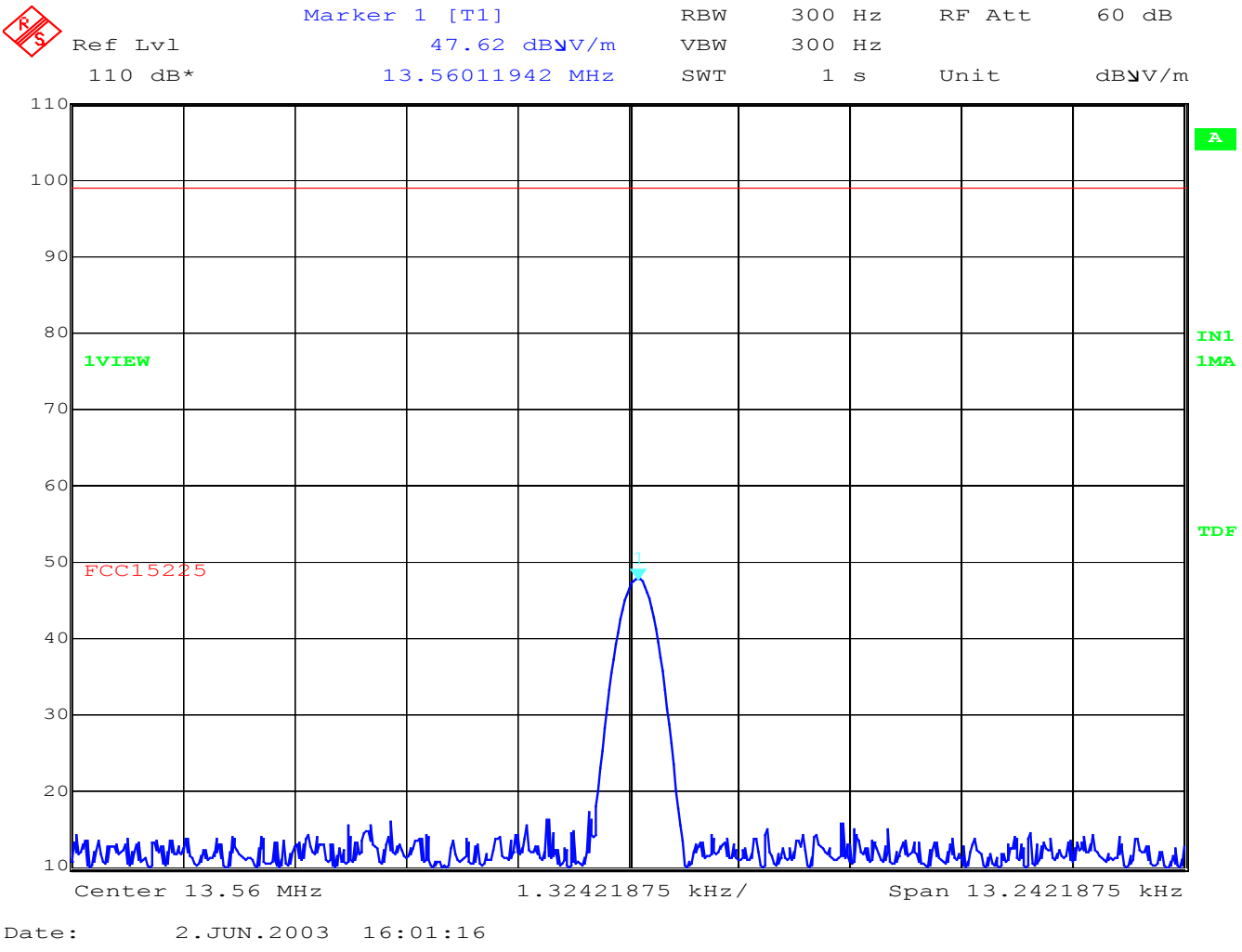
Temperature = +30 deg. C

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

FCC Part 15.225
Frequency Stability – Temperature
With test fixture, in temperature chamber

Company: Stryker Instruments
Model: TPS Plus
Date: 06-02-03



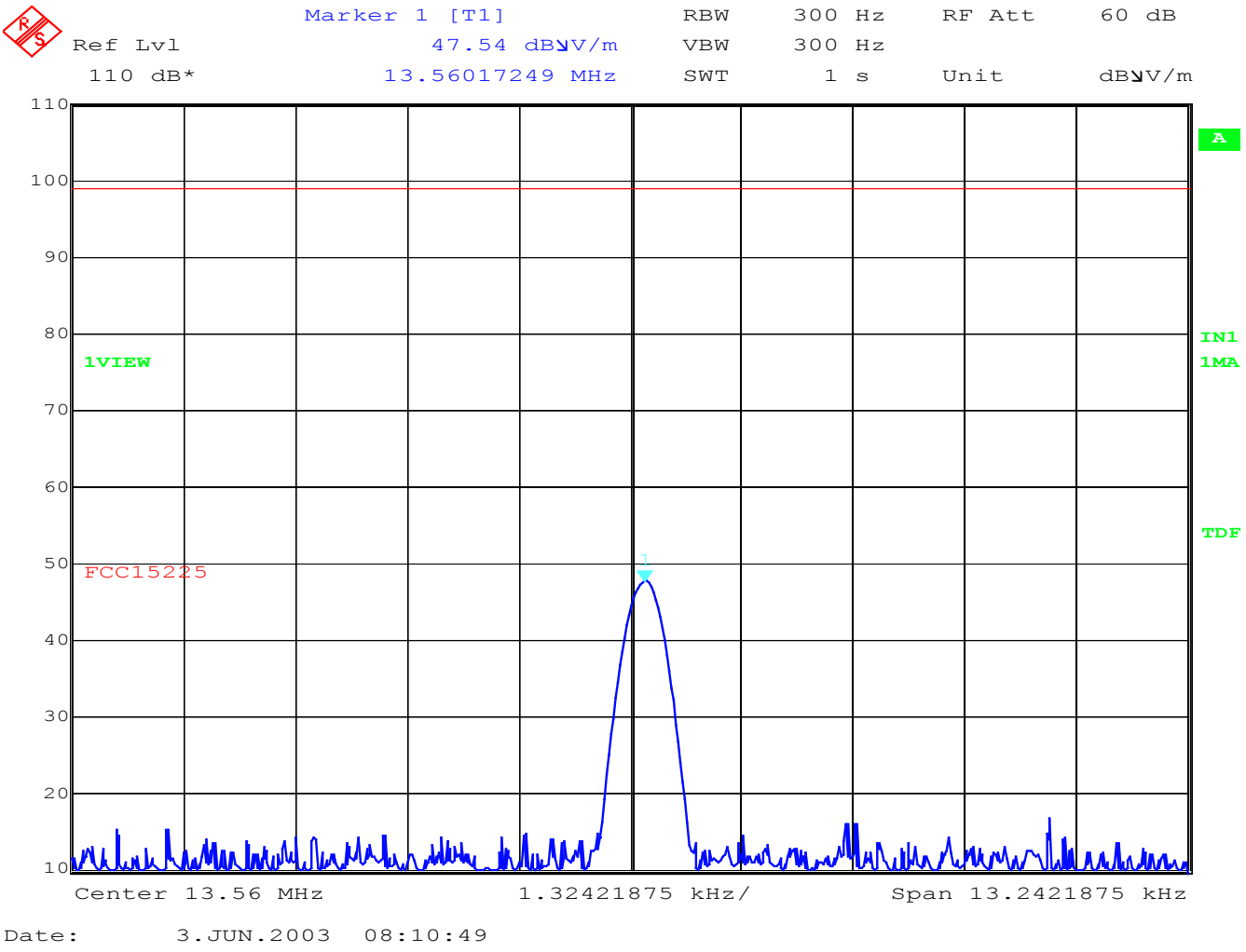
Temperature = +40 deg. C

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

FCC Part 15.225
Frequency Stability – Temperature
With test fixture, in temperature chamber

Company: Stryker Instruments
Model: TPS Plus
Date: 06-02-03



Temperature = +50 deg. C

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5.0 FREQUENCY STABILITY - PART 2.1055d **(Voltage)**

The frequency stability of TPS Irrigation Console was measured by varying the primary supply voltage from 85% to 115% of nominal value for all equipment other than hand carried battery equipment.

FREQUENCY STABILITY FOR VOLTAGE VARIATION:

85% 13559973.46
100% 13560000.00
115% 13560172.50

This is well within the specified limits.

FREQUENCY STABILITY FOR HAND HELD DEVICES:

For hand carried, battery powered equipment, the supply voltage was reduced to the battery operating end point specified by the manufacturer. Readings were taken at the reduced end point and with a fresh battery:

Fresh Battery verses Battery end point:

Frequency #1 **0 Hz**
Frequency #2 **0 Hz**
Frequency #3 **0 Hz**
Frequency #4 **0 Hz**
Frequency #5 **0 Hz**
Frequency #6 **0 Hz**

As stated in Part 15, Section 15.225 (c), the Frequency Tolerance and Margin for this range are as follows:

Frequency Tolerance: **0.0001**

Limit: **1356 Hz**

This test was not run since the device is connect to the AC power line.

1250 Peterson Dr., Wheeling, IL 60090

GRAPHS TAKEN FOR FREQUENCY

STABILITY WHEN VARYING THE

PRIMARY SUPPLY VOLTAGE

PART 2.1055d

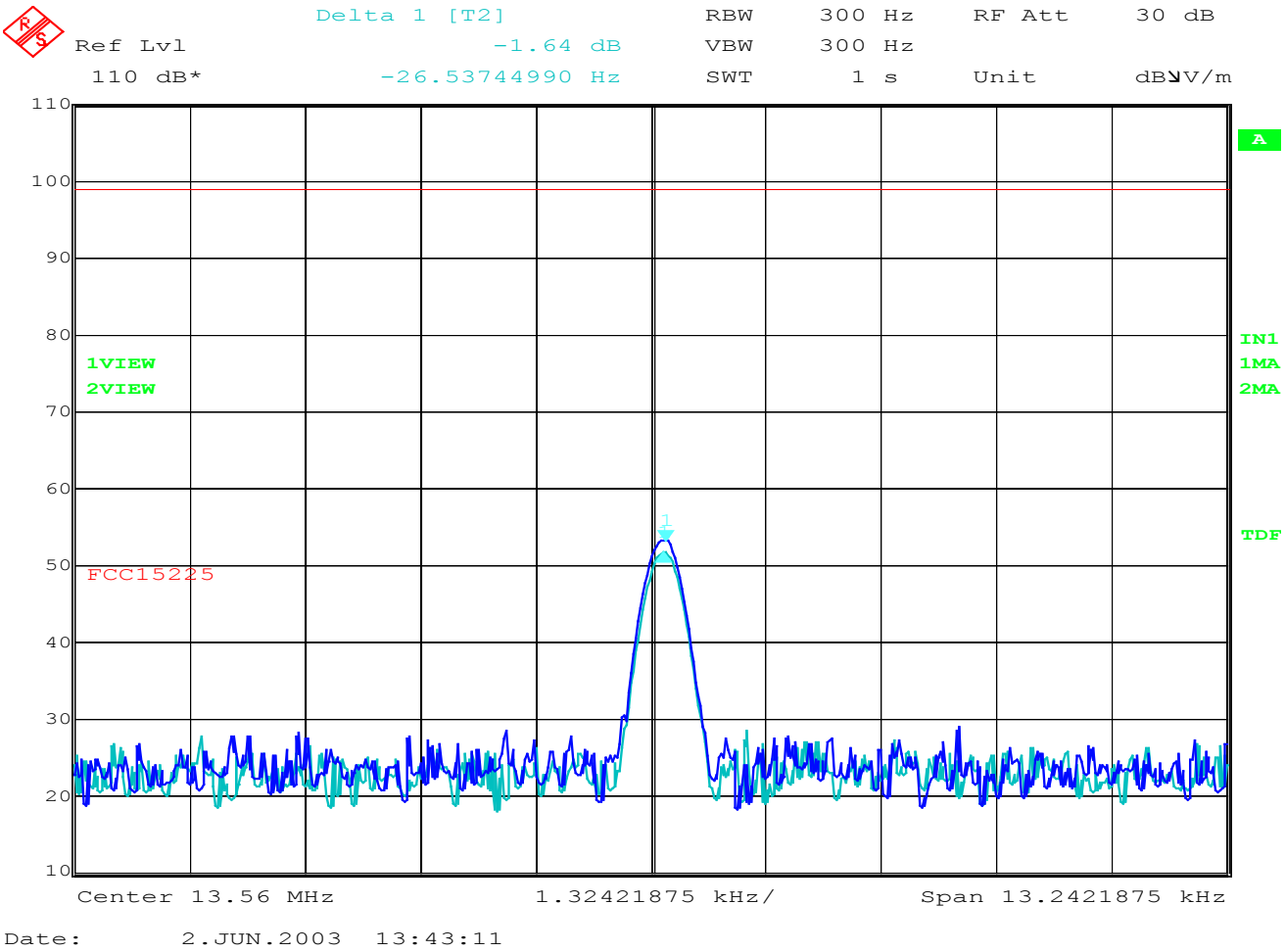
This is well within the specified limits.

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

FCC Part 15.225
Frequency Stability – Supply Voltage
Test Distance: 10 meters

Company: Stryker Instruments
Model: TPS Plus
Date: 06-02-03



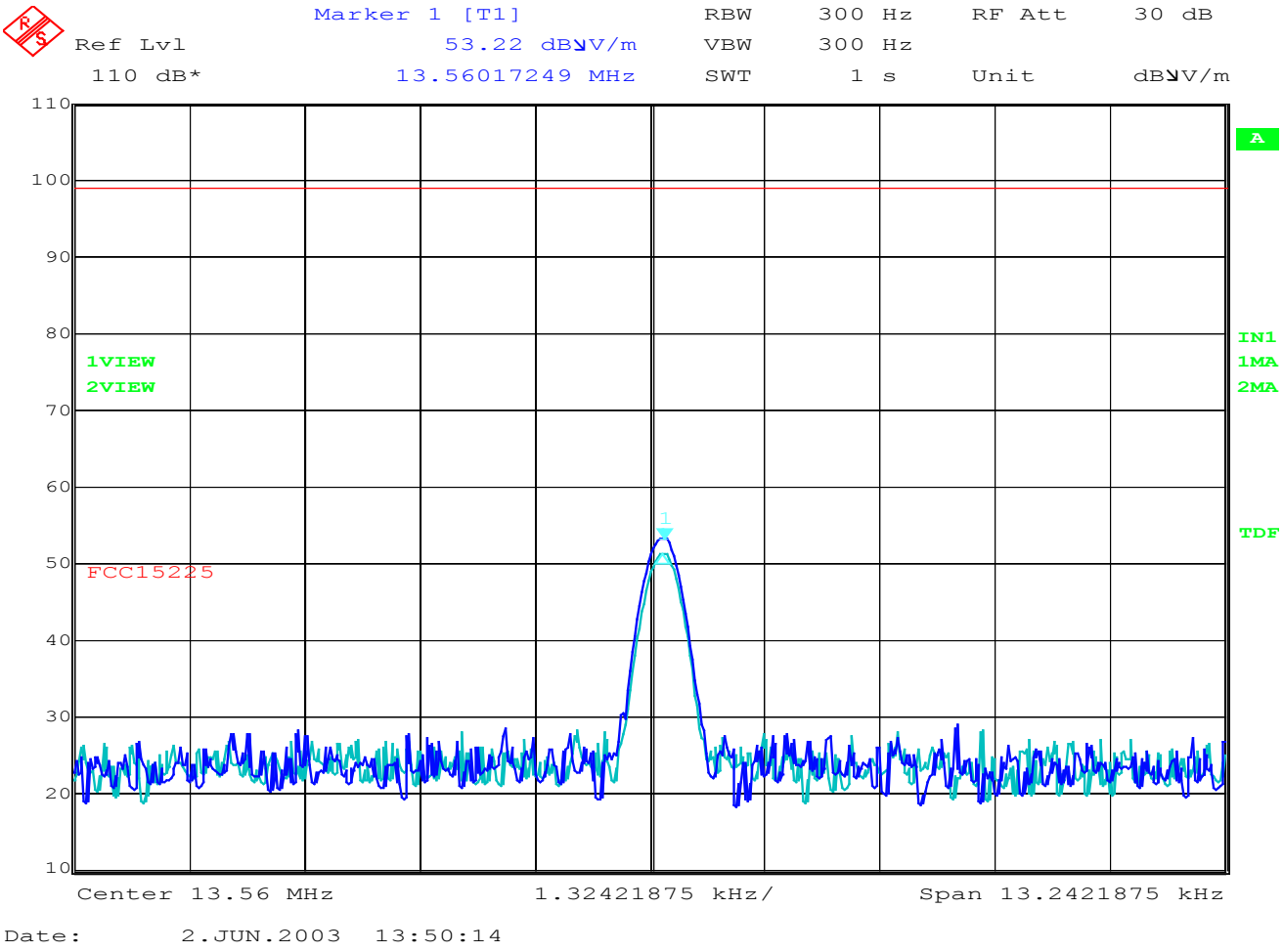
Blue = 120 Volt supply
Green = 102 Volt supply
Limit = 1.356 kHz

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

FCC Part 15.225
Frequency Stability – Supply Voltage
Test Distance: 10 meters

Company: Stryker Instruments
Model: TPS Plus
Date: 06-02-03



Blue = 120 Volt supply
Green = 138 Volt supply
Limit = 1.356 kHz