



# L.S. Compliance, Inc.

W66 N220 Commerce Court  
Cedarburg, WI 53012  
262-375-4400 Fax: 262-375-4248

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## COMPLIANCE TESTING OF:

Terra Player:

Model BT-100 Base Unit  
Model CR-100 Rack Mount Unit  
Model TR-100 Table Top Unit

## PREPARED FOR:

TerraDigital Systems, LLC  
Attn.: Terry Albazzaz  
8125 River Drive, Suite 100  
Morton Grove, IL 60053

## TEST REPORT NUMBER:

303242

## TEST DATE(S):

May 12<sup>th</sup> through June 4<sup>th</sup>, 2003

*All results of this report relate only to the items that were tested. This report is not to be reproduced, except in full, without written approval of L. S. Compliance, Inc.*

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## 1. L. S. Compliance In Review

L. S. Compliance, Inc. is located in Cedarburg, Wisconsin – United States.

We may be contacted by:

Mail: L. S. Compliance, Inc.  
W66 N220 Commerce Court  
Cedarburg, Wisconsin 53012

Phone: 262-375-4400  
Fax: 262-375-4248  
E-mail: [eng@lsr.com](mailto:eng@lsr.com)

As an EMC Testing Laboratory, our Accreditation and Assessments are recognized through the following:

### **A2LA – American Association for Laboratory Accreditation**

Accreditation based on ISO/IEC 17025 : 2003  
with Electrical (EMC) Scope of Accreditation  
A2LA Certificate Number: **1255.01**

### **U. S. Conformity Assessment Body (CAB) Validation**

Validated by the European Commission as a U. S. Conformity Assessment Body operating under the U. S. /EU, Mutual Recognition Agreement (MRA) operating under the European Union EMC Directive 89/336/EEC, Article 10.2.  
Date of Validation: **January 16, 2001**

### **Federal Communications Commission (FCC) – USA**

Listing of 3 Meter Semi-Anechoic Chamber based on 47CFR 2.948  
FCC Registration Number: **90756**

Listing of 3 and 10 meter OATS based on 47CFR 2.948  
FCC Registration Number: **90757**

### **Industry Canada**

On-file, 3 Meter Semi-Anechoic Chamber based on 47CFR 2.948  
File Number: **IC 3088**




On-file 3 and 10 Meter OATS based on RSS-210  
File Number: **IC 3088-A**

## 2. A2LA Certificate of Accreditation







### 3. A2LA Scope of Accreditation

	
<b>American Association for Laboratory Accreditation</b>	
<u>SCOPE OF ACCREDITATION TO ISO/IEC 17025-1999</u>	
L.S. COMPLIANCE, INC. W66 N220 Commerce Court Cedarburg, WI 53012 James Blaha Phone: 262 375 4400	
<b>ELECTRICAL (EMC)</b>	
Valid to: January 31, 2003	Certificate Number: 1255-01
In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following tests:	
<u>Test</u>	<u>Test Method(s)</u>
Conducted Emissions Continuous/Discontinuous	Code of Federal Regulations (CFR) 47, FCC Method Parts 15 and 18 using ANSI C63.4; EN: 55011, 55022, 55081-1, 55081-2; CISPR: 11, 22; CNS 13438
Radiated Emissions	Code of Federal Regulations (CFR) 47, FCC Method Parts 15 and 18 using ANSI C63.4; EN: 55011, 55022, 55081-1, 55081-2; CISPR: 11,22; CNS 13438
Conducted Immunity Fast Transients/Burst	IEC: 1000-4-4, 801-4; EN: 61000-4-4, 50082-1, 50082-2
Surge	IEC: 1000-4-5, 801-5; ENV 50142; EN: 61000-4-5, 50082-1, 50082-2
RF Fields	IEC: 1000-4-6, 801-6; ENV 50141; EN: 61000-4-6, 50082-1, 50082-2
Voltage Dips/Interruptions	IEC 1000-4-11; EN: 61000-4-11, 50082-1, 50082-2
Radiated Immunity RF Fields	IEC: 801-3, 1000-4-3; ENV 50140; EN: 61000-4-3, 50082-1, 50082-2
RF Fields (50 Hz)	IEC 1000-4-8; EN 61000-4-8
RF Fields (Pulse Mode)	EN: 50082-1, 50082-2; ENV 50204
Electrostatic Discharge (ESD)	IEC: 1000-4-2, 801-2; BSEN 60801-2; EN: 61000-4-2, 50082-1, 50082-2
<p>(A2LA Cert. No. 1255.01) 06/26/01</p> <p>5301 Buckeystown Pike, Suite 350 • Frederick, MD 21704-8373 • Phone: 301-644-3248 • Fax: 301-662-2974</p> <p> Page 1 of 1 </p>	

#### 4. Validation Letter – U.S. Competent Body for EMC Directive 89/336/EEC

 <p>January 16, 2001</p>		<p><b>UNITED STATES DEPARTMENT OF COMMERCE</b> <b>National Institute of Standards and Technology</b> Gaithersburg, Maryland 20899-</p>
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Mr. James J. Blaha  
L.S. Compliance Inc.  
W66 N220 Commerce Court  
Cedarburg, WI 53012-2636

Dear Mr. Blaha:

I am pleased to inform you that the European Commission has validated your organization's nomination as a U.S. Conformity Assessment Body (CAB) for the following checked (✓) sectoral annex(es) of the U.S.-EU Mutual Recognition Agreement (MRA).

- (✓) Electromagnetic Compatibility-Council Directive 89/336/EEC, Article 10(2)
- ( ) Telecommunication Equipment-Council Directive 98/13/EC, Annex III
- ( ) Telecommunication Equipment-Council Directive 98/13/EC, Annex III and IV
- Identification Number:
- ( ) Telecommunication Equipment-Council Directive 98/13/EC, Annex V
- Identification Number:

This validation is only for the location noted in the address block, unless otherwise indicated below.

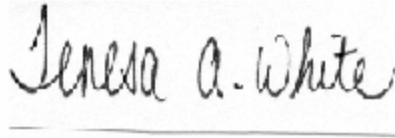
- (✓) Only the facility noted in the address block above has been approved.
- ( ) Additional EMC facilities:
- ( ) Additional R&TTE facilities:

Please note that an organization's validations for various sectors of the MRA are listed on our web site at <http://ts.nist.gov/mra>. You may now participate in the conformity assessment activities for the operational period of the MRA as described in the relevant sectoral annex or annexes of the U.S.-EU MRA document.

NIST will continue to work with you throughout the operational period. All CABs validated for the operational phase of the Agreement must sign and return the enclosed CAB declaration form, which states that each CAB is responsible for notifying NIST of any relevant changes such as accreditation status, liability insurance, and key staff involved with projects under the MRA. Please be sure that you fully understand the terms under which you are obligated to operate as a condition of designation as a CAB. As a designating authority, NIST is responsible for monitoring CAB performance to ensure continued competence under the terms of the MRA.

**NIST**

5. Signature Page



Prepared By:

June 19, 2003

Teresa A. White, Document Coordinator

Date

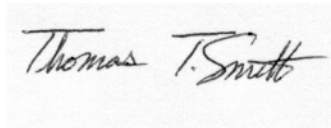


Tested By:

June 19, 2003

Abtin Spantman, EMC Engineer

Date

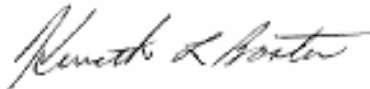


Tested By:

June 19, 2003

Thomas T. Smith, EMC Engineer

Date



Approved By:

June 19, 2003

Kenneth L. Boston, EMC Lab Manager

Date

PE #31926 Licensed Professional Engineer

Registered in the State of Wisconsin, United States

## 6. Product and General Information

<b>Manufacturer:</b>	TerraDigital Systems, LLC
<b>Model No.:</b>	BT-100, CR-100 and TR-100
<b>Serial No.:</b>	Engineering Units
<b>Description:</b>	Terra Player Base unit, Rack Mount unit, and Table-top Models

## 7. Product Description

The TerraPlayer is a wireless, network-connected Digital Audio Jukebox.

There are two components to the system: a TerraPlayer Radio and a TerraPlayer Base. The Terra Player BT-100 (Base Transceiver) connects to either a PC (via USB connection) or a group of PCs on a LAN (via an Ethernet connection). It transmits music from the PC to a TerraPlayer Radio.

There are two versions of the TerraPlayer Radio. The TR-100 (Table-top Radio) is for stand-alone use, with built-in stereo speakers, amplifier, and an AM/FM radio. The CR-100 (Component Radio) is for component stereo systems, and connects your stereo to a Personal Computer, and allows music originating from the Personal Computer to be linked into your component stereo.

## 8. Test Requirements

The above mentioned tests were performed in order to determine the compliance of the TerraPlayer system with limits contained in various provisions of Title 47 CFR, FCC Part 15, including:

15.109	15.247a2	15.247d
15.205	15.247b	15.247e
15.207	15.247c	

All radiated emissions tests were performed to measure the emissions in the frequency bands described by the above sections, and to determine whether said emissions are below the limits established by the above sections. These tests were performed in accordance with the procedure described in the American National Standard for methods of measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2001). Another document used as reference for the EMI receiver specification was the International Special Committee on Radio Interference CISPR 16-1 (2002). Measurement technique guidelines found in Appendix C to FCC 97-114 were also consulted.



## 9. Summary of Test Report

### DECLARATION OF CONFORMITY

The TerraDigital Systems TerraPlayer system was found to **MEET** the requirements as described within the specification of Title 47 CFR FCC, Part 15.247, Subpart c, for a digitally modulated spread spectrum transmitter.

## 10. Introduction

During May and June of 2003, a series of Radiated and Conducted Emission tests were performed on several samples of the TerraPlayer system, Model Numbers BT-100, CR-100 and TR-100, here forth referred to as the "*Equipment Under Test*" or "*EUT*". The three models tested all use the same RF transmitter topology and are used to transmit digitized audio. These tests were performed using the procedures outlined in ANSI C63.4-2001 for intentional radiators, and in accordance with the limits set forth in FCC Part 15.247 for a digital device. These tests were performed by Thomas T. Smith, EMC Engineer, Abtin Spantman, EMC Engineer, and Kenneth Boston, EMC Lab Manager of L.S. Compliance, Inc. and witnessed by Steve Hawkins of TerraDigital Systems.

## 11. Purpose

All Radiated and Conducted Emission tests upon the EUT were performed to measure the emissions in the frequency bands described in title 47 CFR, FCC Part 15, including 15.35, 15.207, and 15.247 to determine whether these emissions are below the limits expressed within the standards. These tests were performed in accordance with the procedure described in the American National Standard for methods of measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2001). Another document used as a reference for the EMI Receiver specification was the Comite International Special Des Perturbations Radioelectriques CISPR 16-1, 2002

## 12. Radiated Emissions Test

### Test Setup

The test setup was assembled in accordance with Title 47, CRF FCC Part 15 and ANSI C63.4-2001. Radiated tests were conducted on each of the three sample types of case and mounting styles as found in the three model numbers listed. The essential radio transceiver found in all models is the same, and therefore radiated tests are performed on all three to determine the worst case. Each EUT was placed on an 80cm high non-conductive table (80cm pedestal for the BT100) centered on a flush mounted 2-meter diameter turntable inside the 3 Meter Semi-Anechoic, FCC listed Chamber located at L. S. Compliance, Inc., Cedarburg, Wisconsin. The EUTs were operated in continuous operation mode, using AC power as provided by the manufacturer. The applicable limits apply at a 3 meter distance. Measurements above 5 GHz were also performed at a 1 meter separation distance. The calculations to determine the limits are detailed in the following pages. Please refer to Appendix A for a list of the test equipment. The test sample, in each case, was operated on one of three (3) standard channels: low (Ch:1), medium (Ch:3) and high (Ch:6) to comply with FCC Part 15.31.

Channel 1: 904.704 MHz

Channel 3: 912.896 MHz

Channel 6: 925.184 MHz

### Test Procedure

Radiated Emission measurements were performed on each EUT in the 3 Meter Semi-Anechoic, FCC listed Chamber, located at L. S. Compliance, Inc. in Cedarburg, Wisconsin. The frequency range from 30 MHz to 10,000 MHz was scanned, and levels were manually noted at the various fixed degree settings of azimuth on the turntable and antenna height. All three models were evaluated, with each EUT being placed on the non-conductive table (or pedestal) in the 3 Meter Semi-Anechoic Chamber, with the antenna mast placed such that the antenna was 3 meters from the test object. A Biconical Antenna was used to measure emissions from 30 MHz to 300 MHz, and a Log Periodic Antenna was used to measure emissions from 300 MHz to 1000 MHz. A Double Ridged Waveguide Horn Antenna was used from 1 GHz to 10 GHz. The maximum radiated emissions were found by raising and lowering the antenna between 1 and 4 meters in height, using both horizontal and vertical antenna polarities. From 5 to 10 GHz, the Horn Antenna was used with an HP E4407B to measure emissions at a 1 meter distance.

### **Test Equipment Utilized**

A list of the test equipment and antennas utilized for the Radiated Emissions test can be found in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. All calibrations of the antennas used were performed at a N.I.S.T. traceable site. In addition, the Connecting Cables were measured for losses using a calibrated Signal Generator and a HP 8546A EMI Receiver. The resulting correction factors and the cable loss factors from these calibrations were entered into the HP 8546A EMI Receiver database. As a result, the data taken from the HP 8546A EMI Receiver accounts for the antenna correction factor as well as cable loss or other corrections, and can therefore be entered into the database as a corrected meter reading. The HP 8546A EMI Receiver was operated with a bandwidth of 120 kHz for measurements below 1 GHz, and a bandwidth of 1 MHz for measurements above 1 GHz. The Peak, Quasi-Peak and Average Detector functions were all utilized. From 5 GHz to 10 GHz, an HP E4407B Spectrum Analyzer and an EMCO Horn Antenna were used.

### **Test Results**

The EUT was found to MEET the Radiated Emissions requirements of Title 47 CFR, FCC Part 15.247 for a digitally modulated spread spectrum transmitter. The frequencies with significant signals were recorded and plotted as shown in the Data Charts and Graphs.

### CALCULATION OF RADIATED EMISSIONS LIMITS (in the 15.205 restricted bands)

The following table depicts the general radiated emission limits. These limits are obtained from Title 47 CFR, part 15.209a, for radiated emissions measurements, and are applied as limits in restricted bands as expressed in Title 47 CFR, Part 15.205.

Frequency (MHz)	3 m Limit mV/m	3 m Limit dBμV/m
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
960-10,000	500	54.0

#### Sample conversion from field strength μV/m to dBμV/m:

from 30 -88 MHz for example:  
$$\text{dB}\mu\text{V/m} = 20 \log_{10} (3\text{m limit})$$
$$\text{dB}\mu\text{V/m} = 20 \log_{10} (100)$$
$$40.0 \text{ dB}\mu\text{V/m} = 20 \log_{10} (100)$$

For measurements made at 1 meter, a 9.5 dB correction has been invoked.

960 MHz to 10,000 MHz  
500 μV/m or 54.0 dBμV/m at 3 meters  
 $54.0 + 9.5 = 63.5 \text{ dB}\mu\text{V/m}$  at 1 meter

*Note: Limits are conservatively rounded to the nearest whole number.*

### Summary of Results and Conclusions

Based on the procedures outlined in this report, and the test results, it can be determined that the EUT does **MEET** the emission requirements of Title 47 CFR, FCC Part 15, Subpart C for a digitally modulated spread spectrum transmitter.

The enclosed test results pertain to the samples of the test item listed, and only for the tests performed per the data sheets. Any subsequent modification or changes to the test items could invalidate the data contained herein, and could therefore invalidate the findings of this report.

## Measurement of Electromagnetic Radiated Emissions Within the 3 Meter FCC Listed Chamber

Manufacturer: TerraDigital Systems, LLC

Date of Test: May 2003

Model Nos.: BT-100, TR-100 and CR-100

Serial No.: Engineering Units

Test Requirements: 15.247 and 15.205

Distance: 3 Meters, 1 Meter (>6GHz checked at 30cm)	Frequency Range Inspected: 30 to 10,000 MHz
Configuration: Continuous Transmit, simulated digital signal for full frequency	

### Test Equipment Used:

EMI Measurement Instrument: HP 8546A and Agilent E4407B	Biconical Antenna: EMCO 93110B
Double-Ridged Wave Guide/Horn Antenna: EMCO 3115	Log Periodic Antenna: EMCO 43146A

Detector(s) Used:	v	Peak	v	Quasi-Peak	v	Average
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The following table depicts the level of significant radiated emissions found

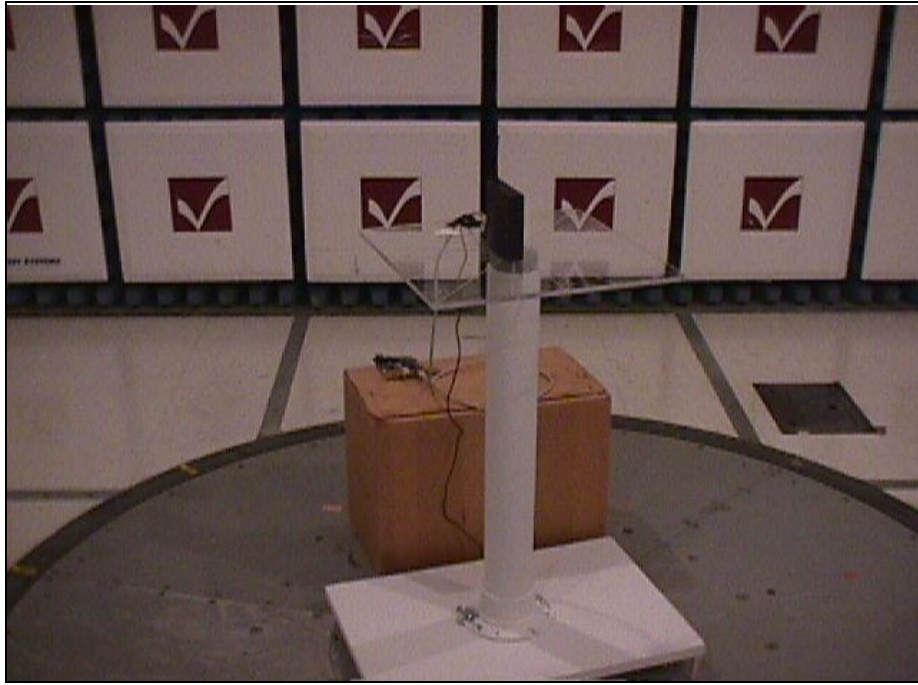
Frequency (MHz)	Antenna Polarity	Equipment Under Test	Channel #	Antenna Height (meters)	Azimuth (0° - 360°)	EMI Meter Reading (dBmV/m)	15.247 Limit (dBmV/m)	Margin (dB)
73.7	H	Table	3	2.20	230	37.2	40	2.8
75.0	V	Base	6	1.00	0	31.4	40	8.6
108.5	V	Table	3	1.00	300	31.0	43	12.0
125.0	V	Base	3	1.00	180	35.4	43	7.6
131.0	H	Table	3	1.80	260	35.2	43	7.8
168.0	H	Table	6	1.70	255	32.0	43	11.0
270.3	H	Table	3	1.25	330	33.4	46	12.6
284.6	H	Table	3	1.10	340	31.2	46	14.8
2714	H	Rack	1	1.25	165	38.5	54	15.5
2740	H	Rack	3	1.40	160	39.0	54	15.0
2775	H	Rack	6	1.70	230	40.1	54	13.9
3651	V	Base	3	1.00	245	36.5	54	17.5
3702	H	Rack	6	1.60	150	35.3	54	18.7
4625	V	Rack	6	1.30	115	43.5	54	10.5
5428	V	Rack	1	1.60	230	40.7	54	13.3

**Notes:** A Quasi-Peak Detector was used in measurements below 1 GHz, and both an Average and a Peak Detector were used in measurements above 1 GHz. All other Radiated Spurious Emissions seen were found to be greater than 20 dB below the limits, or below the noise floor of the instrumentation. All peak emissions seen were greater than 20 dB below the nominal specification limit (74 dBμV/m for most frequencies).



## Photos Taken During Radiated Emission Testing

### Setup for the Radiated Emissions Test for the Base Unit

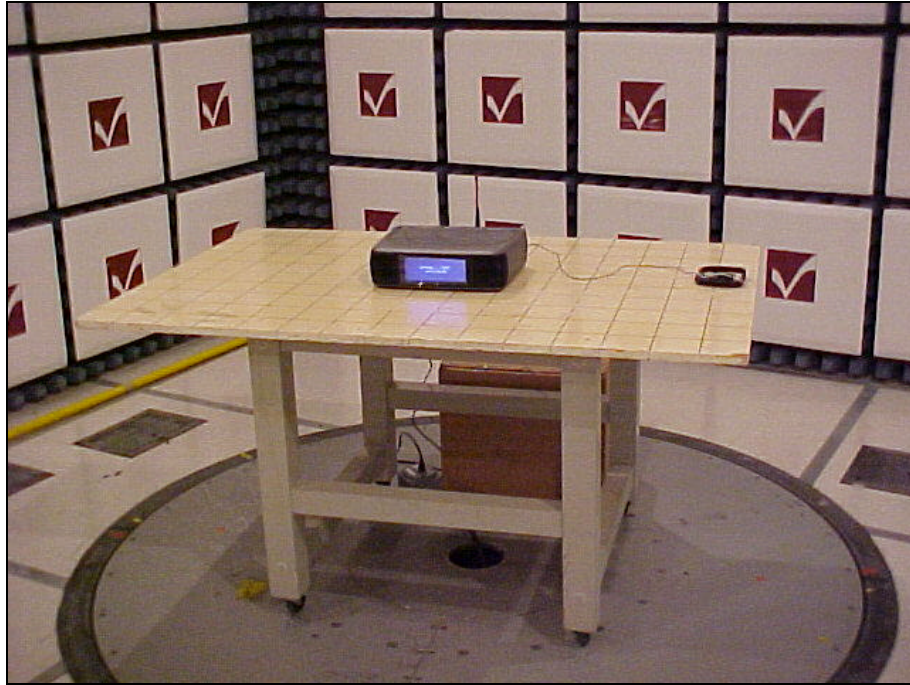


Front view of the EUT

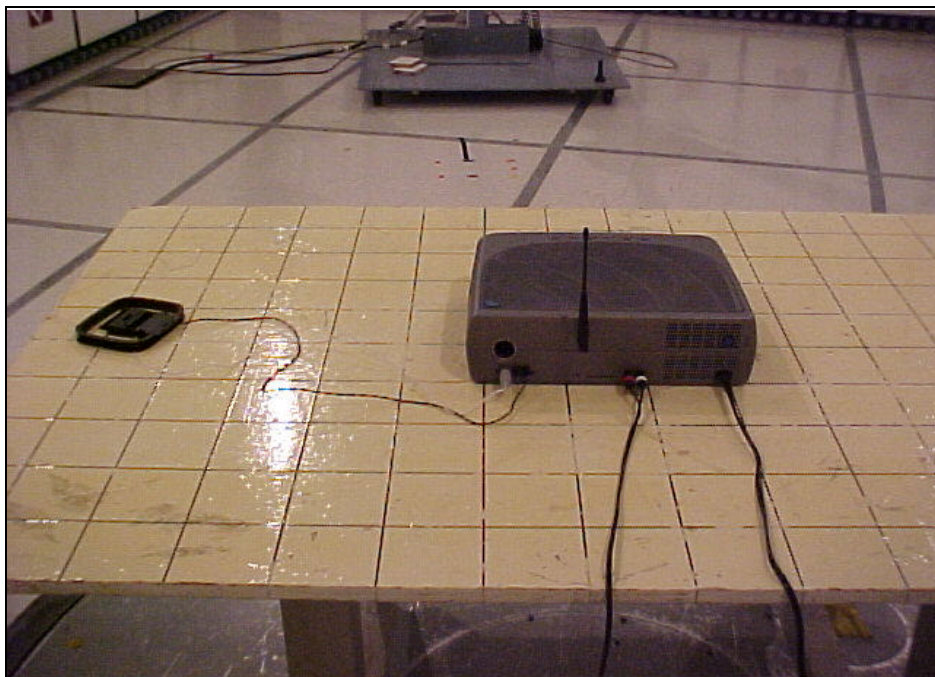


View of populated ports in rear of EUT

Setup for the Radiated Emissions Test for the Table-Top Unit



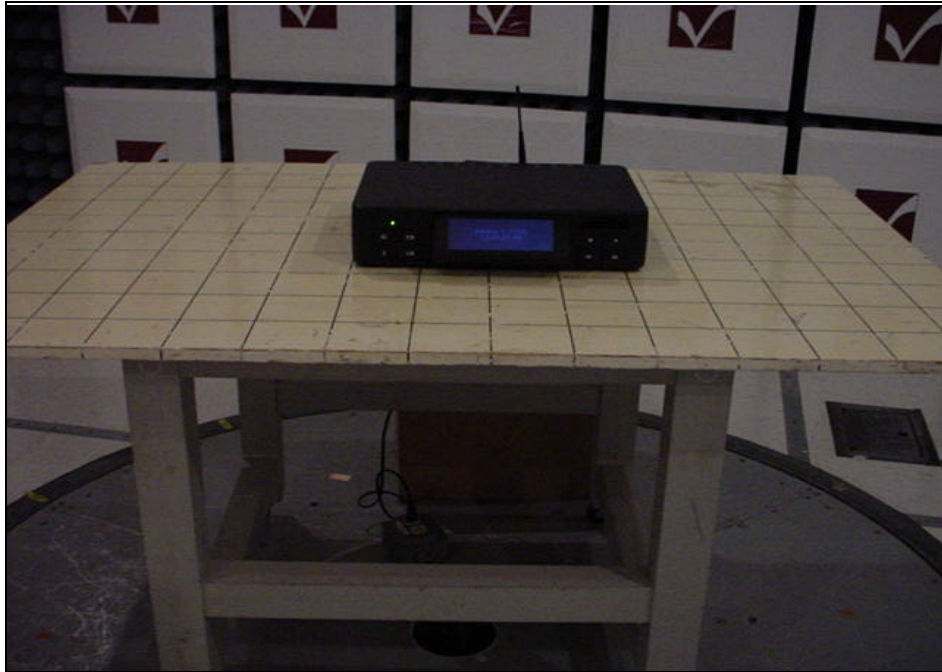
Front view of the EUT



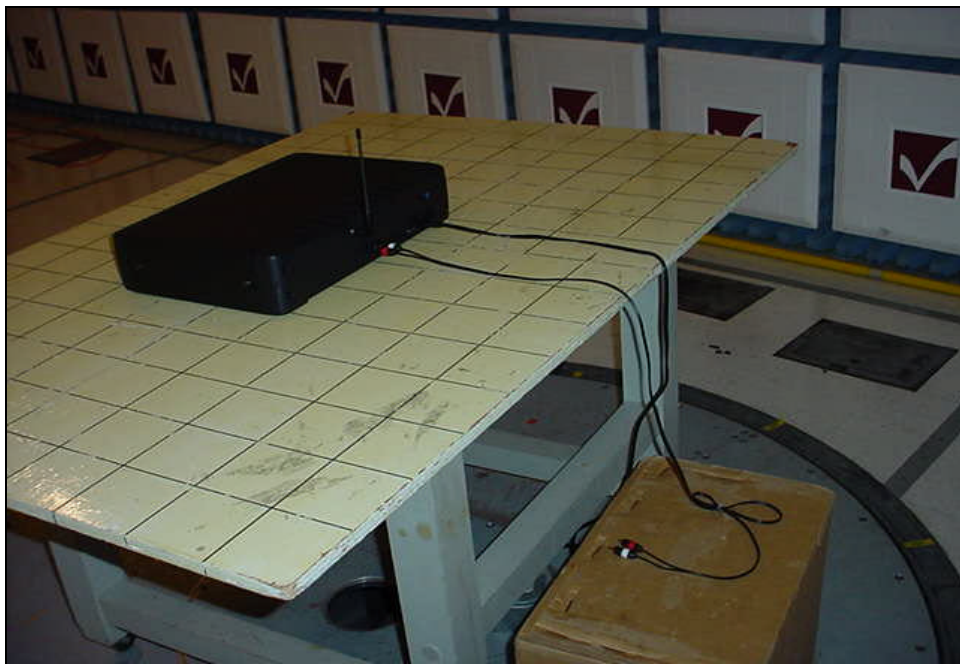
View of populated ports in rear of EUT



### Setup for the Radiated Emissions Test for the Rack-Mount Unit



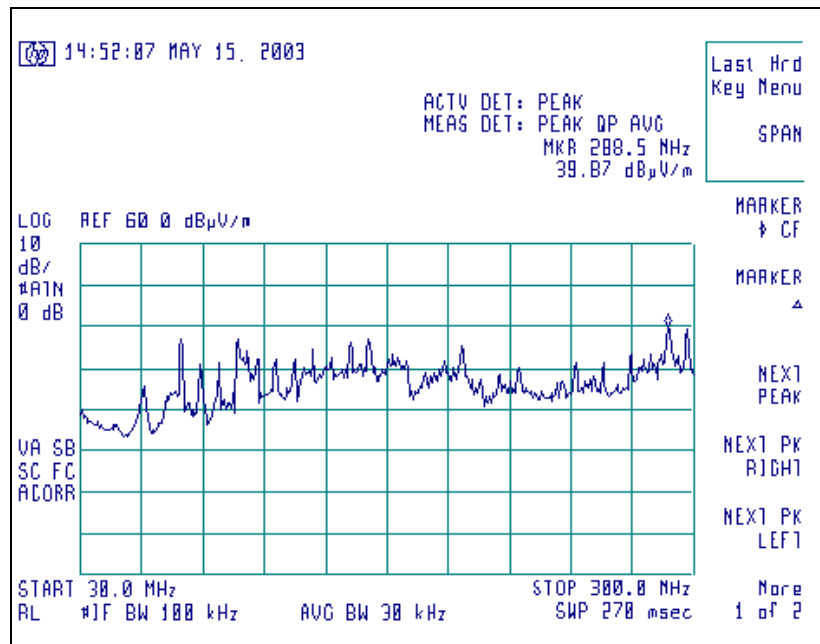
Front view of the EUT



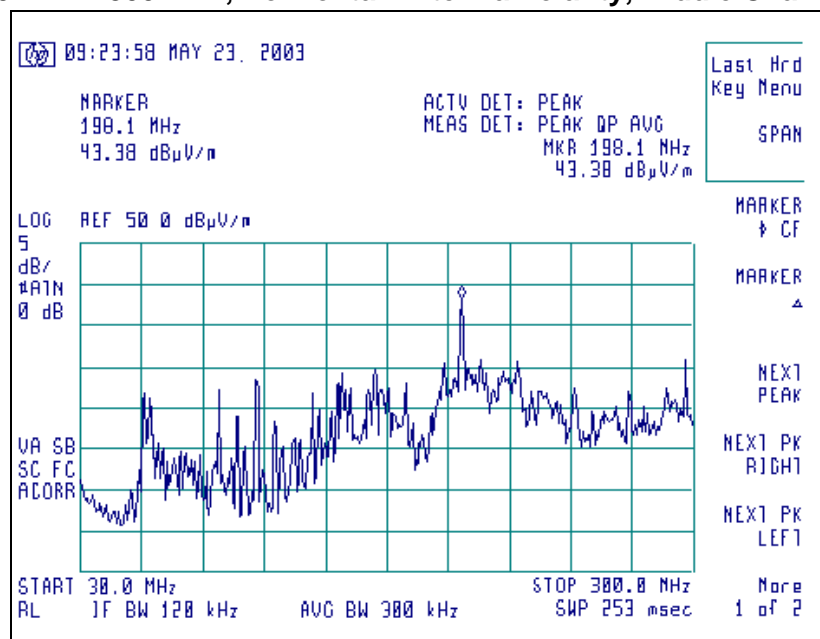
View of populated ports in rear of EUT

## Graphs made during Radiated Emission Testing

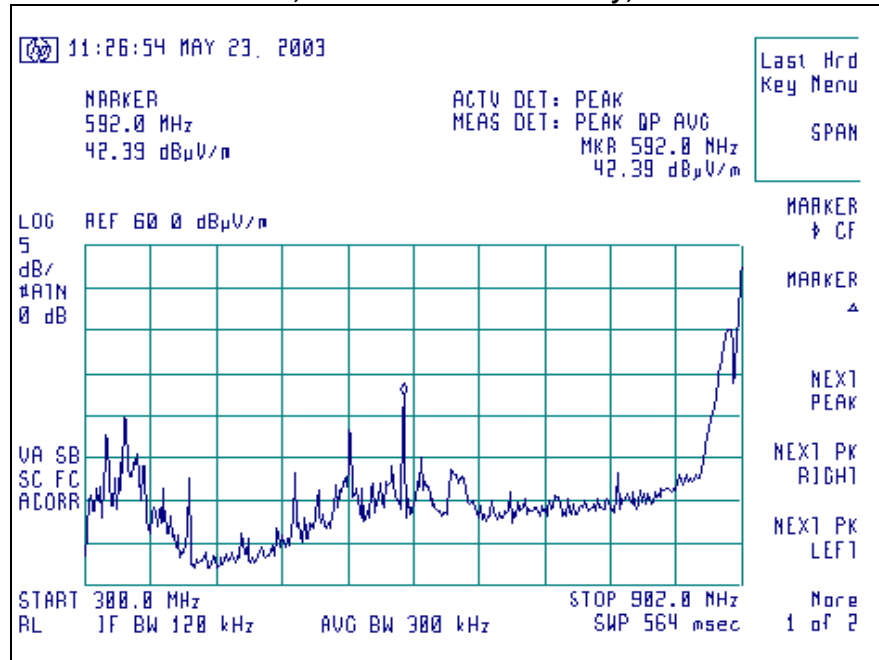
### Signature Scan of Radiated Emissions, at 3 meter, Table-Top Unit 30 MHz - 300 MHz, Horizontal Antenna Polarity, Middle Channel.



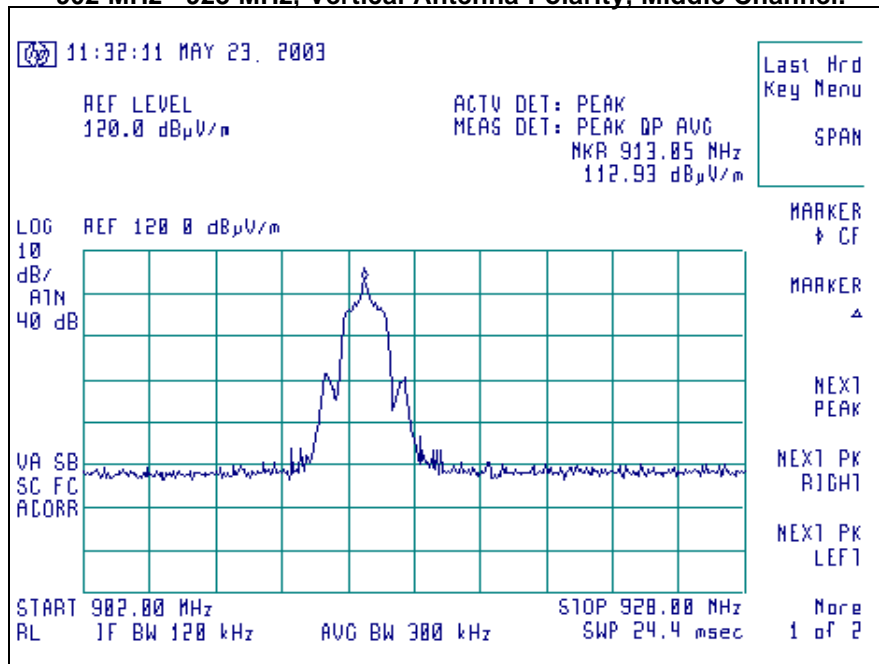
### Signature Scan of Radiated Emissions, at 3 meter, Rack-Mount Unit 30 MHz - 300 MHz, Horizontal Antenna Polarity, Middle Channel.



**Signature Scan of Radiated Emissions, at 3 meter, Rack-Mount Unit  
300 MHz - 902 MHz, Vertical Antenna Polarity, Middle Channel.**

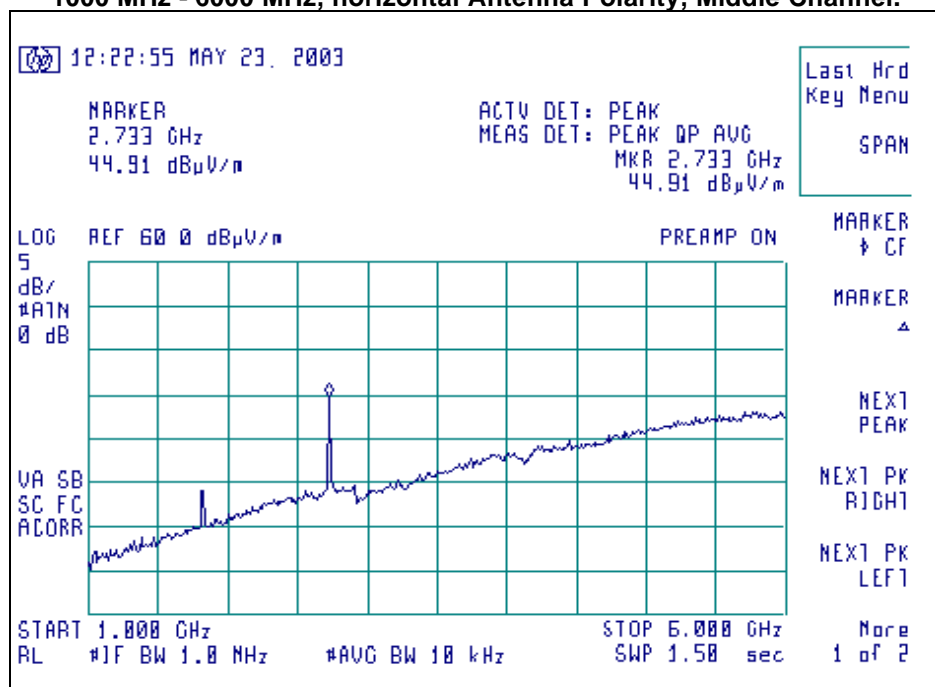


**Signature Scan of Radiated Emissions, at 3 meter, Rack-Mount Unit  
902 MHz - 928 MHz, Vertical Antenna Polarity, Middle Channel.**

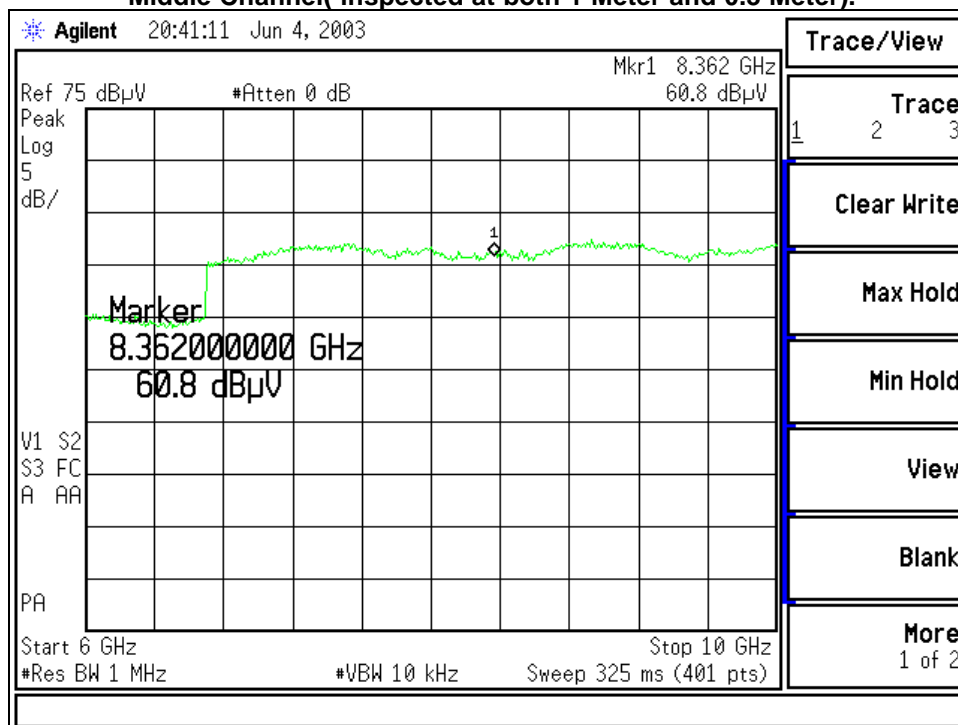




**Signature Scan of Radiated Emissions, at 3 meter, Rack-Mount Unit  
1000 MHz - 6000 MHz, horizontal Antenna Polarity, Middle Channel.**



**Signature Scan of Radiated Emissions, at 1meter, Rack-Mount Unit  
6000 MHz – 10,000 MHz, Vertical Antenna Polarity,  
Middle Channel( inspected at both 1 Meter and 0.3 Meter).**



### **13. Conducted Emissions Test (AC Line)**

#### **Test Setup**

The Conducted Emissions test was performed within a Shielded Room, located at L.S. Compliance, Inc. in Cedarburg, Wisconsin. The conducted (AC Line) measurements were performed on the BT-100, CR-100 and TR-100 samples. The test area and setup are in accordance with ANSI C63.4-2001 and with Title 47 CFR, FCC Part 15, Subpart B (Industry Canada RSS-210). The EUT was placed on a non-conductive wooden table, with a height of 80 cm above the reference ground plane. The EUT's power supply was plugged into a 50 $\Omega$  (ohm), 50/250  $\mu$ H Line Impedance Stabilization Network (LISN). The AC power supply of 120V was fed into the shielded room via an appropriate broadband EMI Filter, and then to the LISN line input. Final readings were then taken and recorded. The RF Sampling Port of the LISN was cabled to a 10 dB Attenuator-Limiter, and then to the HP 8546A EMI Receiver. The LISN used has the ability to terminate the unused port with a 50 $\Omega$  (ohm) load when switched to either L1 (line) or L2 (neutral).

#### **Test Procedure**

The appropriate frequency range and bandwidths were entered into the EMI Receiver, and measurements were made. The bandwidth used for these measurements is 9 kHz, as specified in CISPR 16-1 (2002), Section 4, Table 1, for Quasi-Peak and Average detectors in the frequency range of 150 kHz to 30MHz. Final readings were then taken and recorded.

#### **Test Equipment Utilized**

A list of the test equipment and accessories utilized for the Conducted Emissions test is found in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. Calibrations of the LISN and Limiter are traceable to N.I.S.T. All cables are calibrated and checked periodically for conformance. The emissions are measured on the HP 8546A EMI Receiver, which has automatic correction for all factors stored in memory and allows direct readings to be taken.

#### **Test Results**

The EUTs were found to MEET the Conducted Emission requirements of FCC Part 15, Conducted Emissions for an Intentional Radiator. See the Data Charts and Graphs for more details of the test results.

## Measurement of Electromagnetic Conducted Emission In the Shielded Room

Frequency Range inspected: 0.15 MHz to 30 MHz

**Manufacturer:** TerraDigital Systems, LLC  
**Date of Test:** May 2003  
**Model Nos.:** BT -100, CR-100 and TR-100  
**Serial No.:** Engineering Units  
**Test Requirements:** FCC 15.207(a)

Frequency Range Inspected: 0.15 MHz to 30 MHz						
Configuration: Continuous Transmit						
Detector(s) Used:			Peak	v	Quasi-Peak	v Average

### Test Equipment Used:

EMI Receiver: HP 8546A	L.I.S.N: EMCO 3816/2
Transient Limiter: HP 11947A	

*The following table depicts the levels of significant conducted emissions found:*

Frequency (MHz)	Equipment Under Test	Chan. #	Line	Quasi-Peak EMI Reading (dBmV/m)	Quasi-Peak Limit (dBmV/m)	Quasi-Peak Margin (dB)	Average EMI Reading (dBmV/m)	Average Limit (dBmV/m)	Average Margin (dB)
0.32	Base	1	L1	47.3	59.7	12.4	35.8	49.7	13.9
12.0	Base	3	L1	22.7	60.0	37.3	16.6	50.0	33.4
18.0	Table	3	L1	46.4	60.0	13.6	44.1	50.0	5.9
19.37	Table	3	L2	46.8	60.0	13.2	44.0	50.0	6.0
21.8	Rack	3	L2	34.1	60.0	25.9	33.4	50.0	16.6
24.6	Rack	3	L2	39.4	60.0	20.6	38.6	50.0	11.4
27.3	Rack	3	L2	31.0	60.0	29.0	29.4	50.0	20.6

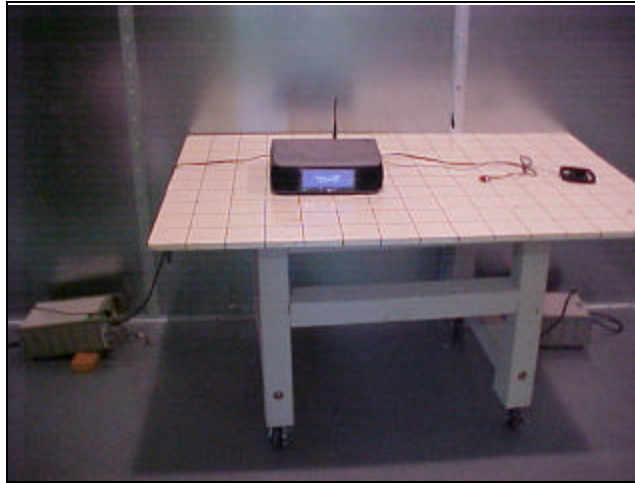
All other emissions were found to be better than 20 dB below the limits.

Photos Taken During Conducted Emission Testing

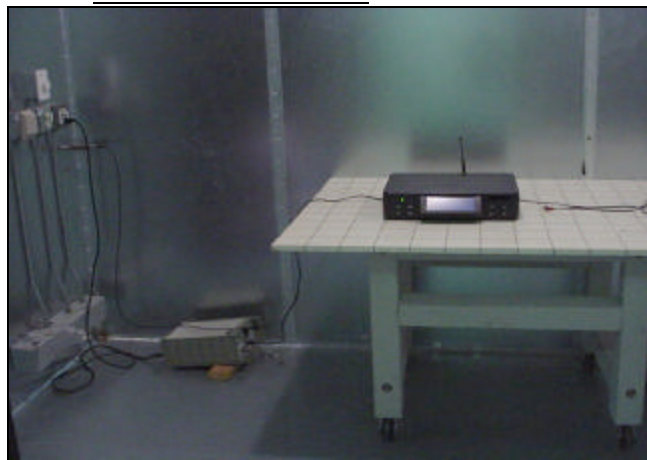
Setup for the Conducted Emissions Test on the Base Unit:



Setup for the Conducted Emissions Test on the Table-Top Unit:

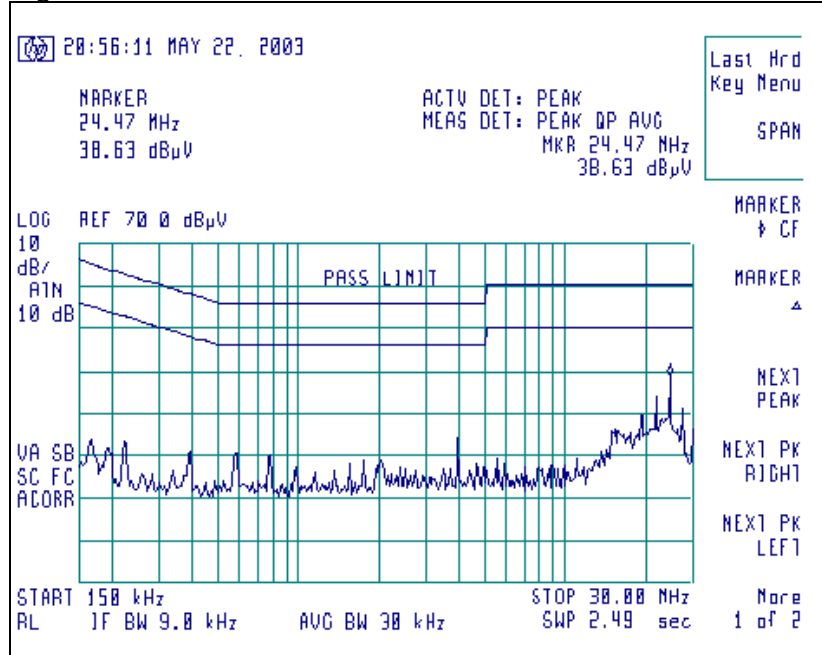


Setup for the Conducted Emissions Test on the Rack-Mount Unit:

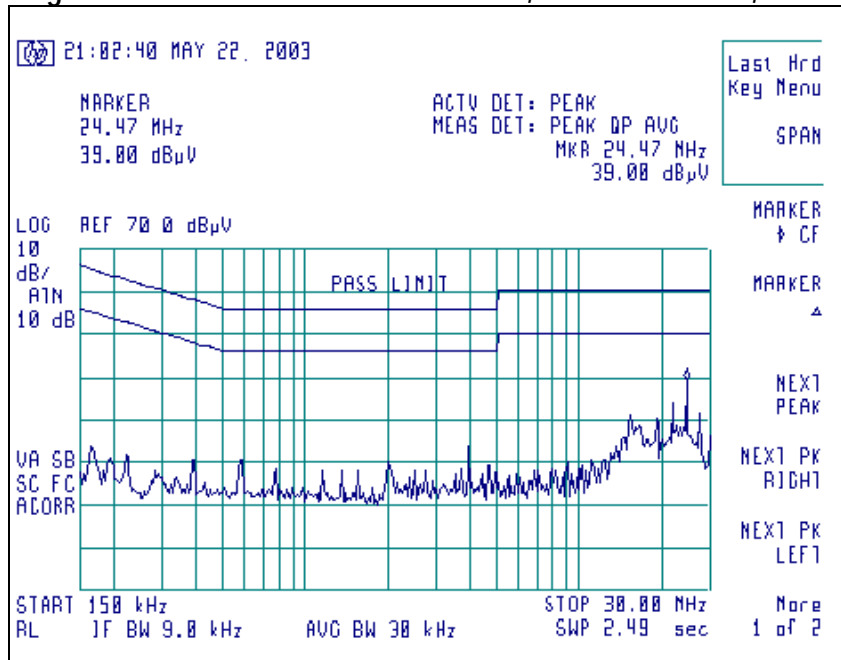


## Graphs made during Conducted Emission Testing

### Signature Scan of Conducted Emissions, Rack-Mount Unit, Line 1



### Signature Scan of Conducted Emissions, Rack-Mount Unit, Line 2

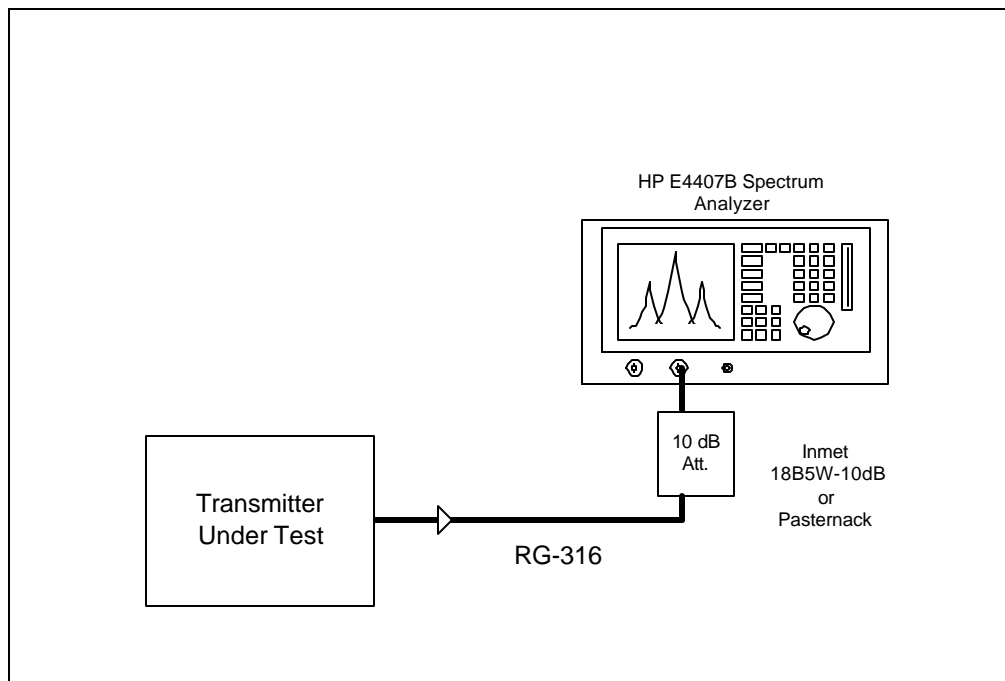




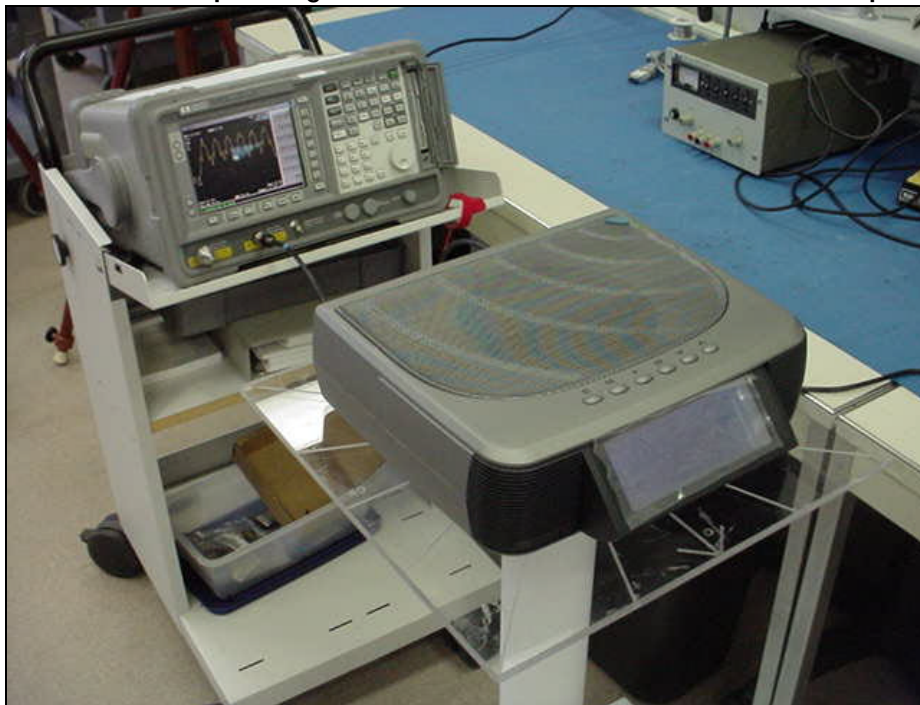
#### 14. Power Output Test Performed

For the FCC Part 15.247b measurement, the output of the TerraPlayer, TR-100 sample was connected via a short jumper cable, with a reverse-gender connector, through a 10 dB Attenuator to the input of the HP E4407B Spectrum Analyzer. The unit was configured to run in a normal continuous transmit mode, while being supplied with a random, internal full-frequency digital audio signal as a modulation source. The HP receiver was set to a 3 MHz Bandwidth, and the transmit signal was then stored, with the peak signal level stored. This power level was collected for three channels and can be seen in the chart presented below. The AC line voltage was varied from 102 VAC (-15%) to 138 VAC (+15%) in order to evaluate the change in power output as required by 15.31(e). No power change greater than 0.2 dB was seen.

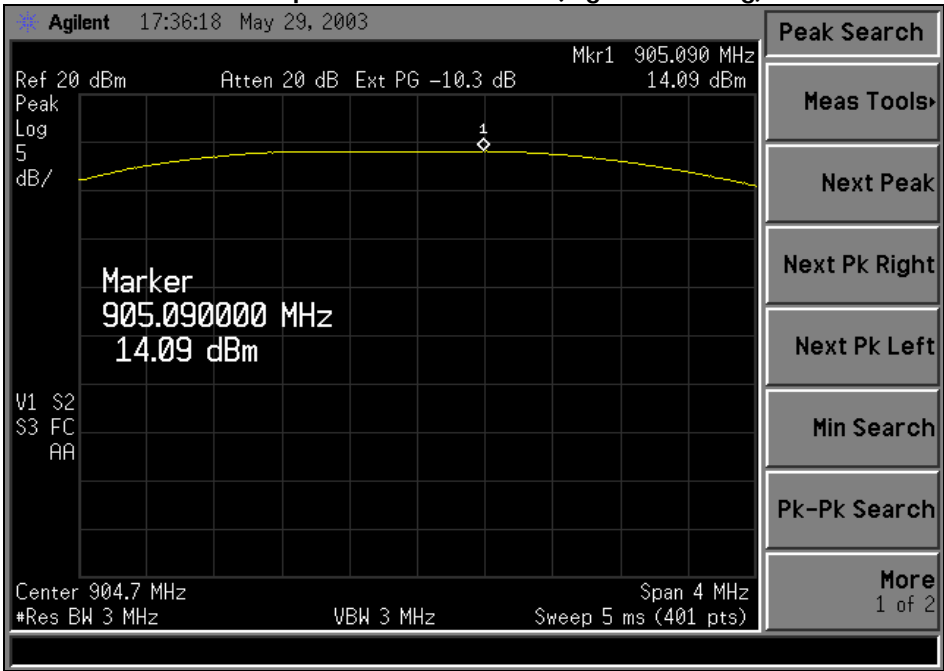
CHANNEL	CENTER FREQ (MHz)	LIMIT (dBm)	MEASURED POWER (dBm)	MARGIN (dB)
1	904.7	30 dBm	+14.1	15.9
3	912.9	30 dBm	+13.9	16.1
6	925.2	30 dBm	+13.6	16.4



View of Test Setup During the Conducted RF measurements, Table-Top Unit



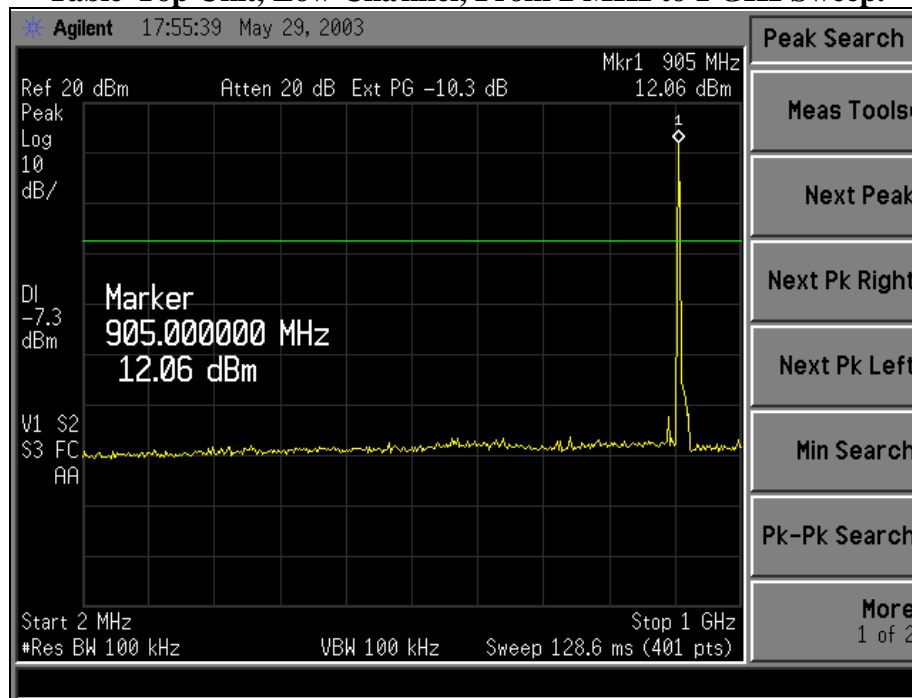
Signature Scan of Conducted RF Power measurements, Table-Top Unit, Low Channel (highest reading)



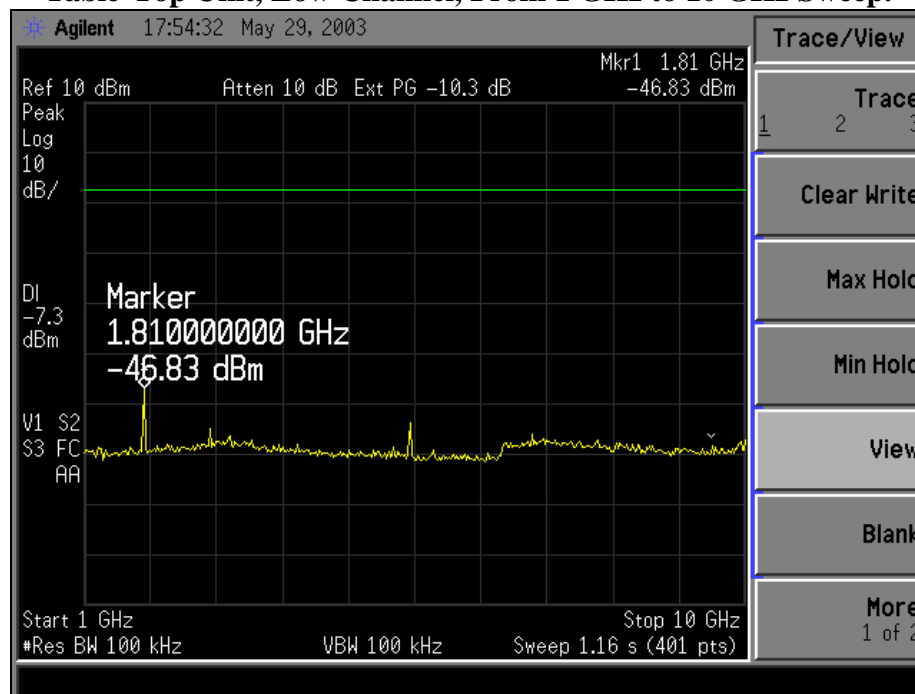
## 15. Conducted Spurious Emissions

FCC Part 15.247 (c) requires an antenna conducted measurement of conducted harmonic and spurious levels, as reference to the carrier frequency in a 100 kHz bandwidth. For this test, the transmitter was directly connected to the HP E4407B Spectrum Analyzer, through a very short Coaxial Cable and a 10 DB Attenuator. Plots were then taken, with any noticeable spurious or harmonic signals identified. No significant levels at any spurious products could be found within -20 dBc of the fundamental of the transmitter. The highest spurious signal seen was at 1809 MHz (Channel 1), which was measured at -46.8 dBm in a 100 kHz bandwidth, which is about 58.9 dB below the Channel 1 fundamental signal.

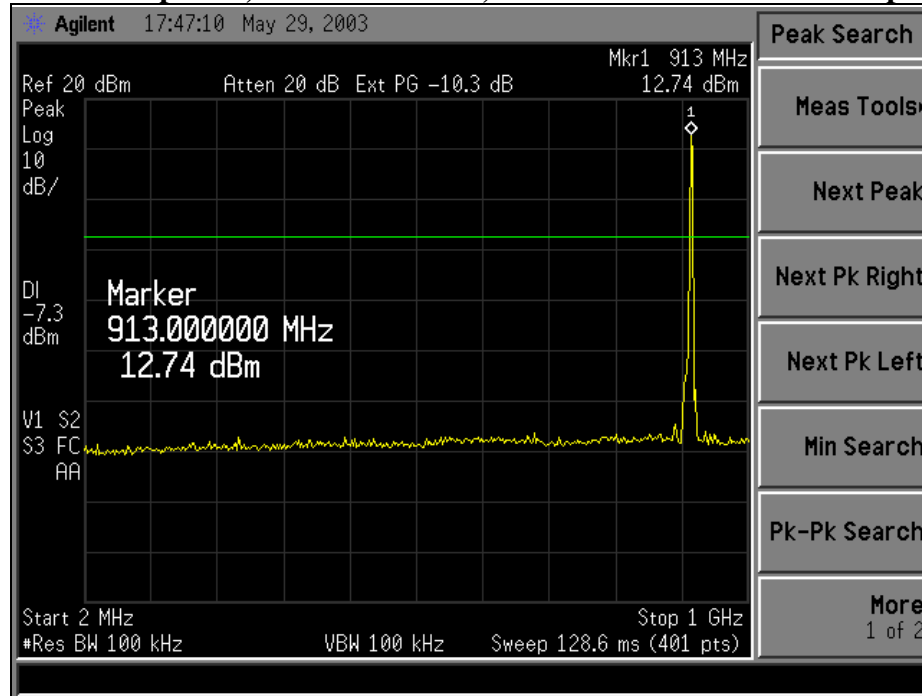
**Signature Scan of Conducted Spurious measurements,  
Table-Top Unit, Low Channel, From 2 MHz to 1 GHz Sweep.**



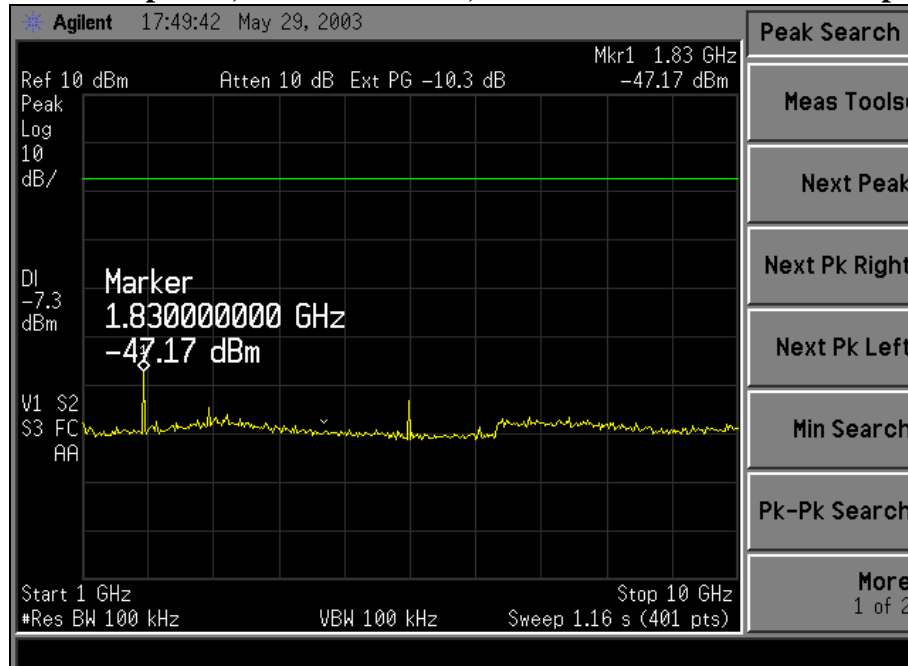
**Signature Scan of Conducted Spurious measurements,  
Table-Top Unit, Low Channel, From 1 GHz to 10 GHz Sweep.**



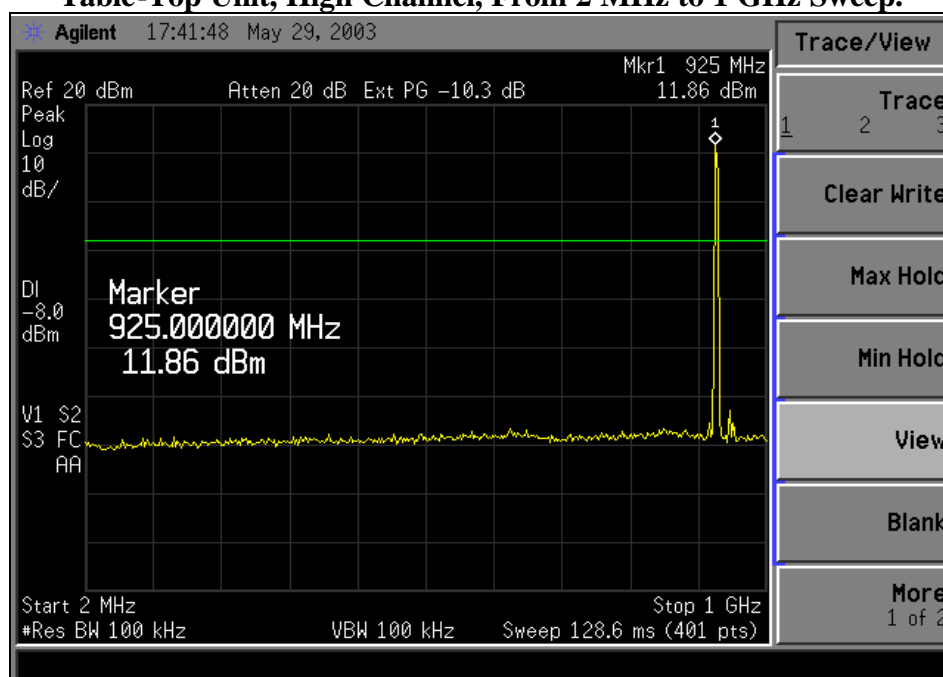
**Signature Scan of Conducted Spurious measurements,  
Table-Top Unit, Middle Channel, From 2 MHz to 1 GHz Sweep.**



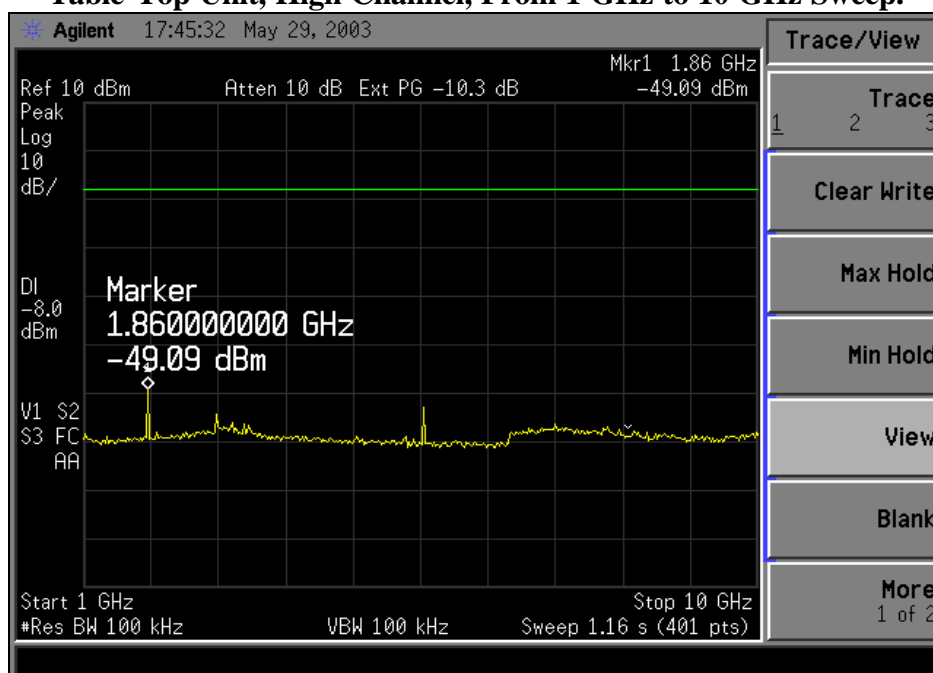
**Signature Scan of Conducted Spurious measurements,  
Table-Top Unit, Middle Channel, From 1 GHz to 10 GHz Sweep.**



**Signature Scan of Conducted Spurious measurements,  
Table-Top Unit, High Channel, From 2 MHz to 1 GHz Sweep.**



**Signature Scan of Conducted Spurious measurements,  
Table-Top Unit, High Channel, From 1 GHz to 10 GHz Sweep.**



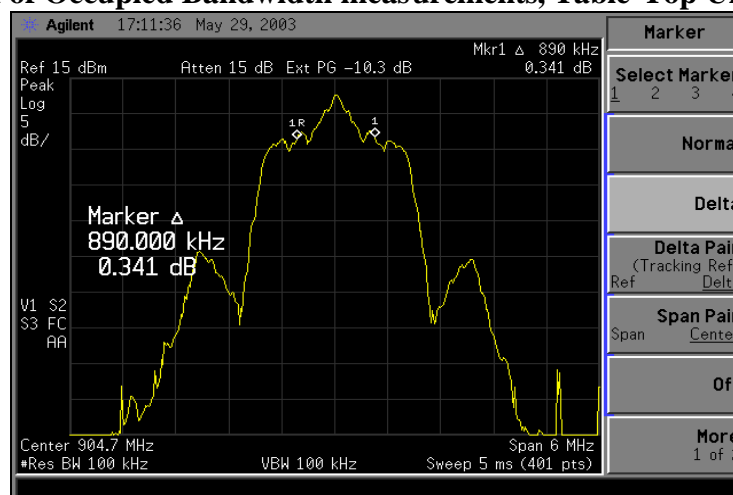
## 16. Occupied Bandwidth Measurements

The 6 dB bandwidth requirement found in FCC Part 15.247.a.2 is a minimum of 500 kHz. Direct measurement of the transmitted signal, via a cabled connection to the HP E4407B Analyzer, was then used to determine the signal bandwidth. For each of the representative channels, refer to the graphs found on the following pages. From this data, the bandwidth of channel 3, which is the closest data to the specification limit, is 870 kHz, which is above the minimum of 500 kHz.

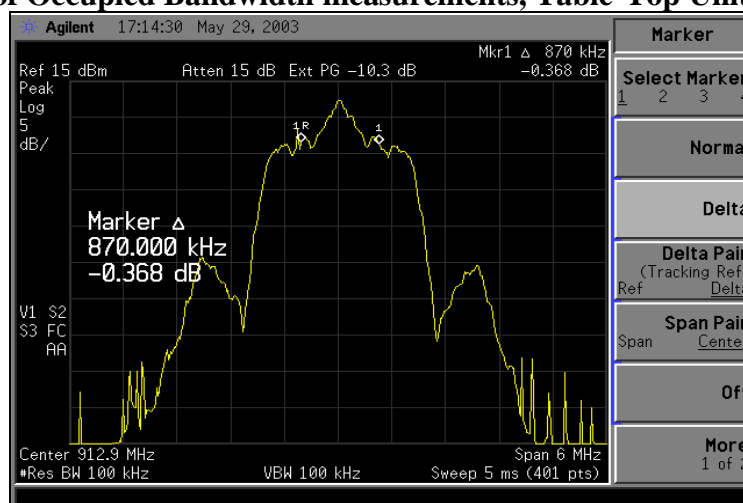
CHANNEL	CENTER FREQ (MHz)	MEASURED 6 dB BW (kHz)	MINIMUM LIMIT (kHz)
1	904.7	890	500
3	912.9	870	500
6	925.2	900	500



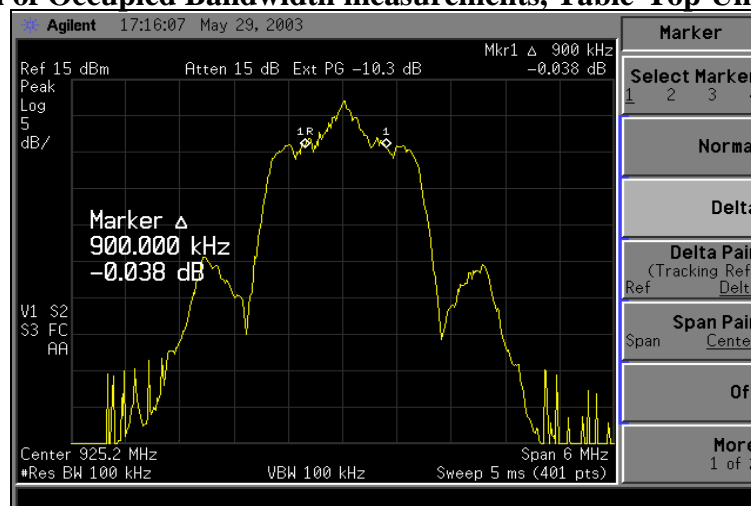
## Signature Scan of Occupied Bandwidth measurements, Table-Top Unit, Low Channel



## Signature Scan of Occupied Bandwidth measurements, Table-Top Unit, Middle Channel



## Signature Scan of Occupied Bandwidth measurements, Table-Top Unit, High Channel

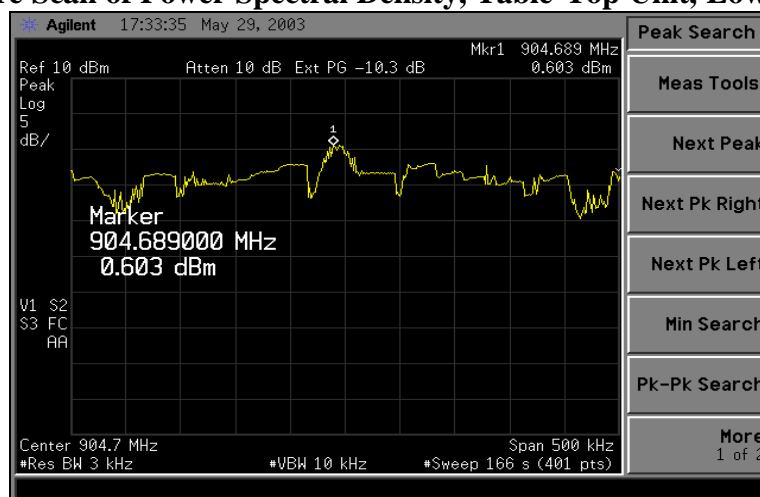


## 17. Power Spectral Density

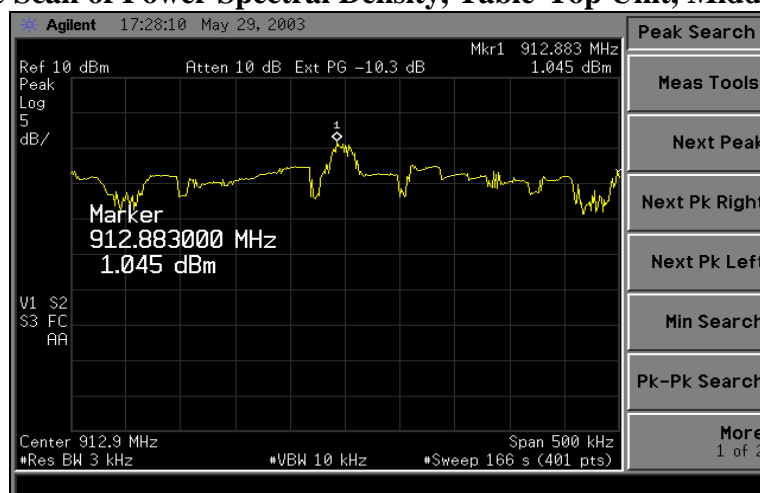
In accordance with FCC Part 15.247(d), the peak power spectral density should not exceed +8 dBm in any 3 kHz band. This measurement was performed along with the conducted power output readings performed as described in Section 14. The peak output frequency for each representative frequency was scanned, with a narrow bandwidth (3 kHz), and reduced sweep, and a power density measurement was performed by conducted measurement with the HP Analyzer. The highest density was found to be no greater than +1.0 dBm, which is under the allowable limit by 7.0 dB.

CHANNEL	CENTER FREQ	MEASURED P	SPEC	MARGIN
1	904.7	+0.6 dBm	+8.0dBm	7.4 dB
3	912.9	+1.0 dBm	+8.0dBm	7.0 dB
6	925.2	+ 0.2 dBm	+8.0dBm	7.8 dB

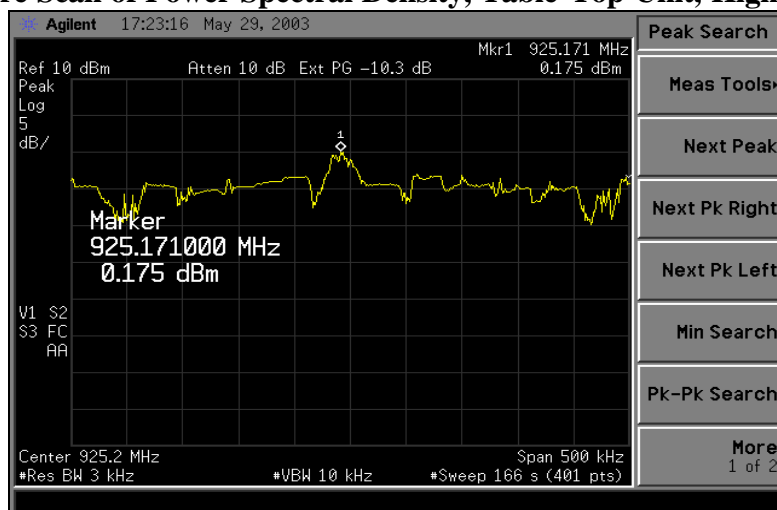
### Signature Scan of Power Spectral Density, Table-Top Unit, Low Channel



### Signature Scan of Power Spectral Density, Table-Top Unit, Middle Channel



### Signature Scan of Power Spectral Density, Table-Top Unit, High Channel



## APPENDIX A

### Test Equipment List

Asset #	Manufacturer	Model #	Serial #	Description	Date	Due
AA960008	EMCO	3816/2NM	9701-1057	Line Impedance Stabilization Network	09/19/02	09/19/03
AA960031	HP	119474A	3107A01708	Transient Limiter	06/07/02	06/07/03
AA960077	EMCO	93110B	9702-2918	Biconical Antenna	9/19/02	9/19/03
AA960078	EMCO	93146	9701-4855	Log-Periodic Antenna	09/19/02	09.19.03
AA960081	EMCO	3115	6907	Double Ridge Horn Antenna	11/12/02	11/12/03
CC00221C	Agilent	E4407B	US39160256	Spectrum Analyzer	10/28/02	10/28/03
EE960004	EMCO	2090	9607-1164	Device Controller	N/A	N/A
EE960013	HP	8546A	3617A00320	Receiver RF Section	09/20/02	09/20/03
EE960014	HP	85460A	3448A00296	Receiver Pre-Selector	09/20/02	09/20/03
N/A	LSC	Cable	0011	3 Meter ½" Armored Cable	06/07/02	06/07/03
N/A	LSC	Cable	0038	1 Meter RG 214 Cable	06/07/02	06/07/03
N/A	LSC	Cable	0050	10 Meter RG 214 Cable	06/07/02	06/07/03
N/A	Pasternack	Attenuator	N/A	10 dB Attenuator	06/07/02	06/07/03

*Note 1\* - Equipment calibrated within a traceable system.*

*Table of Expanded Uncertainty Values, (K=2) for Specified Measurements*

Measurement Type	Particular Configuration	Uncertainty Values
Radiated Emissions	3 – Meter chamber, Biconical Antenna	4.24 dB
Radiated Emissions	3-Meter Chamber, Log Periodic Antenna	4.8 dB
Radiated Emissions	10-Meter OATS, Biconical Antenna	4.18 dB
Radiated Emissions	10-Meter OATS, Log Periodic Antenna	3.92 dB
Conducted Emissions	Shielded Room/EMCO LISN	1.60 dB
Radiated Immunity	3 Volts/Meter in 3Meter Chamber	1.128 Volts/Meter
Conducted Immunity	3 Volts level	1.0 V