FCC CFR47 PART 15 SUBPART C
CERTIFICATION
TEST REPORT

FOR

HANDHELD TERMINAL

MODEL NUMBER: DT-X10M30URC2

FCC ID: BBQDT-X10M30URC2

REPORT NUMBER: 05I3440-1

ISSUE DATE: JUNE 16, 2005

Prepared for
CASIO COMPUTER CO., LTD.
6-2, HON-MACHI L-CHOME, SHIBUYA-KU,
TOKYO, JAPAN

Prepared by
COMPLIANCE ENGINEERING SERVICES, INC.
d.b.a.
COMPLIANCE CERTIFICATION SERVICES
561F MONTEREY ROAD,
MORGAN HILL, CA 95037, USA
TEL: (408) 463-0885
FAX: (408) 463-0888

LAB CODE:200065-0

Revision History

Rev.	Revisions	Revised By
A	Initial Issue	MH

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	CASIO COMPUTER CO., LTD. 6-2, HON-MACHI L-CHOME, SHIBUYA-KU, TOKYO, JAPAN
EUT DESCRIPTION:	HANDHELD TERMINAL
MODEL:	DT-X10M30URC2
SERIAL NUMBER (TERMINAL):	79AAE 303200515BAAA1
DATE TESTED:	MAY 31 - JUNE 12, 2005

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART C	NO NON-COMPLIANCE NOTED

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By: Tested By:

MIKE HECKROTTE
ENGINEERING MANAGER
COMPLIANCE CERTIFICATION SERVICES

THANH NGUYEN
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 200 MHz	+/- 3.3 dB
Radiated Emission, 200 to 1000 MHz	+4.5 / -2.9 dB
Radiated Emission, 1000 to 2000 MHz	+4.5 / -2.9 dB
Power Line Conducted Emission	+/- 2.9 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is Handheld Terminal Device with two different models of cradles (DT-861 IO & DT-169 CHGE). The EUT with Cradle DT-861 IO have the worst condition and position for the preliminary tests. Therefore all the radiated emissions test data were performed on DT-X10M30URC2 with cradle DT-861 IO. AC conducted emissions were performed on EUT with both models of cradles.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

WLAN 2400 to 2483.5 MHz Authorized Band

Frequency Range (MHz)	Output Power (dBm)	Output Power (mW)
2412 - 2462	20.42	110.15

BLUETOOTH 2400 to 2483.5 MHz Authorized Band

Frequency Range (MHz)	Output Power (dBm)	Output Power (mW)
2402 - 2480	1.43	1.39

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes two different types of antennas for WLAN and BT, WLAN with a maximum gain of -0.23 dBi and BT with a maximum gain of -4.90 dBi.

5.4. SOFTWARE AND FIRMWARE

The EUT driver software used during testing were WlanTestUtils_PPC2002 for WLAN and BTRadioTestV1 for BT.

The test utility software used during testing were TestSample.exe for WLAN and BTRadioTest.exe for BT.

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power. The highest measured output power was at 2462 MHz for WLAN and 2402 MHz for BT.

The worst-case data rate for this channel is determined to be 11 Mb/s for WLAN by investigation.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

EUT stand alone with Cradle only.

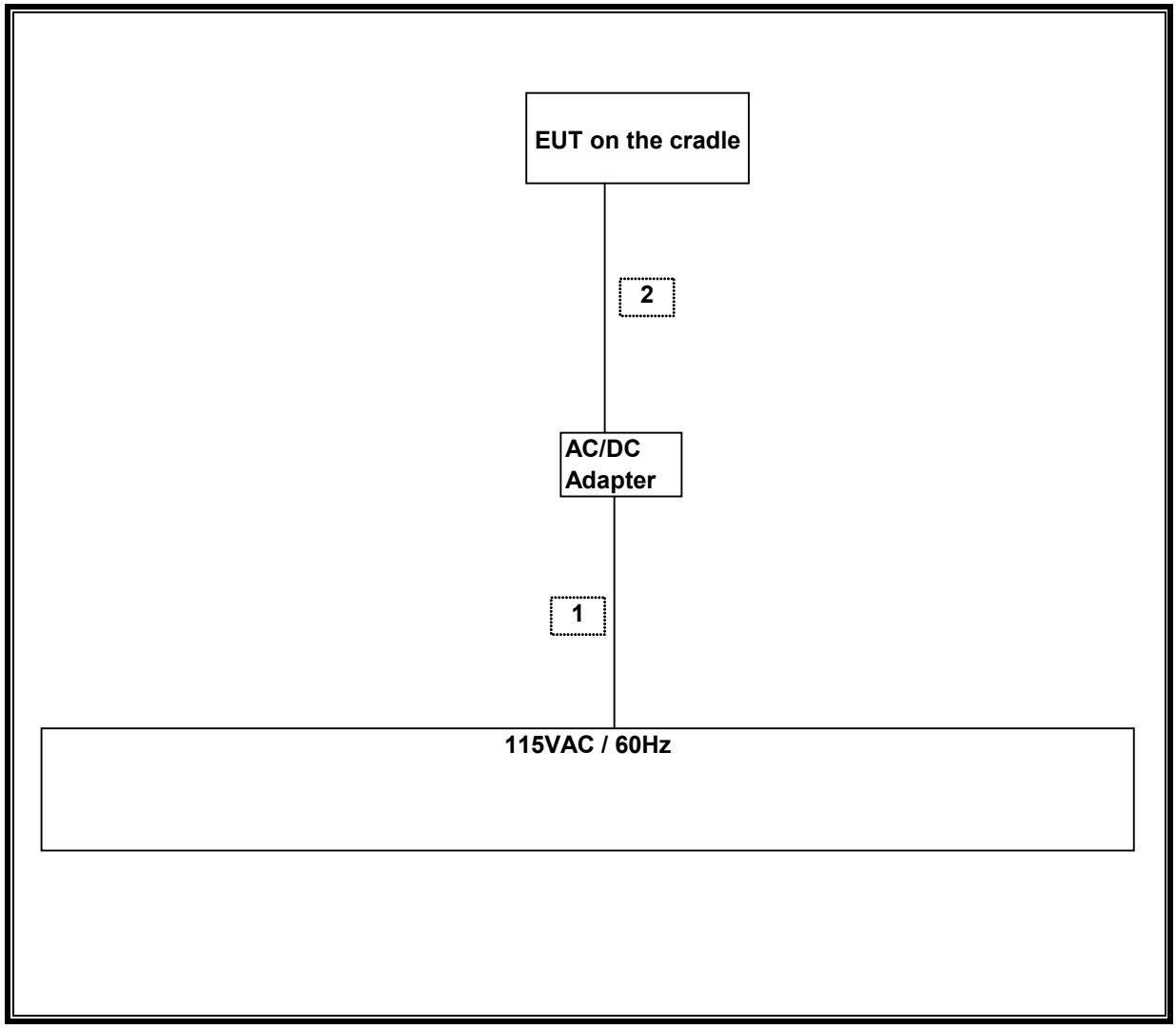
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	US 115V	Un-shielded	2m	N/A
2	DC	1	DC Plug	Un-shielded	1.5m	Ferrite Bead at EUT end

TEST SETUP

EUT stand alone with Cradle only.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**Cal Due**
EMI Test Receiver	R & S	ESHS 20	827129/006	10/22/2005
Site A Line Stabilizer / Conditioner	Tripplite	LC-1800a	A0051681	CNR
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	8/30/2005
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	8379443	10/21/2005
Spectrum Analyzer	HP	E4446A	US42510266	8/25/2005
Antenna, Horn 1 ~ 18 GHz	EMCO	3117	29310	9/12/2005
Preamplifier, 1 ~ 26.5 GHz	HP	8449B	3008A00369	8/17/2005
Peak Power Meter	Agilent	E4416A	GB41291160	2/9/2006
EMI Receiver, 9 kHz ~ 2.9 GHz	HP	8542E	3942A00286	3/29/2006
RF Filter Section	HP	85420E	3705A00256	3/29/2006
30MHz---- 2Ghz	Sunol Sciences	JB1 Antenna	A121003	9/22/2005
4.0 High Pass Filter	Micro Tronics	HPM13351	3	N/A
2.4 - 2.5 Reject Filter	Micro Tronics	BRM50702	3	N/A
Amplifier 1-26GHz	MITEQ	NSP2600-SP	924341	8/17/05
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	2238	9/12/05

7. LIMITS AND RESULTS

7.1. CHANNEL TESTS FOR THE WLAN MODULE

7.1.1. 6 dB BANDWIDTH

LIMIT

§15.247 (a) (2) For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

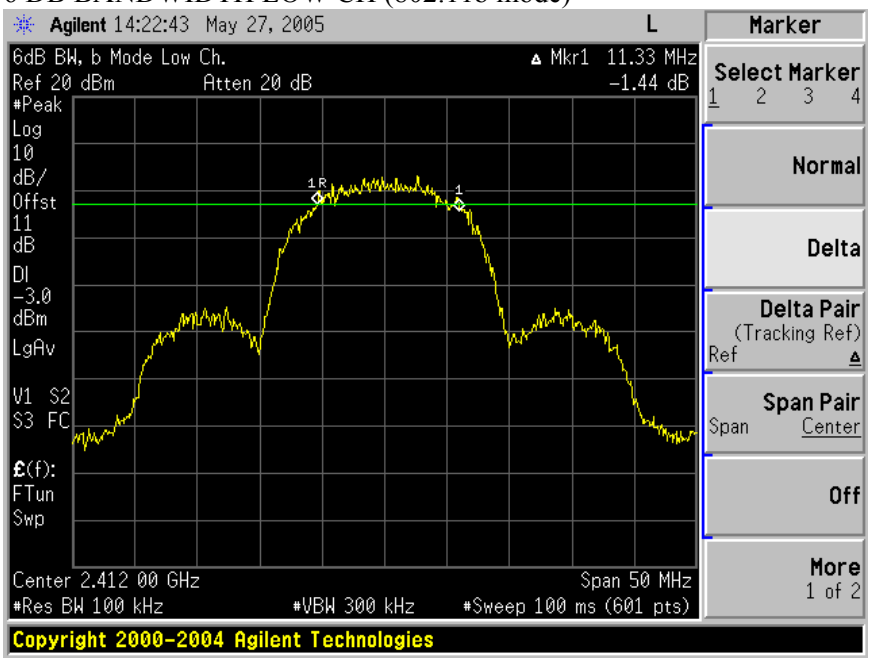
No non-compliance noted:

802.11b Mode

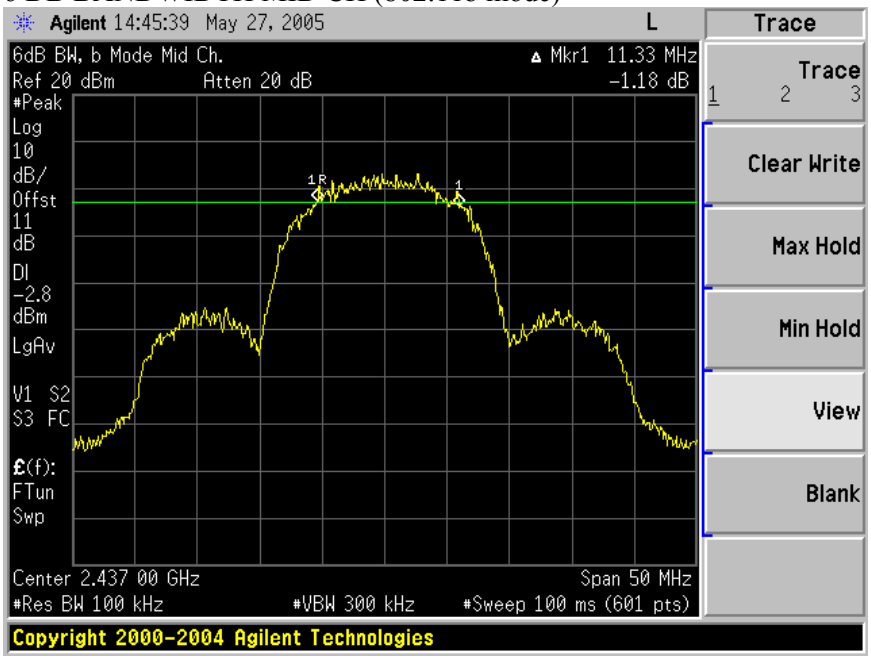
Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	11333.333	500	10833
Middle	2437	11333.333	500	10833
High	2462	11333.333	500	10833

6 DB BANDWIDTH (802.11b MODE)

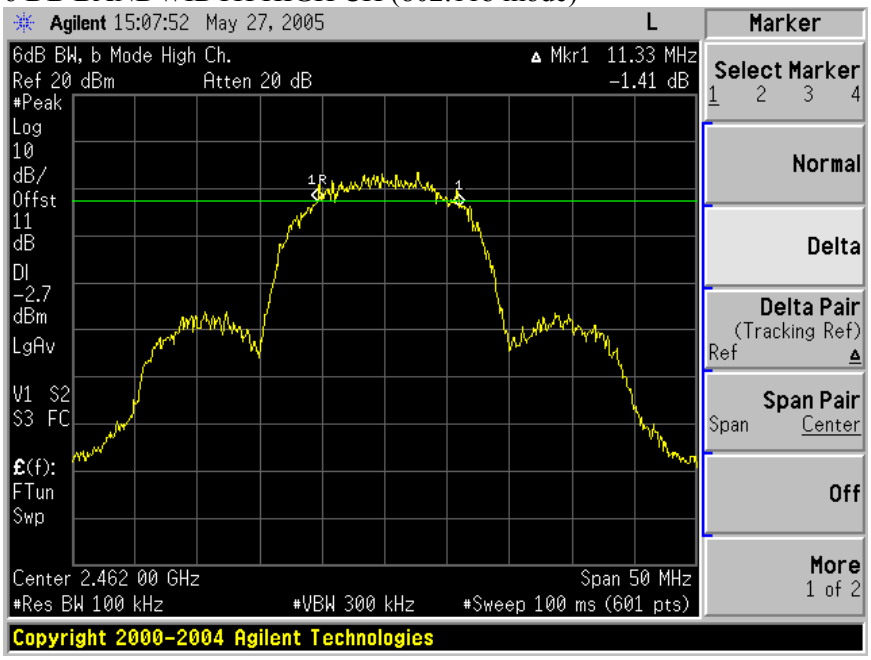
6 DB BANDWIDTH LOW CH (802.11b mode)



6 DB BANDWIDTH MID CH (802.11b mode)



6 DB BANDWIDTH HIGH CH (802.11b mode)



7.1.2. 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

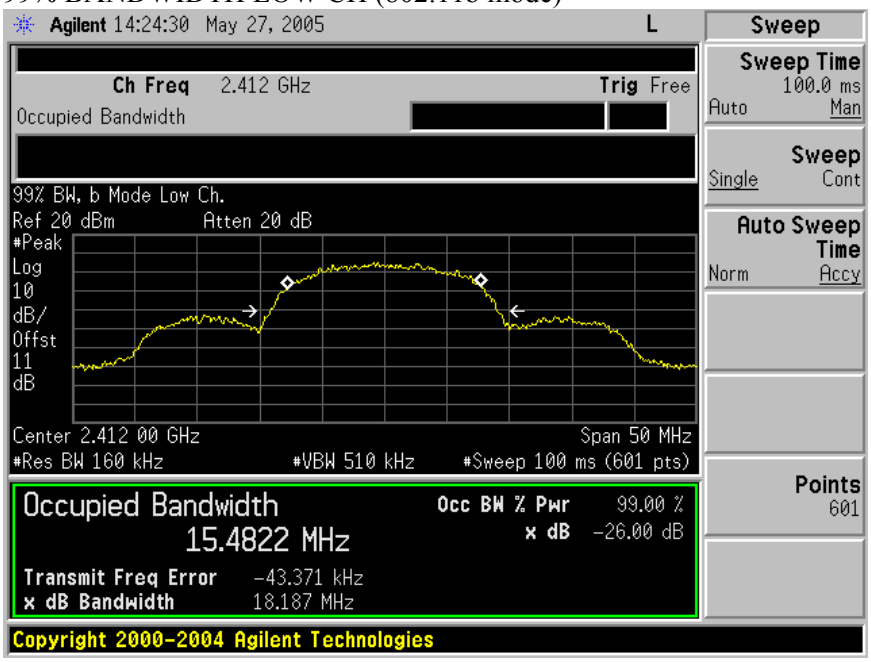
No non-compliance noted:

802.11b Mode

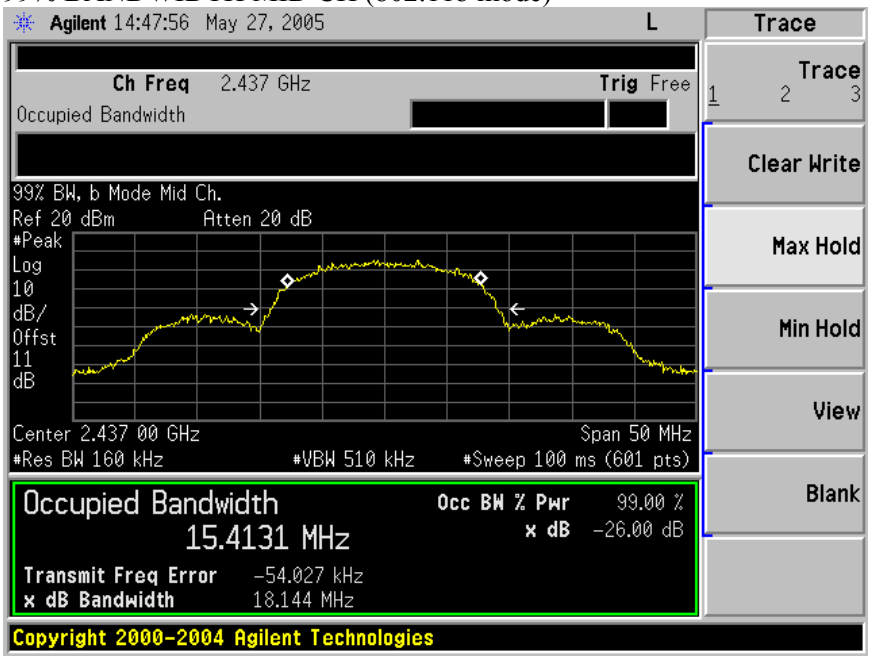
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	15.482
Middle	2437	15.413
High	2462	15.384

99% BANDWIDTH (802.11b MODE)

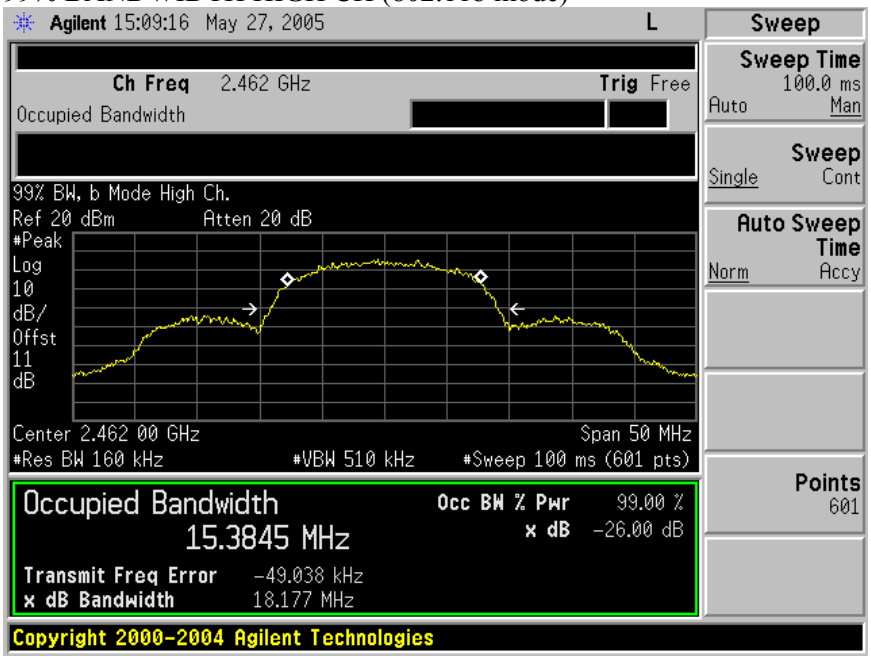
99% BANDWIDTH LOW CH (802.11b mode)



99% BANDWIDTH MID CH (802.11b mode)



99% BANDWIDTH HIGH CH (802.11b mode)



7.1.3. PEAK OUTPUT POWER

PEAK POWER LIMIT

§15.247 (b) The maximum peak output power of the intentional radiator shall not exceed the following:

§15.247 (b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz , and 5725-5850 MHz bands: 1 watt.

§15.247 (b) (4) Except as shown in paragraphs (b)(4) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.247 (b) (4) (i) Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer and the analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 99% bandwidth.

RESULTS

The maximum antenna gain is 0.63 dBi for other than fixed, point-to-point operations, therefore the limit is 30 dBm.

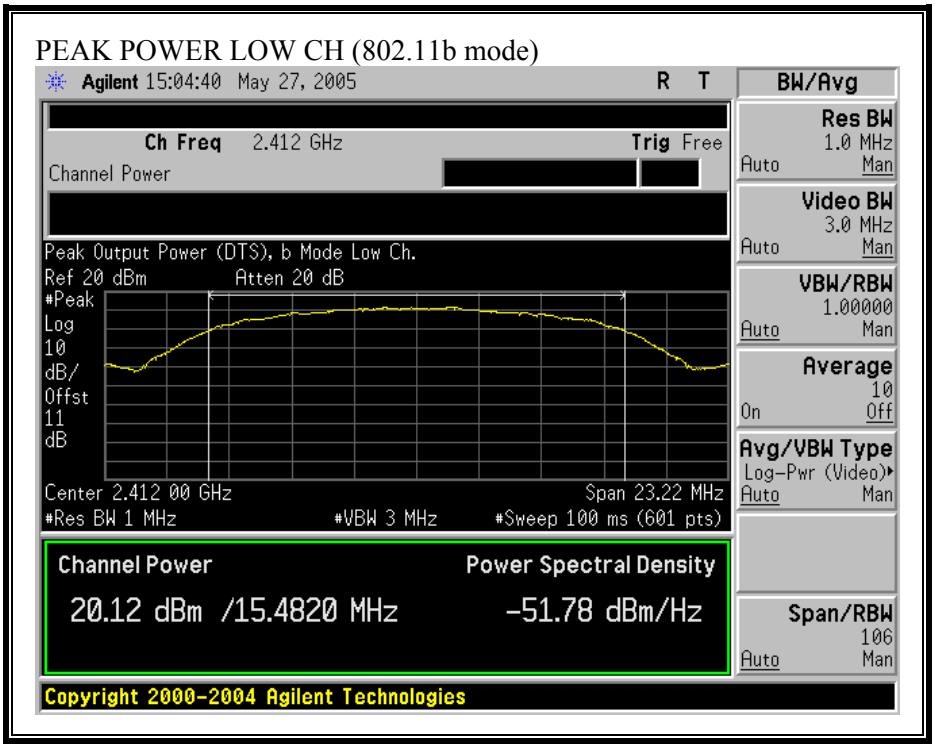
No non-compliance noted:

802.11b Mode

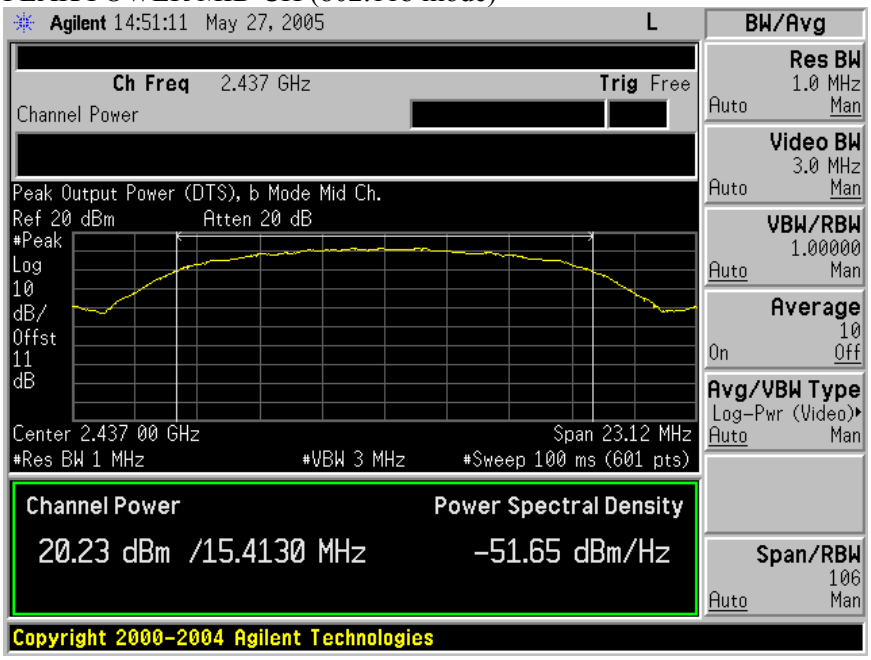
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	20.12	30	-9.88
Middle	2437	20.23	30	-9.77
High	2462	20.42	30	-9.58

OUTPUT POWER (802.11b MODE)

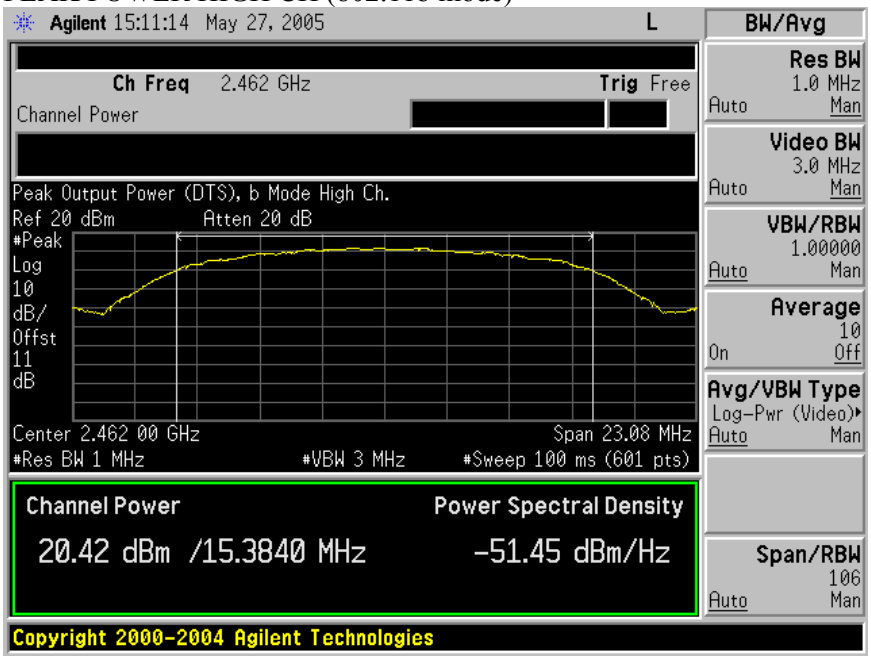
PEAK POWER LOW CH (802.11b mode)



PEAK POWER MID CH (802.11b mode)



PEAK POWER HIGH CH (802.11b mode)



7.1.4. MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*($900/f^2$)	6
30–300	61.4	0.163	1.0	6
300–1500	.....	.....	f/300	6
1500–100,000	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500	.....	.....	f/1500	30
1500–100,000	.....	.....	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density
NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.
NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

CALCULATIONS

Given

$E = \sqrt{(30 * P * G)} / d$

and

$S = E ^ 2 / 3770$

where

E = Field Strength in Volts/meter
P = Power in Watts
G = Numeric antenna gain
d = Distance in meters
S = Power Density in milliwatts/square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

$d = \sqrt{((30 * P * G) / (3770 * S))}$

Changing to units of Power to mW and Distance to cm, using:

P (mW) = P (W) / 1000 and
d (cm) =100 * d (m)

yields

$d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$
$d = 0.282 * \sqrt{(P * G / S)}$

where

d = distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power Density in mW/cm^2

Substituting the logarithmic form of power and gain using:

P (mW) = 10 ^ (P (dBm) / 10) and
G (numeric) = 10 ^ (G (dBi) / 10)

yields

$d = 0.282 * 10 ^ ((P + G) / 20) / \sqrt{S}$ Equation (1)

where

d = MPE distance in cm
P = Power in dBm
G = Antenna Gain in dBi
S = Power Density Limit in mW/cm^2

Equation (1) and the measured peak power is used to calculate the MPE distance.

LIMITS

From §1.1310 Table 1 (B), S = 1.0 mW/cm^2

RESULTS

No non-compliance noted:

Mode	Power Density Limit (mW/cm^2)	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
802.11b	1.0	20.42	-0.23	2.88

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

7.1.5. AVERAGE POWER

AVERAGE POWER LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

No non-compliance noted:

The cable assembly insertion loss of 11dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

802.11b Mode

Channel	Frequency (MHz)	Power (dBm)
Low	2412	14.14
Middle	2437	14.27
High	2462	14.20

7.1.6. PEAK POWER SPECTRAL DENSITY

LIMIT

§15.247 (d) For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer, the maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer using RBW = 3 kHz and VBW > 3 kHz, sweep time = span / 3 kHz, and video averaging is turned off. The PPSD is the highest level found across the emission in any 3 kHz band.

RESULTS

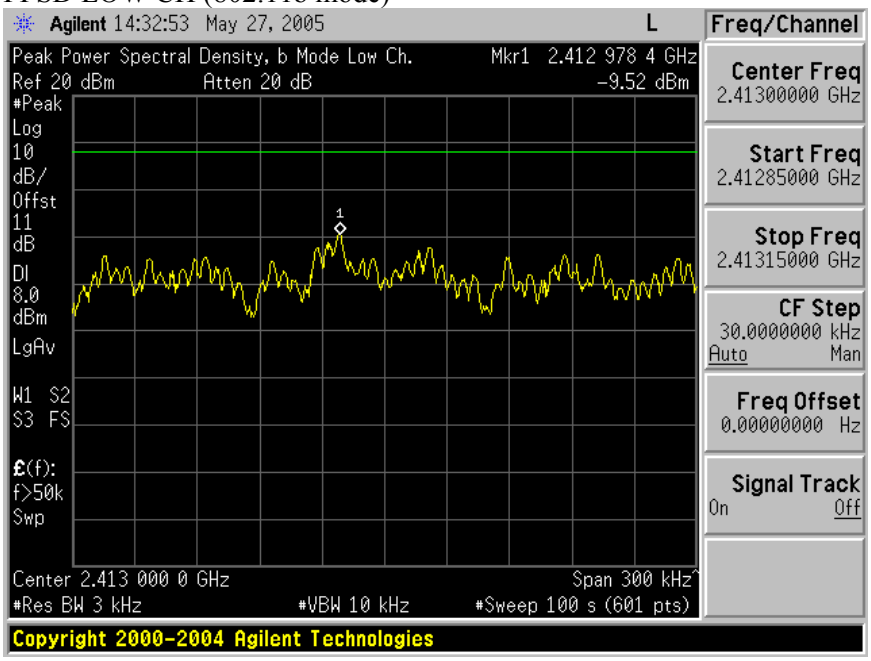
No non-compliance noted:

802.11b Mode

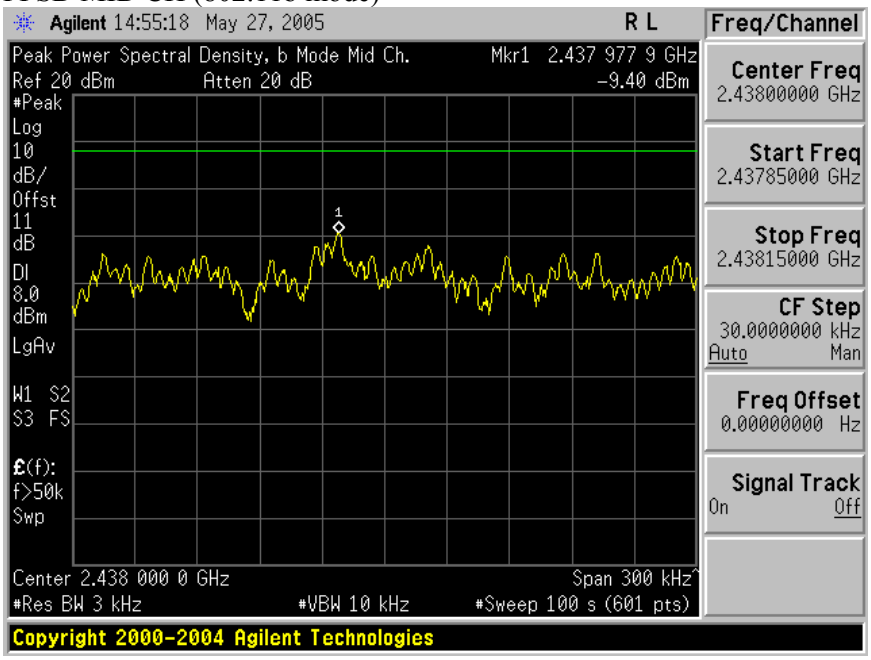
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-9.52	8	-17.52
Middle	2437	-9.40	8	-17.40
High	2462	-9.28	8	-17.28

PEAK POWER SPECTRAL DENSITY (802.11b MODE)

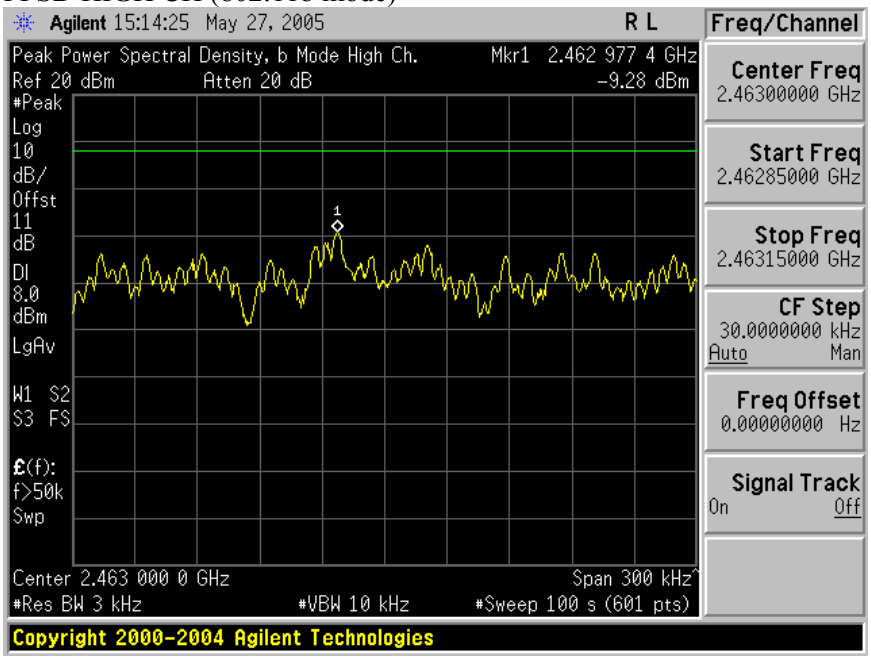
PPSD LOW CH (802.11b mode)



PPSD MID CH (802.11b mode)



PPSD HIGH CH (802.11b mode)



7.1.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

§15.247 (c) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in§15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

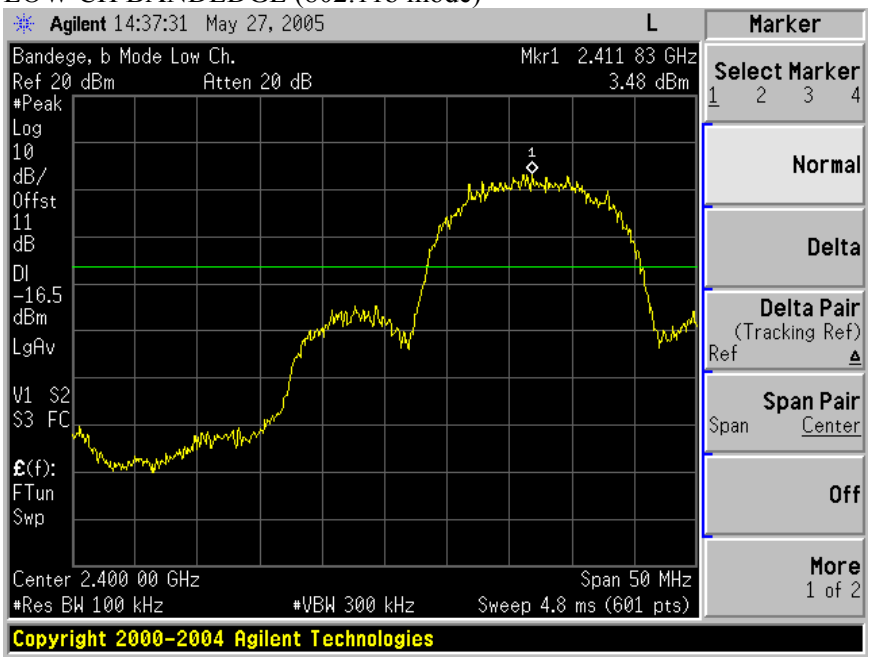
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

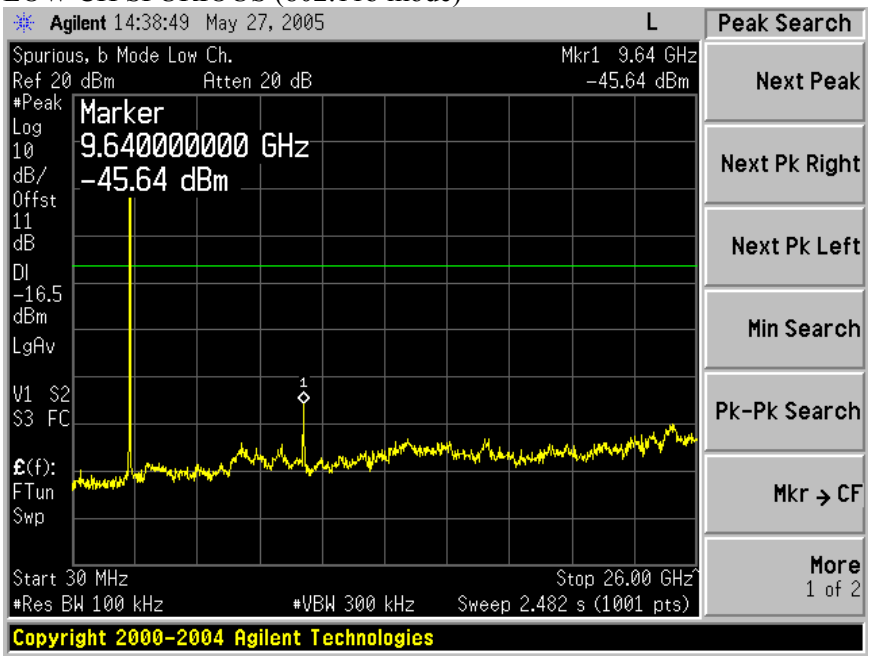
No non-compliance noted:

SPURIOUS EMISSIONS, LOW CHANNEL (802.11b MODE)

LOW CH BANDEDGE (802.11b mode)

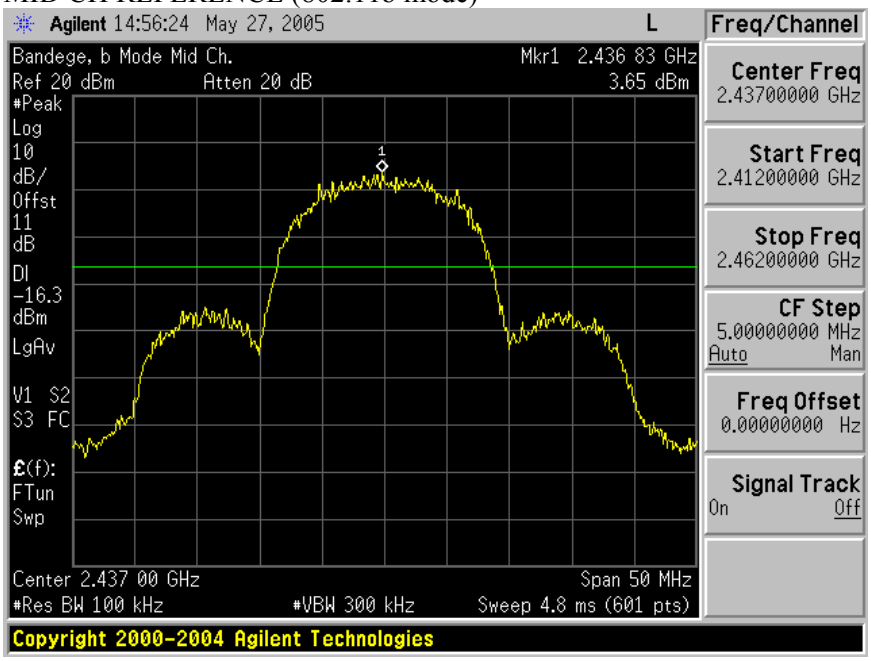


LOW CH SPURIOUS (802.11b mode)

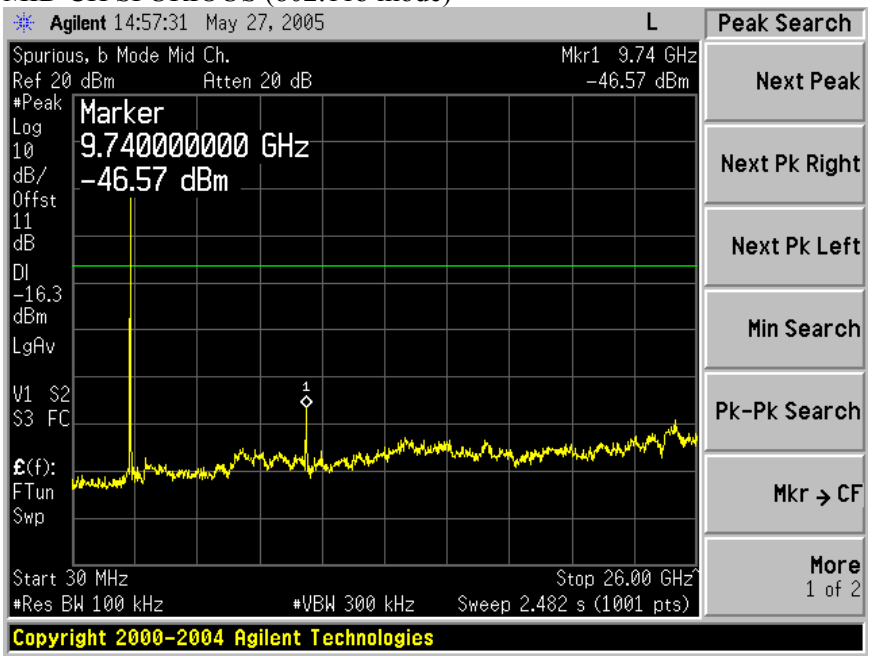


SPURIOUS EMISSIONS, MID CHANNEL (802.11b MODE)

MID CH REFERENCE (802.11b mode)



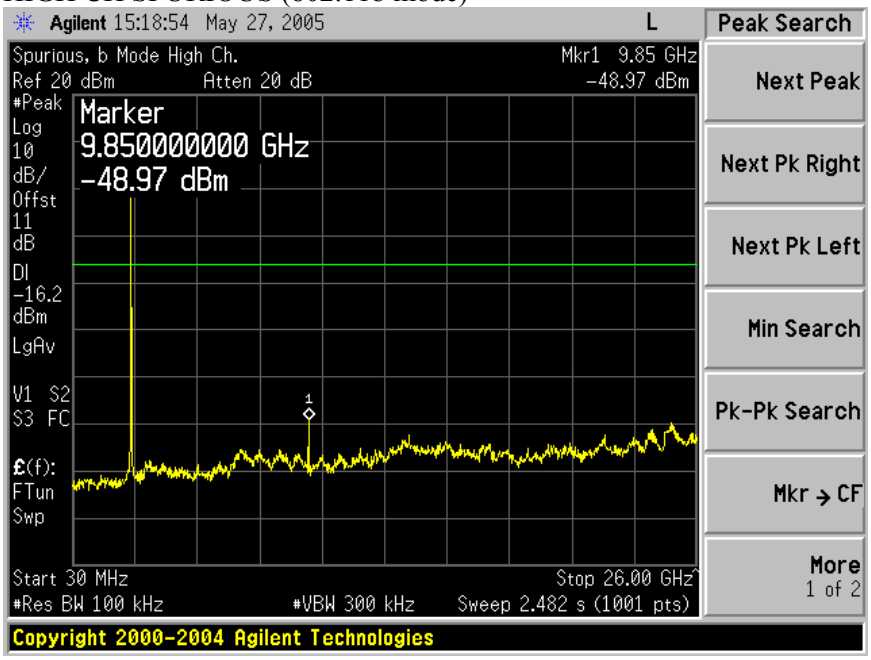
MID CH SPURIOUS (802.11b mode)



SPURIOUS EMISSIONS, HIGH CHANNEL (802.11b MODE)

HIGH CH BANDEDGE (802.11b mode)

HIGH CH SPURIOUS (802.11b mode)



7.2. CHANNEL TESTS FOR THE BLUETOOTH MODULE

7.2.1. 20 dB BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 20 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

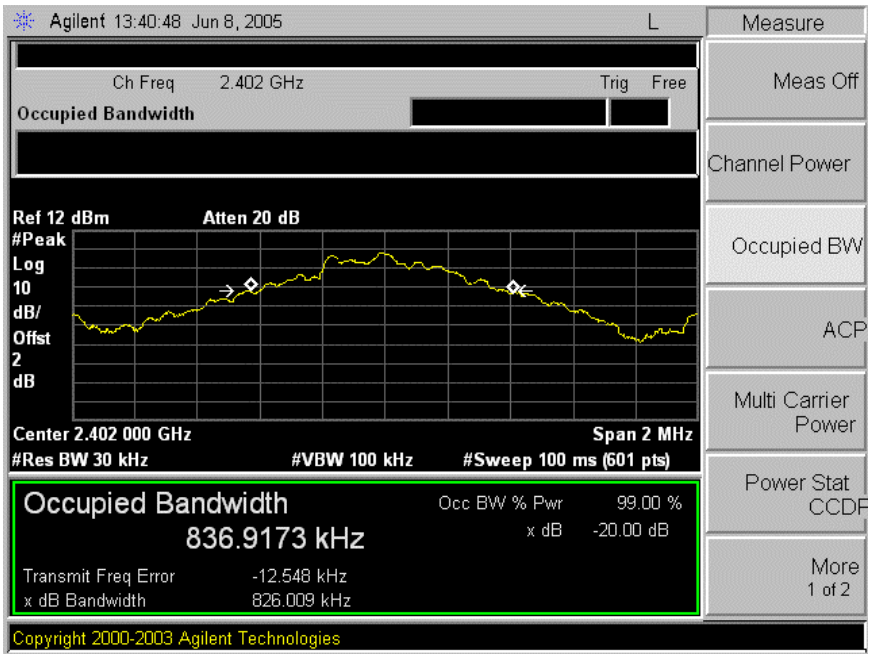
RESULTS

No non-compliance noted:

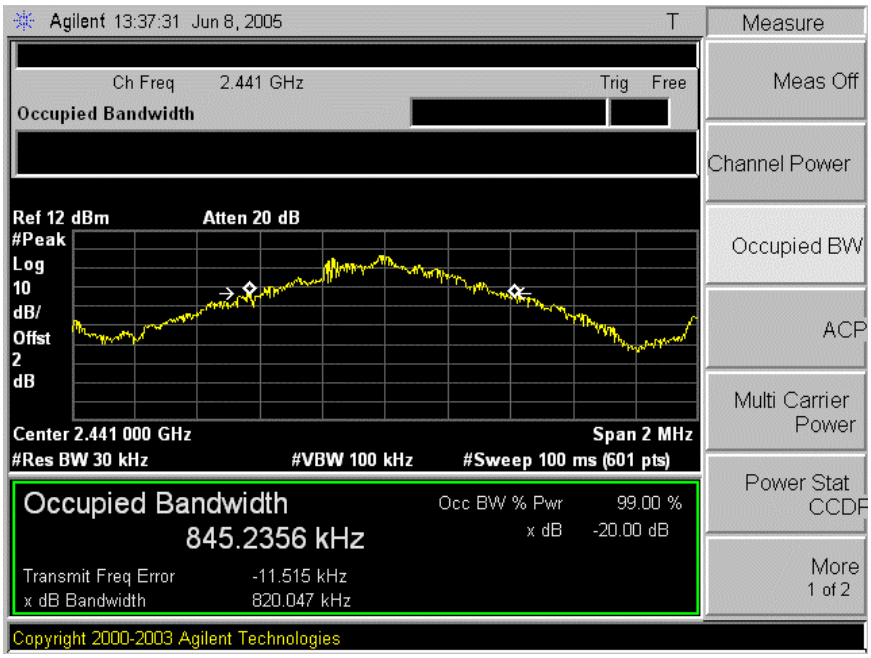
Channel	Frequency (MHz)	20 dB Bandwidth (kHz)
Low	2402	826.01
Middle	2441	845.24
High	2480	841.33

20 dB BANDWIDTH

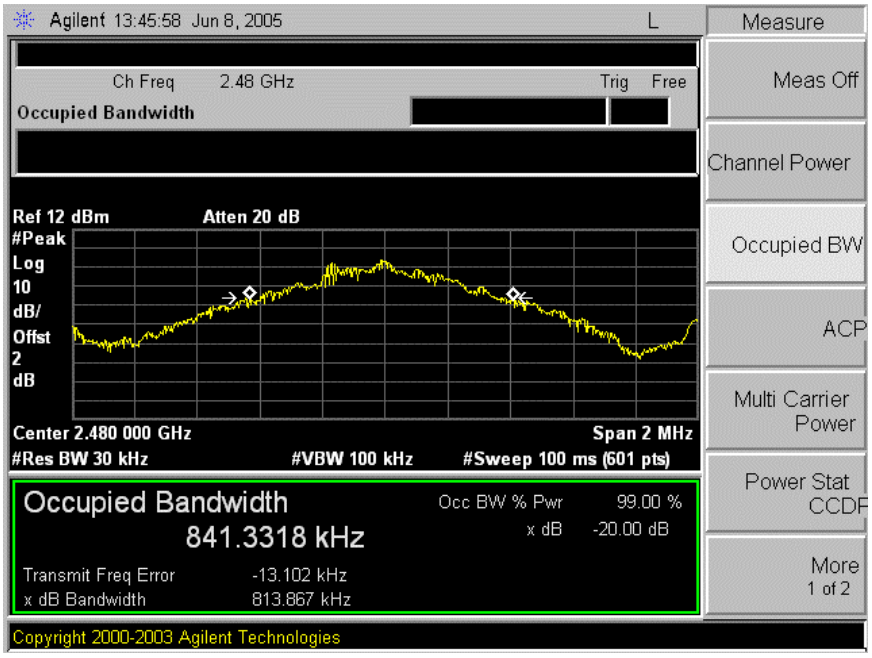
20 dB BANDWIDTH LOW CH



20 dB BANDWIDTH MID CH



20 dB BANDWIDTH HIGH CH



7.2.2. HOPPING FREQUENCY SEPARATION

LIMIT

§15.247 (a) (1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

TEST PROCEDURE

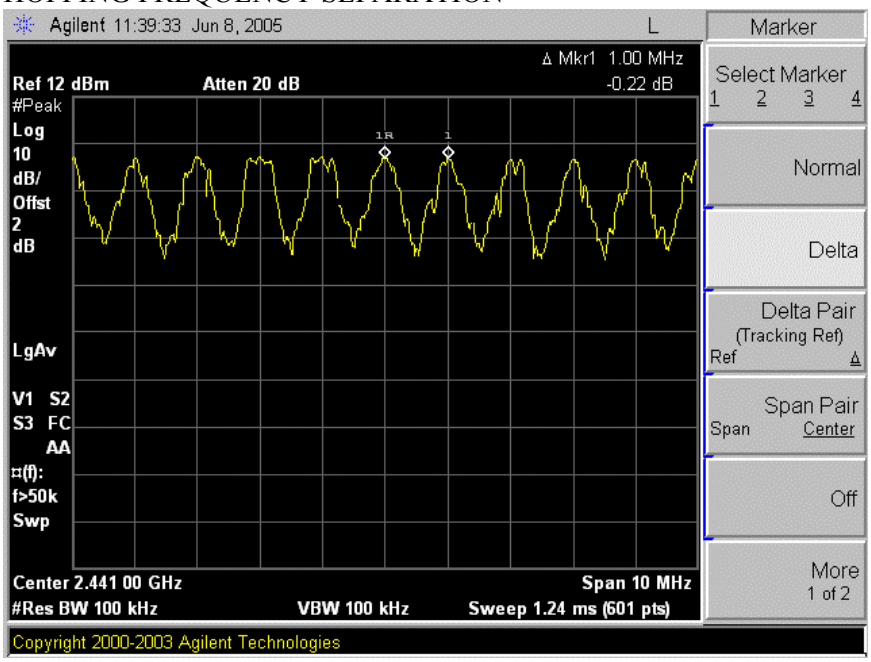
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

RESULTS

No non-compliance noted:

HOPPING FREQUENCY SEPARATION

HOPPING FREQUENCY SEPARATION



7.2.3. NUMBER OF HOPPING CHANNELS

LIMIT

§15.247 (a) (1) (iii) Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to 1 % of the span. The analyzer is set to Max Hold.

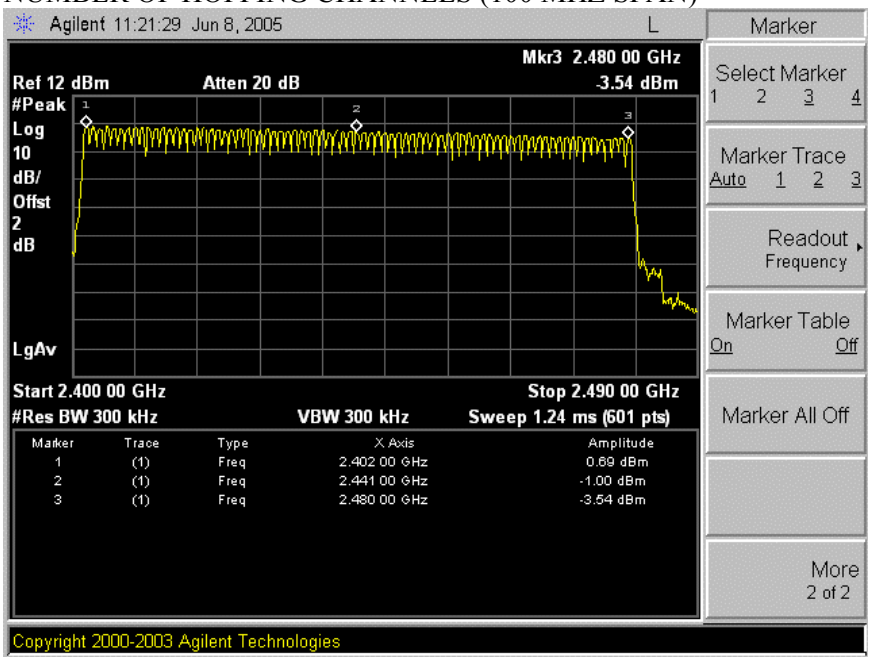
RESULTS

No non-compliance noted:

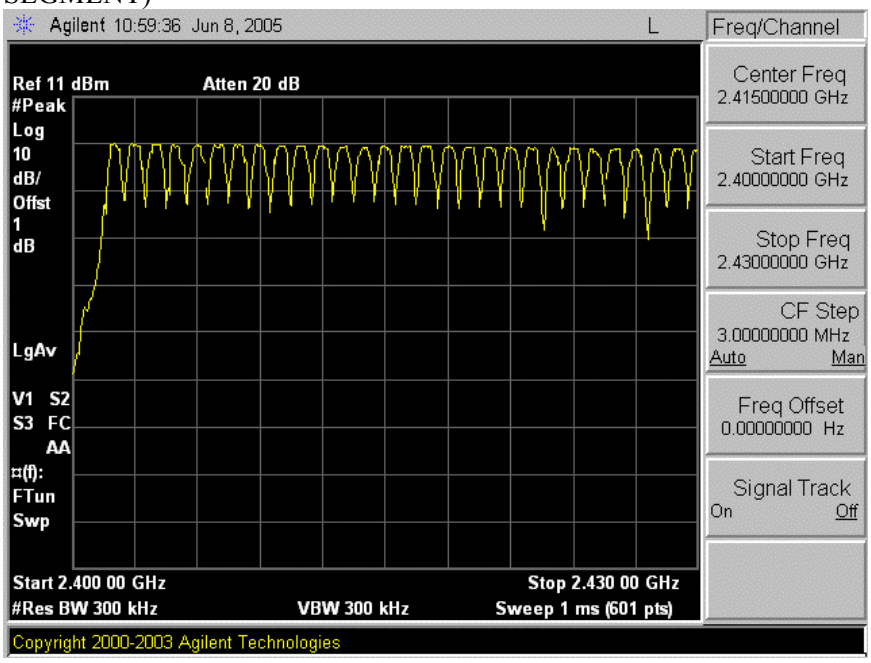
79 Channels observed.

NUMBER OF HOPPING CHANNELS

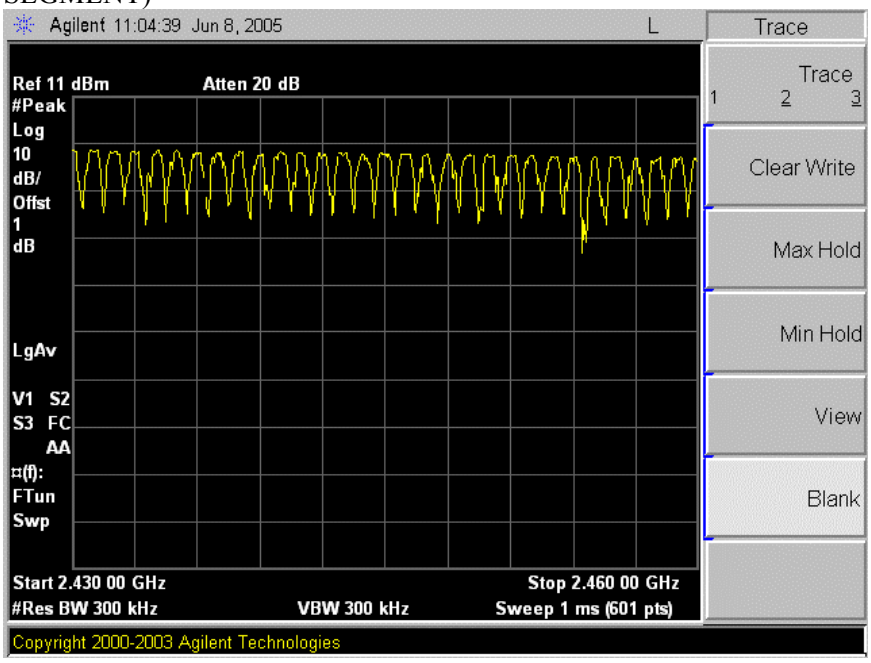
NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



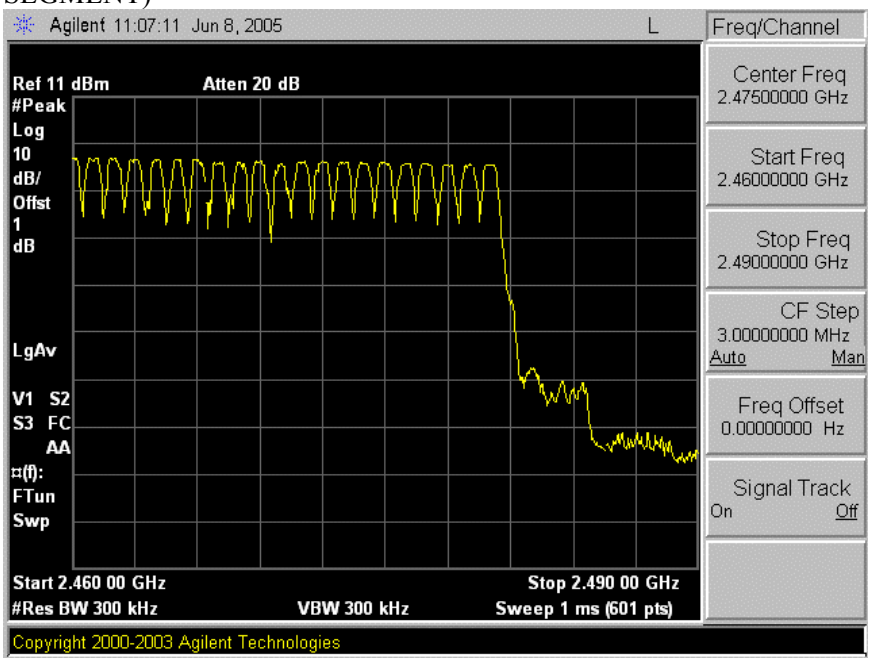
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, SECOND SEGMENT)



NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, THIRD SEGMENT)



7.2.4. AVERAGE TIME OF OCCUPANCY

LIMIT

§15.247 (a) (1) (iii) Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

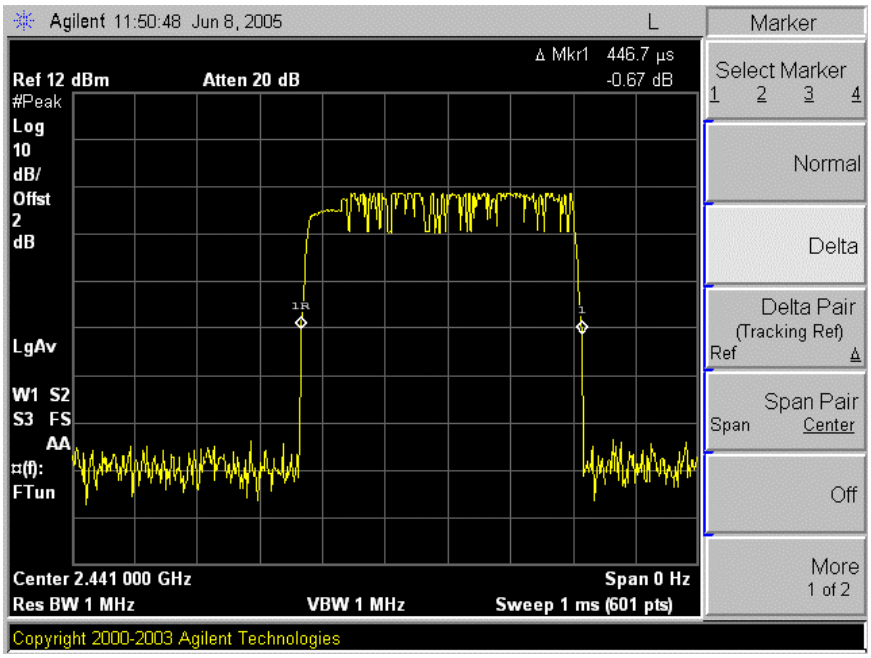
The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

RESULTS

No non-compliance noted:

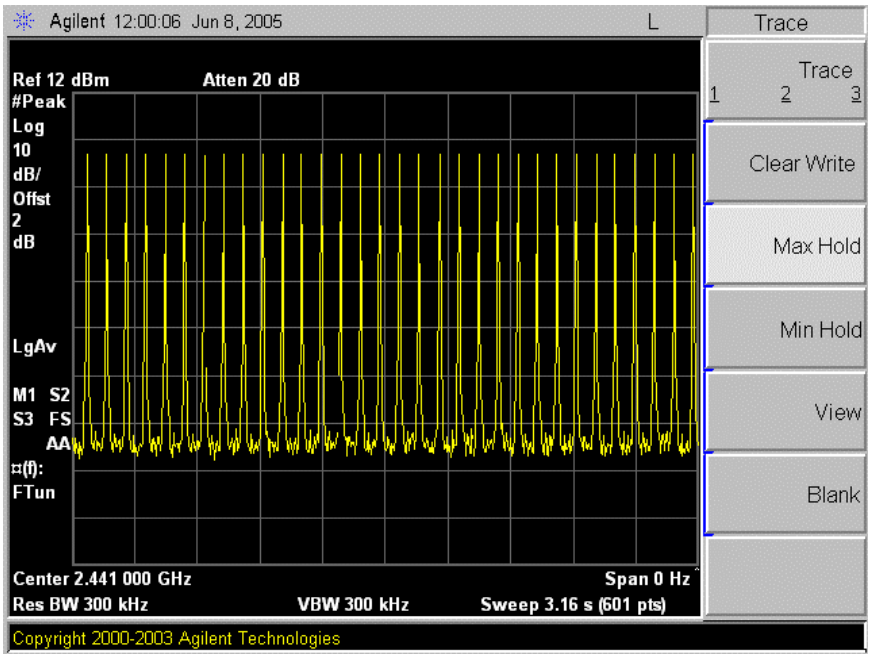
PULSE WIDTH

PULSE WIDTH



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD

NUMBER OF PULSES



7.2.5. PEAK OUTPUT POWER

PEAK POWER LIMIT

§15.247 (b) The maximum peak output power of the intentional radiator shall not exceed the following:

§15.247 (b) (1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels: 1 watt.

§15.247 (b) (4) Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum antenna gain is -4.9 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer and the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

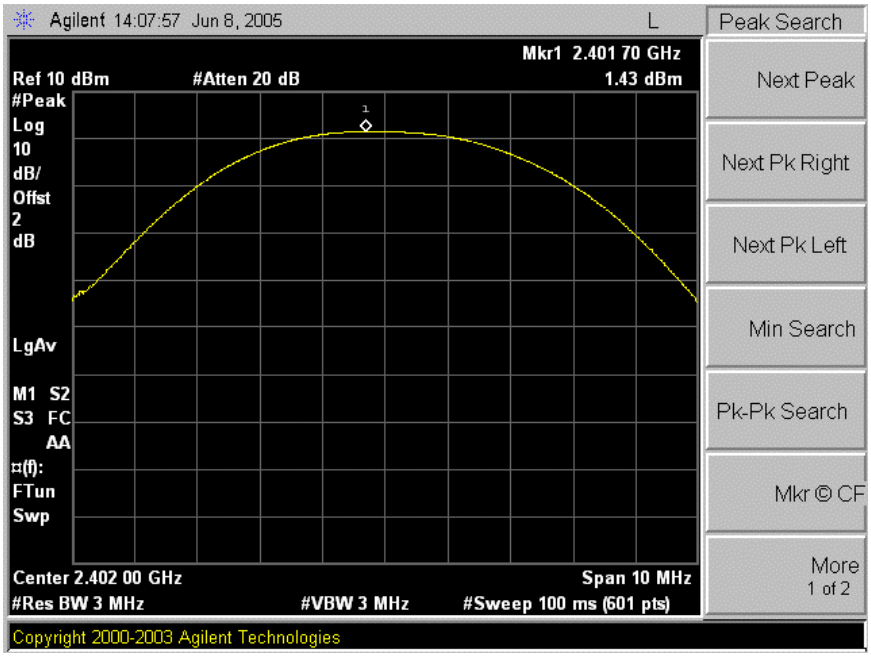
RESULTS

No non-compliance noted:

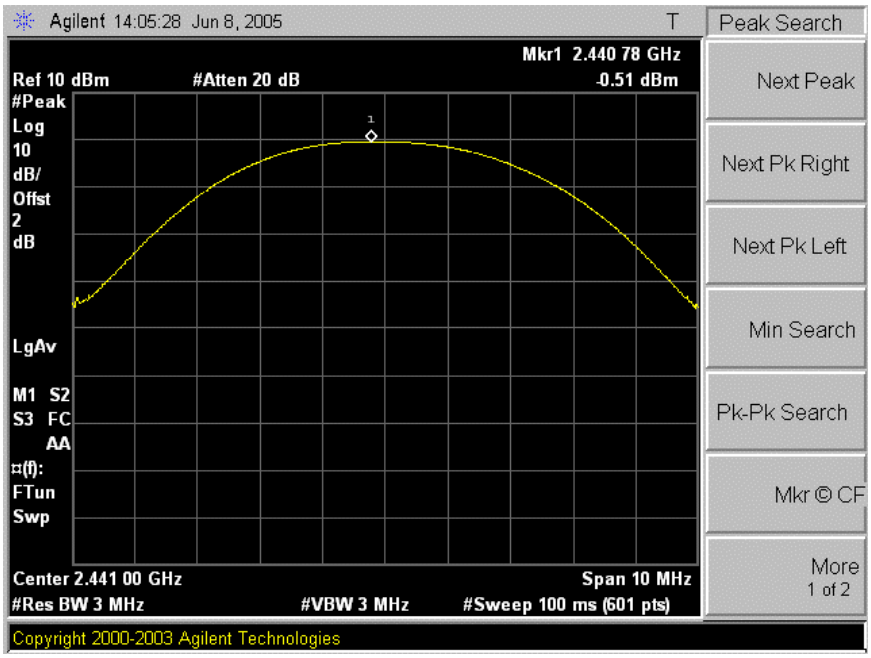
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	1.43	30	-28.57
Middle	2441	-0.51	30	-30.51
High	2480	-2.98	30	-32.98

OUTPUT POWER

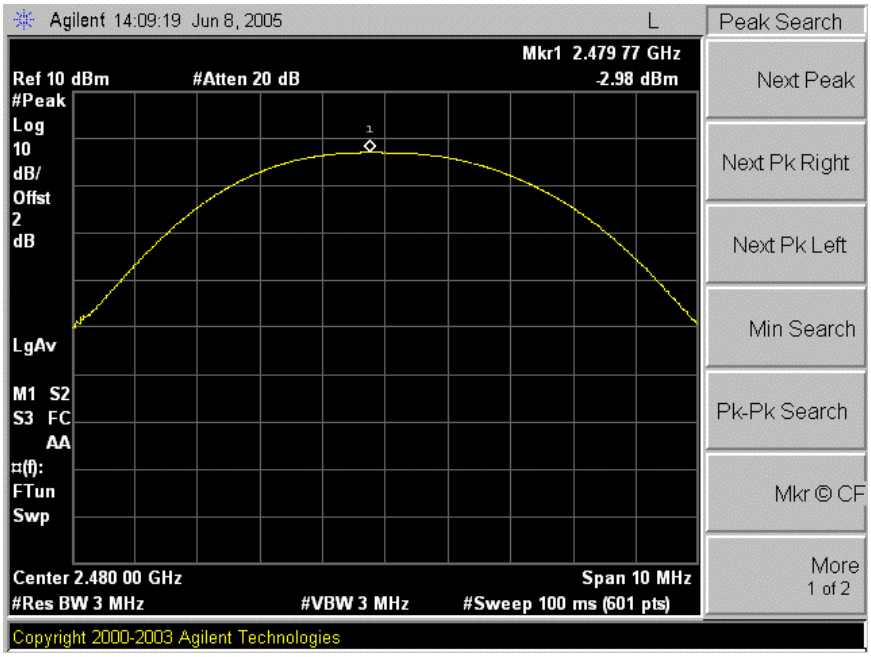
PEAK POWER LOW CH



PEAK POWER MID CH



PEAK POWER HIGH CH



7.2.6. MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f^2)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f^2)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density
NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.
NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

CALCULATIONS

Given

$E = \sqrt{(30 * P * G)} / d$

and

$S = E ^ 2 / 3770$

where

E = Field Strength in Volts/meter
P = Power in Watts
G = Numeric antenna gain
d = Distance in meters
S = Power Density in milliwatts/square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

$d = \sqrt{((30 * P * G) / (3770 * S))}$

Changing to units of Power to mW and Distance to cm, using:

P (mW) = P (W) / 1000 and
d (cm) =100 * d (m)

yields

$d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$
$d = 0.282 * \sqrt{(P * G / S)}$

where

d = distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power Density in mW/cm^2

Substituting the logarithmic form of power and gain using:

P (mW) = 10 ^ (P (dBm) / 10) and
G (numeric) = 10 ^ (G (dBi) / 10)

yields

$d = 0.282 * 10 ^ ((P + G) / 20) / \sqrt{S}$ Equation (1)

where

d = MPE distance in cm
P = Power in dBm
G = Antenna Gain in dBi
S = Power Density Limit in mW/cm^2

Equation (1) and the measured peak power is used to calculate the MPE distance.

LIMITS

From §1.1310 Table 1 (B), S = 1.0 mW/cm^2

RESULTS

No non-compliance noted:

Mode	Power Density Limit (mW/cm^2)	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
Bluetooth	1.0	1.43	-4.90	0.19

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

7.2.7. AVERAGE POWER

AVERAGE POWER LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

No non-compliance noted:

The cable assembly insertion loss 1dB was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	-4.68
Middle	2441	-6.21
High	2480	-8.80

7.2.8. PEAK POWER SPECTRAL DENSITY

LIMIT

§15.247 (d) For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

§15.247 (f) The digital modulation operation of the hybrid system, with the frequency hopping turned off, shall comply with the power density requirements of paragraph (d) of this section.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer, the maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer using RBW = 3 kHz and VBW > 3 kHz, sweep time = span / 3 kHz, and video averaging is turned off. The PPSD is the highest level found across the emission in any 3 kHz band.

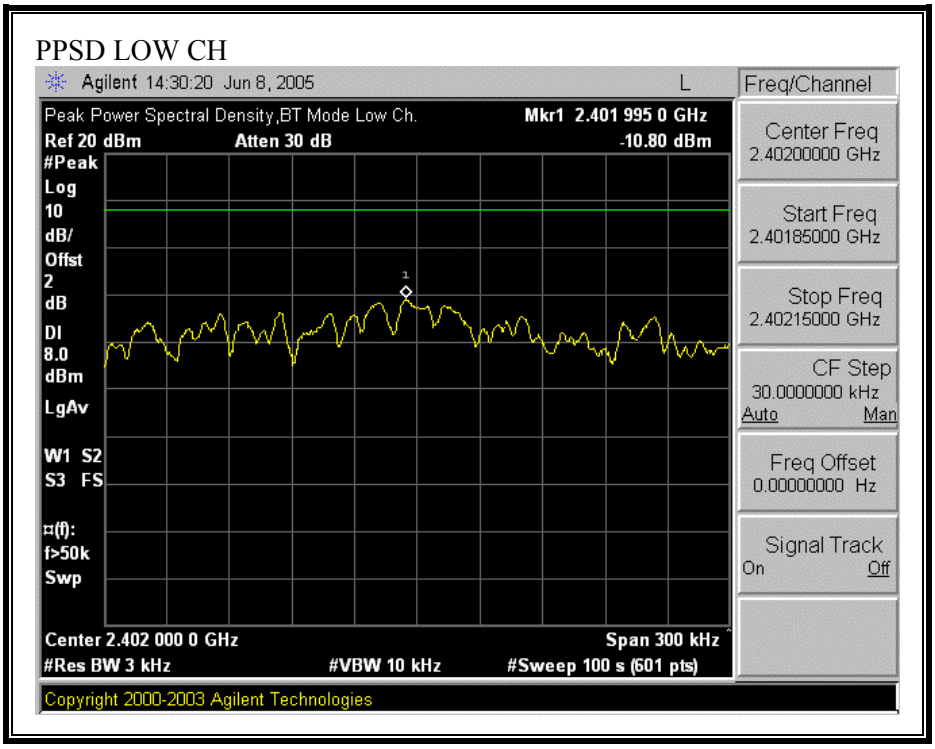
RESULTS

No non-compliance noted:

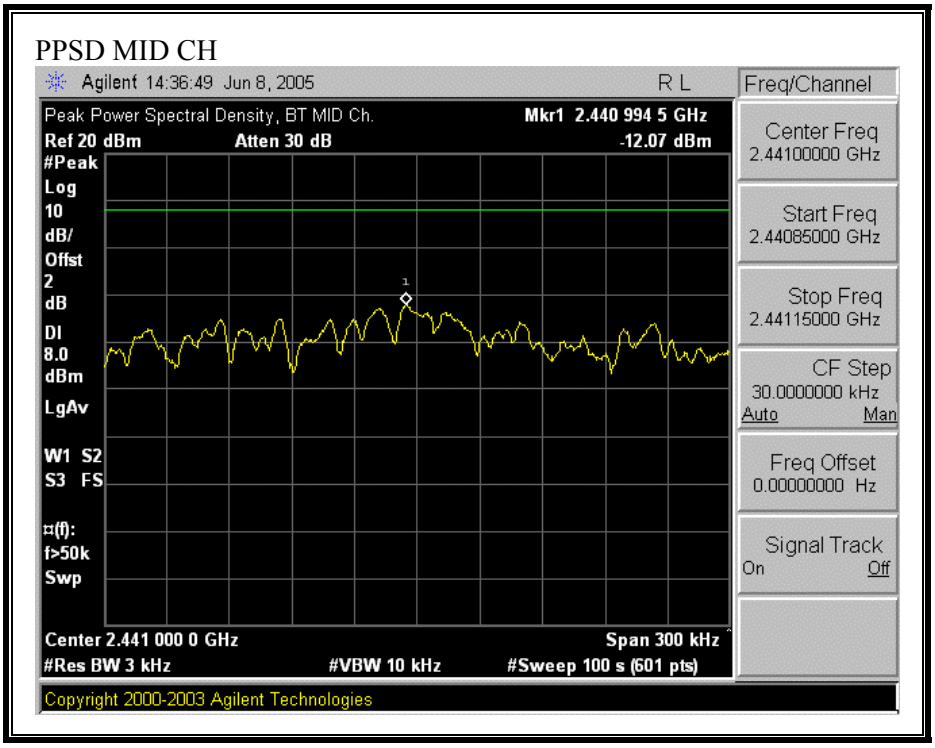
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-10.80	8	-18.80
Middle	2441	-12.07	8	-20.07
High	2480	-14.90	8	-22.90

PEAK POWER SPECTRAL DENSITY

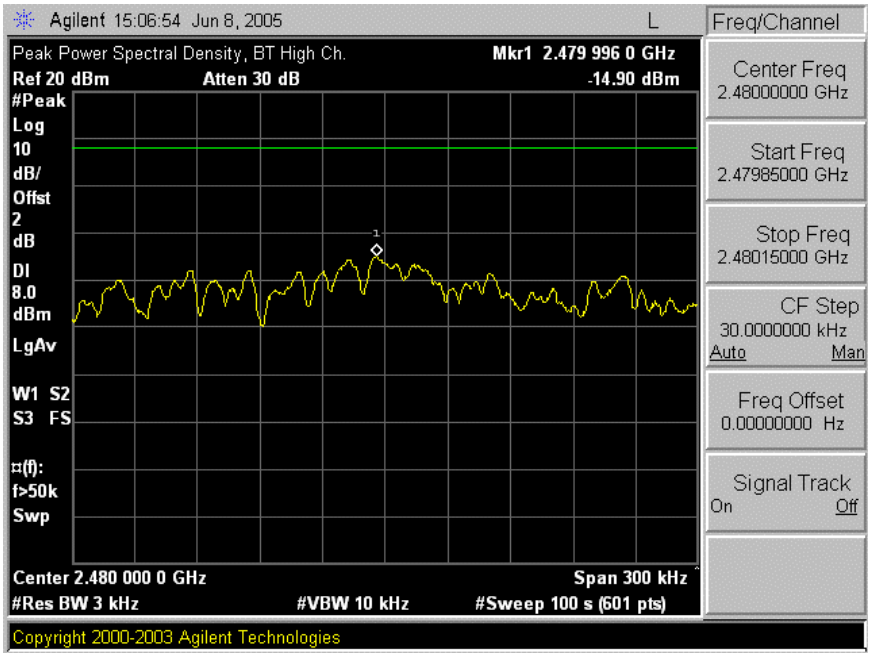
PPSD LOW CH



PPSD MID CH



PPSD HIGH CH



7.2.9. CONDUCTED SPURIOUS EMISSIONS

LIMITS

§15.247 (c) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in§15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

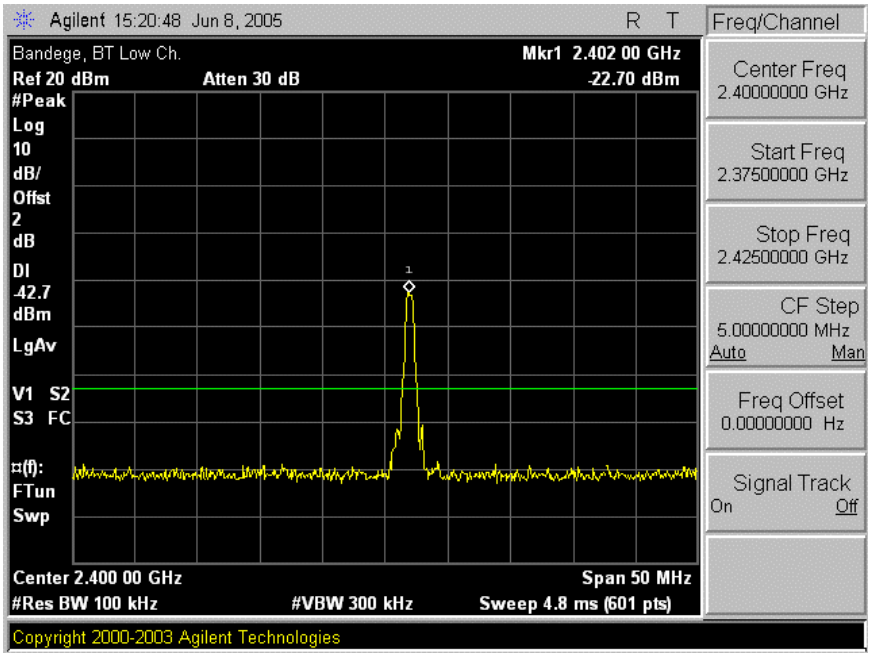
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

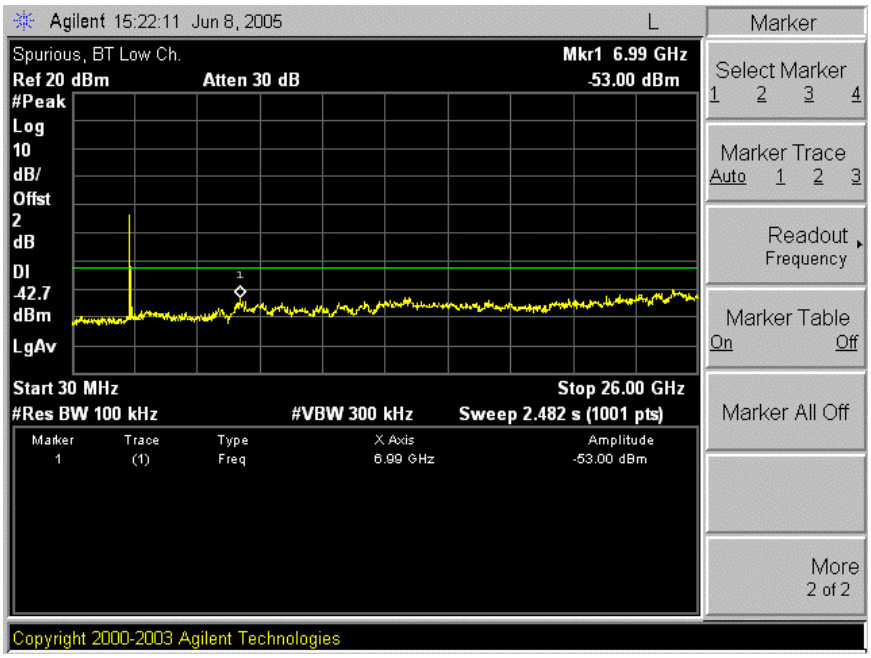
No non-compliance noted:

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CHANNEL BANDEDGE

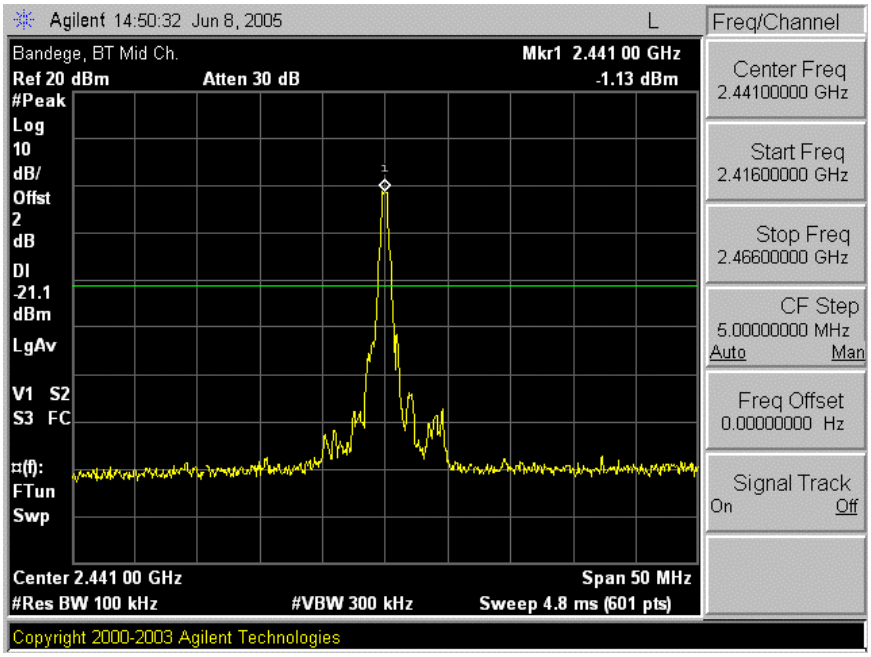


LOW CHANNEL SPURIOUS

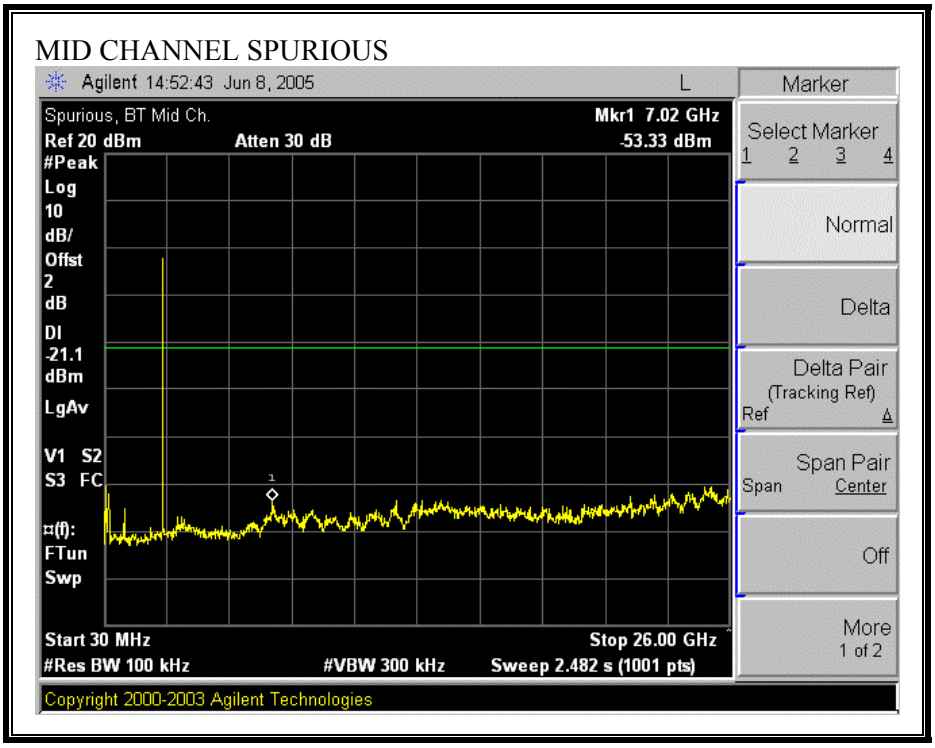


SPURIOUS EMISSIONS, MID CHANNEL

MID CHANNEL REFERENCE

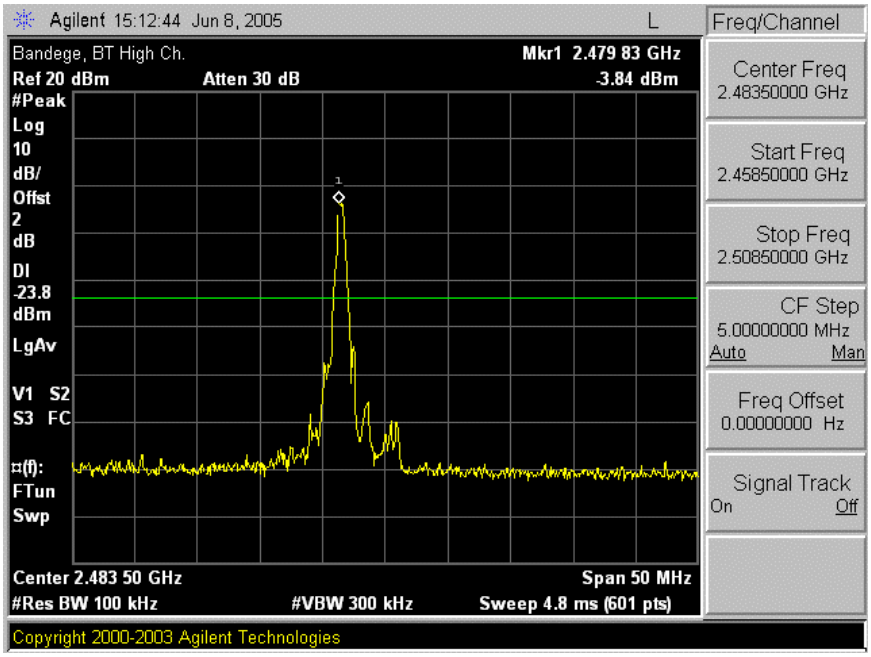


MID CHANNEL SPURIOUS

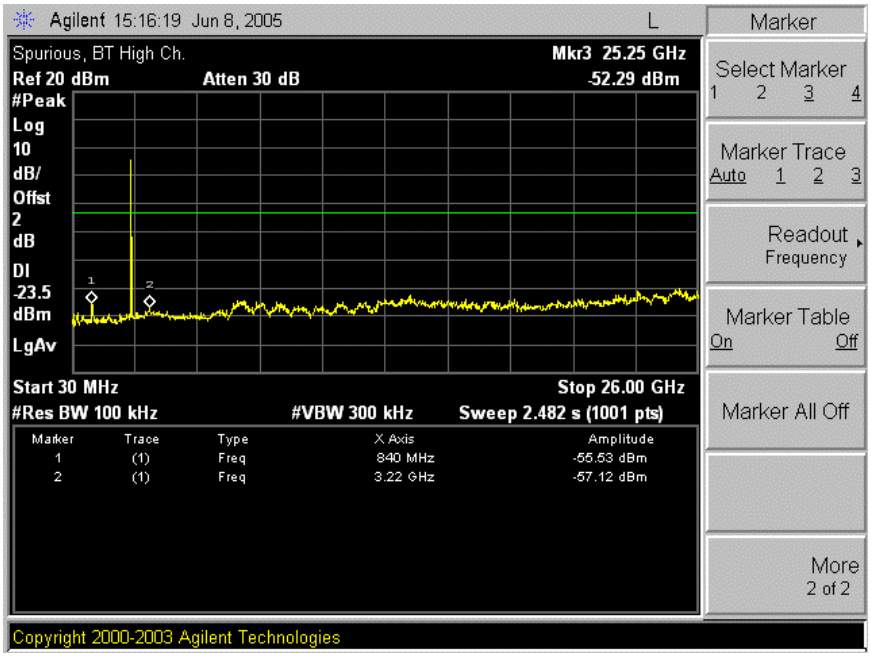


SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CHANNEL BANDEDGE

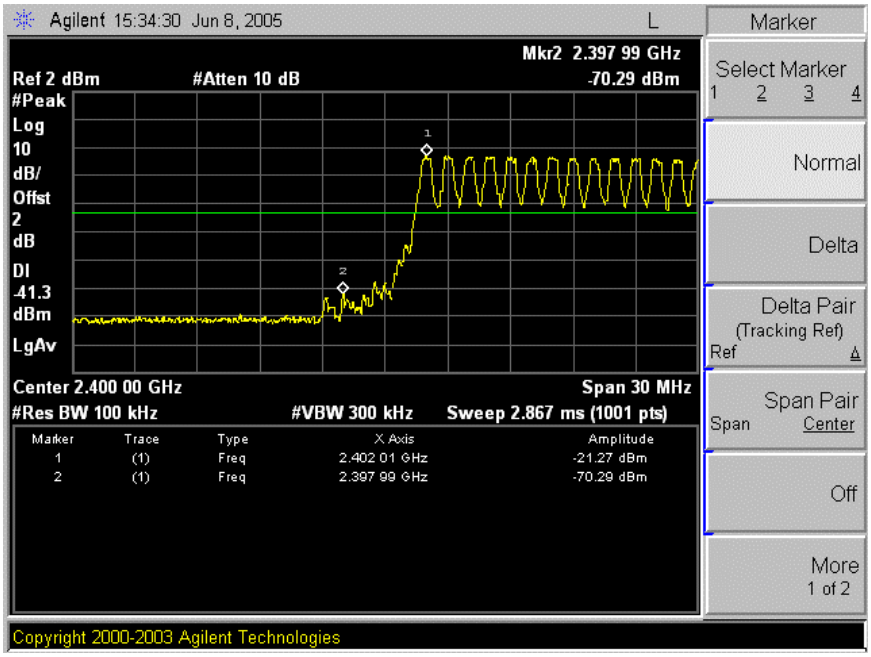


HIGH CHANNEL SPURIOUS

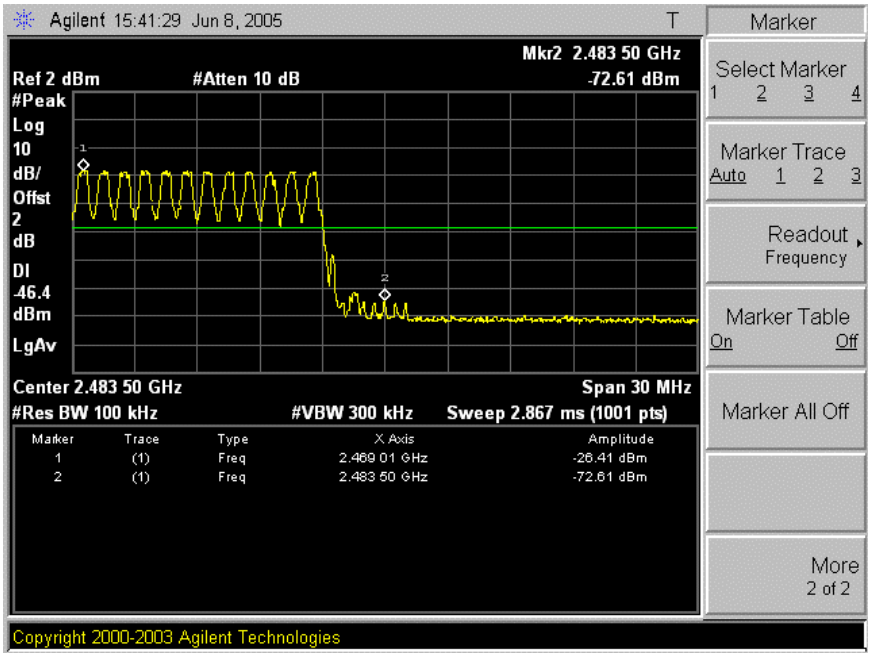


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



HIGH BANDEDGE WITH HOPPING ON



7.3. CO-LOCATED MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*($900/f^2$)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

CALCULATIONS

Given

$E = \sqrt{(30 * P * G)} / d$

and

$S = E ^ 2 / 3770$

where

E = Field Strength in Volts/meter
P = Power in Watts
G = Numeric antenna gain
d = Distance in meters
S = Power Density in milliwatts/square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

$d = \sqrt{((30 * P * G) / (3770 * S))}$

Changing to units of Power to mW and Distance to cm, using:

P (mW) = P (W) / 1000 and
d (cm) =100 * d (m)

yields

$d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$
$d = 0.282 * \sqrt{(P * G / S)}$

where

d = distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power Density in mW/cm^2

For multiple colocated transmitters operating simultaneously the total power density can be calculated by summing the Power * Gain product of each transmitter.

yields

$d = 0.282 * \sqrt{((P1 * G1) + (P2 * G2) + ... + (Pn * Pn)) / S)}$ Equation (1)

where

d = distance in cm
Px = Power of transmitter x in mW
Gx = Numeric gain of antenna x
S = Power Density in mW/cm^2

In the table below, Power and Gain are entered in units of dBm and dBi respectively, then these are converted to their linear forms prior to the summation function.

The conversions from the logarithmic form of power and gain are made using:

P (mW) = 10 ^ (P (dBm) / 10) and Equation (2)

G (numeric) = 10 ^ (G (dBi) / 10) Equation (3)

Equations (1), (2) and (3) and the measured peak powers are used to calculate the MPE distance.

LIMITS

From §1.1310 Table 1 (B), S = 1.0 mW/cm^2

RESULTS

No non-compliance noted:

Mode	Power Density Limit (mW/cm^2)	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
802.11		20.42	-0.23	
Bluetooth		1.43	-4.90	
Combined	1.0			2.89

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

7.4. RADIATED EMISSIONS

7.4.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS

LIMITS

§15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	*4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2] Above 38.6

*4.5 – 5.25 for LP0002 Standard.

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

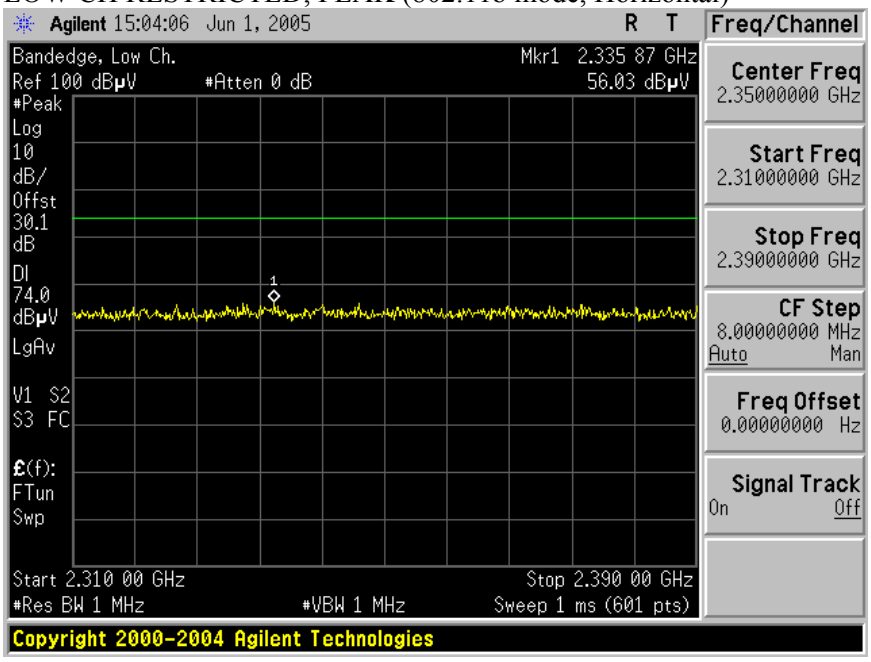
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each 5 GHz band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

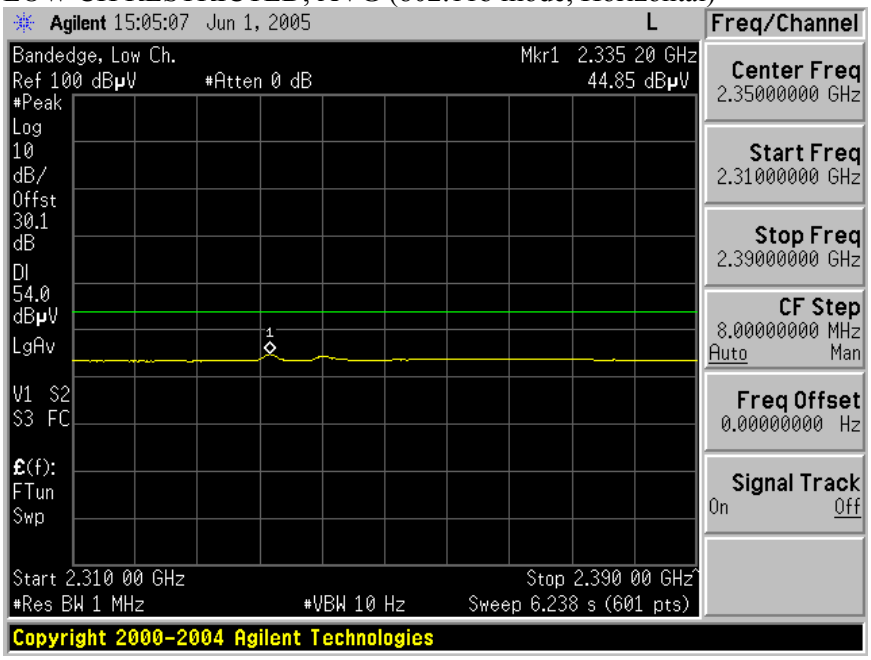
7.4.2. TRANSMITTER ABOVE 1 GHz FOR THE WLAN MODULE

RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11b mode, Horizontal)

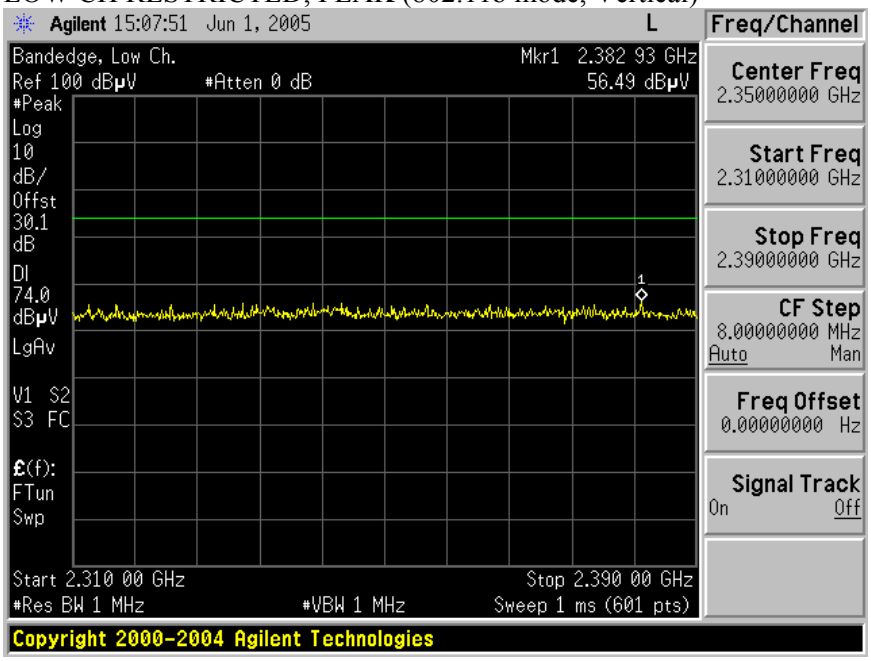


LOW CH RESTRICTED, AVG (802.11b mode, Horizontal)

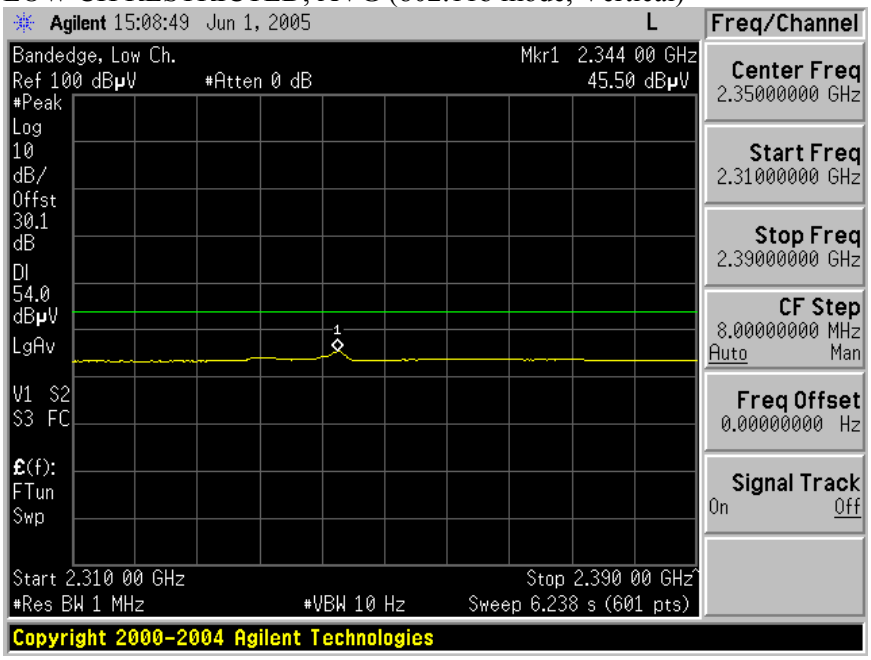


RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11b mode, Vertical)

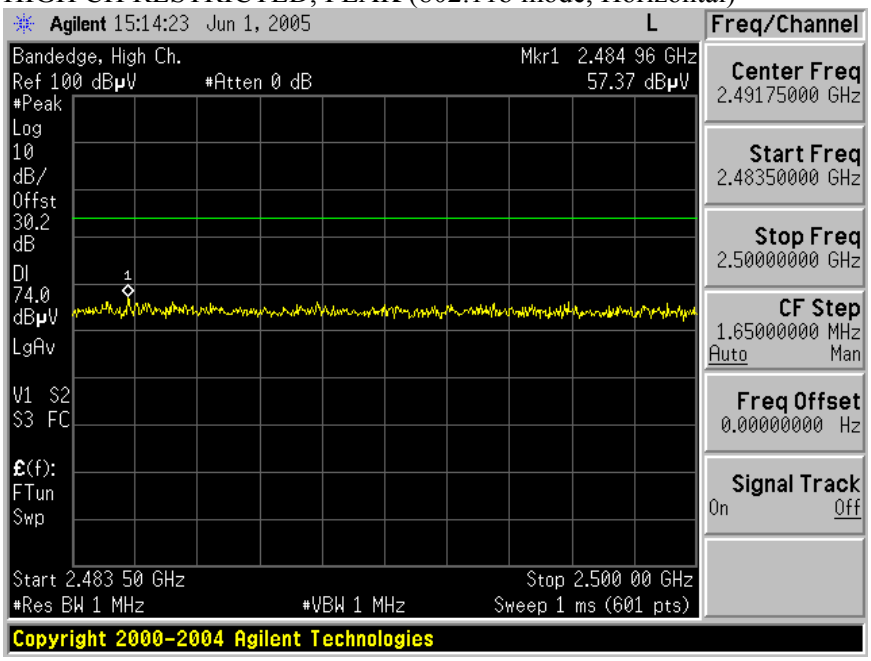


LOW CH RESTRICTED, AVG (802.11b mode, Vertical)

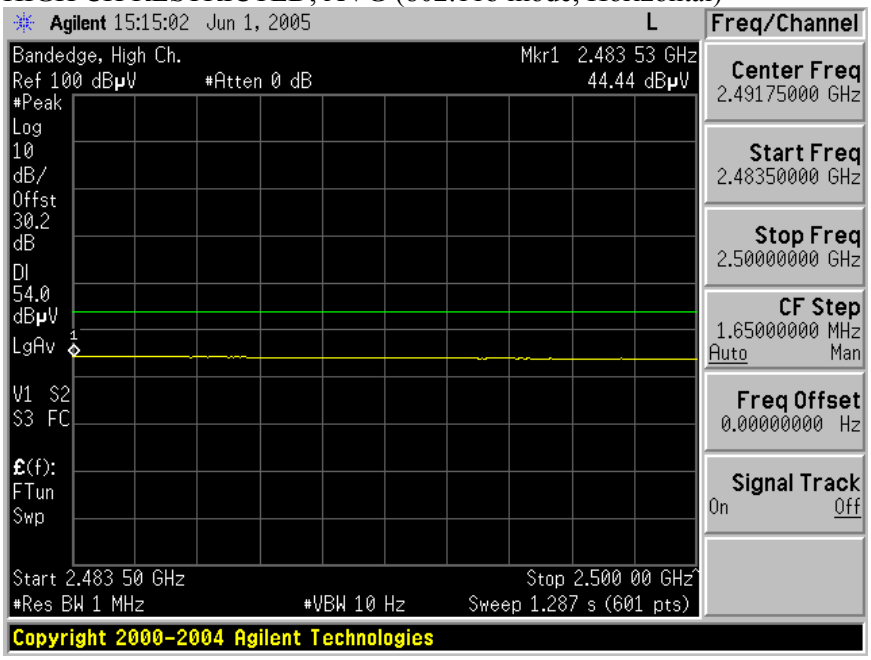


RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11b mode, Horizontal)

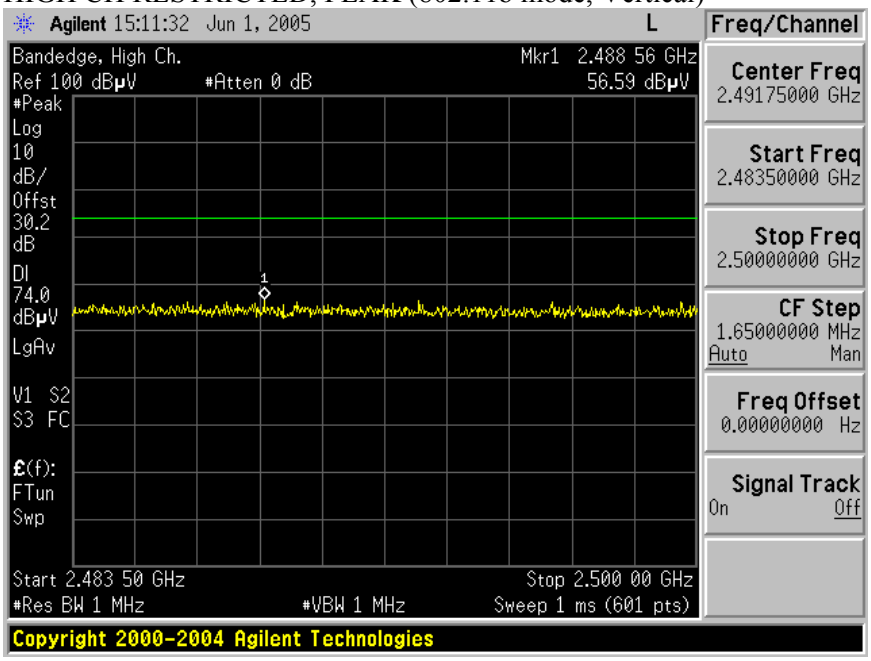


HIGH CH RESTRICTED, AVG (802.11b mode, Horizontal)

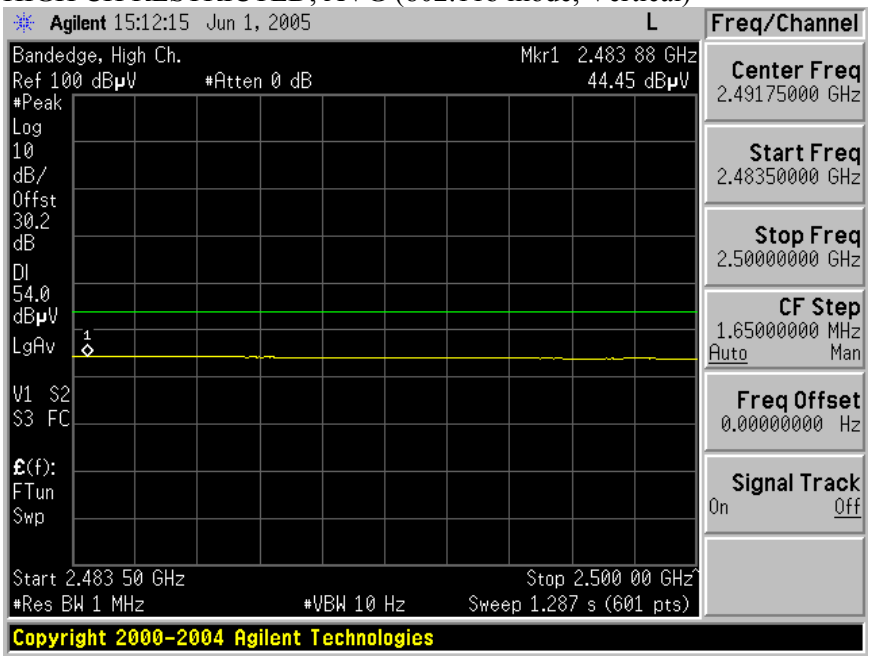


RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11b mode, Vertical)



HIGH CH RESTRICTED, AVG (802.11b mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (b MODE)

06/01/05 **High Frequency Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

Test Engr:William Zhuang
Project #:05I3440-1
Company:Casio Computer Co., Ltd.
EUT Descrip.:Handheld Terminal
EUT M/N:
Test Target:FCC 15.247
Mode Oper:Tx On, WLAN

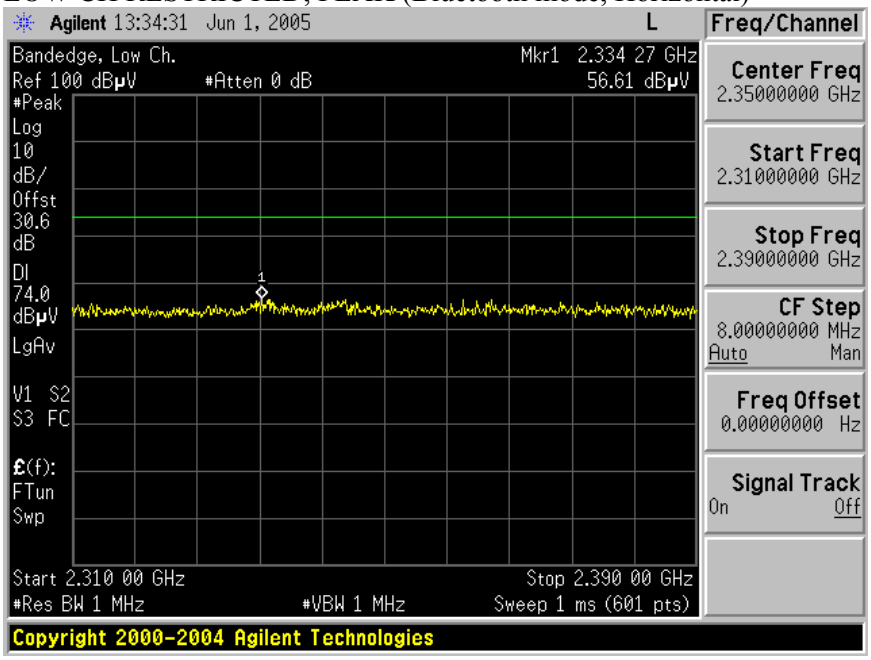
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch. 2412MHz															
4.824	3.0	51.9	49.5	33.6	3.2	-33.6	0.0	0.6	55.8	53.4	74.0	54.0	-18.2	-0.6	V
4.824	3.0	50.6	49.0	33.6	3.2	-33.6	0.0	0.6	54.5	52.9	74.0	54.0	-19.5	-1.1	H
7.236	3.0	42.5	31.0	36.1	3.9	-33.3	0.0	0.6	49.8	38.4	74.0	54.0	-24.2	-15.6	H
7.236	3.0	44.6	34.6	36.1	3.9	-33.3	0.0	0.6	52.0	41.9	74.0	54.0	-22.0	-12.1	V
9.648	3.0	45.0	41.2	38.1	4.5	-33.9	0.0	0.8	54.5	50.6	74.0	54.0	-19.5	-3.4	V
9.648	3.0	46.3	43.0	38.1	4.5	-33.9	0.0	0.8	55.7	52.5	74.0	54.0	-18.3	-1.6	H
Mid Ch. 2437MHz															
4.874	3.0	51.5	48.5	33.7	3.2	-33.5	0.0	0.6	55.5	52.5	74.0	54.0	-18.5	-1.5	V
4.874	3.0	51.2	46.2	33.7	3.2	-33.5	0.0	0.6	55.2	50.2	74.0	54.0	-18.8	-3.8	H
7.311	3.0	43.7	32.9	36.2	3.9	-33.3	0.0	0.6	51.2	40.4	74.0	54.0	-22.8	-13.6	H
7.311	3.0	45.1	35.2	36.2	3.9	-33.3	0.0	0.6	52.5	42.7	74.0	54.0	-21.5	-11.3	V
9.748	3.0	45.4	41.2	38.1	4.5	-34.0	0.0	0.8	54.9	50.7	74.0	54.0	-19.1	-3.3	V
9.748	3.0	46.4	42.8	38.1	4.5	-34.0	0.0	0.8	55.9	52.3	74.0	54.0	-18.1	-1.7	H
High Ch. 2462MHz															
4.924	3.0	50.2	48.2	33.7	3.3	-33.5	0.0	0.6	54.3	52.3	74.0	54.0	-19.7	-1.7	V
4.924	3.0	52.5	48.4	33.7	3.3	-33.5	0.0	0.6	56.6	52.5	74.0	54.0	-17.4	-1.5	H
7.386	3.0	41.9	30.3	36.2	4.0	-33.3	0.0	0.6	49.4	37.8	74.0	54.0	-24.6	-16.2	H
7.386	3.0	44.2	34.1	36.2	4.0	-33.3	0.0	0.6	51.8	41.7	74.0	54.0	-22.2	-12.3	V
9.848	3.0	47.2	43.0	38.2	4.5	-34.0	0.0	0.8	56.8	52.6	74.0	54.0	-17.2	-1.4	V
9.848	3.0	45.5	39.9	38.2	4.5	-34.0	0.0	0.8	55.1	49.5	74.0	54.0	-18.9	-4.5	H

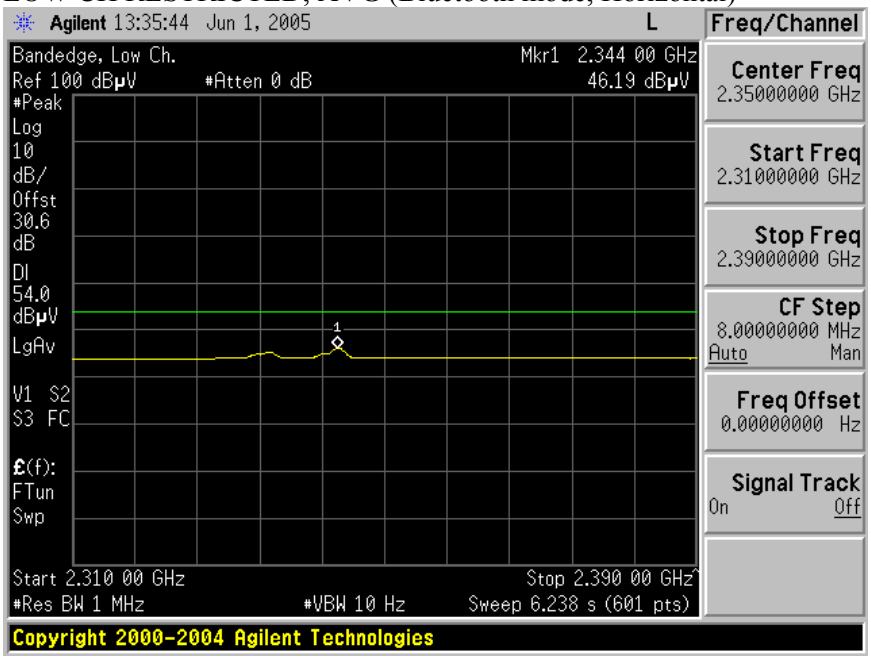
7.4.3. TRANSMITTER ABOVE 1 GHz FOR THE BLUETOOTH MODULE

RESTRICTED BANDEDGE (BLUETOOTH MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (Bluetooth mode, Horizontal)

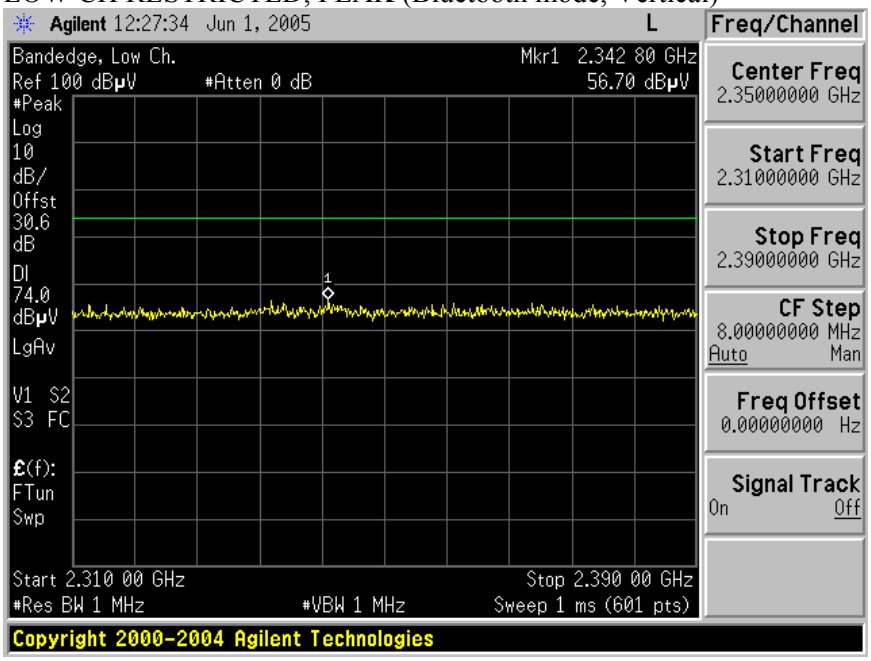


LOW CH RESTRICTED, AVG (Bluetooth mode, Horizontal)

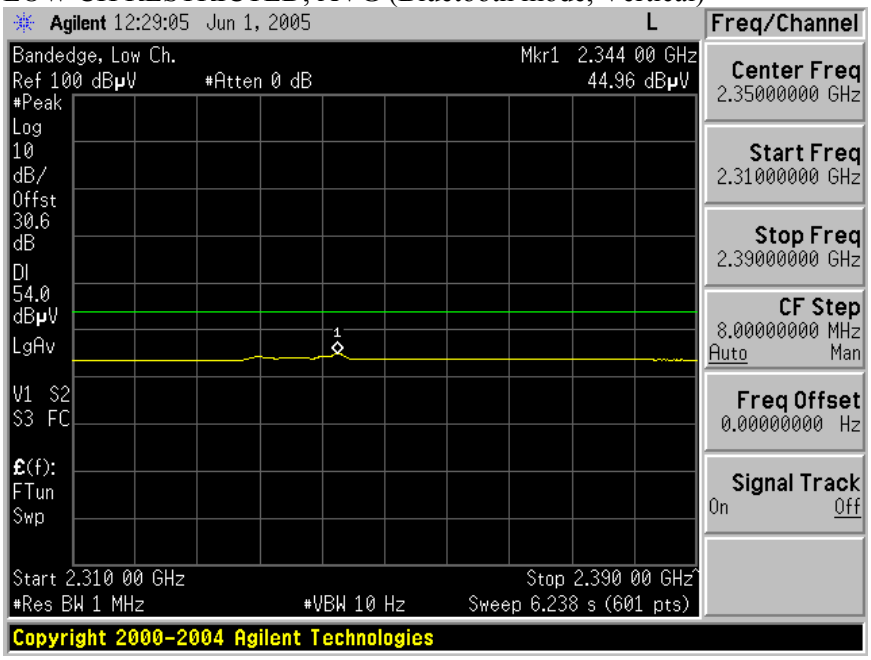


RESTRICTED BANDEDGE (BLUETOOTH MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (Bluetooth mode, Vertical)

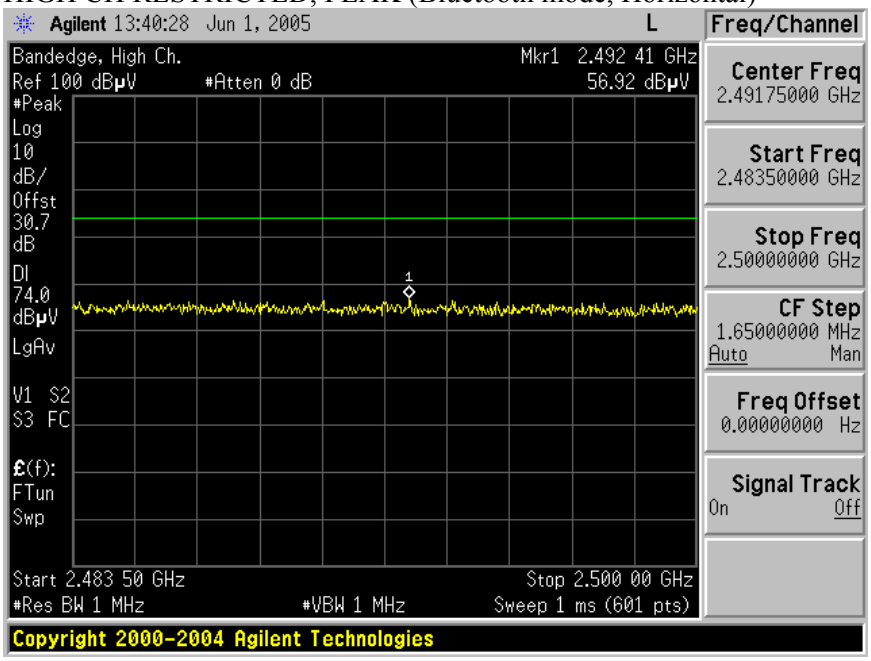


LOW CH RESTRICTED, AVG (Bluetooth mode, Vertical)

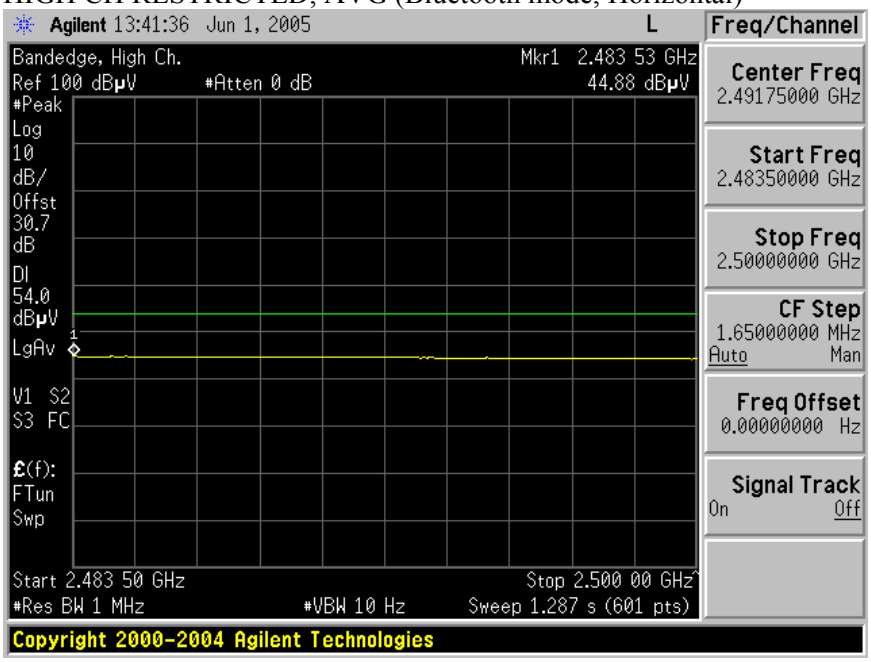


RESTRICTED BANDEDGE (BLUETOOTH MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (Bluetooth mode, Horizontal)

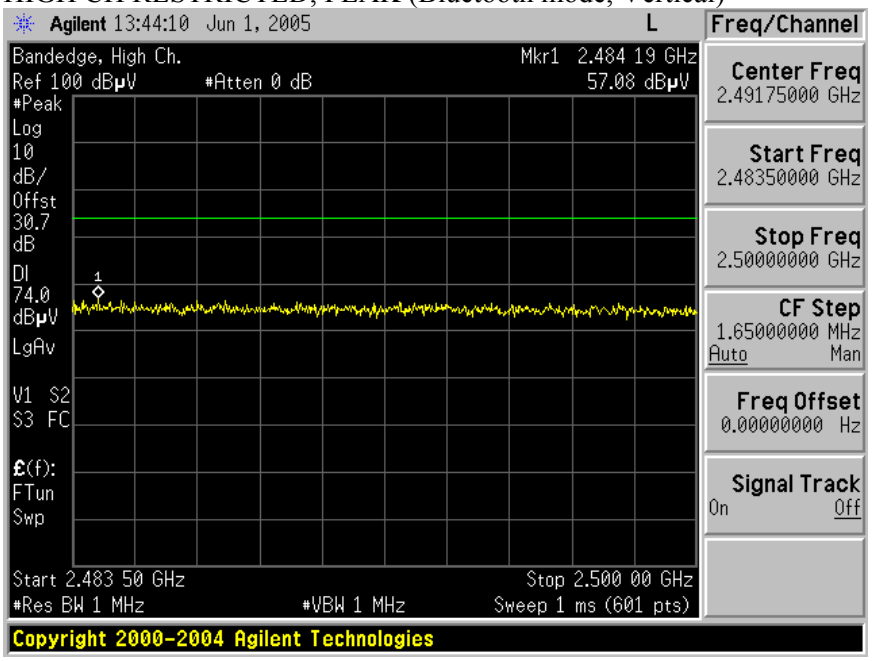


HIGH CH RESTRICTED, AVG (Bluetooth mode, Horizontal)

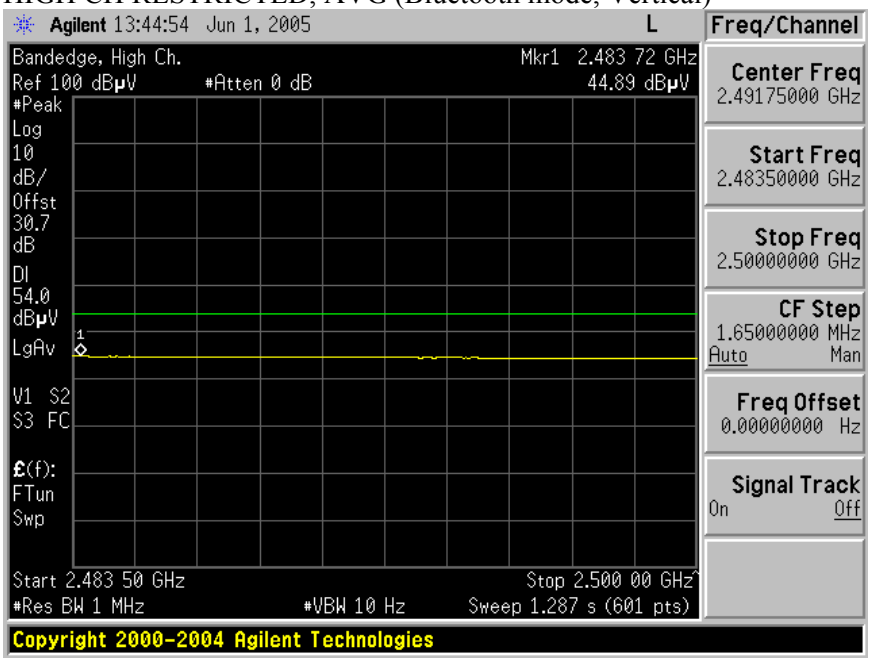


RESTRICTED BANDEDGE (BLUETOOTH MODE, HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (Bluetooth mode, Vertical)



HIGH CH RESTRICTED, AVG (Bluetooth mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (BLUETOOTH MODE)

06/01/05 **High Frequency Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

Test Engr:William Zhuang
Project #:05I3440-1
Company:Casio Computer Co., Ltd.
EUT Descrip.:Handheld Terminal
EUT M/N:
Test Target:FCC 15.247
Mode Oper:Tx On, BLUETOOTH

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch. 2402MHz															
4.804	3.0	45.3	41.0	33.6	3.2	-33.6	0.0	0.6	49.1	44.9	74.0	54.0	-24.9	-9.1	V
4.804	3.0	47.7	43.8	33.6	3.2	-33.6	0.0	0.6	51.6	47.6	74.0	54.0	-22.4	-6.4	H
7.206	3.0	40.0	29.0	36.1	3.9	-33.3	0.0	0.6	47.4	36.3	74.0	54.0	-26.6	-17.7	H
7.206	3.0	39.6	28.7	36.1	3.9	-33.3	0.0	0.6	46.9	36.1	74.0	54.0	-27.1	-17.9	V
9.608	3.0	42.3	34.4	38.1	4.5	-33.9	0.0	0.8	51.7	43.8	74.0	54.0	-22.3	-10.2	V
9.608	3.0	44.7	40.1	38.1	4.5	-33.9	0.0	0.8	54.1	49.5	74.0	54.0	-19.9	-4.5	H
Low Ch. 2441MHz															
4.882	3.0	40.3	28.4	33.7	3.2	-33.5	0.0	0.6	44.3	32.4	74.0	54.0	-29.7	-21.6	V
4.882	3.0	40.6	28.5	33.7	3.2	-33.5	0.0	0.6	44.6	32.5	74.0	54.0	-29.4	-21.5	H
7.323	3.0	40.5	28.7	36.2	3.9	-33.3	0.0	0.6	47.9	36.2	74.0	54.0	-26.1	-17.8	H
7.323	3.0	40.7	28.7	36.2	3.9	-33.3	0.0	0.6	48.2	36.2	74.0	54.0	-25.8	-17.8	V
9.764	3.0	42.3	32.0	38.1	4.5	-34.0	0.0	0.8	51.8	41.5	74.0	54.0	-22.2	-12.5	V
9.764	3.0	41.7	34.9	38.1	4.5	-34.0	0.0	0.8	51.3	44.4	74.0	54.0	-22.7	-9.6	H
Low Ch. 2480MHz															
4.960	3.0	42.9	35.9	33.7	3.3	-33.5	0.0	0.6	47.0	40.0	74.0	54.0	-27.0	-14.0	V
4.960	3.0	43.0	36.3	33.7	3.3	-33.5	0.0	0.6	47.1	40.4	74.0	54.0	-26.9	-13.6	H
7.440	3.0	41.1	28.7	36.2	4.0	-33.3	0.0	0.6	48.7	36.2	74.0	54.0	-25.3	-17.8	H
7.440	3.0	40.9	28.6	36.2	4.0	-33.3	0.0	0.6	48.5	36.2	74.0	54.0	-25.5	-17.8	V
9.920	3.0	40.8	29.3	38.2	4.5	-34.0	0.0	0.8	50.4	38.9	74.0	54.0	-23.6	-15.1	V
9.920	3.0	41.7	31.0	38.2	4.5	-34.0	0.0	0.8	51.3	40.6	74.0	54.0	-22.7	-13.4	H

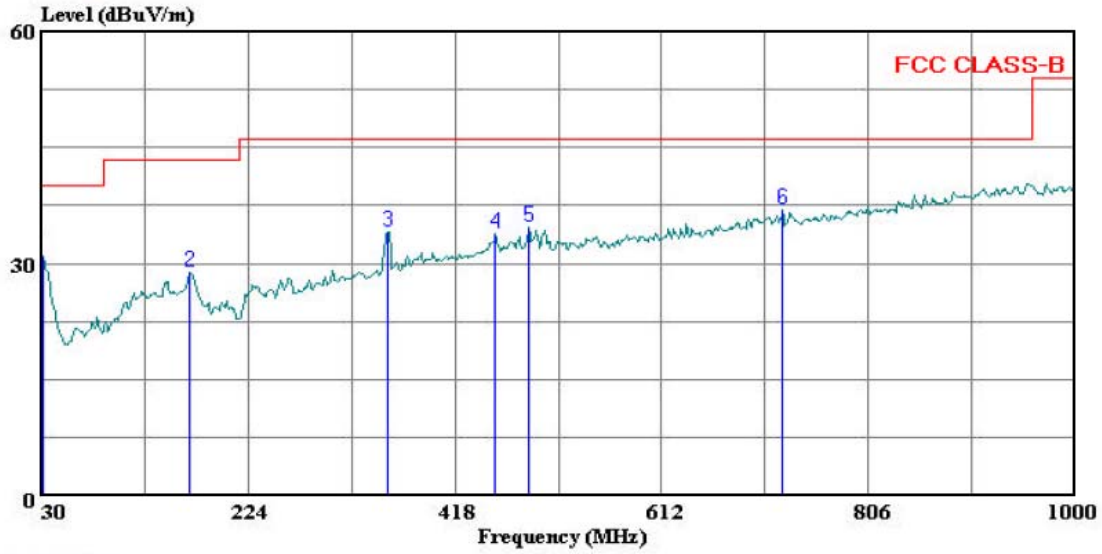
7.4.4. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz FOR WLAN

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT

561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 2 File#: 3442.EMI Date: 06-05-2005 Time: 10:40:55



(Audix ATC)

Trace: 1 Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator: : Thanh Nguyen
Project #: : 05I3440-1
Company: : CASIO COMPUTER CO.,LTD
EUT: : HandHeld Terminal
Model No. : DT-X10M30URC2
Configuration : EUT with DT169CHGE Cradle
Target of Test : FCC CLASS B
Mode of Operation: Tx WLAN, worst case

HORIZONTAL DATA

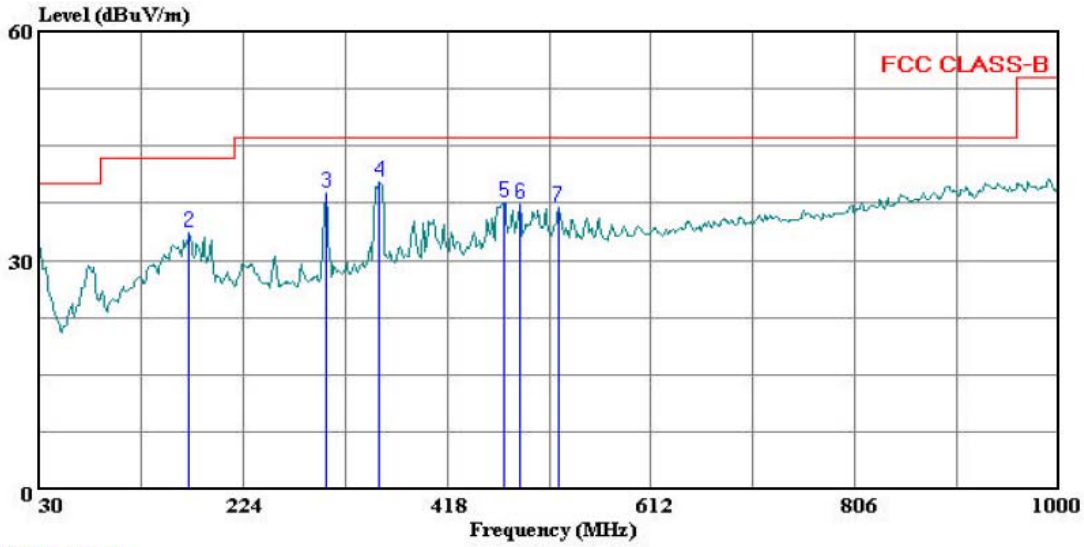
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	30.970	10.50	20.45	30.95	40.00	-9.05	Peak
2	169.680	15.42	13.40	28.82	43.50	-14.68	Peak
3	354.950	16.96	17.00	33.97	46.00	-12.03	Peak
4	455.830	14.54	19.33	33.87	46.00	-12.13	Peak
5	487.840	14.62	20.00	34.62	46.00	-11.38	Peak
6	725.490	13.46	23.53	36.99	46.00	-9.01	Peak

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT

COMPLIANCE Engineering Services, Inc.
561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 4 File#: 3442.EMI Date: 06-05-2005 Time: 10:52:11



(Audix ATC)

Trace: 3 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator: : Thanh Nguyen
Project #: : 05I3440-1
Company: : CASIO COMPUTER CO.,LTD
EUT: : HandHeld Terminal
Model No. : DT-X10M30URC2
Configuration : EUT with DT169CHGE Cradle
Target of Test : FCC CLASS B
Mode of Operation: Tx WLAN, worst case

VERTICAL DATA

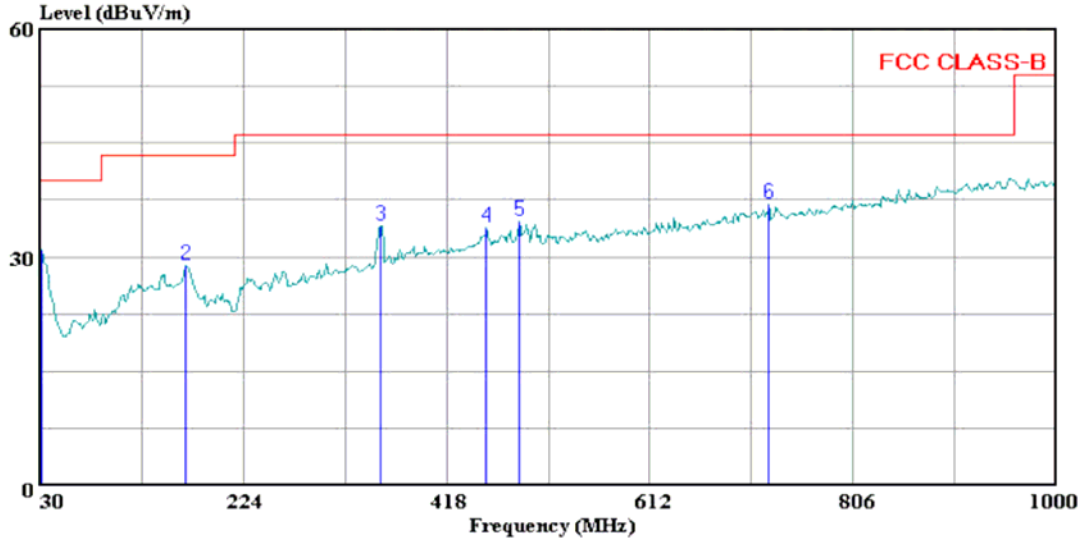
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	30.000	11.38	20.45	31.83	40.00	-8.17	Peak
2	172.590	20.25	13.31	33.56	43.50	-9.94	Peak
3	303.540	23.06	15.75	38.81	46.00	-7.19	Peak
4	353.980	23.42	16.97	40.39	46.00	-5.61	Peak
5	472.320	17.84	19.69	37.54	46.00	-8.46	Peak
6	487.840	17.41	20.00	37.41	46.00	-8.59	Peak
7	523.730	16.43	20.62	37.05	46.00	-8.95	Peak

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT

COMPLIANCE Engineering Services, Inc.
561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 2 File#: 3442.EMI Date: 06-05-2005 Time: 10:40:55



(Audix ATC)

Trace: 1 Ref Trace:

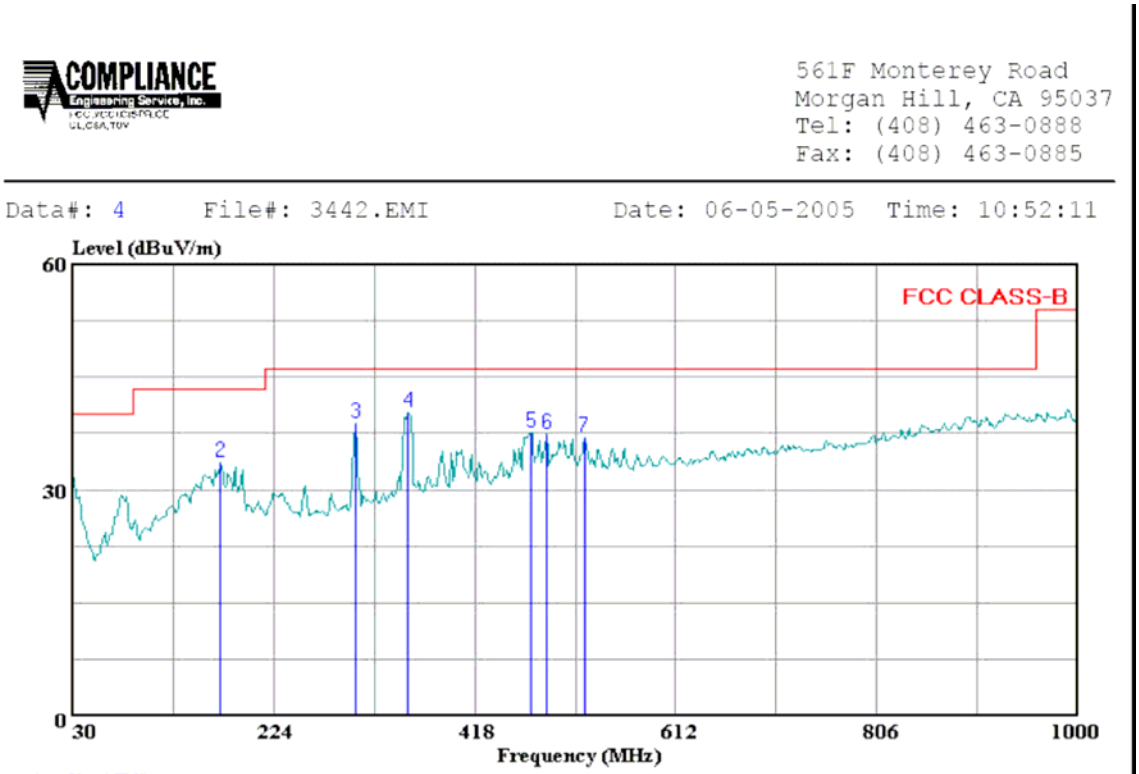
Condition: FCC CLASS-B HORIZONTAL
Test Operator: : Thanh Nguyen
Project #: : 05I3440-1
Company: : CASIO COMPUTER CO.,LTD
EUT: : HandHeld Terminal
Model No. : DT-X10M30URC2
Configuration : EUT with DT861 IO Cradle
Target of Test : FCC CLASS B
Mode of Operation: Tx WLAN, worst case

HORIZONTAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	30.970	10.50	20.45	30.95	40.00	-9.05	Peak
2	169.680	15.42	13.40	28.82	43.50	-14.68	Peak
3	354.950	16.96	17.00	33.97	46.00	-12.03	Peak
4	455.830	14.54	19.33	33.87	46.00	-12.13	Peak
5	487.840	14.62	20.00	34.62	46.00	-11.38	Peak
6	725.490	13.46	23.53	36.99	46.00	-9.01	Peak

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT

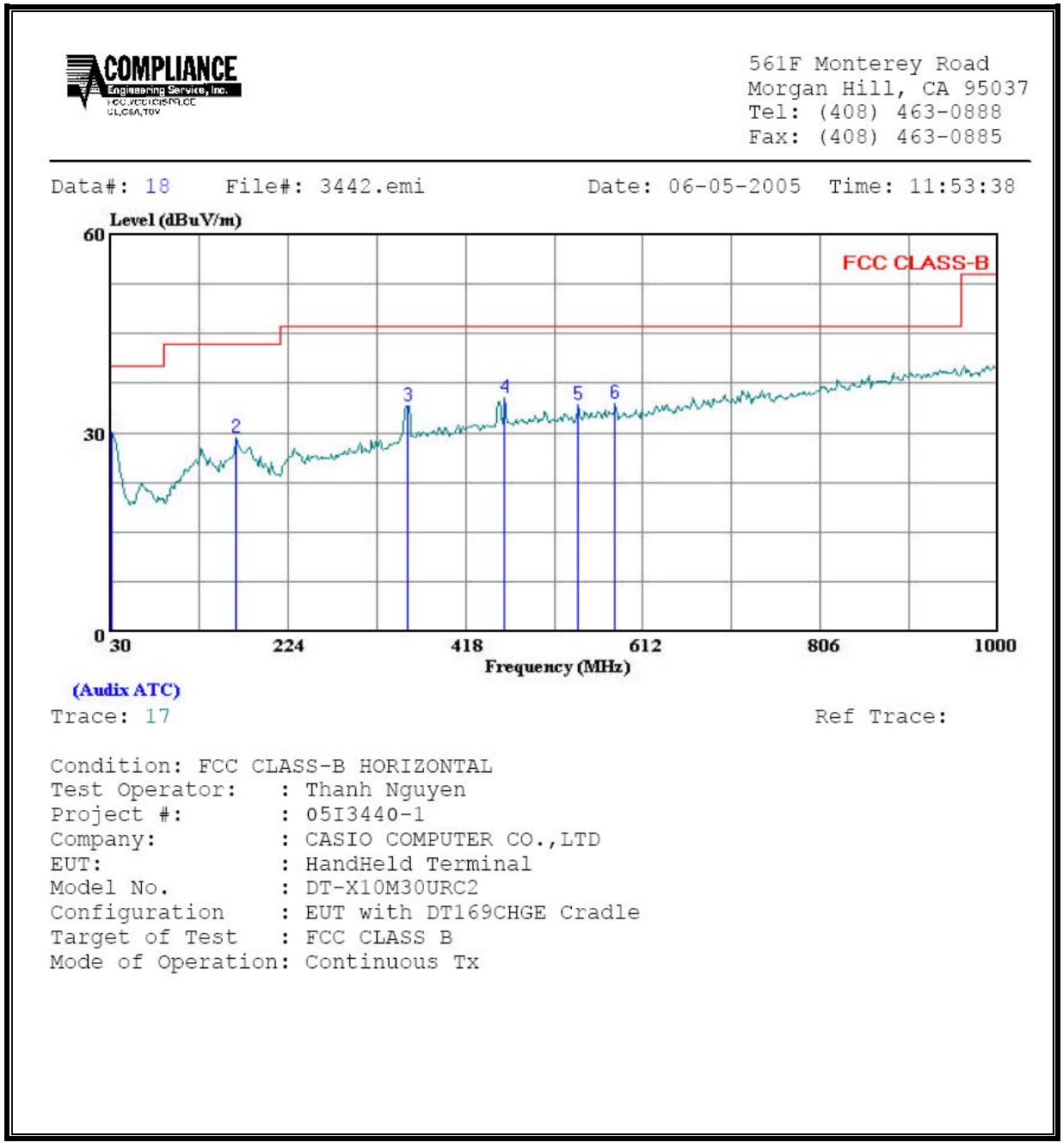


VERTICAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	30.000	11.38	20.45	31.83	40.00	-8.17	Peak
2	172.590	20.25	13.31	33.56	43.50	-9.94	Peak
3	303.540	23.06	15.75	38.81	46.00	-7.19	Peak
4	353.980	23.42	16.97	40.39	46.00	-5.61	Peak
5	472.320	17.84	19.69	37.54	46.00	-8.46	Peak
6	487.840	17.41	20.00	37.41	46.00	-8.59	Peak
7	523.730	16.43	20.62	37.05	46.00	-8.95	Peak

7.4.5. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz FOR BLUETOOTH

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)



HORIZONTAL DATA

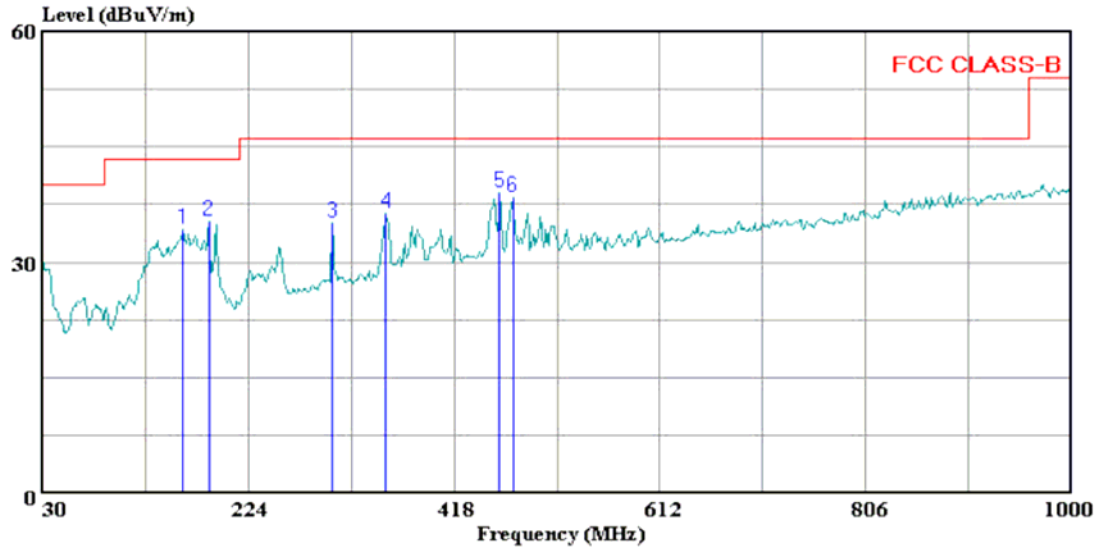
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	30.970	9.61	20.45	30.06	40.00	-9.94	Peak
2	167.740	15.80	13.51	29.31	43.50	-14.19	Peak
3	354.950	17.09	17.00	34.10	46.00	-11.90	Peak
4	460.680	15.80	19.44	35.24	46.00	-10.76	Peak
5	541.190	13.43	20.78	34.21	46.00	-11.79	Peak
6	581.930	13.19	21.31	34.50	46.00	-11.50	Peak

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT

561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 20 File#: 3442.emi Date: 06-05-2005 Time: 11:58:48



(Audix ATC)

Trace: 19 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator: : Thanh Nguyen
Project #: : 05I3440-1
Company: : CASIO COMPUTER CO.,LTD
EUT: : HandHeld Terminal
Model No. : DT-X10M30URC2
Configuration : EUT with DT169CHGE Cradle
Target of Test : FCC CLASS B
Mode of Operation: Continuous Tx

VERTICAL DATA

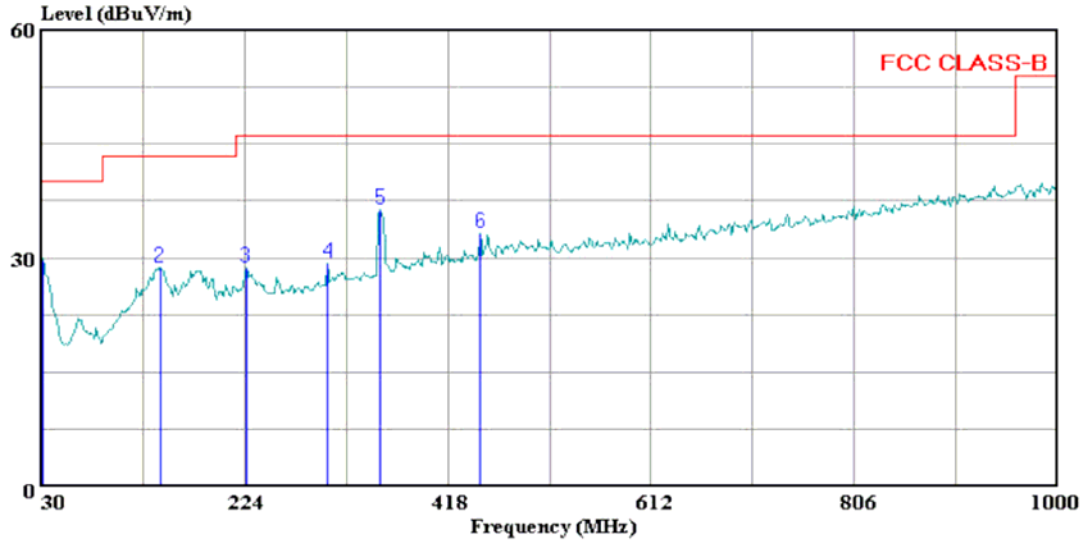
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	162.890	20.52	13.68	34.20	43.50	-9.30	Peak
2	187.140	22.34	12.87	35.21	43.50	-8.29	Peak
3	303.540	19.31	15.75	35.06	46.00	-10.94	Peak
4	353.980	19.33	16.97	36.30	46.00	-9.70	Peak
5	460.680	19.50	19.44	38.94	46.00	-7.06	Peak
6	473.290	18.63	19.71	38.34	46.00	-7.66	Peak

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT

COMPLIANCE Engineering Services, Inc.
561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 16 File#: M30cf.emi Date: 06-13-2005 Time: 12:13:08



(Audix ATC)

Trace: 15 Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator: : Thanh Nguyen
Project #: : 05I3440-1
Company: : CASIO Computer Co.; LTD
EUT: : Mobile Communication Terminal
Model No. : DT-X10M30URC2
Configuration : EUT and the DT-861 IO Cradle
Target of Test : FCC Class B
Mode of Operation: BT Tx worst Case

HORIZONTAL DATA

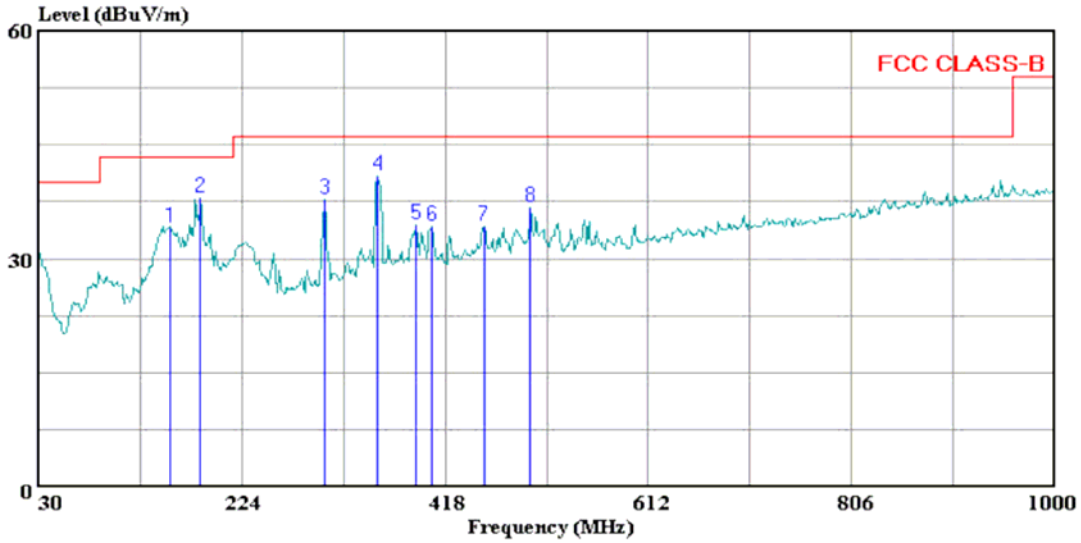
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	30.970	9.26	20.45	29.71	40.00	-10.29	Peak
2	143.490	13.98	14.63	28.61	43.50	-14.90	Peak
3	225.940	15.73	12.91	28.64	46.00	-17.36	Peak
4	303.540	13.47	15.75	29.22	46.00	-16.78	Peak
5	353.980	19.35	16.97	36.32	46.00	-9.68	Peak
6	449.040	13.97	19.17	33.14	46.00	-12.86	Peak

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT

561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 14 File#: M30cf.emi Date: 06-13-2005 Time: 12:08:43



(Audix ATC)

Trace: 13 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator: : Thanh Nguyen
Project #: : 05I3440-1
Company: : CASIO Computer Co.; LTD
EUT: : Mobile Communication Terminal
Model No. : DT-X10M30URC2
Configuration : EUT and the DT-861 IO Cradle
Target of Test : FCC Class B
Mode of Operation: BT Tx worst Case

VERTICAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	156.100	20.12	13.92	34.04	43.50	-9.46	Peak
2	184.230	25.24	12.86	38.10	43.50	-5.40	Peak
3	303.540	21.98	15.75	37.73	46.00	-8.27	Peak
4	353.980	23.89	16.97	40.86	46.00	-5.14	Peak
5	390.840	16.59	17.83	34.42	46.00	-11.58	Peak
6	405.390	16.01	18.18	34.19	46.00	-11.81	Peak
7	454.860	14.90	19.30	34.20	46.00	-11.80	Peak
8	499.480	16.62	20.22	36.84	46.00	-9.16	Peak

7.5. POWERLINE CONDUCTED EMISSIONS

LIMIT

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The resolution bandwidth is set to 9 kHz for both peak detection and quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

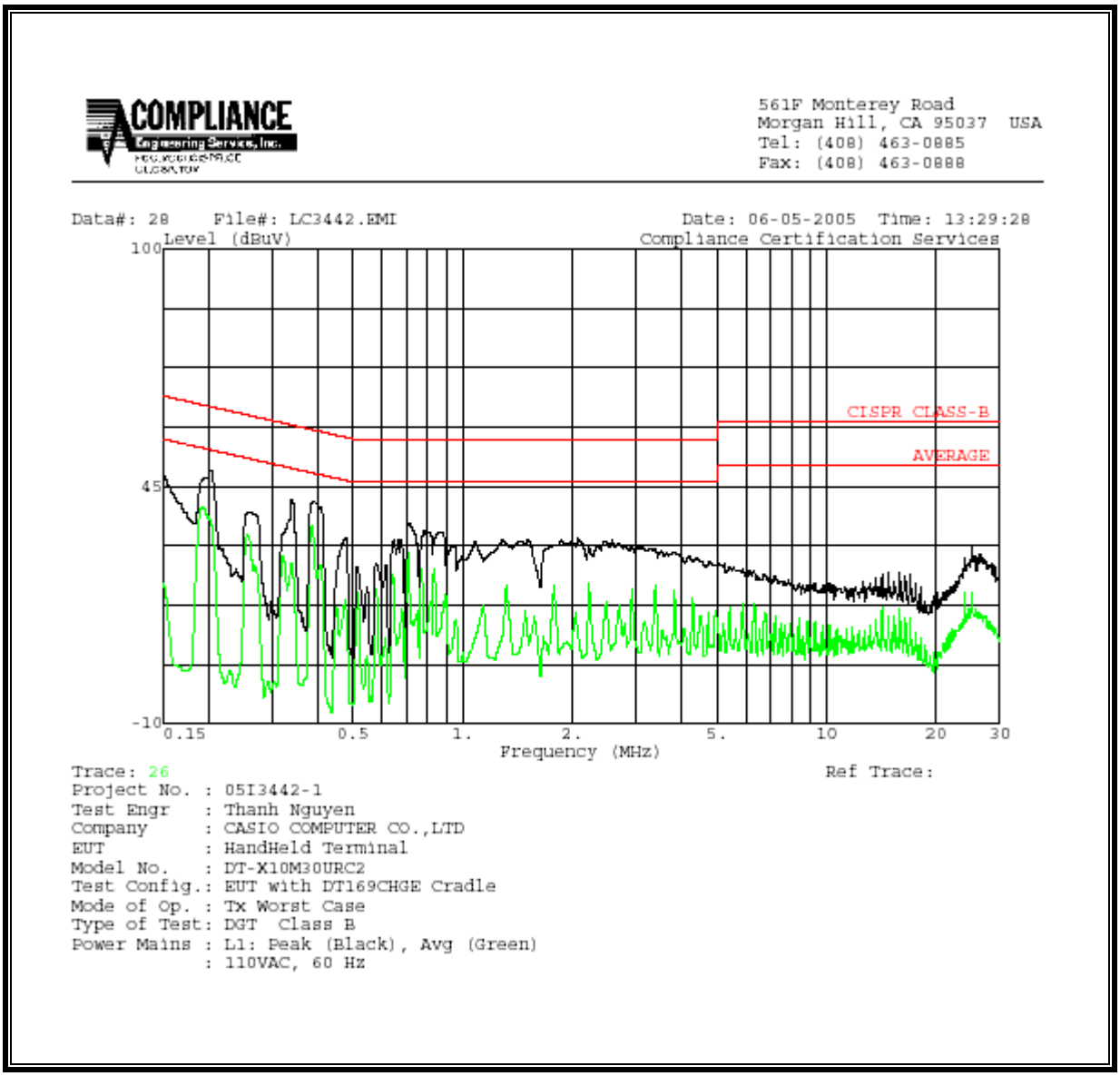
No non-compliance noted:

12 WORST EMISSIONS

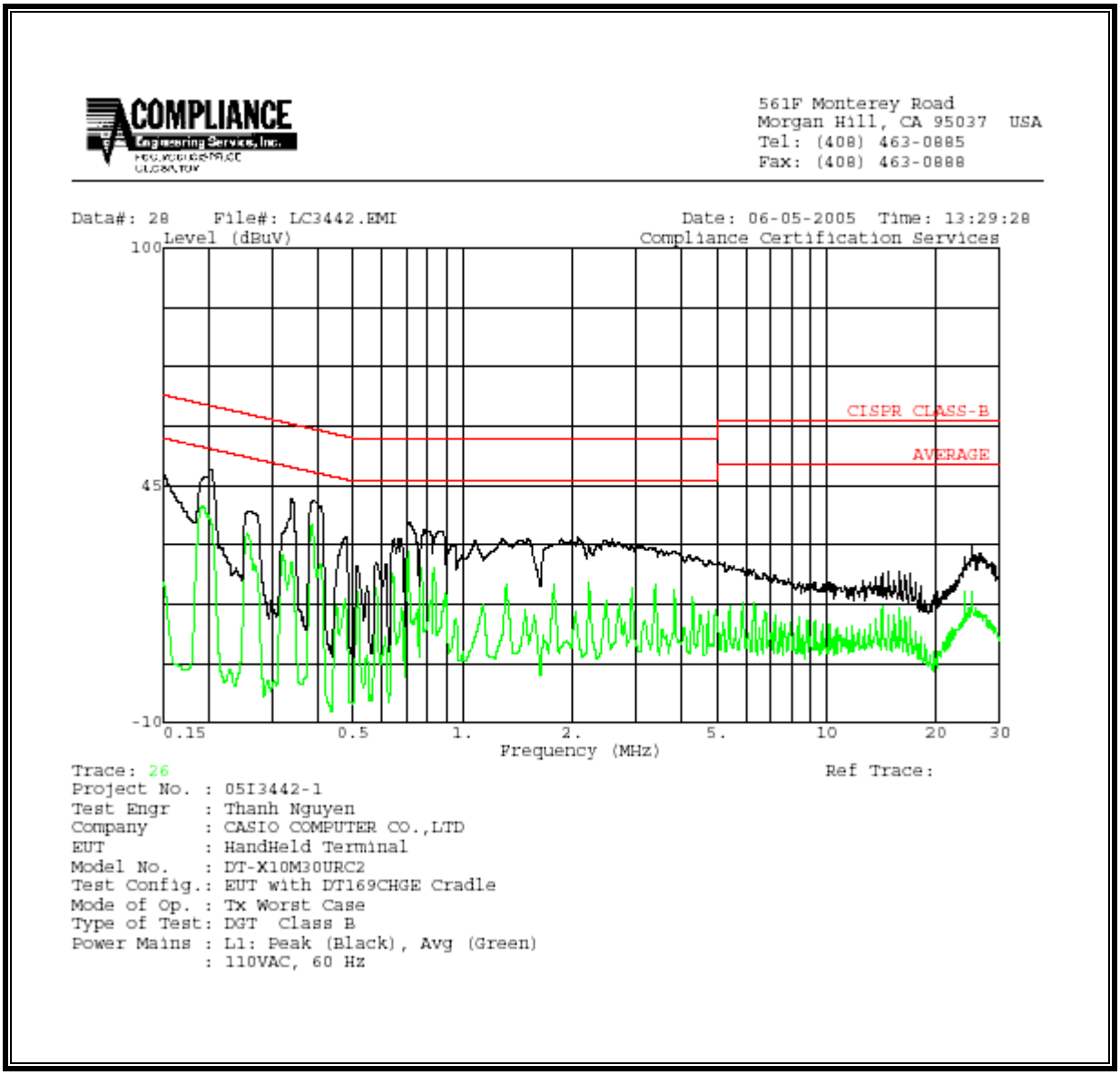
DT-169CHGE CRADLE

CONDUCTED EMISSIONS DATA (110VAC 60Hz)									
Freq.	Reading			Closs	Limit	FCC_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.20	48.64	--	40.28	0.00	63.49	53.49	-14.85	-13.21	L1
0.39	41.27	--	36.02	0.00	58.00	48.00	-16.73	-11.98	L1
0.71	36.04	--	30.22	0.00	56.00	46.00	-19.96	-15.78	L1
1.29	32.58	--	--	0.00	56.00	46.00	-23.42	-13.42	L1
2.08	32.94	--	--	0.00	56.00	46.00	-23.06	-13.06	L1
25.05	31.02	--	--	0.00	60.00	50.00	-28.98	-18.98	L1
0.15	48.54	--	24.63	0.00	66.00	56.00	-17.46	-31.37	L2
0.39	42.22	--	36.75	0.00	58.13	48.13	-15.91	-11.38	L2
0.71	35.94	--	29.15	0.00	56.00	46.00	-20.06	-16.85	L2
1.29	34.74	--	--	0.00	56.00	46.00	-21.26	-11.26	L2
2.08	33.38	--	--	0.00	56.00	46.00	-22.62	-12.62	L2
26.00	30.02	--	--	0.00	60.00	50.00	-29.98	-19.98	L2
12 Worst Data									

LINE 1 RESULTS



LINE 2 RESULTS

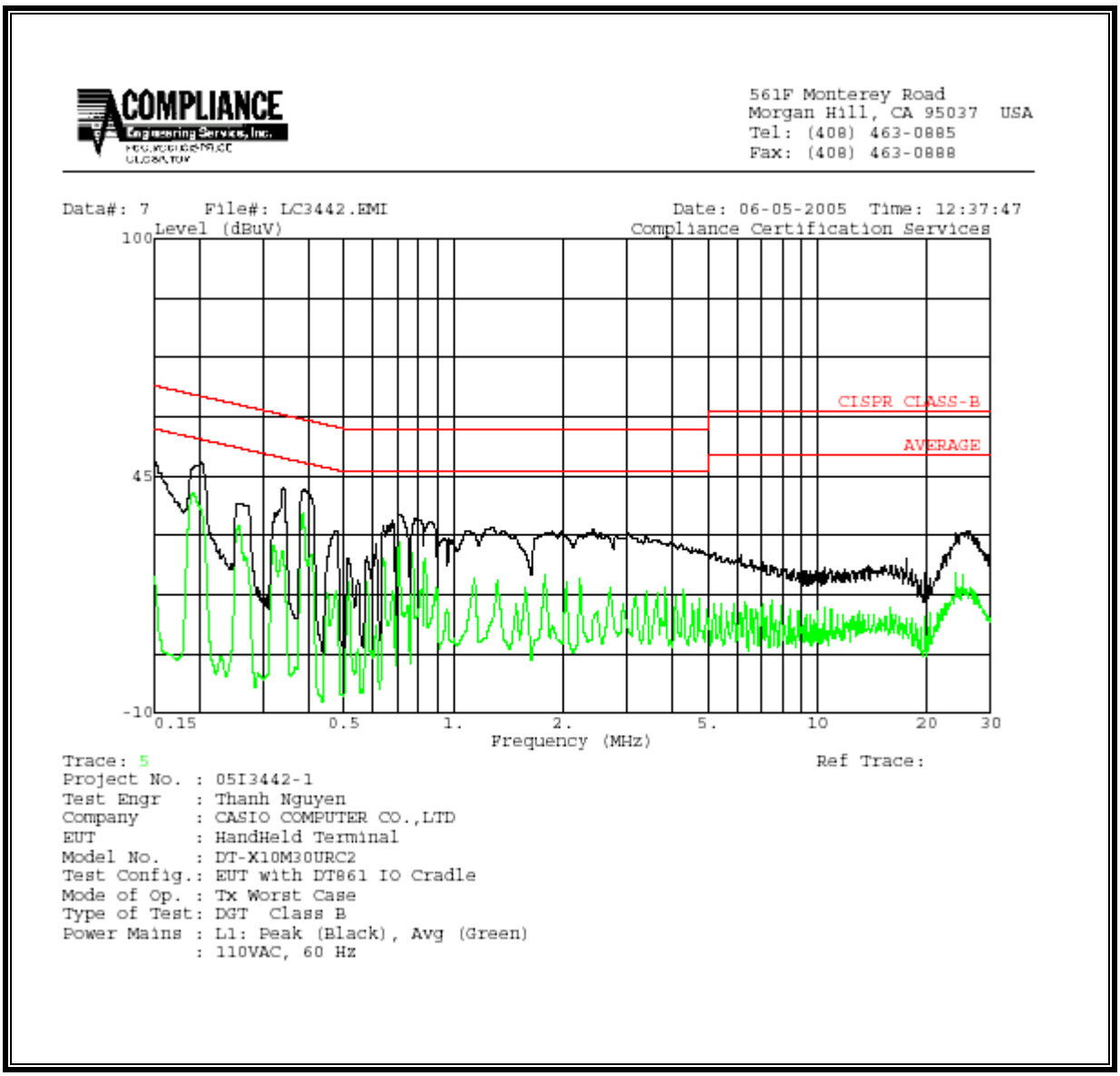


12 WORST EMISSIONS

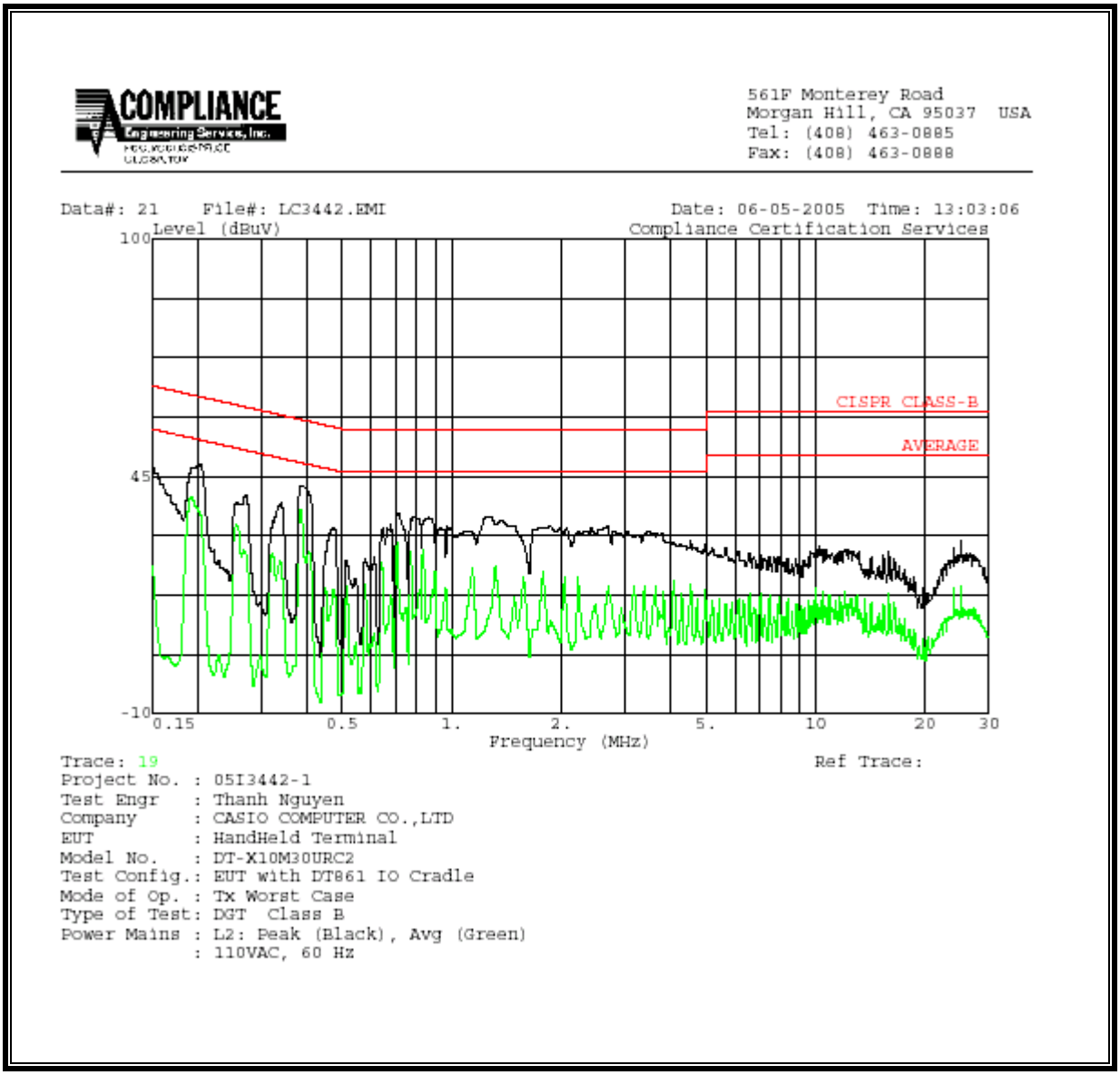
DT-861 IO CRADLE

CONDUCTED EMISSIONS DATA (110VAC 60Hz)									
Freq.	Reading			Closs	Limit		Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.20	47.96	--	41.00	0.00	63.45	53.45	-15.49	-12.45	L1
0.34	42.12	--	27.50	0.00	59.23	49.23	-17.11	-21.73	L1
0.71	35.96	--	30.16	0.00	56.00	46.00	-20.04	-15.84	L1
1.30	32.12	--	--	0.00	56.00	46.00	-23.88	-13.88	L1
2.42	32.82	--	--	0.00	56.00	46.00	-23.18	-13.18	L1
25.59	24.01	--	--	0.00	60.00	50.00	-35.99	-25.99	L1
0.15	49.50	--	24.42	0.00	66.00	56.00	-16.50	-31.58	L2
0.39	42.74	--	37.14	0.00	58.17	48.17	-15.43	-11.03	L2
0.71	36.56	--	30.19	0.00	56.00	46.00	-19.44	-15.81	L2
1.29	35.50	--	--	0.00	56.00	46.00	-20.50	-10.50	L2
3.49	32.28	--	--	0.00	56.00	46.00	-23.72	-13.72	L2
25.05	30.06	--	--	0.00	60.00	50.00	-29.94	-19.94	L2
12 Worst Data									

LINE 1 RESULTS



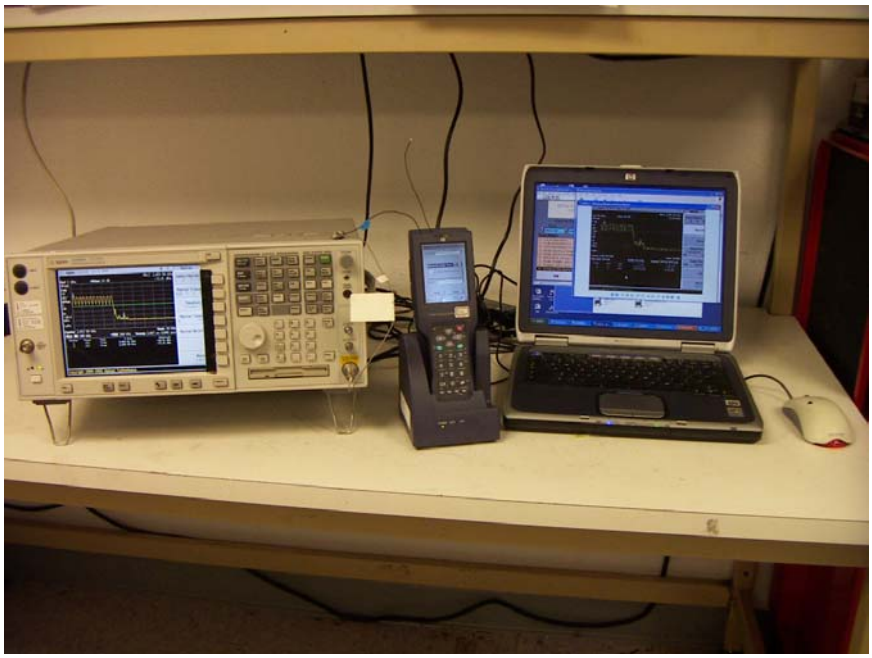
LINE 2 RESULTS



8. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP

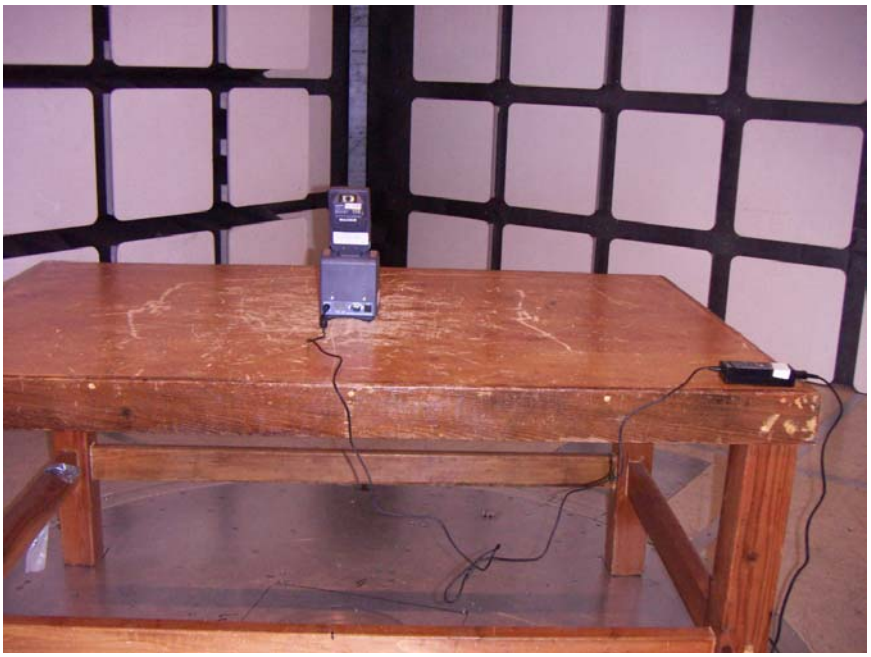
ANTENNA PORT CONDUCTED PHOTO



RADIATED RF MEASUREMENT SETUP IN CRADLE CONFIGURATION

RADIATED FRONT PHOTO

RADIATED BACK PHOTO

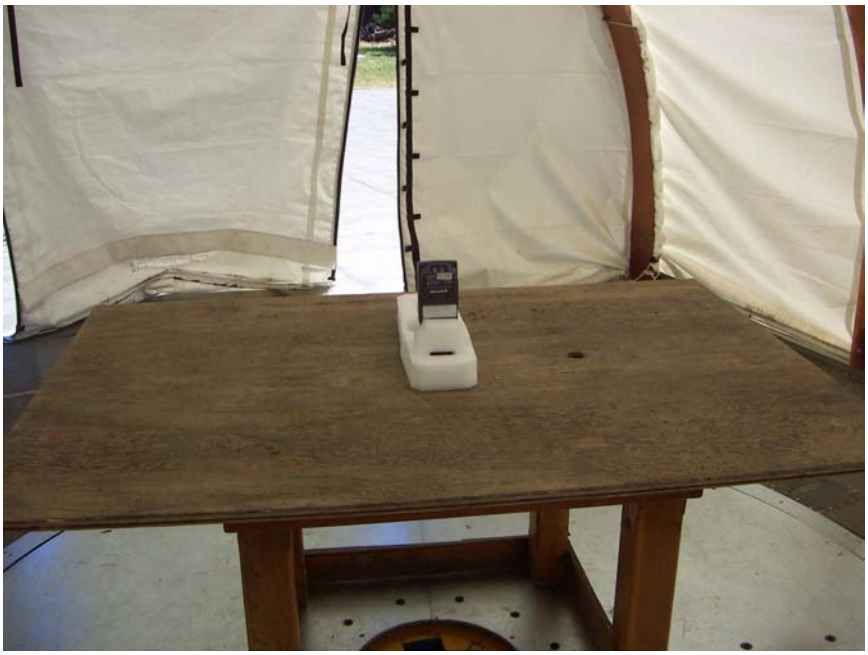


RADIATED RF MEASUREMENT SETUP FOR PORTABLE CONFIGURATION

RADIATED X-AXIS ORIENTATION PHOTO

RADIATED Y AXIS ORIENTATION PHOTO

RADIATED Z AXIS ORIENTATION PHOTO



POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP WITH DT169 CRADLE

LINE CONDUCTED FRONT PHOTO

LINE CONDUCTED BACK PHOTO

POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP WITH DT861 CRADLE

LINE CONDUCTED FRONT PHOTO

LINE CONDUCTED BACK PHOTO

END OF REPORT