



**DIGITAL EMC CO., LTD.**

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**CERTIFICATION OF COMPLIANCE**

NOVATRON CO., LTD  
 #214 Gyeonggi R&DB Center, Iui-dong 906-5  
 Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea.

Dates of Tests: June 20 ~ 26, 2008  
 Test Report S/N: DR50110807F  
 Test Site : DIGITAL EMC CO., LTD.

FCC ID

**UDSNTD38**

APPLICANT

**NOVATRON CO., LTD**

- FCC Classification** : Digital Transmission System (DTS)
- Kind of Equipment** : Multimedia Player
- Manufacturer** : NOVATRON CO., LTD
- FCC ID** : UDSNTD38
- Model name** : NTD38
- Test Device Serial number** : Identical prototype
- Standard(s)** : FCC Part 15.247 Subpart C  
ANSI C-63.4-2003
- Frequency Range** : 2412 ~ 2462 MHz
- Max. Output power** : 802.11b / 14.28dBm Conducted  
802.11g / 13.73dBm Conducted
- Data of issue** : July 2, 2008

**I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.**



NVLAP LAB CODE 200559-0

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**1. General information**

This report contains the result of tests performed by:

DIGITAL EMC CO., LTD.

Address : 683-3, Yubang-Dong, Yongin-Si, Kyunggi-Do, Korea. 449-080

<http://www.digitalemc.com> E-mail : demc@unitel.co.kr

Tel: +82-31-321-2664 Fax: +82-31-321-1664

Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the “General requirements for the competent of calibration and testing laboratory”.

This laboratory is accredited by NVLAP and NVLAP Lab. Code is 200559-0.

**Test operator: engineer**

July 2, 2008

Won -Jung LEE

Data

Name

Signature

**Report Reviewed By: manager**

July 2, 2008

Harvey Sung

Data

Name

Signature

Ordering party:

Company name : NOVATRON CO., LTD

Address : #214, Gyeonggi R&DB Center, Iui-dong 906-5, Yeongtong-gu, Suwon-si, Gyeonggi-do,

Country : Korea

Date of order : March 7, 2008

## 2. Information about test item

### UDSNTD38

#### 2.1 Equipment information

Equipment model no.	NTD38
Kind of equipment	Multimedia Player
Frequency band	2412 ~ 2462 MHz
Type of Modulation	802.11b – CCK, DQPSK, DBPSK 802.11g – OFDM
Type of antenna	Dipole Antenna
Power	Adaptor – Input : AC 120V, 60Hz Output : DC 12V

#### 2.2 Tested frequency

Frequency	DSSS
Low frequency	2412MHz
Middle frequency	2437MHz
High frequency	2462MHz

#### 2.3 Tested environment

Temperature	: 15 ~ 35 (°C)
Relative humidity content	: 20 ~ 75 %
Air pressure	: 86 ~ 103 kPa
Details of power supply	: 120 V / 60Hz (powered by power supply)

## UDSNTD38

**2.4 EMI Suppression Device(s)/Modifications**

EMI suppression device(s) added and/or modifications made during testing

-> none

**2.5 Ancillary Equipment**

Equipment	Model No.	Serial No.	Manufacturer
Adapter	RS-03/12-S335	N/A	SHENZHEN LISING SUM POWER TECH.CO.LTD
-	-	-	-

**2.6 Antenna Requirement of Part 15.203**

The antenna connector of this device is a **SMA plug reverse** type connector which is unique connector type.

### 3. Test Result

#### 3.1 Summary of tests

FCC Section(s)	Parameter	Limit	Test Condition	Status (note 1)
<b>I. Transmit mode(Tx)</b>				
15.247(a)(2)	6 dB Bandwidth	> 500 kHz	Conducted	C
15.247(b)(3)	Transmitter Output Power	< 1Watt		C
15.247(c)	Out of Band Emissions / Band Edge	20dBc in any 100kHz BW (or 30dBc)		C
15.247(d)	Transmitter Power Spectral Density	< 8dBm / 3kHz		C
15.205 15.209	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	< FCC 15.209 limits	Radiated	C
15.207	AC Conducted Emissions	EN 55022	Line Conducted	C
<b>II. Receive mode(Rx)</b>				
15.207	AC Conducted Emissions	EN 55022	Line Conducted	C
15.209	Receiver Spurious Emissions	< FCC 15.209 limits	Radiated	C
Note 1: C=Comply    NC=Not Comply    NT=Not Tested    NA=Not Applicable				

The sample was tested according to the following specification:

- FCC Parts 15.247; ANSI C-63.4-2003

### 3.2 Transmitter requirements

#### 3.2.1 6 dB Bandwidth

**Procedure:**

The bandwidth at 6 dB below the highest inband spectral density was measured with a spectrum analyzer connected to the antenna terminal at the highest, middle and the lowest available channels.

After the trace being stable, Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 6dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is ( as close as possible to ) even with the reference marker level. The marker-delta reading at this point is the 6 dB bandwidth of the emission.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

Span = 50 MHz (Greater than EBW)

RBW = 100 kHz

Sweep = auto

VBW = 100 kHz (VBW ≥ RBW)

Detector function = peak

Trace = max hold

**Measurement Data:**

Test Mode	Frequency (MHz)	Channel No.	Test Results	
			Measured Bandwidth (MHz)	Result
802.11b	2412	1	12.05	Comply
	2437	6	12.05	Comply
	2462	11	12.15	Comply
802.11g	2412	1	16.60	Comply
	2437	6	16.60	Comply
	2462	11	16.60	Comply

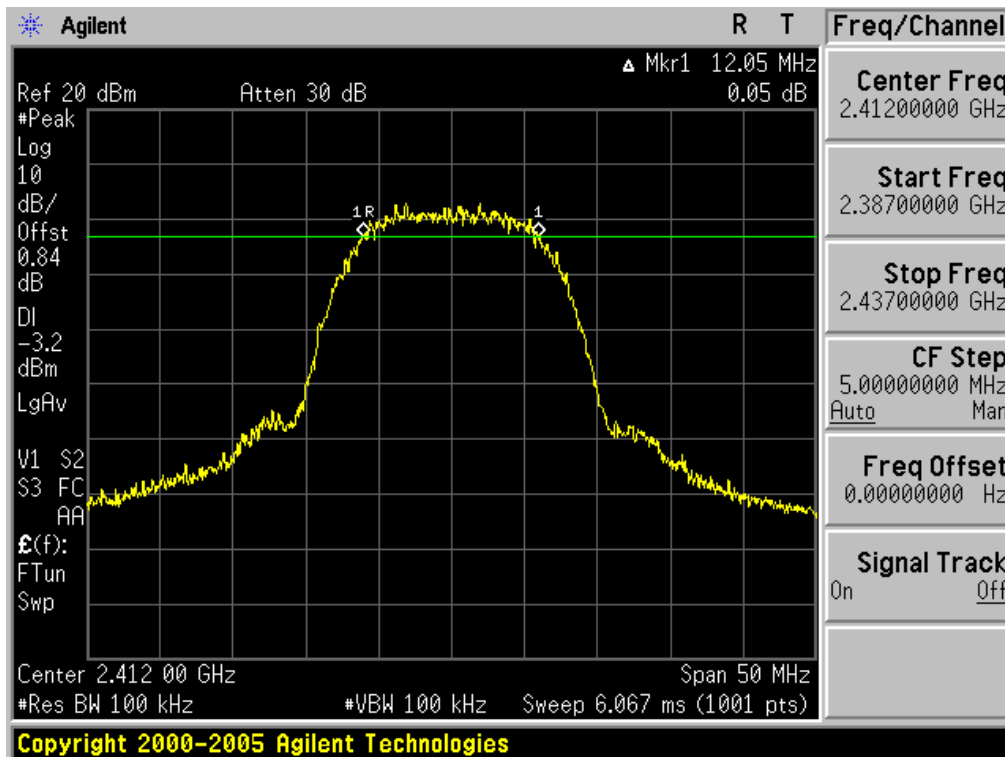
- See next pages for actual measured spectrum plots.

**Minimum Standard:**

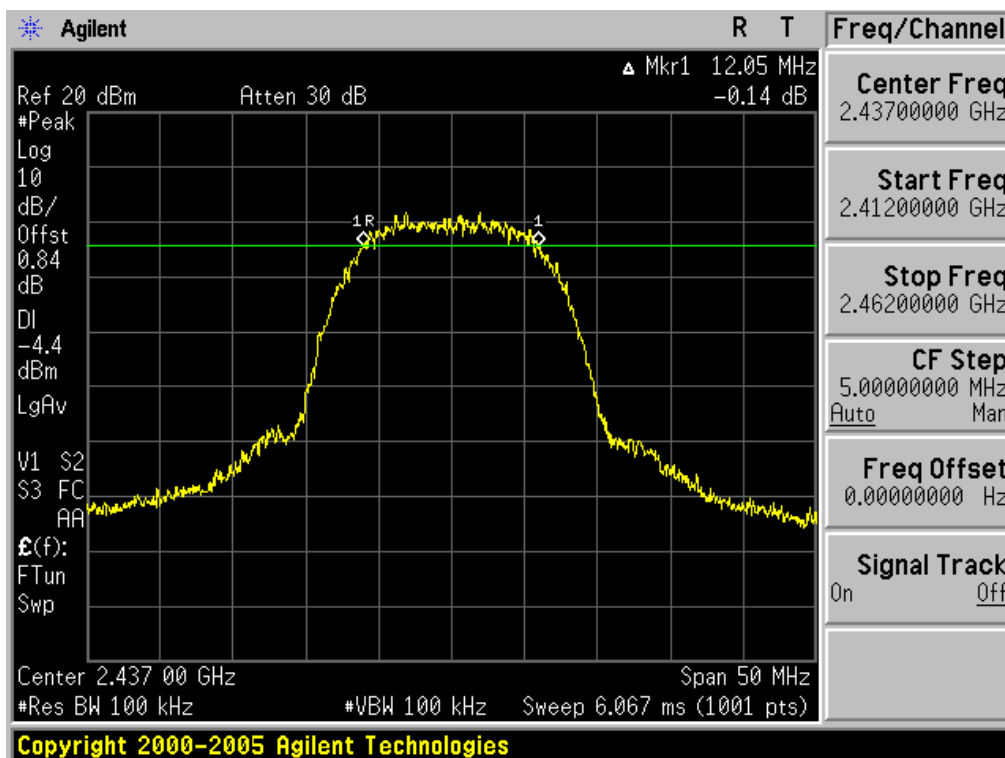
The minimum 6 dB bandwidth shall be at least 500 kHz

6 dB Bandwidth

802.11b Mode



Low Channel

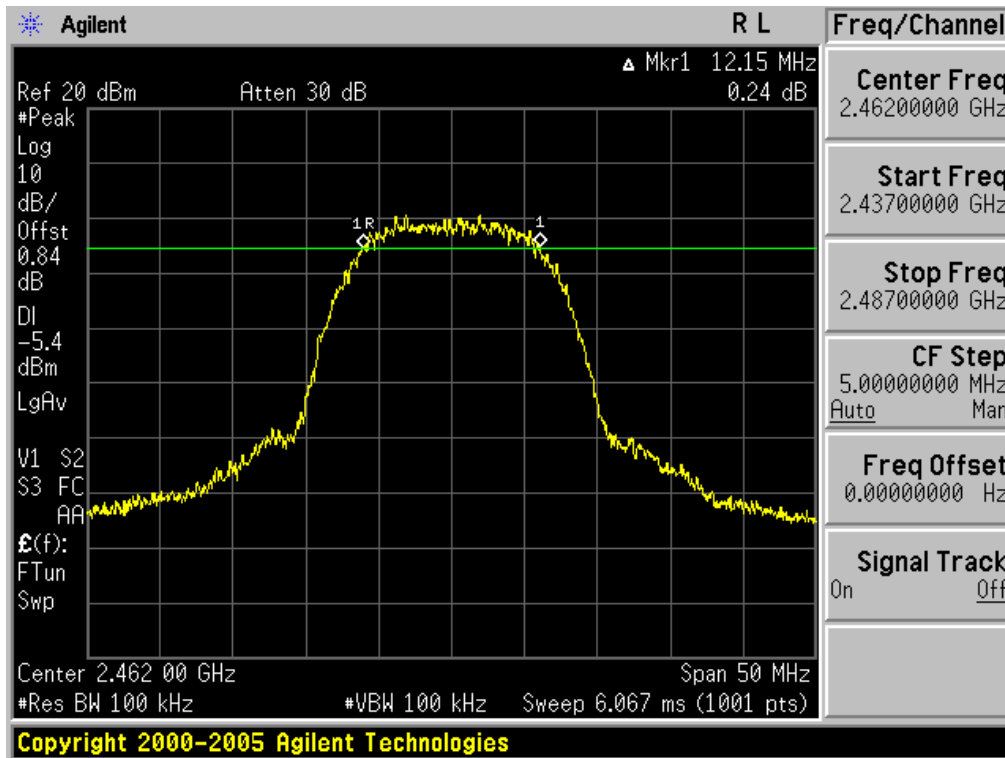


Middle Channel



6 dB Bandwidth

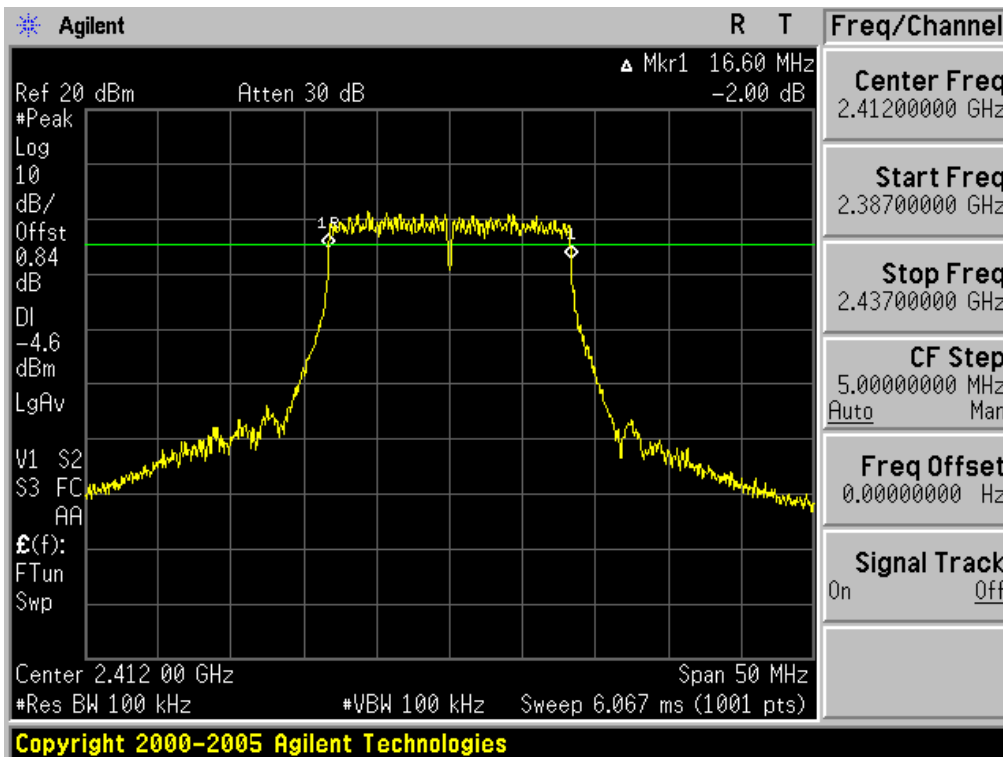
802.11b Mode



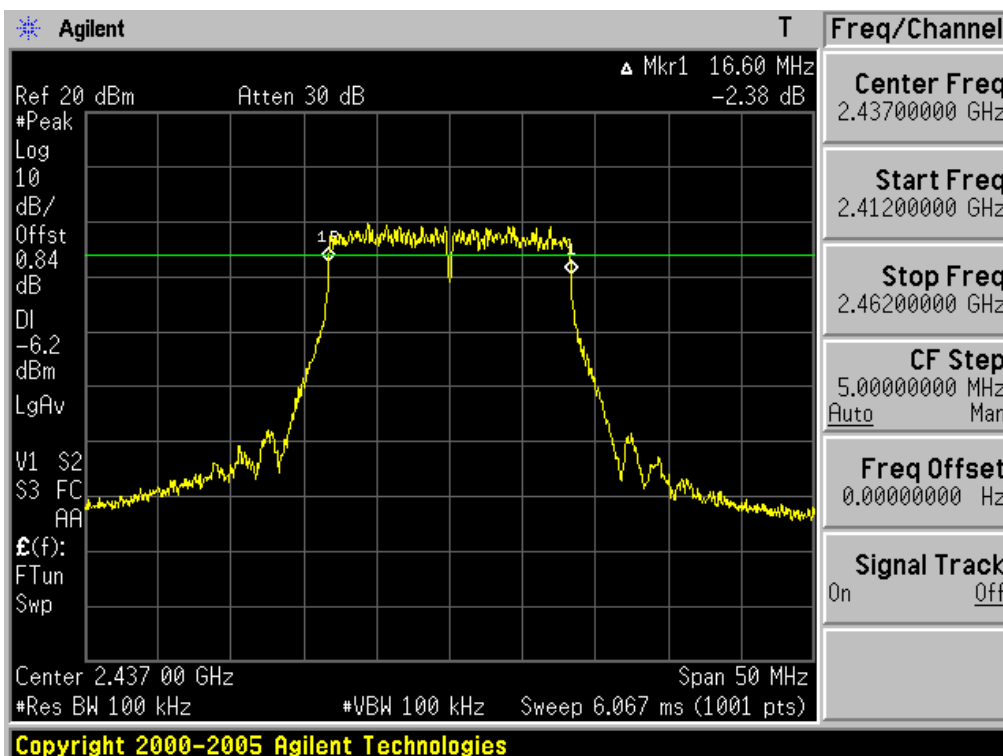
High Channel

6 dB Bandwidth

802.11g Mode



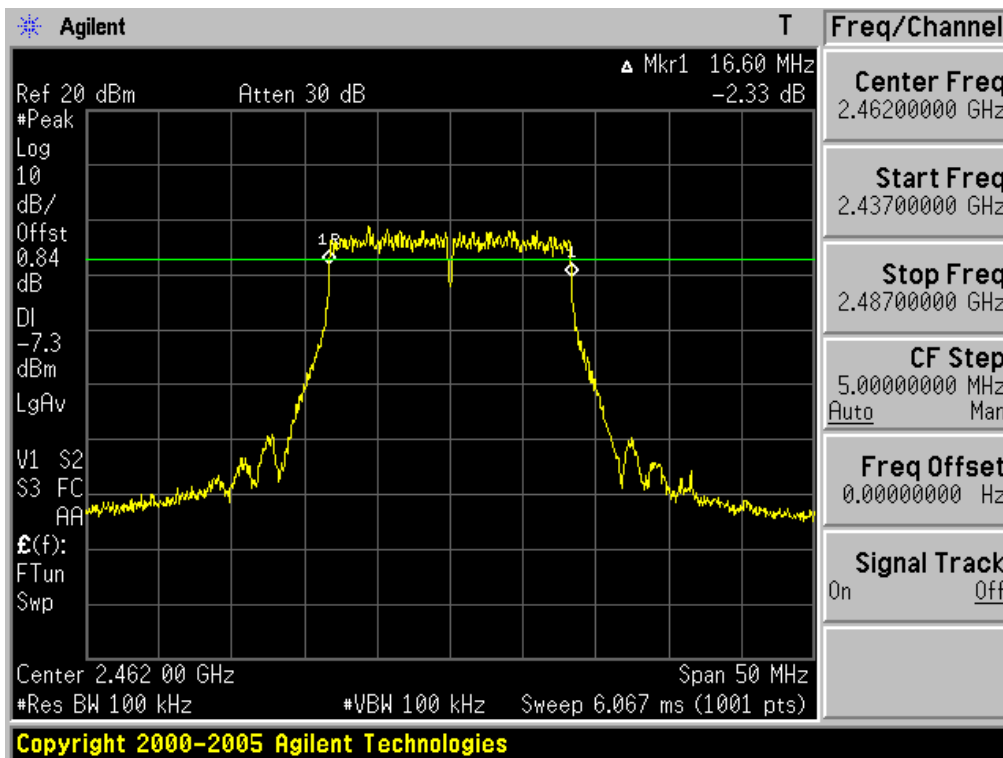
Low Channel



Middle Channel

6 dB Bandwidth

802.11g Mode



High Channel

### 3.2.2 Peak Output Power

**Test Procedure and Spectrum Analyzer setting:**

The peak output power was measured with a spectrum analyzer connected to the antenna terminal at the highest, middle and the lowest available channels.

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.

The test is performed in accordance with FCC document “Measurement of Digital Transmission Systems Operating under Section 15.247”, March 23, 2005. The transmitter operates continuously therefore Power Output Option 2, Method #1 is used.

**Measurement Data:**

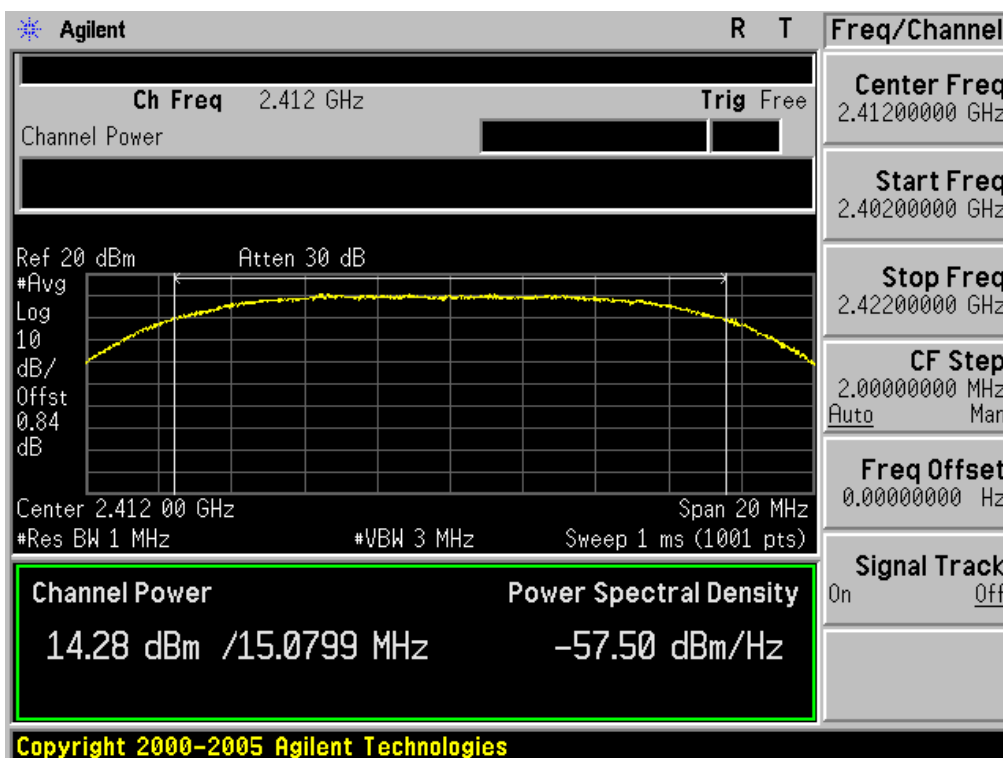
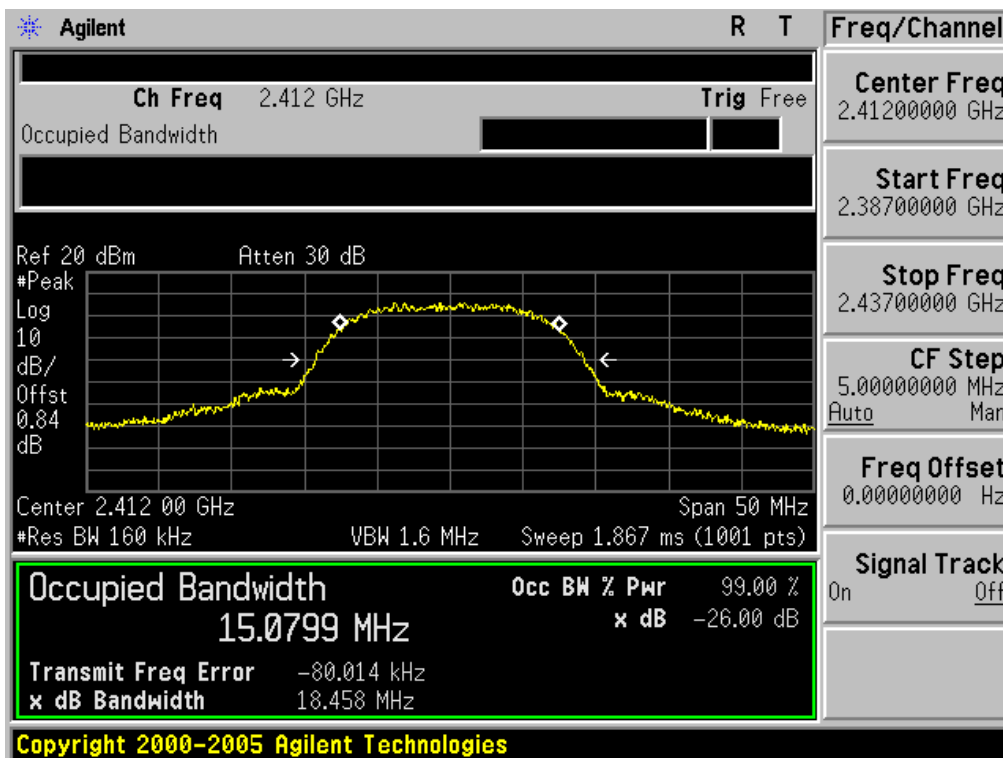
Test Mode	Frequency (MHz)	Ch.	Test Results		
			dBm	W	Result
802.11b	2412	1	14.28	0.0268	Comply
	2437	6	12.86	0.0193	Comply
	2462	11	11.93	0.0156	Comply
802.11g	2412	1	13.73	0.0236	Comply
	2437	6	12.12	0.0163	Comply
	2462	11	11.14	0.0130	Comply

- See next pages for actual measured spectrum plots.

<b>Minimum Standard:</b>	< 1W
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99% Bandwidth and Peak Output Power

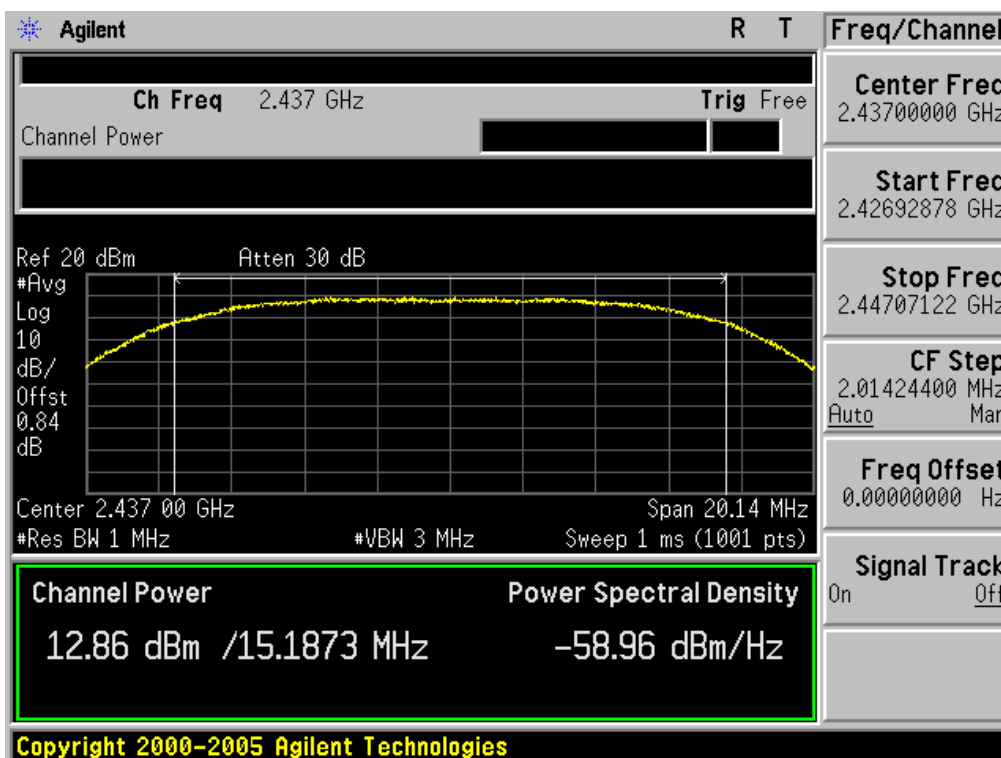
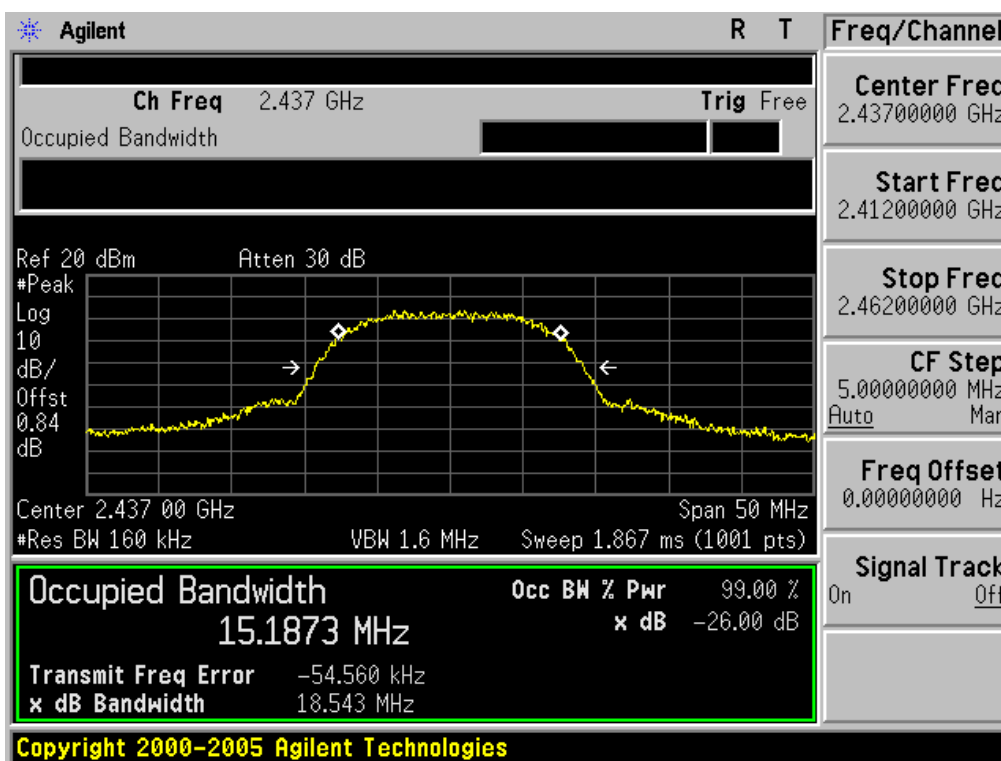
802.11b Mode



Low Channel

99% Bandwidth and Peak Output Power

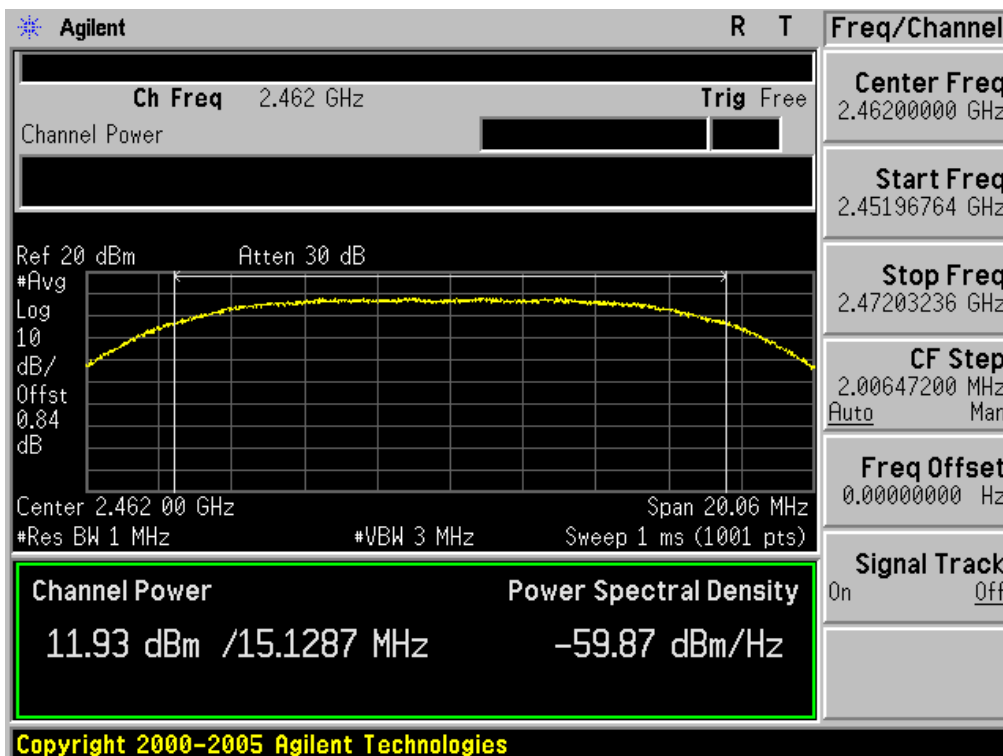
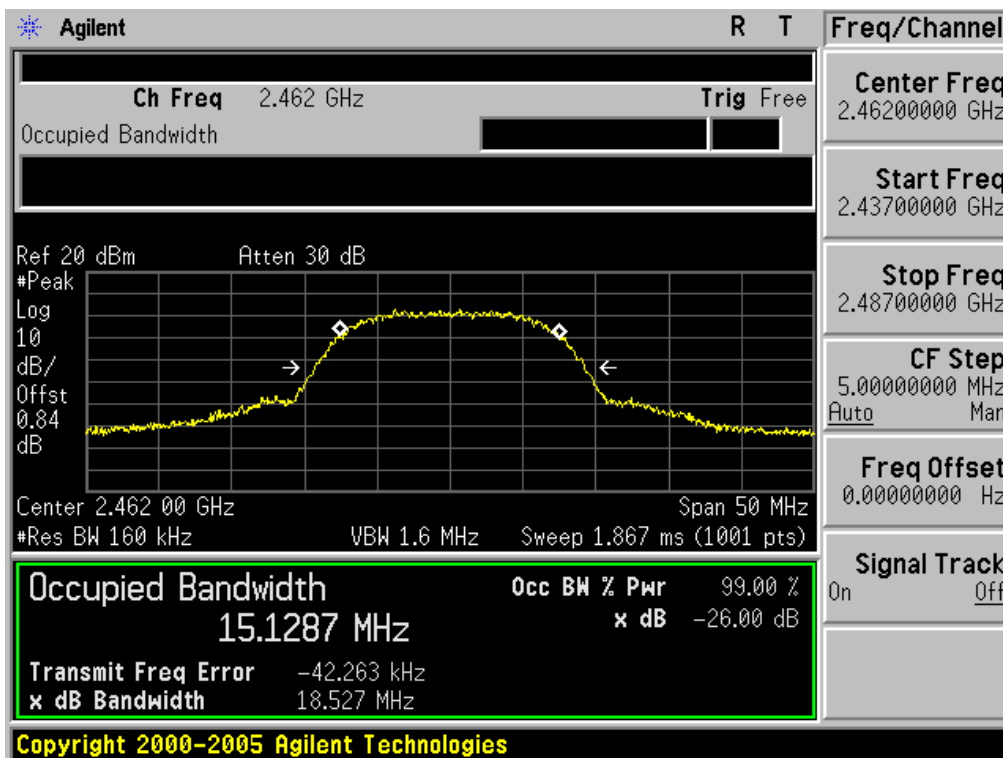
802.11b Mode



Middle Channel

99% Bandwidth and Peak Output Power

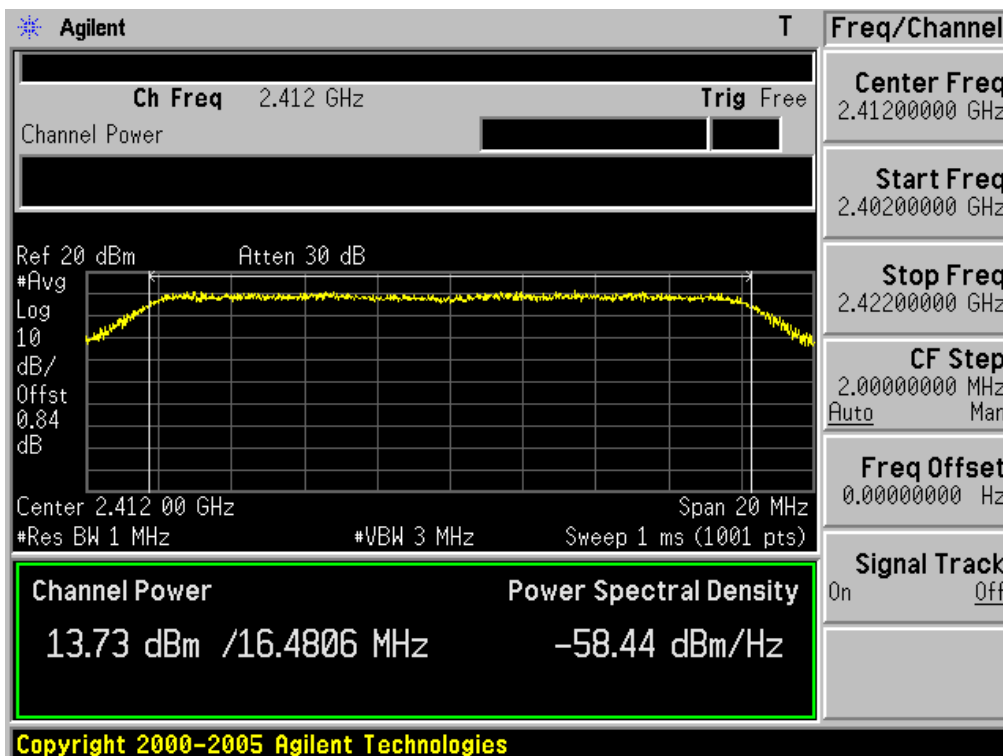
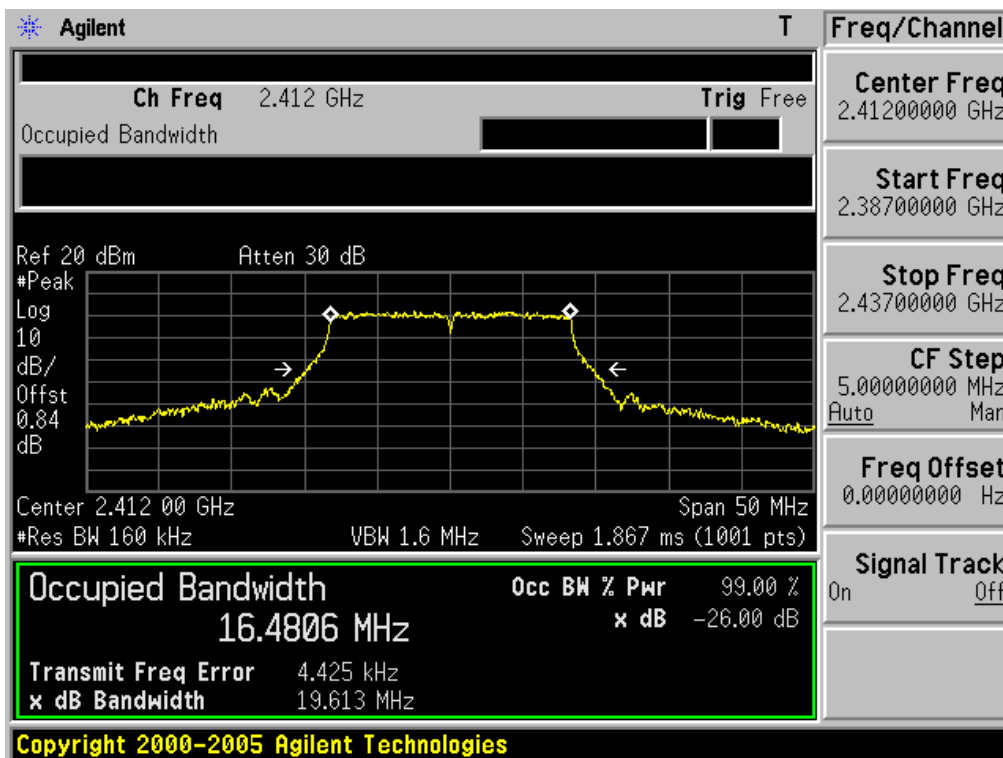
802.11b Mode



High Channel

99% Bandwidth and Peak Output Power

802.11g Mode

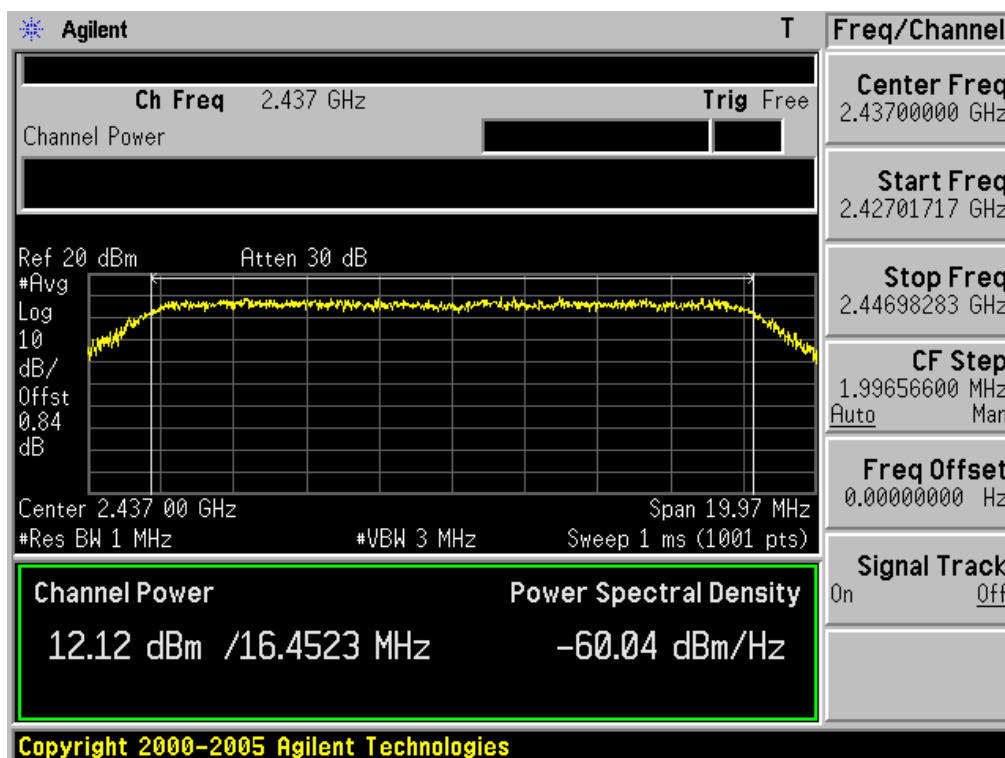
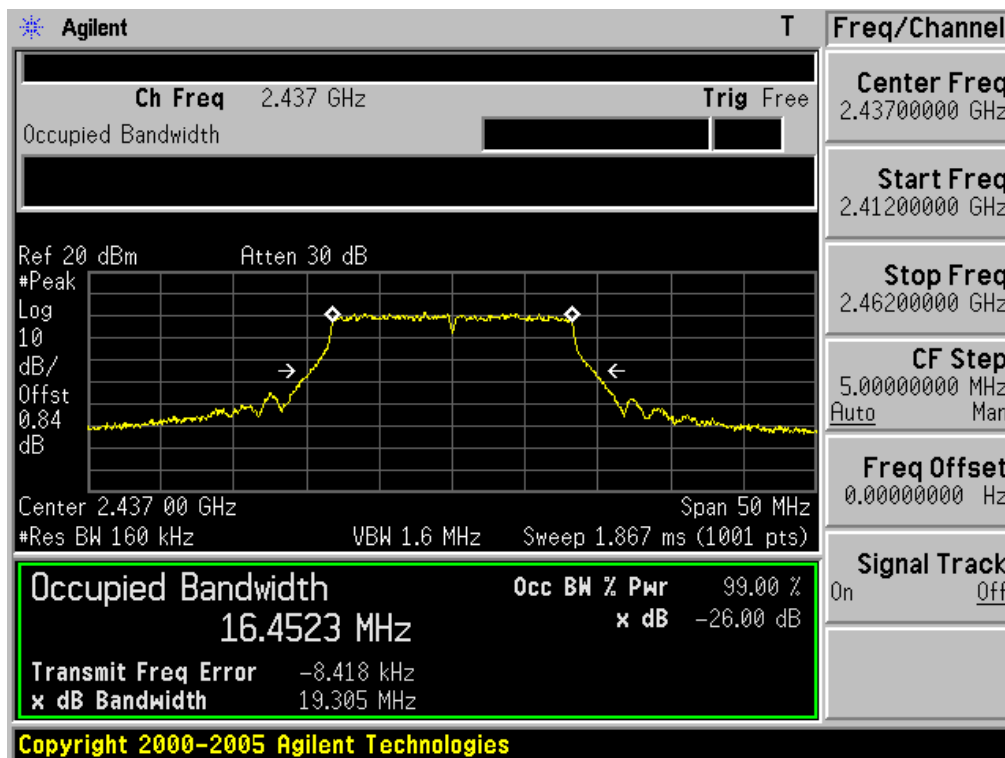


Low Channel



99% Bandwidth and Peak Output Power

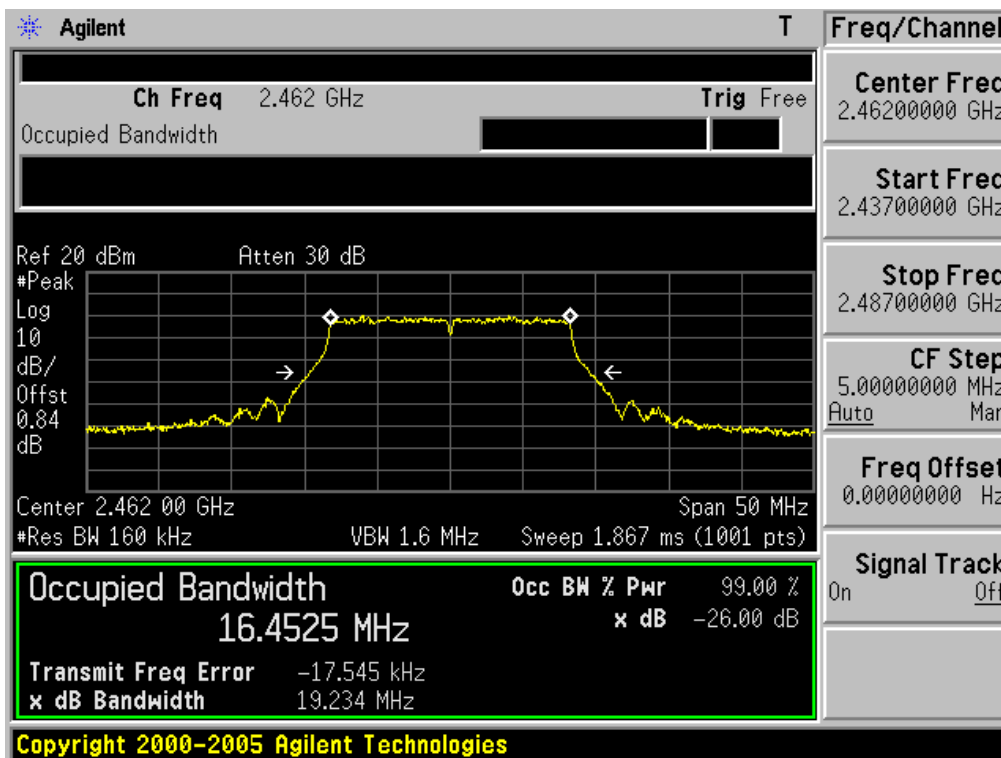
802.11g Mode



Middle Channel

99% Bandwidth and Peak Output Power

802.11g Mode



High Channel

### 3.2.3 Out of Band Emissions / Band Edge

**Procedure:**

The bandwidth at 20dB down from the highest inband spectral density is measured with a spectrum analyzer connected to the antenna terminal at the highest, middle and the lowest available channels.

After the trace being stable, Use the marker-to-peak function to measure 20 dB down both sides of the intentional emission. This device complies with use of power option 2. The attenuation under this paragraph shall be 30dB instead of 20dB.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

RBW = 100 kHz

VBW = 100 kHz

Span = 100 MHz

Detector function = peak

Trace = max hold

Sweep = auto

**Measurement Data: Comply**

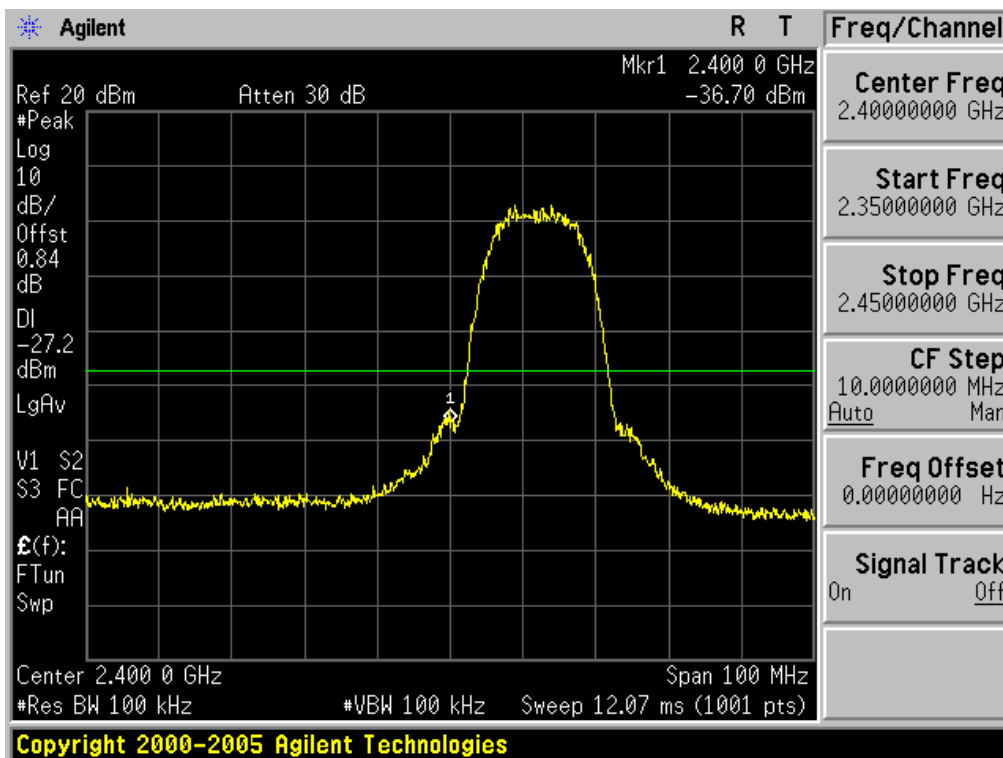
- All conducted emission in any 100kHz bandwidth outside of the spread spectrum band was at least 30dB lower than the highest inband spectral density. Therefore the applying equipment meets the requirement.
- See next pages for actual measured spectrum plots.

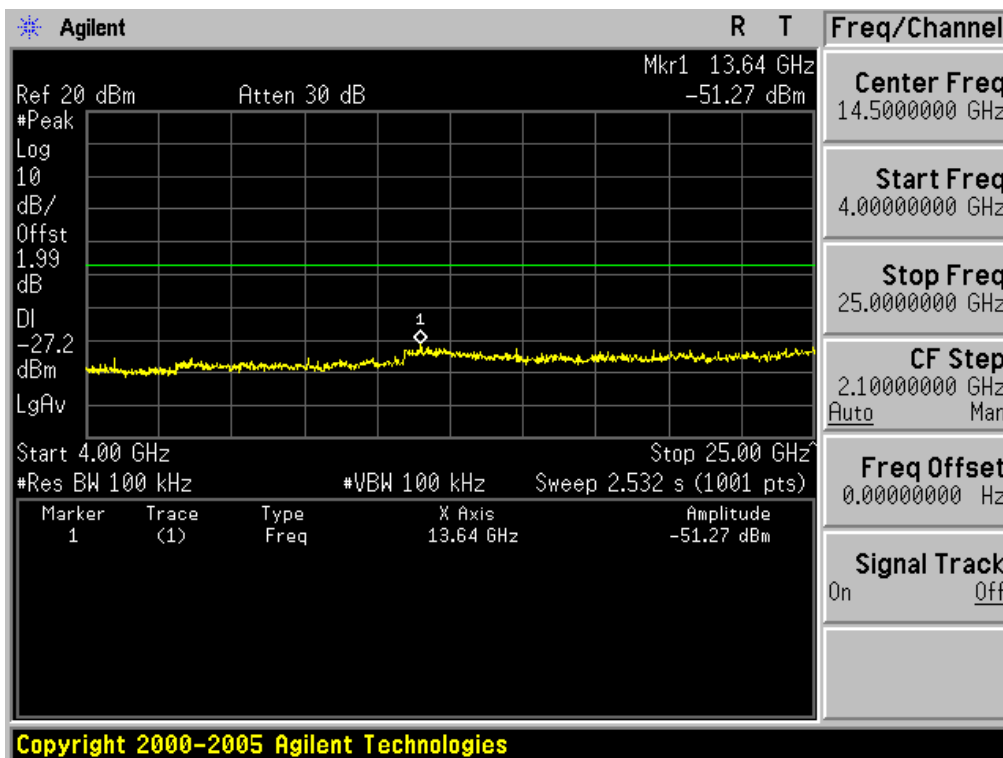
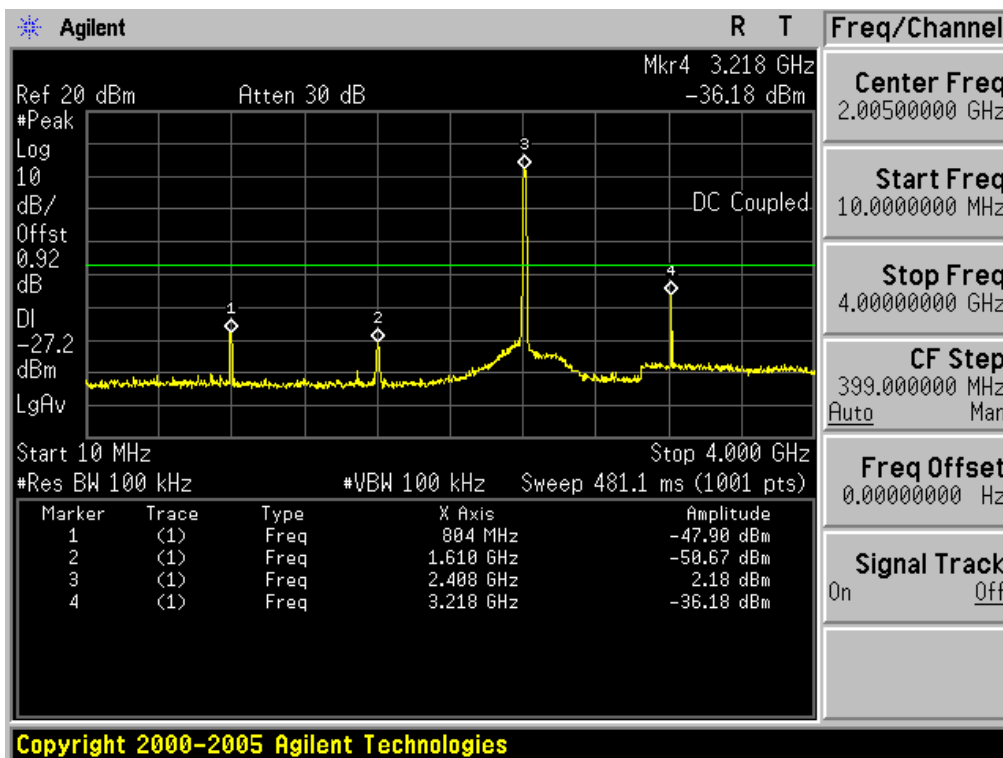
<b>Minimum Standard:</b>	> 30 dBc
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**Measurement Setup**

Same as the Chapter 3.2.1 (Figure 1)

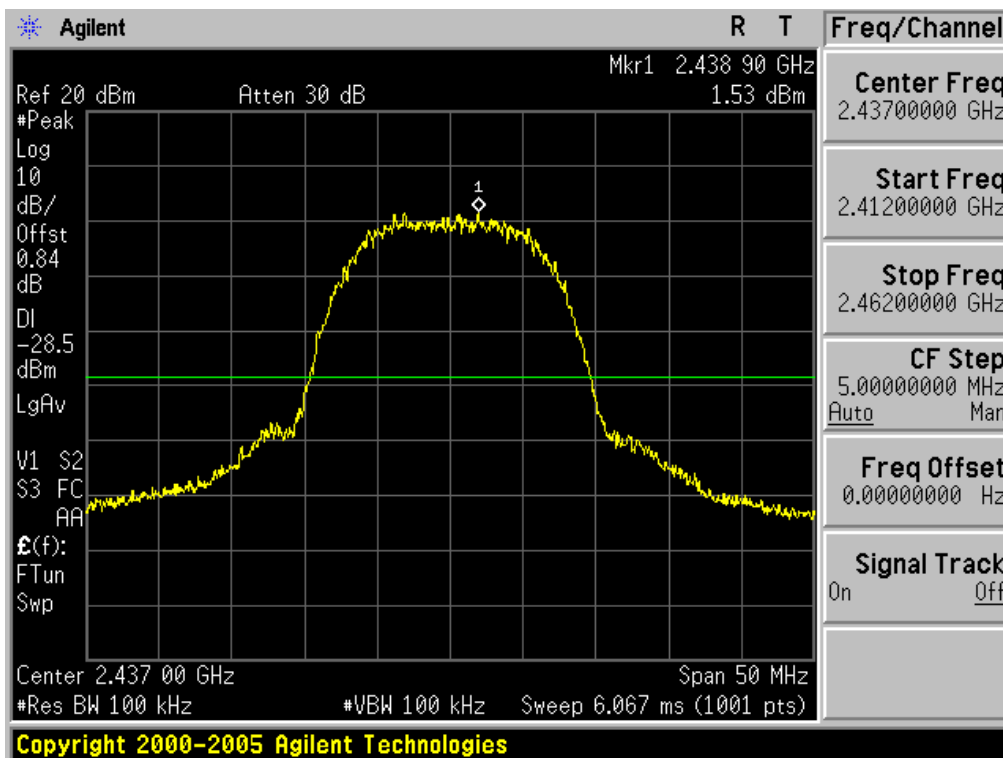
Out of Band Emissions / Band Edge (at 30 dB below) 802.11b Mode

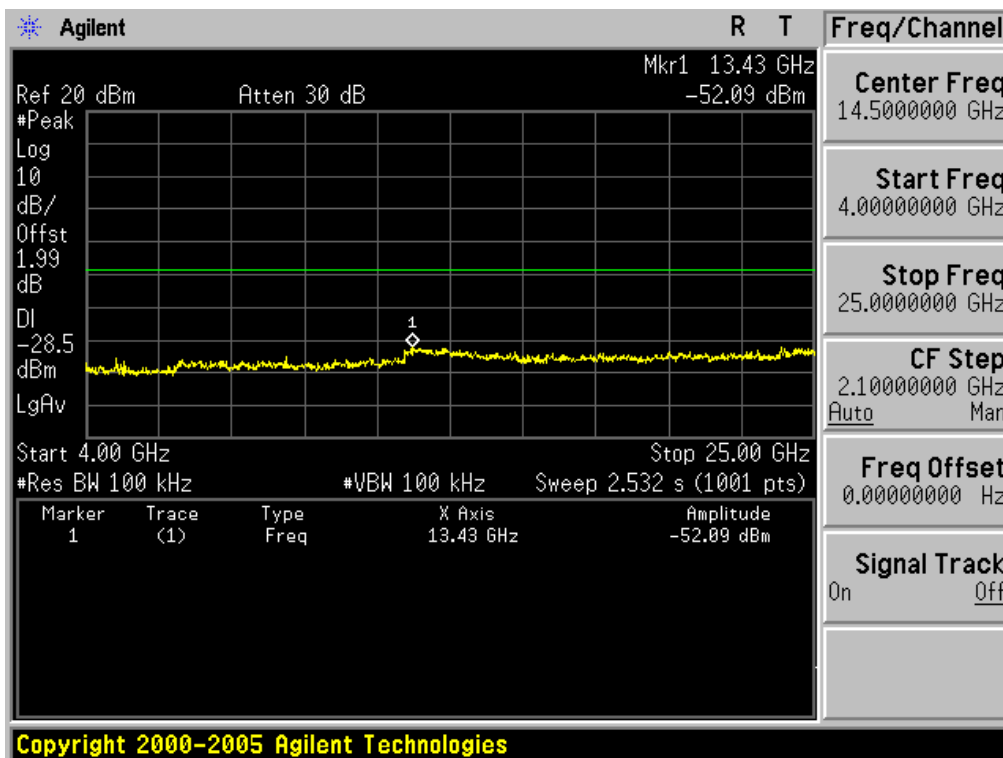
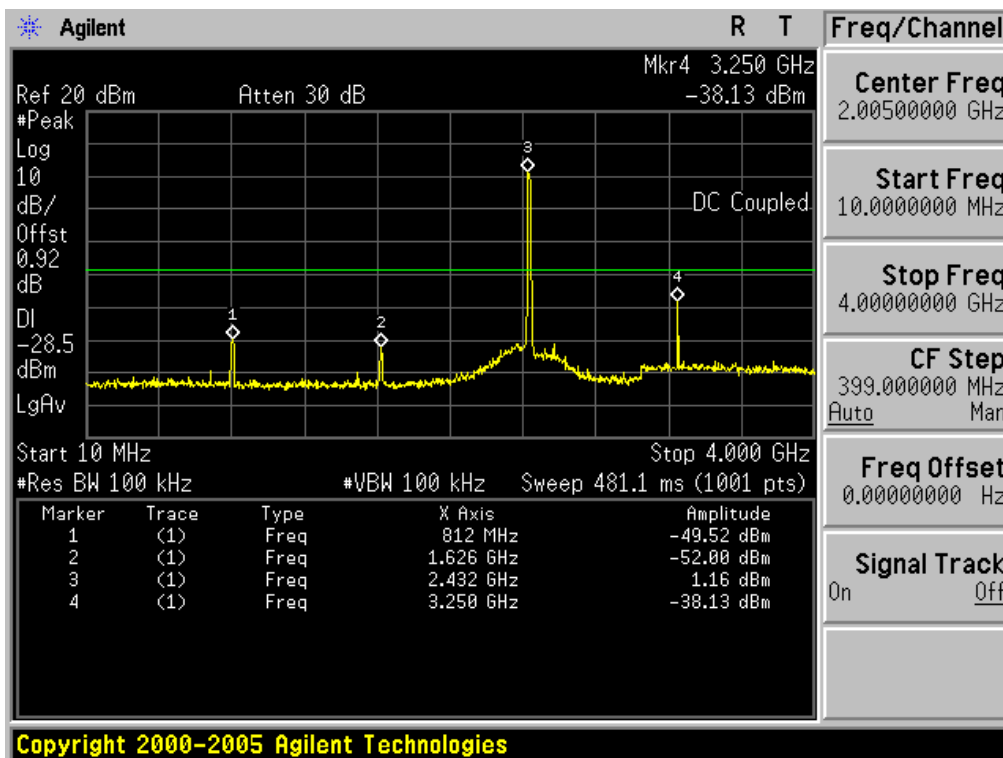




Low Channel

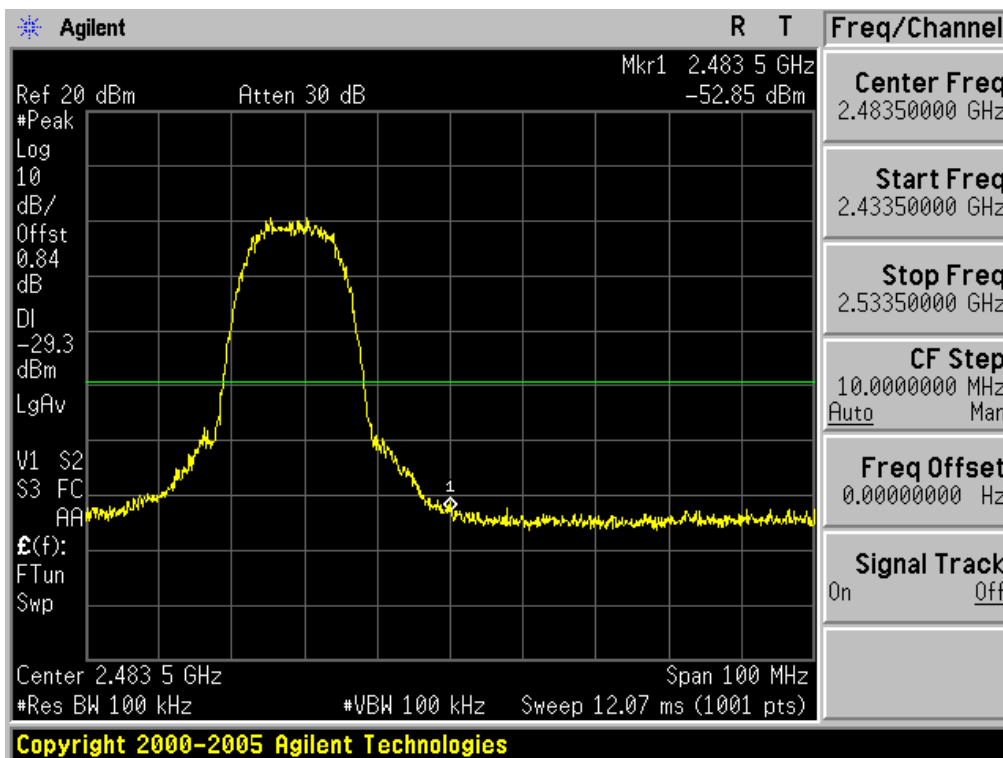
Out of Band Emissions / Band Edge (at 30 dB below) 802.11b Mode



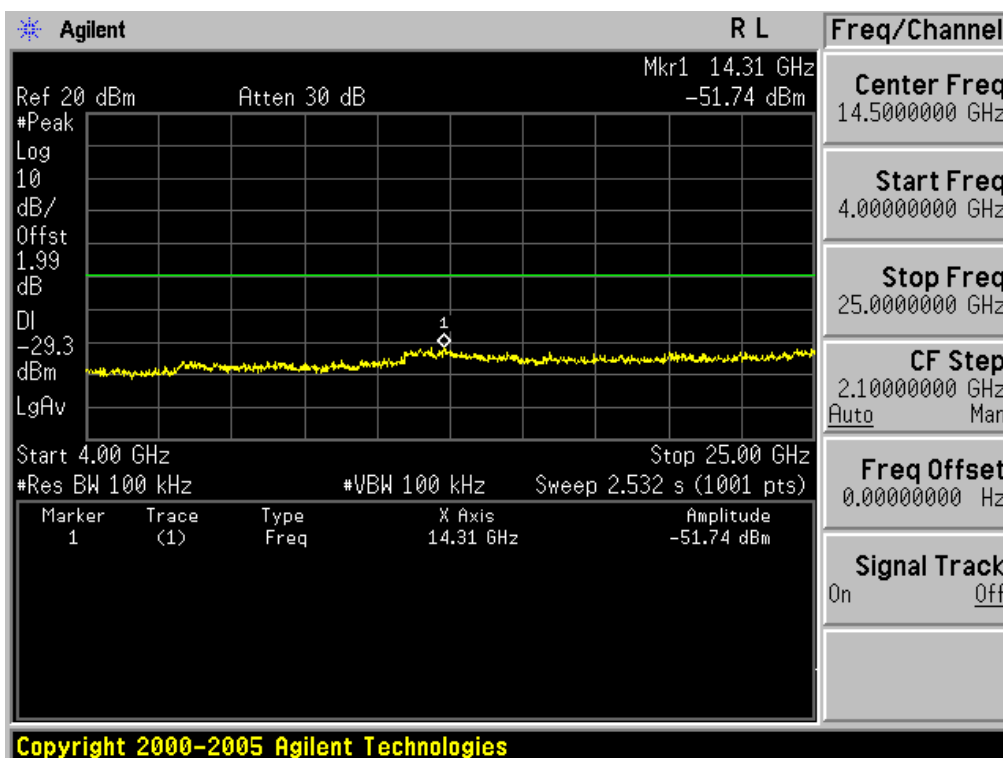
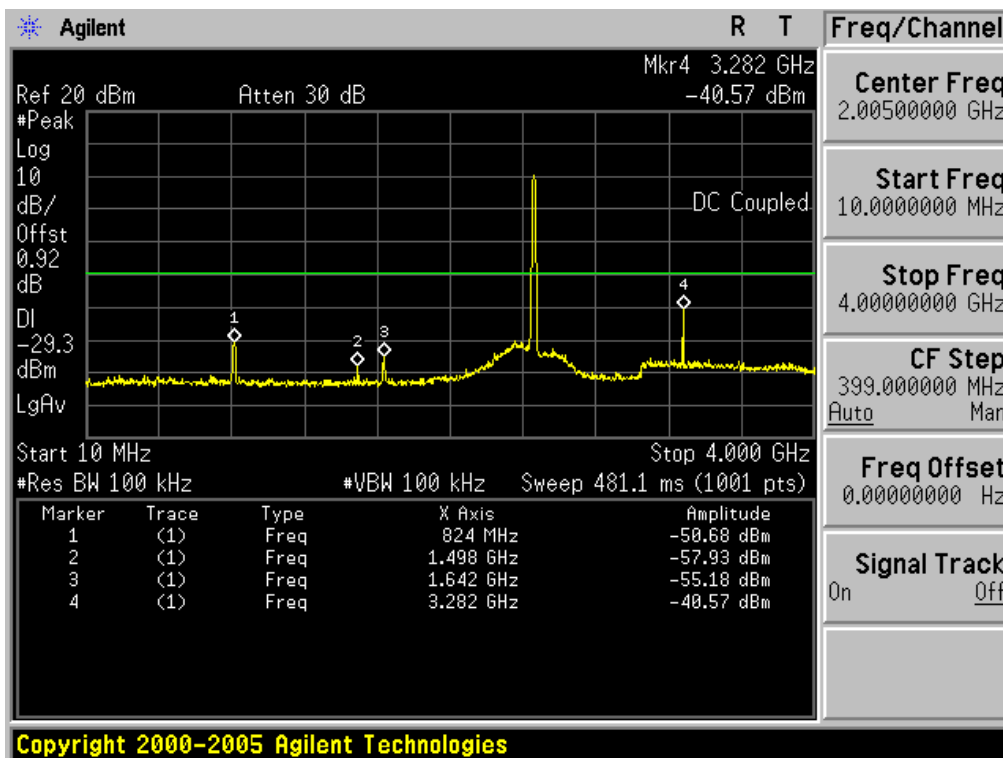


Middle Channel

Out of Band Emissions / Band Edge (at 30 dB below) 802.11b Mode

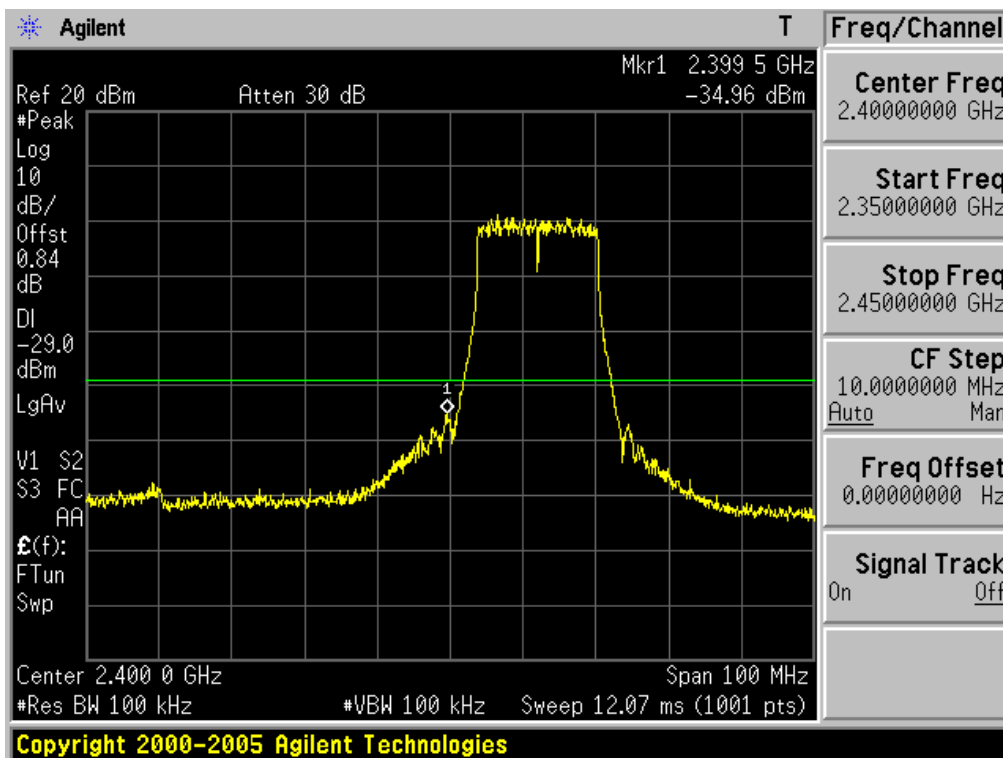


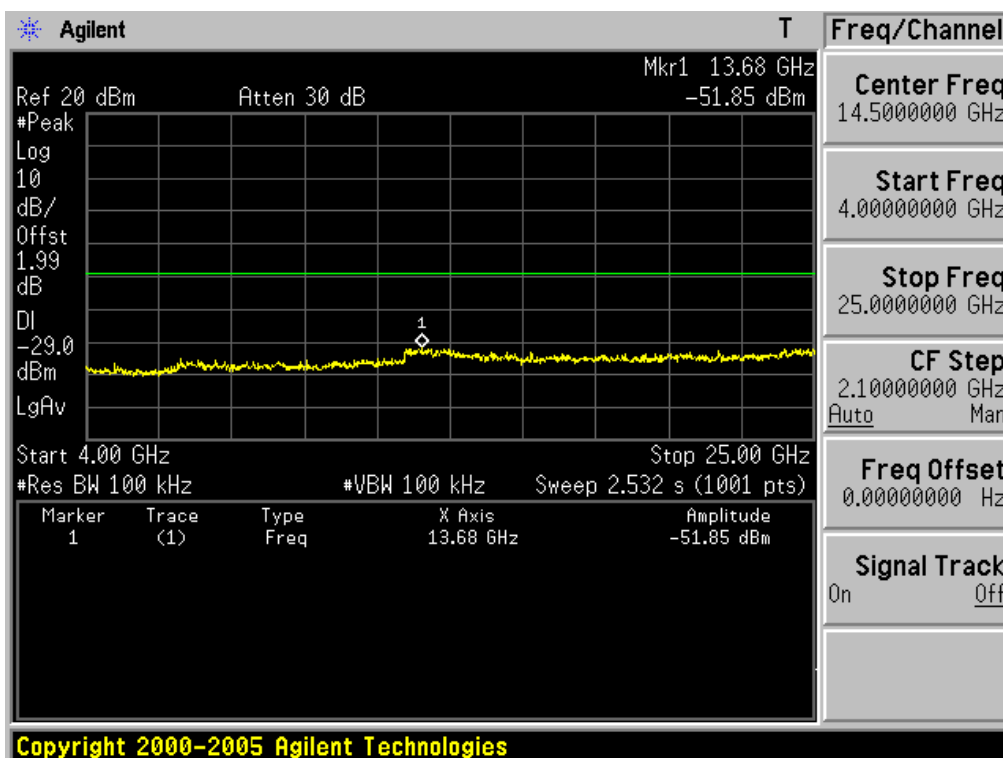
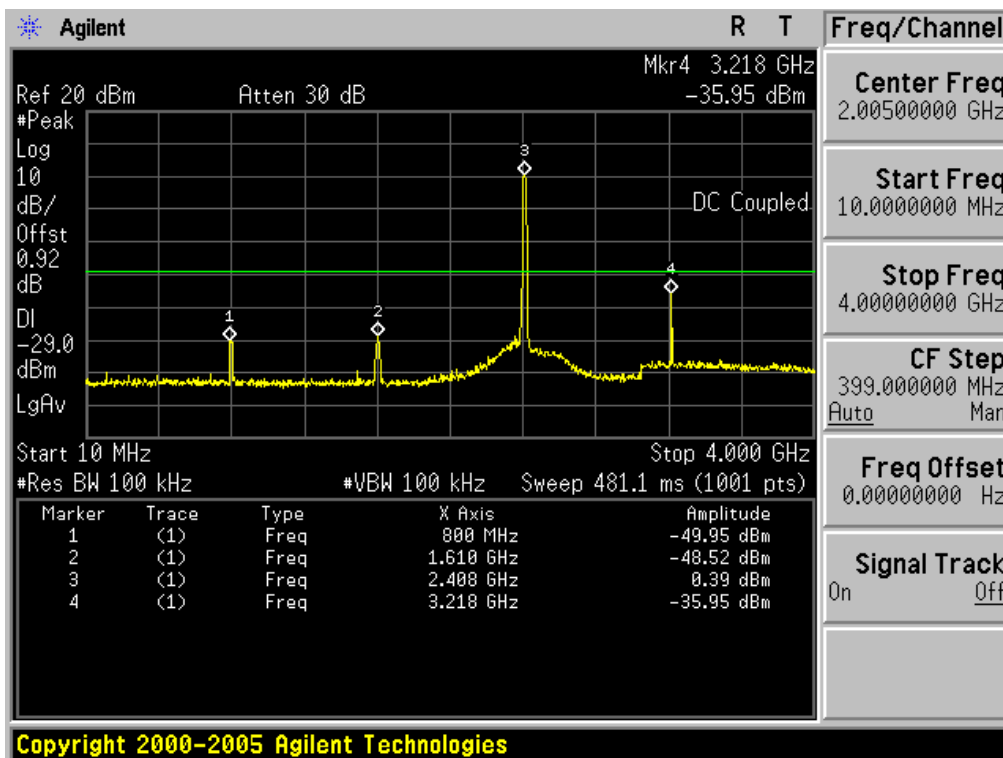




High Channel

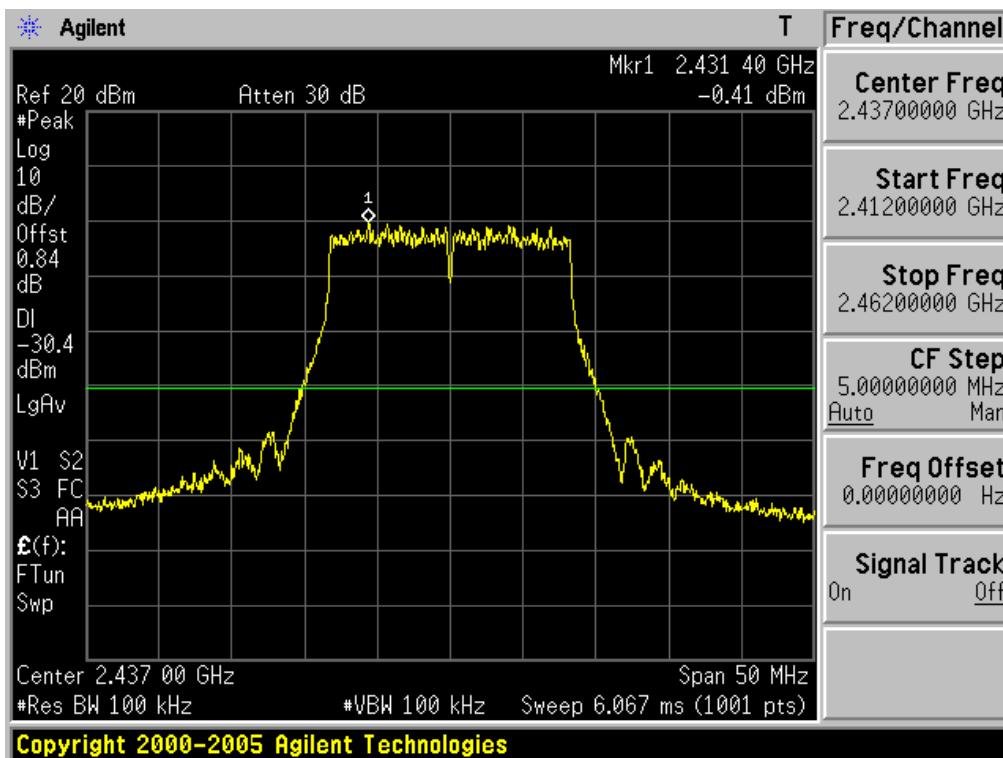
Out of Band Emissions / Band Edge (at 30 dB below) 802.11g Mode

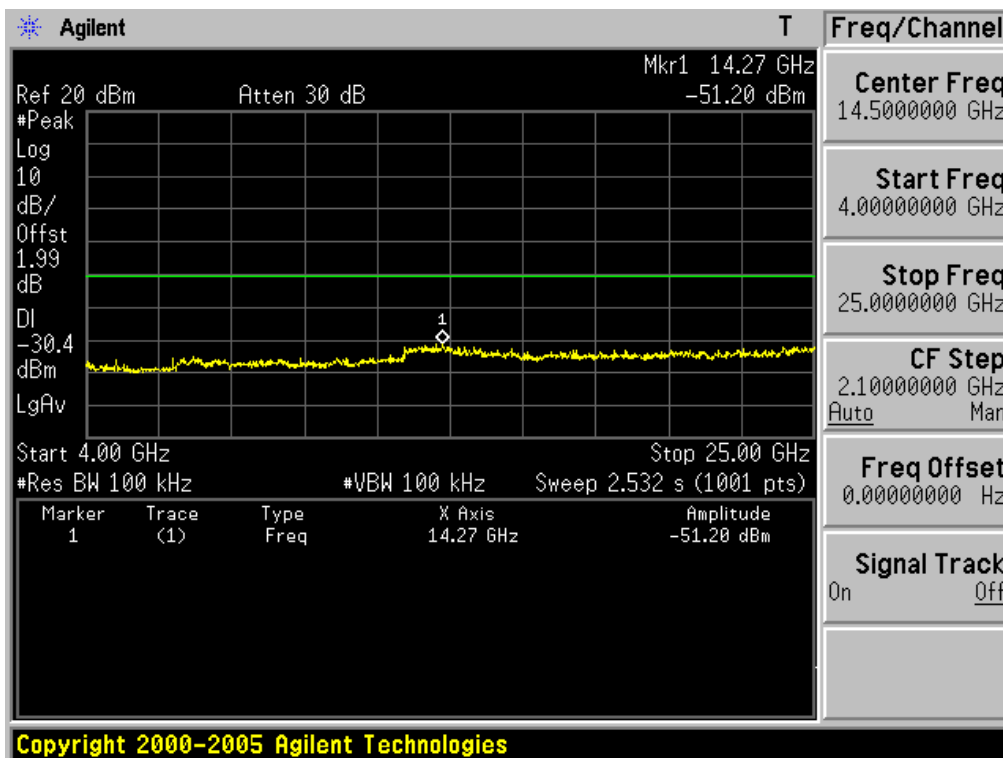
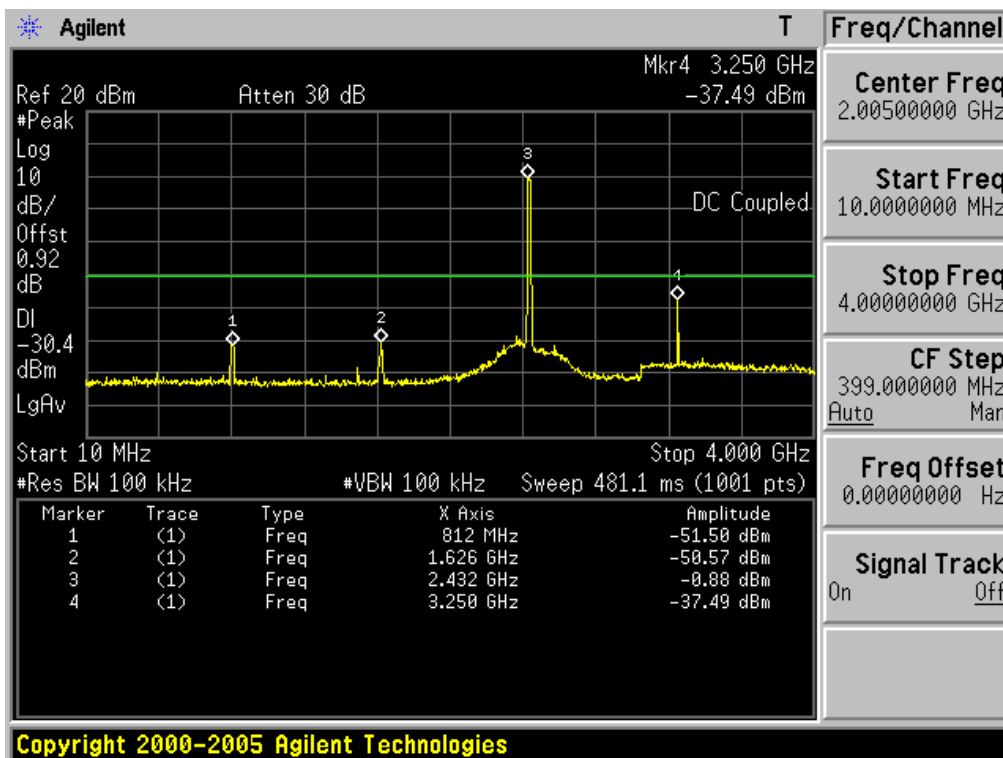




Low Channel

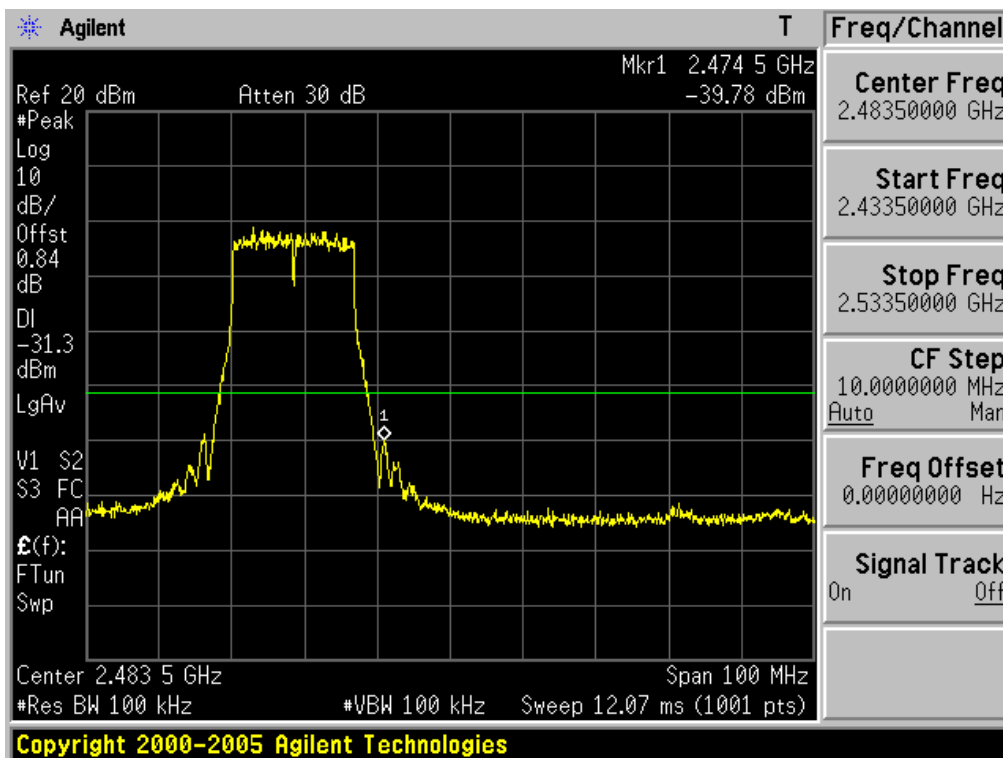
Out of Band Emissions / Band Edge (at 30 dB below) 802.11g Mode

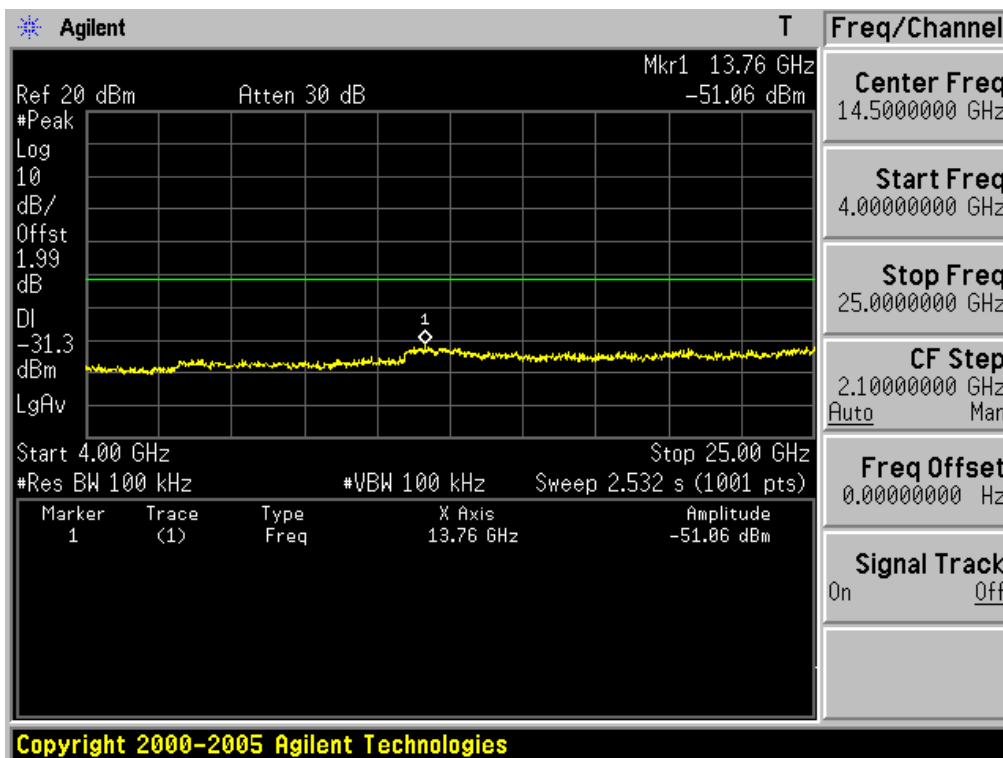
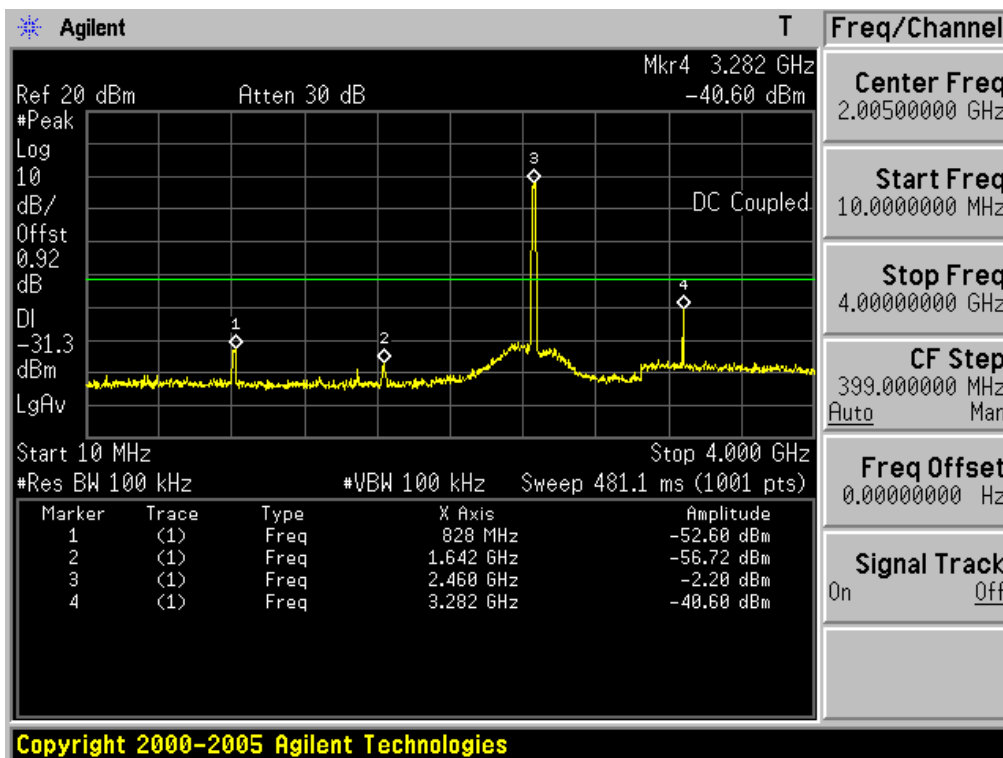




Middle Channel

Out of Band Emissions / Band Edge (at 30 dB below) 802.11g Mode





High Channel

### 3.2.4 Out of band Emission - Radiated

**Procedure:**

The EUT was placed on a 0.8m high wooden table inside a shielded enclosure. An antenna was placed near the EUT and measurements of frequencies and amplitudes of field strengths were recorded for reference during final measurements. For final radiated testing, measurements were performed in OATS. Measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine worst-case orientation for maximum emissions.

The spectrum analyzer is set to:

Center frequency = the worst channel

Frequency Range = 30 MHz ~ 10<sup>th</sup> harmonic.

RBW = 120 kHz ( 30MHz ~ 1 GHz)

= 1 MHz (1 GHz ~ 10<sup>th</sup> harmonic )

VBW = 10Hz (Average), VBW ≥ RBW ( Peak)

Trace = max hold

Sweep = auto

**Measurement Data: Comply**

- Refer to the next page.
- The test results were worst case with the EUT attached to I/O devices along with test setup photos showing attachment while radiated testing was taking place.

**Minimum Standard: FCC Part 15.205 (a), 15.205(b), 15.209(a) and (b)**

**Limit : FCC P15.209(a)**

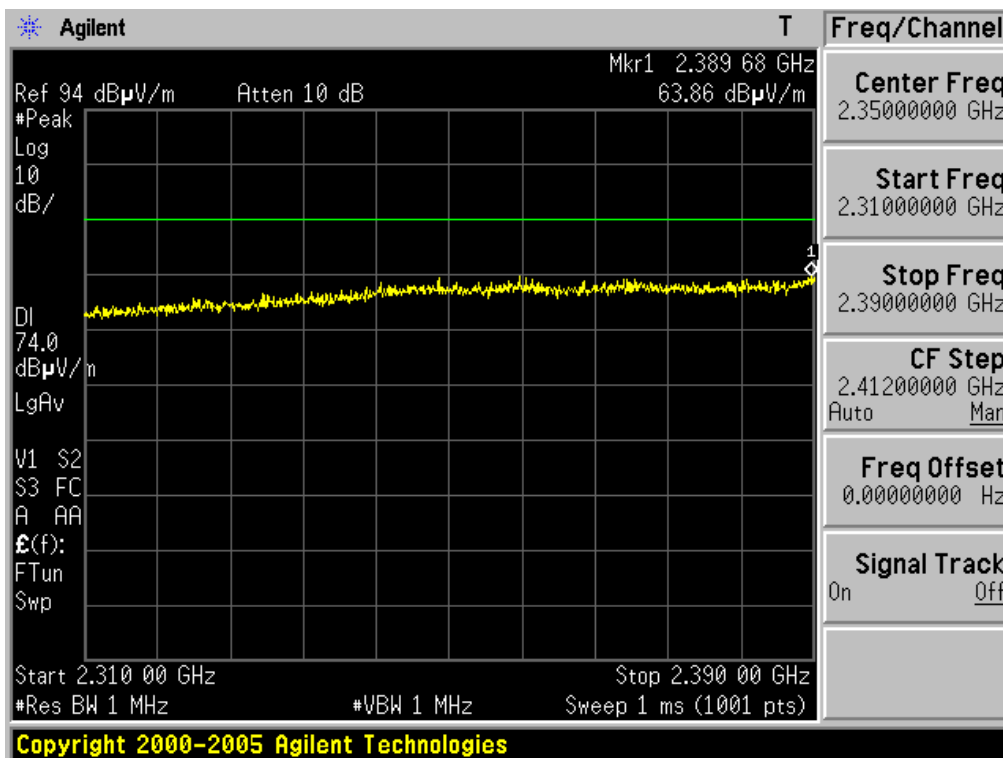
Frequency (MHz)	Limit (uV/m) @ 3m
30 ~ 88	100 **
88 ~ 216	150 **
216 ~ 960	200 **
Above 960	500

\*\* Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.



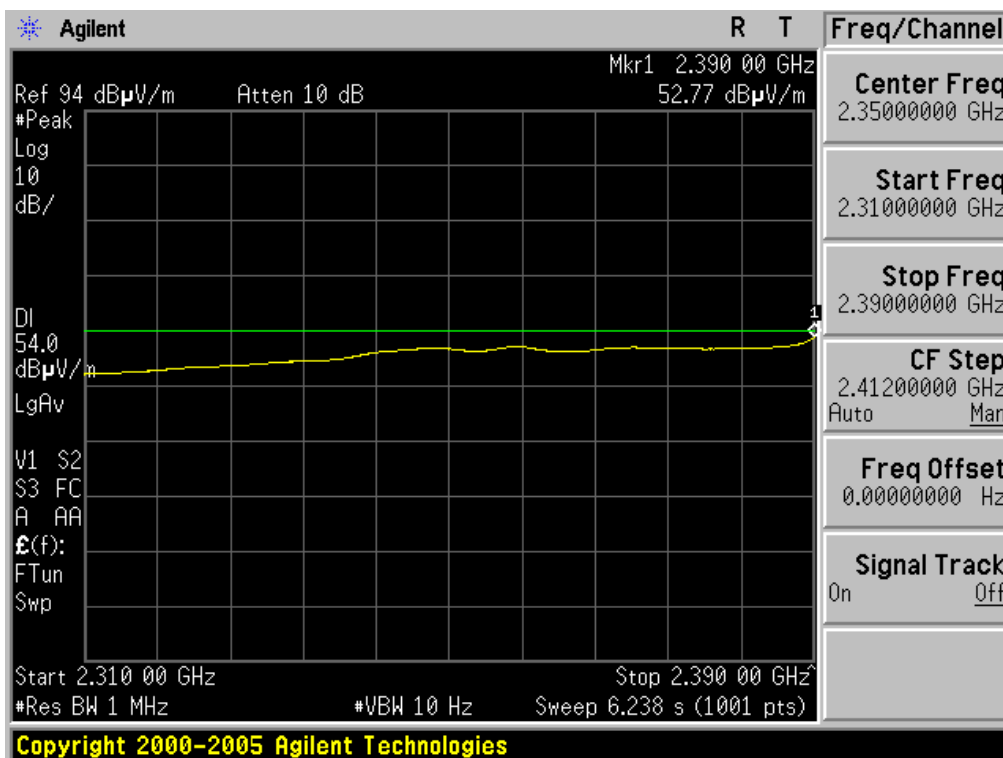
Restricted Band Edge: Low Channel (Peak, Horizontal)

802.11b Mode



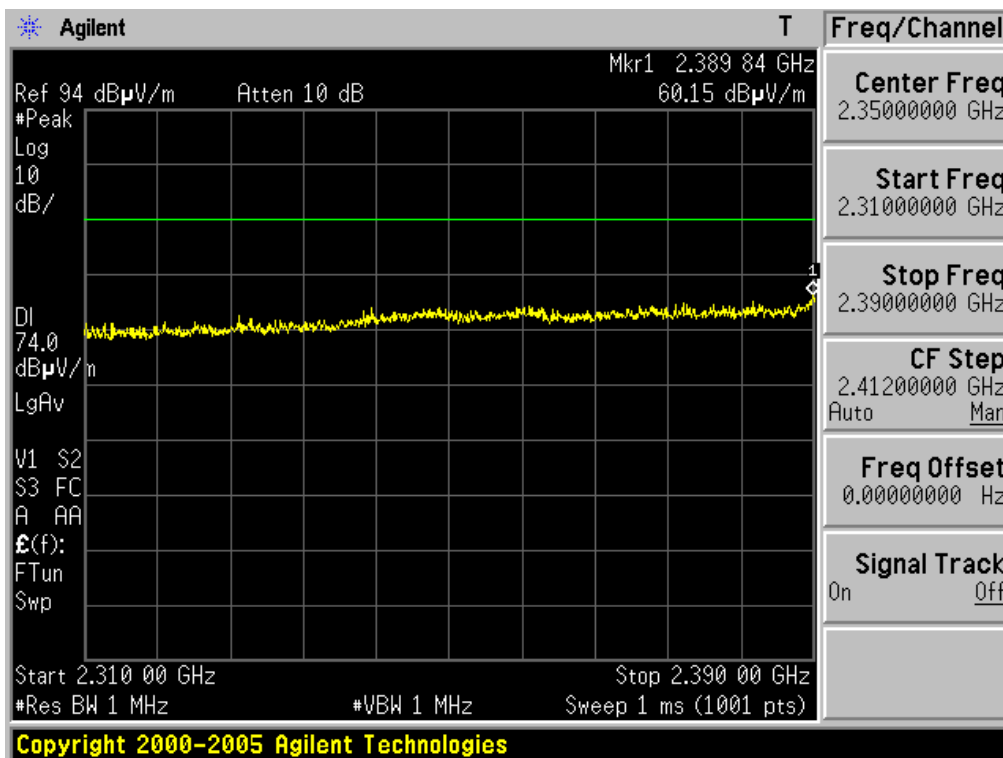
Restricted Band Edge: Low Channel (Average, Horizontal)

802.11b Mode



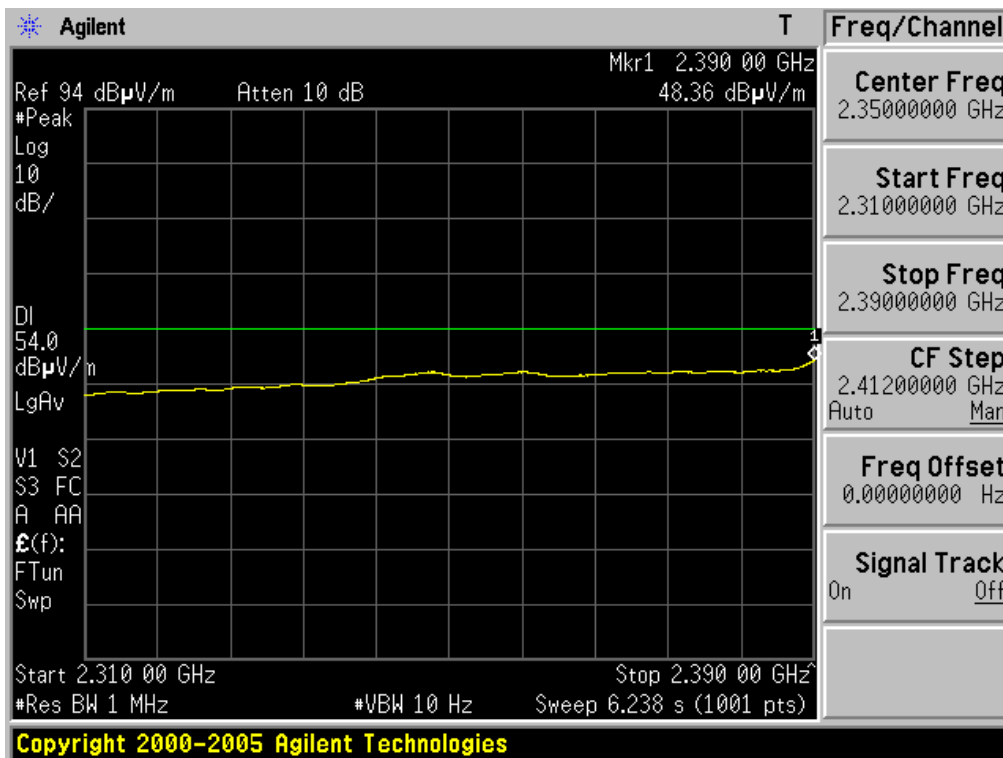
Restricted Band Edge: Low Channel (Peak, Vertical)

802.11b Mode



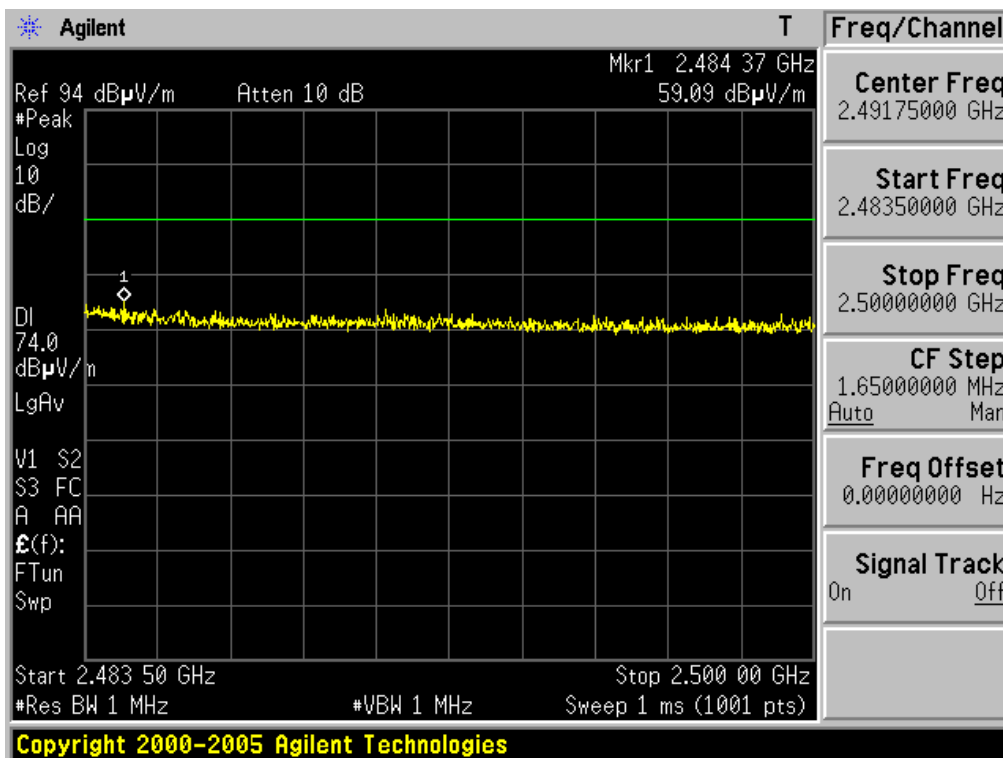
Restricted Band Edge: Low Channel (Average, Vertical)

802.11b Mode



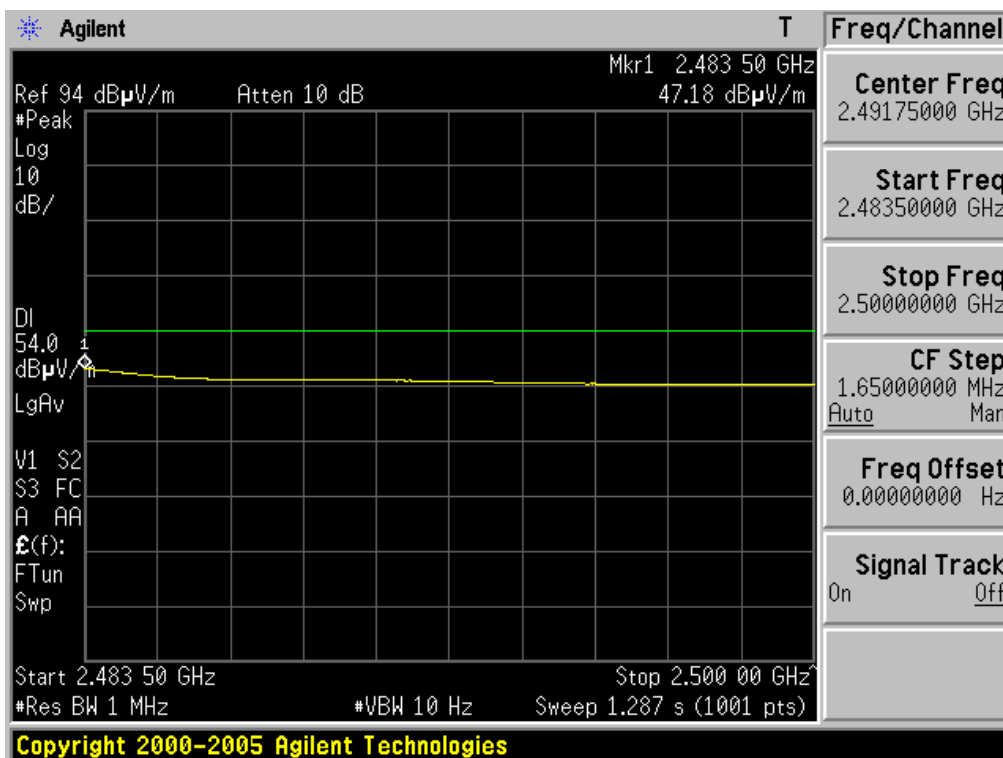
Restricted Band Edge: High Channel (Peak, Horizontal)

802.11b Mode



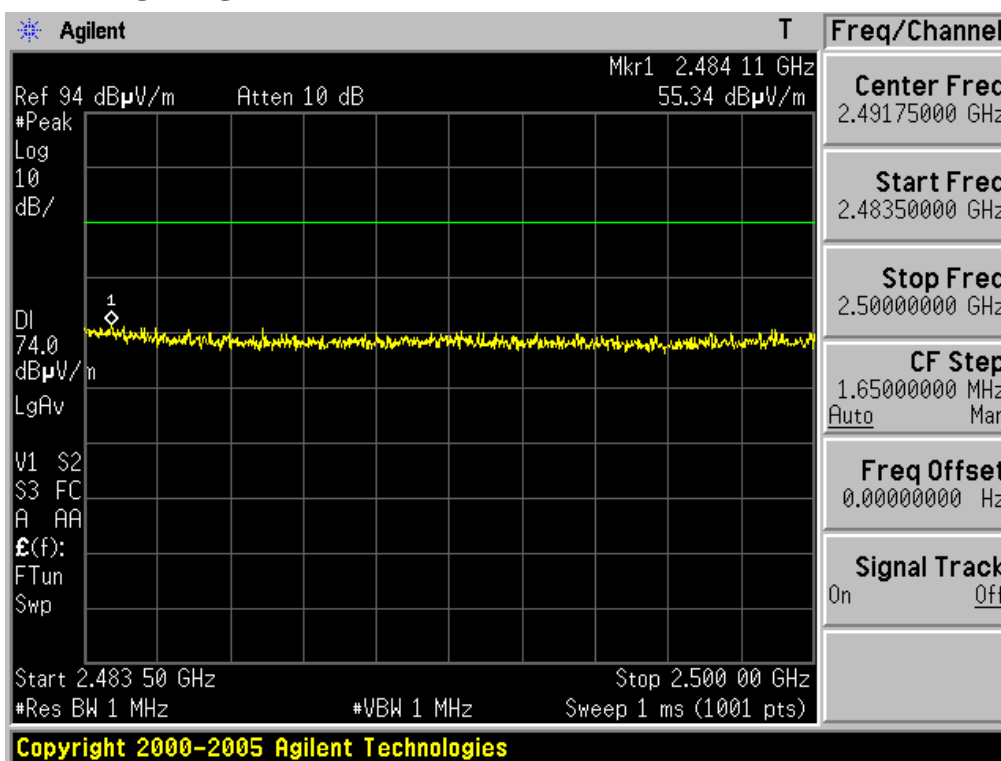
Restricted Band Edge: High Channel (Average, Horizontal)

802.11b Mode



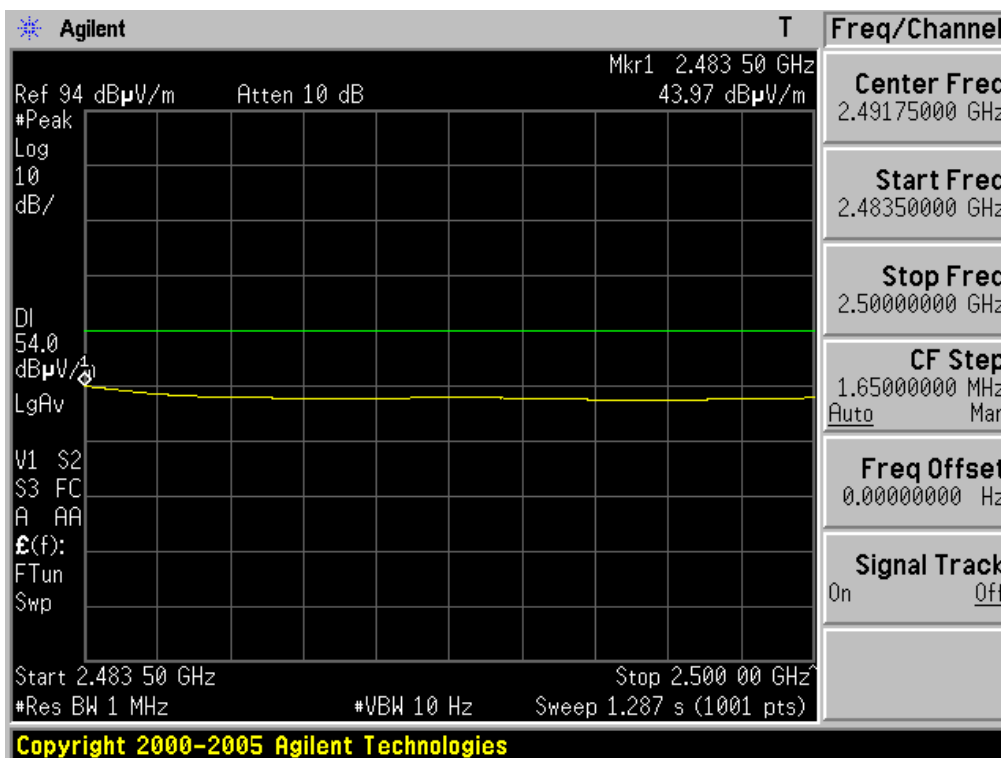
Restricted Band Edge: High Channel (Peak, Vertical)

802.11b Mode



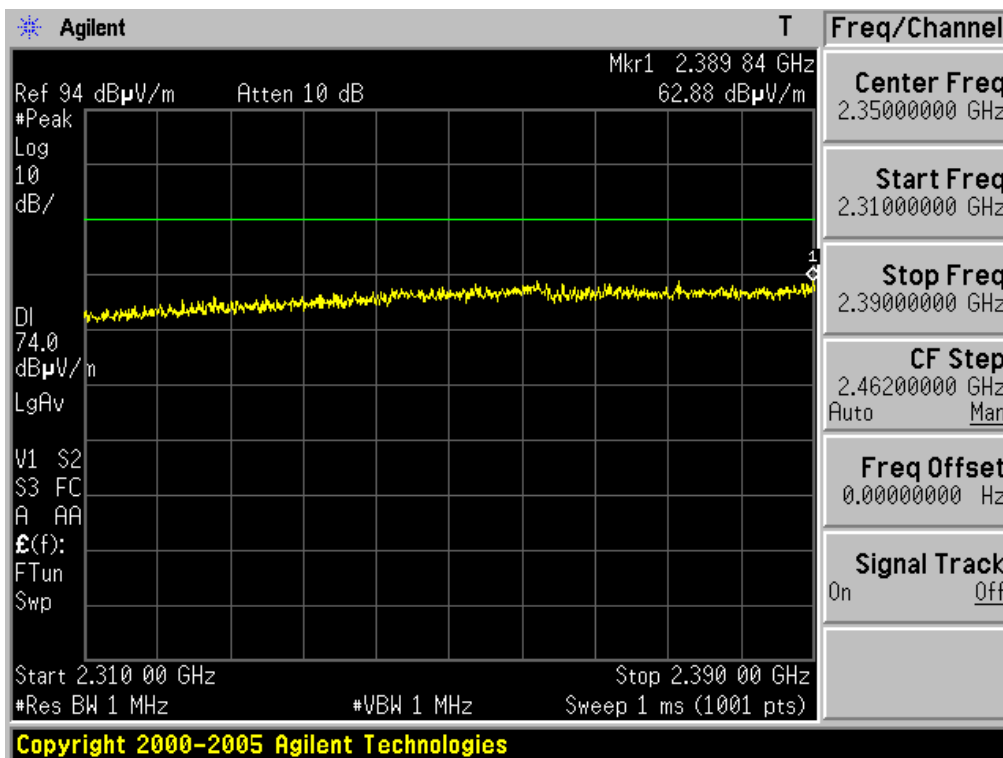
Restricted Band Edge: High Channel (Average, Vertical)

802.11b Mode



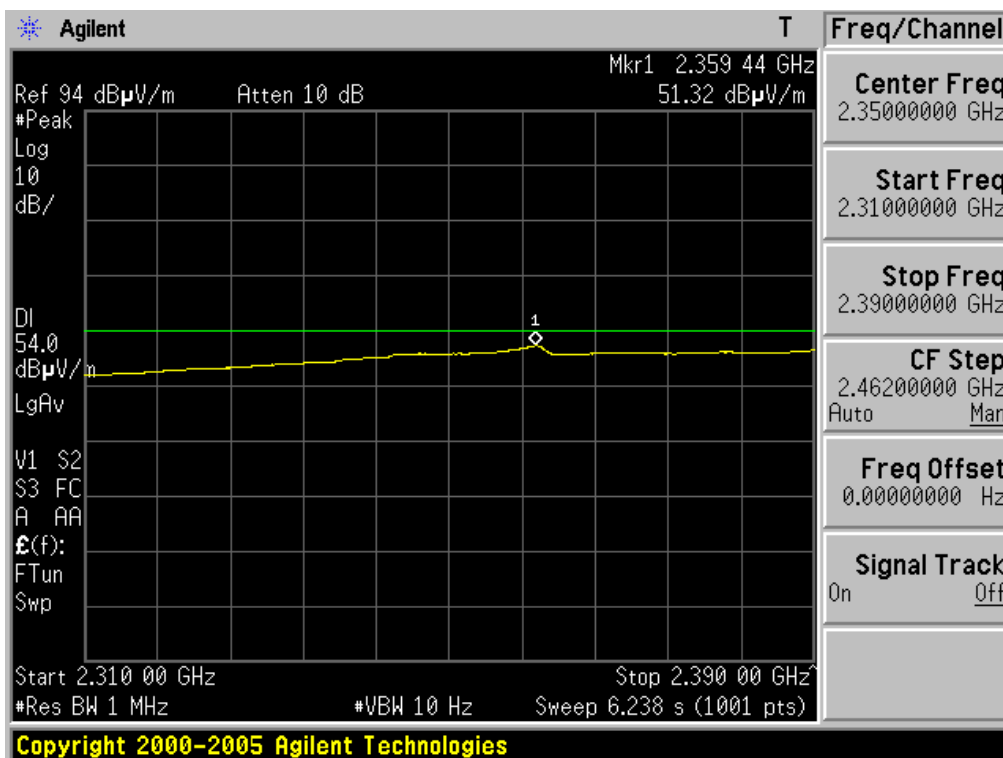
Restricted Band Edge: Low Channel (Peak, Horizontal)

802.11g Mode



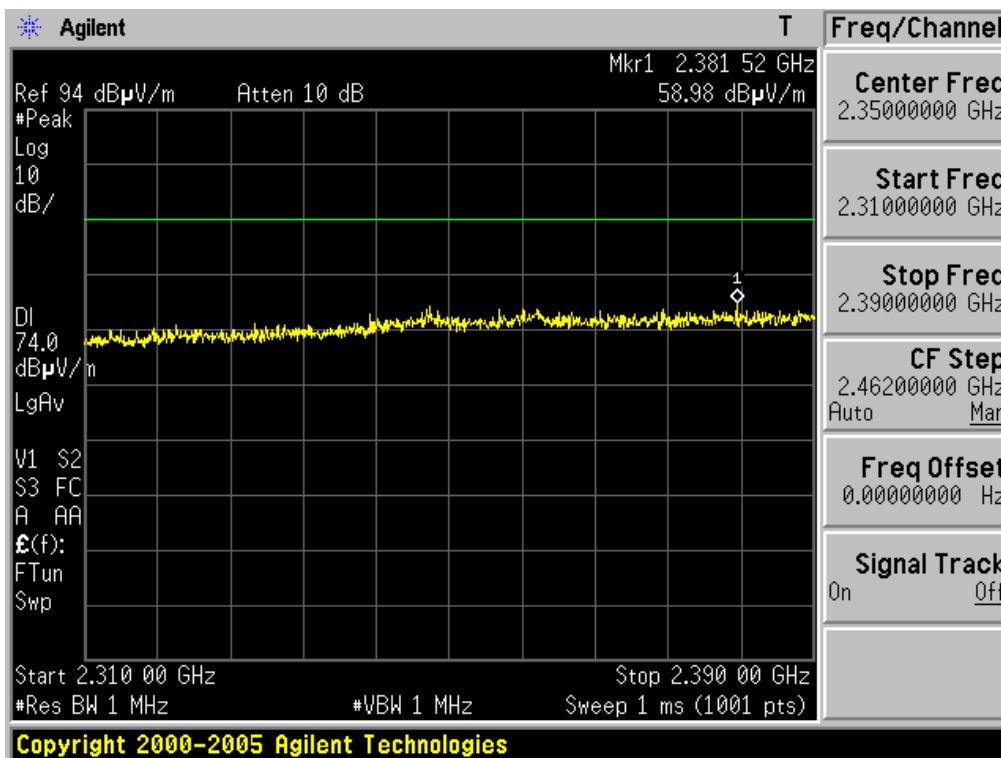
Restricted Band Edge: Low Channel (Average, Horizontal)

802.11g Mode



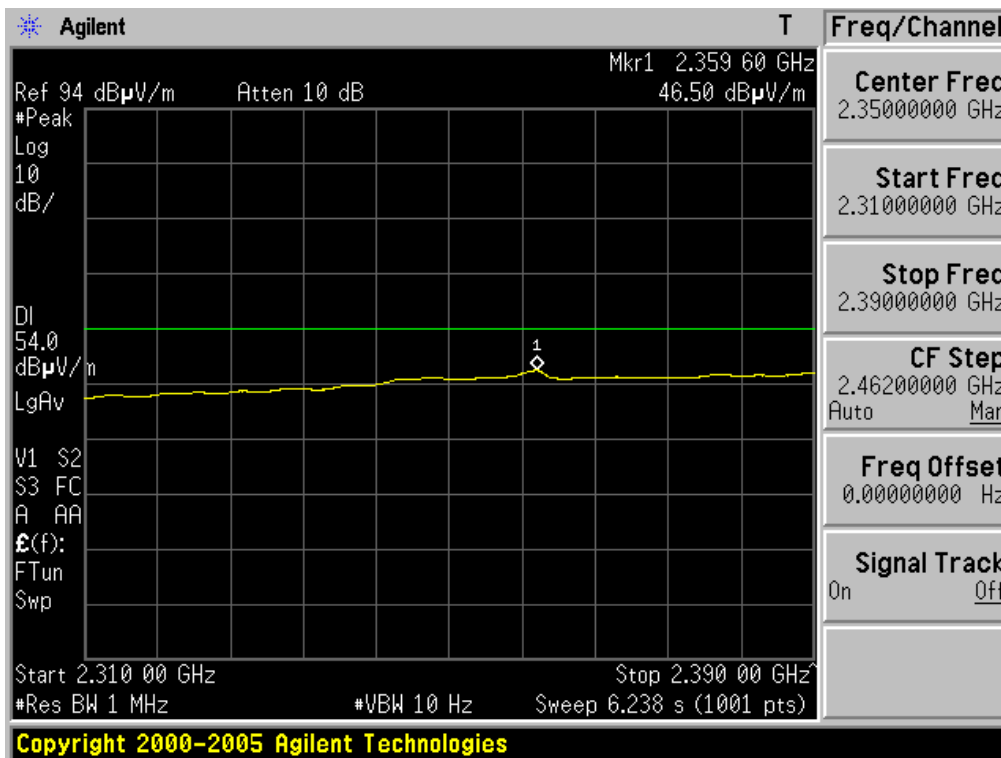
**Restricted Band Edge: Low Channel (Peak, Vertical)**

**802.11g Mode**



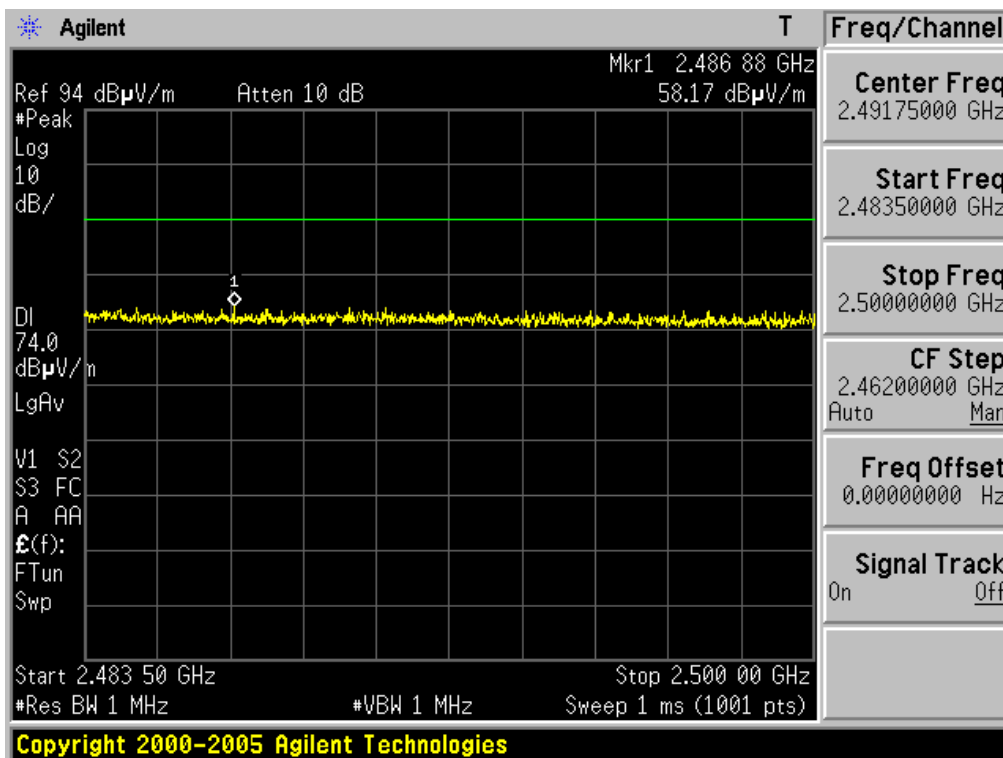
**Restricted Band Edge: Low Channel (Average, Vertical)**

**802.11g Mode**



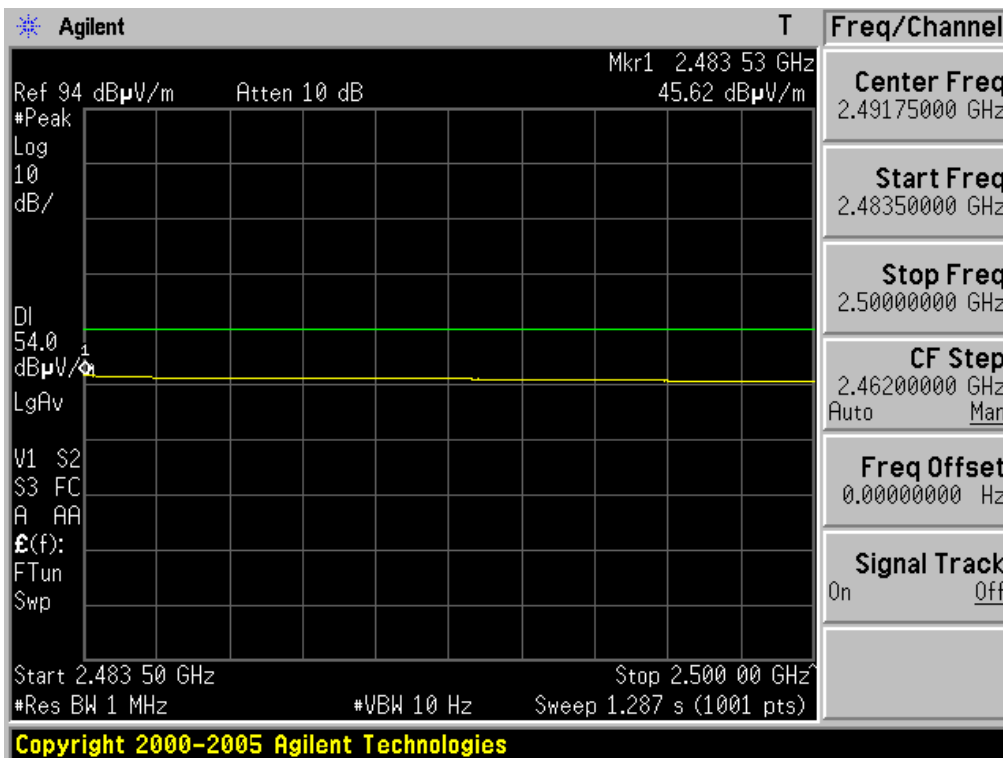
Restricted Band Edge: High Channel (Peak, Horizontal)

802.11g Mode



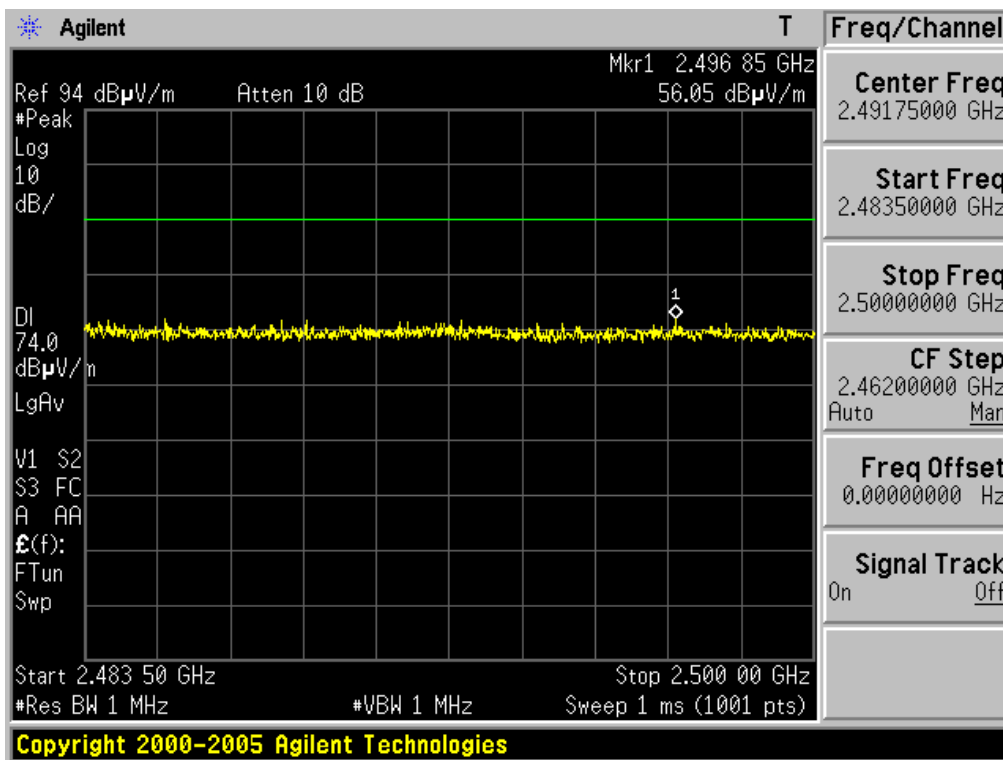
Restricted Band Edge: High Channel (Average, Horizontal)

802.11g Mode



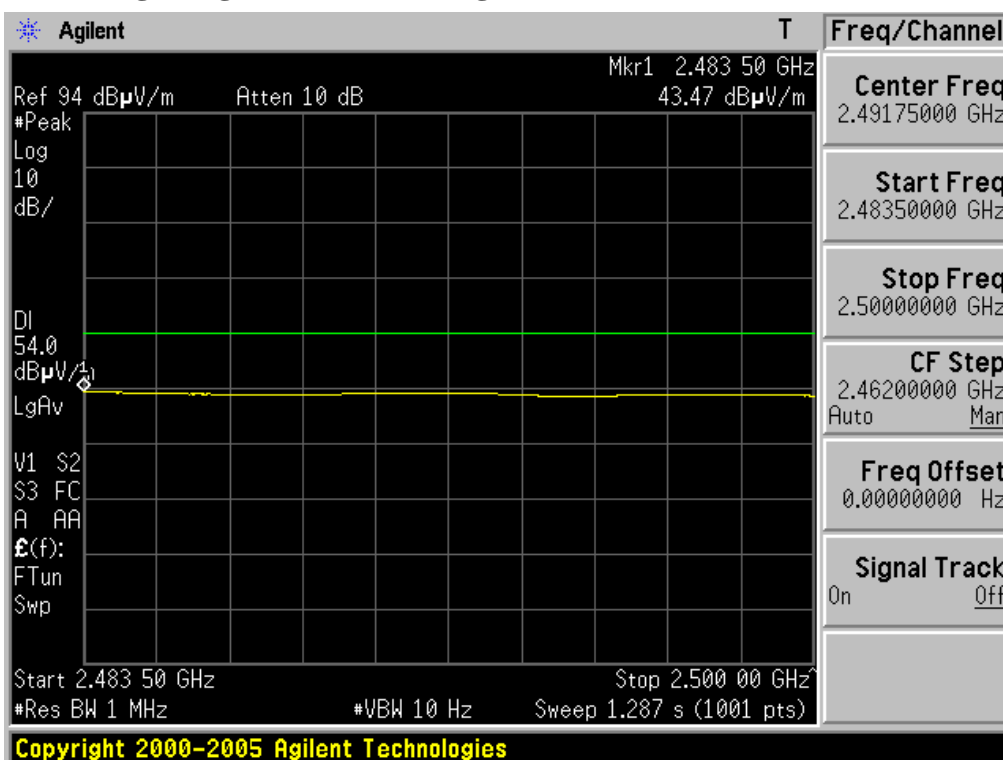
**Restricted Band Edge: High Channel (Peak, Vertical)**

**802.11g Mode**



**Restricted Band Edge: High Channel (Average, Vertical)**

**802.11g Mode**





**Radiated Spurious Emission Data**

- Harmonics

802.11b Mode

<b><u>Low Channel(2412MHz)</u></b>										
Frequency (MHz)	ANT Pol. (H/V)	Reading Value (dBuV)		T.F (dB)	Result (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
		PK	AV		PK	AV	PK	AV	PK	AV
4824	H	45.37	33.50	6.96	52.33	40.46	74.00	54.00	21.67	13.54
4824	V	45.42	33.59	6.96	52.38	40.55	74.00	54.00	21.62	13.45
-	-	-	-	-	-	-	-	-	-	-

<b><u>Middle Channel(2437MHz)</u></b>										
Frequency (MHz)	ANT Pol. (H/V)	Reading Value (dBuV)		T.F (dB)	Result (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
		PK	AV		PK	AV	PK	AV	PK	AV
4874	H	43.03	31.19	7.22	50.25	38.41	74.00	54.00	23.75	15.59
4874	V	42.71	31.00	7.22	49.93	38.22	74.00	54.00	24.07	15.78
-	-	-	-	-	-	-	-	-	-	-

<b><u>High Channel(2462MHz)</u></b>										
Frequency (MHz)	ANT Pol. (H/V)	Reading Value (dBuV)		T.F (dB)	Result (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
		PK	AV		PK	AV	PK	AV	PK	AV
4924	H	42.11	30.75	7.38	49.49	38.13	74.00	54.00	24.51	15.87
4924	V	41.26	30.43	7.38	48.64	37.81	74.00	54.00	25.36	16.19
-	-	-	-	-	-	-	-	-	-	-

Note 1. No other emissions were detected at a level greater than 20dB below limit.

2. T.F(Total Factor) = Cable Loss + Ant Factor –AMP Gain

3. Result = Reading Value + T.F

4. Margin = Limit - Result

Radiated Spurious Emission Data

- Continued

- Spurious

802.11b Mode

<b>Low Channel(2412MHz)</b>														
Frequency (MHz)	ANT Pol. (H/V)	Reading Value (dBuV)			T.F (dB)	Result (dBuV/m)			Limit (dBuV/m)			Margin (dB)		
		PK	QP	AV		PK	QP	AV	PK	QP	AV	PK	QP	AV
32.400	V	-	37.15	-	-7.45	-	29.70	-	-	40.00	-	-	10.30	-
35.000	V	-	39.72	-	-8.92	-	30.80	-	-	40.00	-	-	9.20	-
110.900	V	-	39.62	-	-13.32	-	26.30	-	-	43.50	-	-	17.20	-
131.300	V	-	41.29	-	-10.79	-	30.50	-	-	43.50	-	-	13.00	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

<b>Middle Channel(2437MHz)</b>														
Frequency (MHz)	ANT Pol. (H/V)	Reading Value (dBuV)			T.F (dB)	Result (dBuV/m)			Limit (dBuV/m)			Margin (dB)		
		PK	QP	AV		PK	QP	AV	PK	QP	AV	PK	QP	AV
30.400	V	-	38.05	-	-7.45	-	30.60	-	-	40.00	-	-	9.40	-
35.050	V	-	40.34	-	-8.94	-	31.40	-	-	40.00	-	-	8.60	-
110.900	V	-	38.92	-	-13.32	-	25.60	-	-	43.50	-	-	17.90	-
131.280	V	-	42.69	-	-10.79	-	31.90	-	-	43.50	-	-	11.60	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

<b>High Channel(2462MHz)</b>														
Frequency (MHz)	ANT Pol. (H/V)	Reading Value (dBuV)			T.F (dB)	Result (dBuV/m)			Limit (dBuV/m)			Margin (dB)		
		PK	QP	AV		PK	QP	AV	PK	QP	AV	PK	QP	AV
30.500	V	-	38.68	-	-7.48	-	31.20	-	-	40.00	-	-	8.80	-
35.000	V	-	40.72	-	-8.92	-	31.80	-	-	40.00	-	-	8.20	-
111.000	V	-	39.71	-	-13.31	-	26.40	-	-	43.50	-	-	17.10	-
131.300	V	-	41.49	-	-10.79	-	30.70	-	-	43.50	-	-	12.80	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

- Note 1. No other emissions were detected at a level greater than 20dB below limit.
- 2. T.F(Total Factor) = Cable Loss + Ant Factor –AMP Gain
- 3. Result = Reading Value + T.F
- 4. Margin = Limit - Result

**Radiated Spurious Emission Data**

- Harmonics

802.11g Mode

<b><u>Low Channel(2412MHz)</u></b>										
Frequency (MHz)	ANT Pol. (H/V)	Reading Value (dBuV)		T.F (dB)	Result (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
		PK	AV		PK	AV			PK	AV
4824	H	43.11	31.14	6.96	50.07	38.10	74.00	54.00	23.93	15.90
4824	V	43.29	31.42	6.96	50.25	38.38	74.00	54.00	23.75	15.62
-	-	-	-	-	-	-	-	-	-	-

<b><u>Middle Channel(2437MHz)</u></b>										
Frequency (MHz)	ANT Pol. (H/V)	Reading Value (dBuV)		T.F (dB)	Result (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
		PK	AV		PK	AV			PK	AV
4874	H	42.20	30.27	7.22	49.42	37.49	74.00	54.00	24.58	16.51
4874	V	42.32	30.51	7.22	49.54	37.73	74.00	54.00	24.46	16.27
-	-	-	-	-	-	-	-	-	-	-

<b><u>High Channel(2462MHz)</u></b>										
Frequency (MHz)	ANT Pol. (H/V)	Reading Value (dBuV)		T.F (dB)	Result (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
		PK	AV		PK	AV			PK	AV
4924	H	42.56	30.21	7.38	49.94	37.59	74.00	54.00	24.06	16.41
4924	V	42.65	30.19	7.38	50.03	37.57	74.00	54.00	23.97	16.43
-	-	-	-	-	-	-	-	-	-	-

Note 1. No other emissions were detected at a level greater than 20dB below limit.

2. T.F(Total Factor) = Cable Loss + Ant Factor –AMP Gain

3. Result = Reading Value + T.F

4. Margin = Limit - Result

Radiated Spurious Emission Data

- Continued

- Spurious

802.11g Mode

<b>Low Channel(2412MHz)</b>														
Frequency (MHz)	ANT Pol. (H/V)	Reading Value (dBuV)			T.F (dB)	Result (dBuV/m)			Limit (dBuV/m)			Margin (dB)		
		PK	QP	AV		PK	QP	AV	PK	QP	AV	PK	QP	AV
30.200	V	-	38.58	-	-7.38	-	31.20	-	-	40.00	-	-	8.80	-
36.600	V	-	38.70	-	-9.50	-	29.20	-	-	40.00	-	-	10.80	-
110.500	V	-	39.68	-	-13.38	-	26.30	-	-	43.50	-	-	17.20	-
129.600	V	-	42.43	-	-10.93	-	31.50	-	-	43.50	-	-	12.00	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

<b>Middle Channel(2437MHz)</b>														
Frequency (MHz)	ANT Pol. (H/V)	Reading Value (dBuV)			T.F (dB)	Result (dBuV/m)			Limit (dBuV/m)			Margin (dB)		
		PK	QP	AV		PK	QP	AV	PK	QP	AV	PK	QP	AV
30.300	V	-	36.31	-	-7.41	-	28.90	-	-	40.00	-	-	11.10	-
36.600	V	-	39.60	-	-9.50	-	30.10	-	-	40.00	-	-	9.90	-
110.600	V	-	39.76	-	-13.36	-	26.40	-	-	43.50	-	-	17.10	-
129.600	V	-	42.53	-	-10.93	-	31.60	-	-	43.50	-	-	11.90	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

<b>High Channel(2462MHz)</b>														
Frequency (MHz)	ANT Pol. (H/V)	Reading Value (dBuV)			T.F (dB)	Result (dBuV/m)			Limit (dBuV/m)			Margin (dB)		
		PK	QP	AV		PK	QP	AV	PK	QP	AV	PK	QP	AV
30.200	V	-	37.98	-	-7.38	-	30.60	-	-	40.00	-	-	9.40	-
36.700	V	-	40.24	-	-9.54	-	30.70	-	-	40.00	-	-	9.30	-
110.600	V	-	39.06	-	-13.36	-	25.70	-	-	43.50	-	-	17.80	-
129.680	V	-	43.33	-	-10.93	-	32.40	-	-	43.50	-	-	11.10	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

- Note 1. No other emissions were detected at a level greater than 20dB below limit.
- 2. T.F(Total Factor) = Cable Loss + Ant Factor –AMP Gain
- 3. Result = Reading Value + T.F
- 4. Margin = Limit - Result

### 3.2.5 Transmitter Power Spectral Density

**Procedure:**

The transmitter output is connected to a spectrum analyzer. Locate and zoom in on emission peak within the passband. The maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer using RBW = 3kHz and VBW > 9kHz, sweep time= auto, video averaging is turned off. . Trace average 100 traces in power averaging mode. The PSD is the highest level found across the emission in any 3kHz band. The test is performed in accordance with FCC document “Measurement of Digital Transmission Systems Operating under Section 15.247”, March 23, 2005. The transmitter output power was measured with power output option #2. Therefore, PSD was measured with PSD option #2.

**Measurement Data:**

Test Mode	Frequency (MHz)	Channel No.	Test Results	
			Power Density (dBm)	Result
802.11b	2412	1	-11.91	Comply
	2437	6	-12.90	Comply
	2462	11	-13.98	Comply
802.11g	2412	1	-13.32	Comply
	2437	6	-14.56	Comply
	2462	11	-15.41	Comply

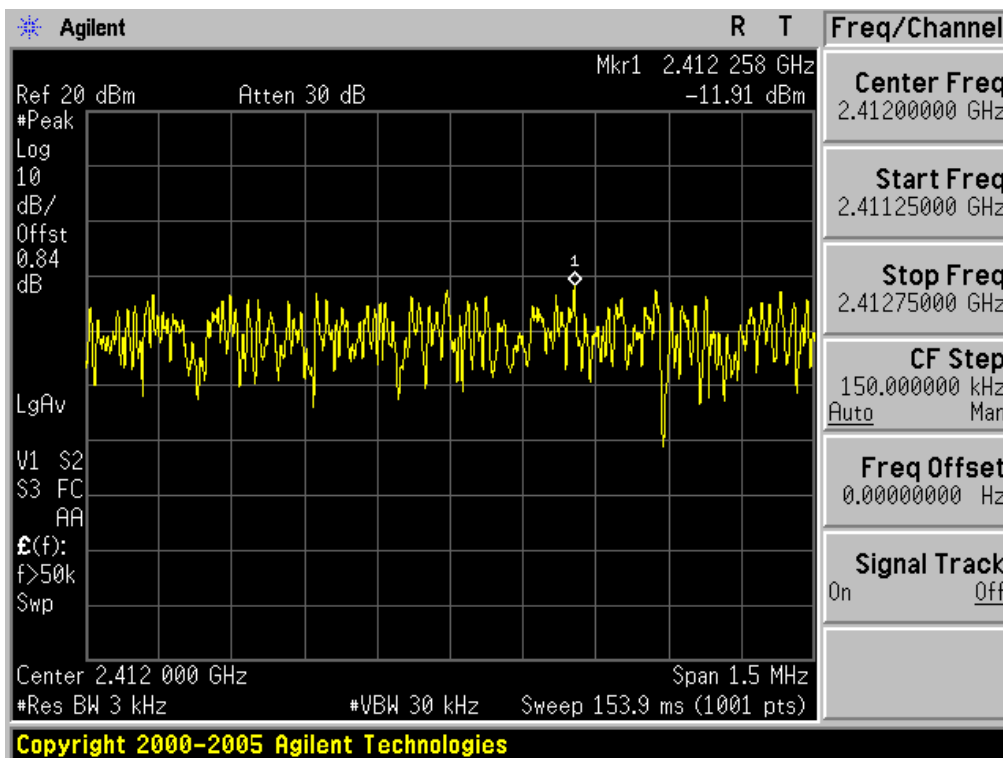
- See next pages for actual measured spectrum plots.

**Minimum Standard:**

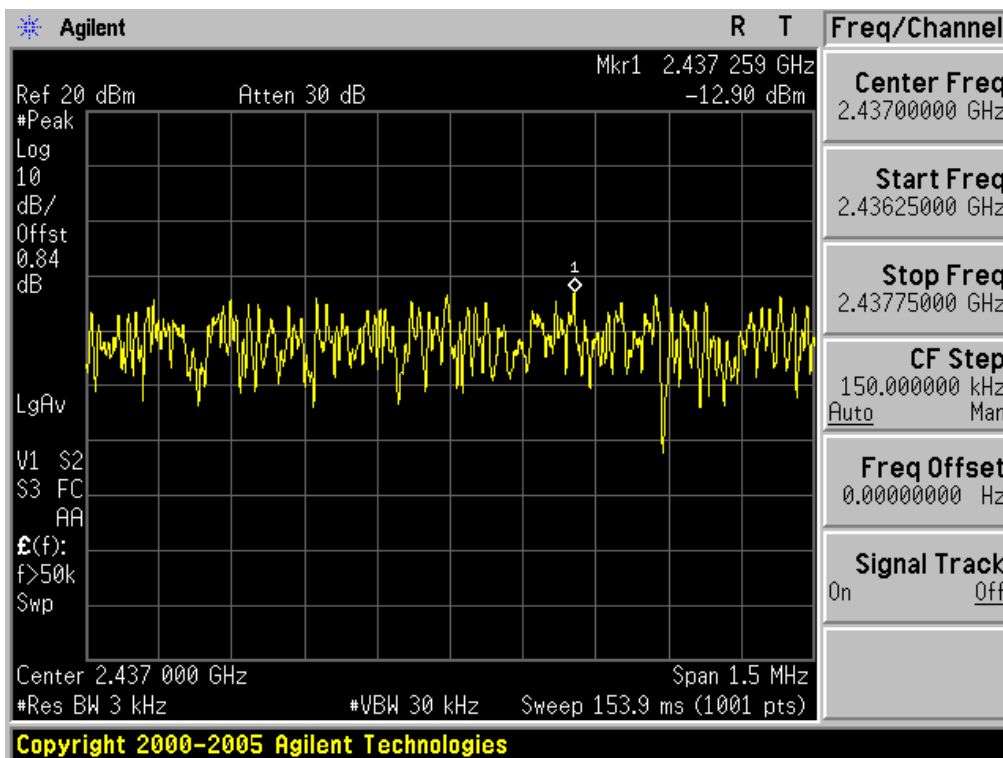
The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission

Transmitter Power Spectral Density

802.11b Mode



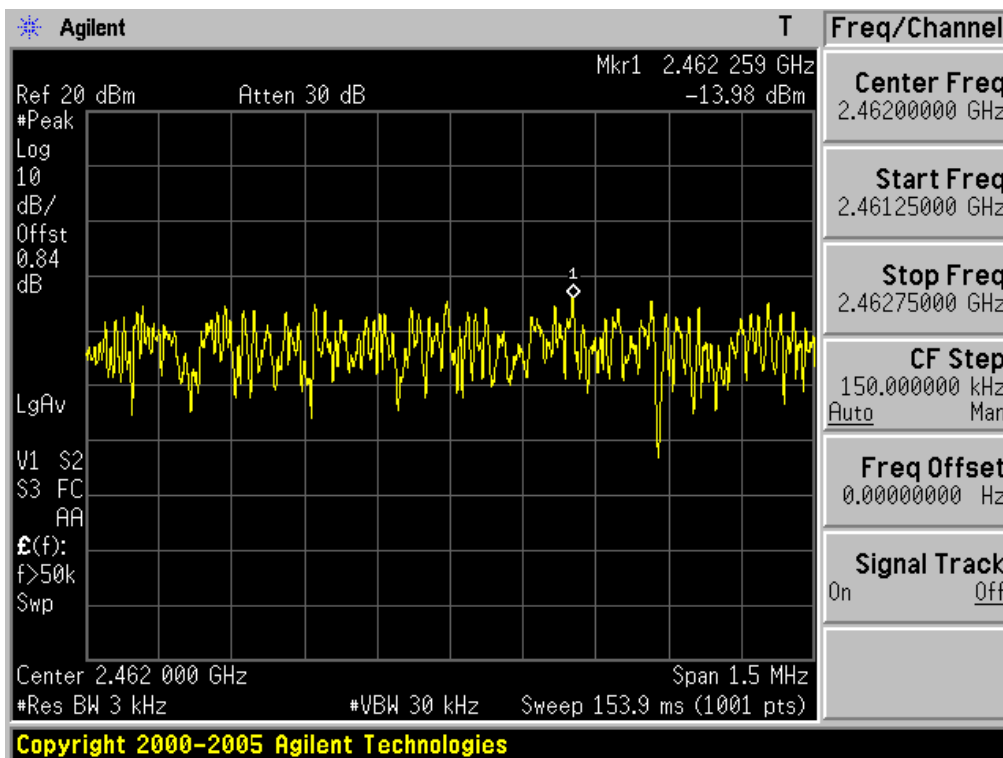
Low Channel



Middle Channel

Transmitter Power Spectral Density

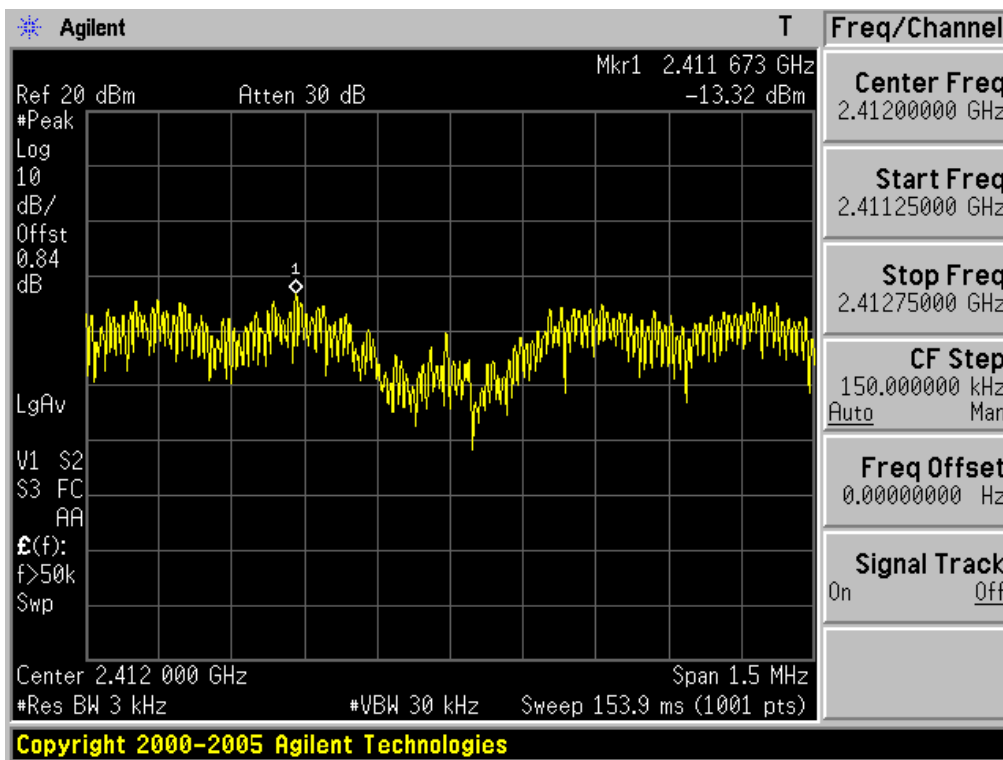
802.11b Mode



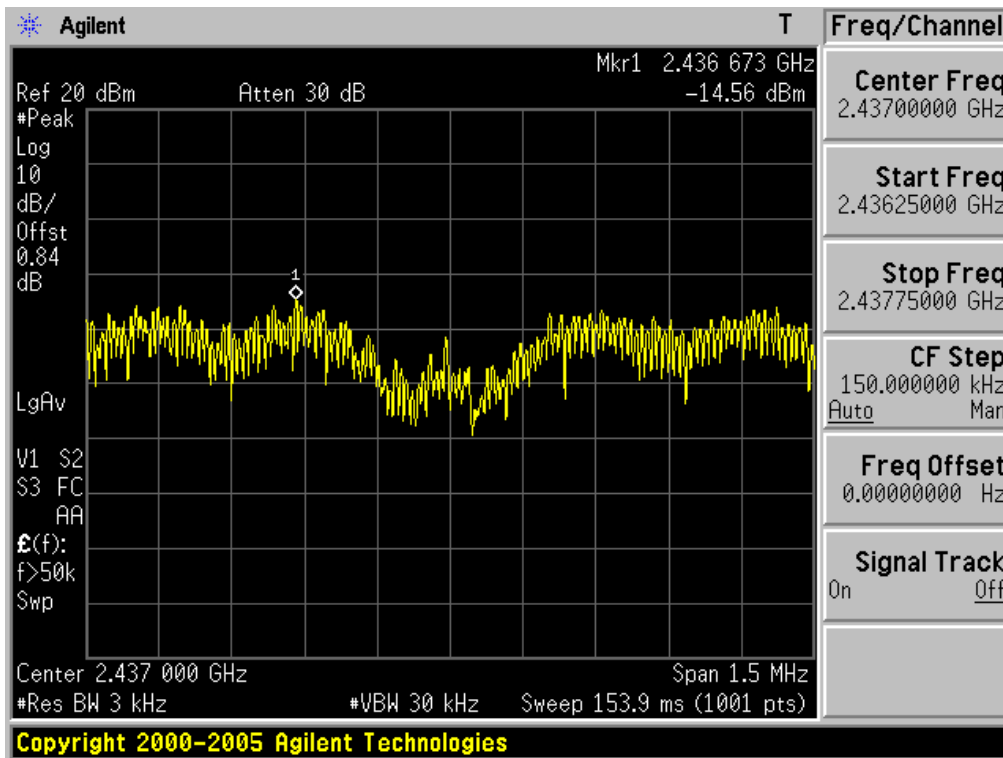
High Channel

Transmitter Power Spectral Density

802.11g Mode



Low Channel

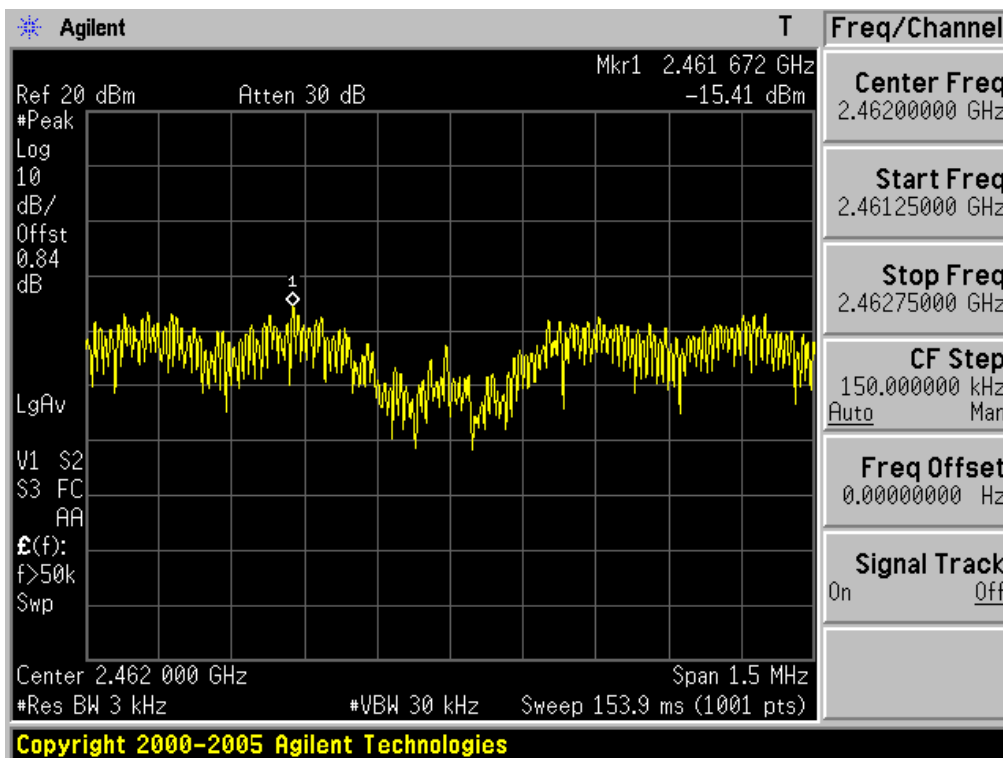


Middle Channel



Transmitter Power Spectral Density

802.11g Mode



High Channel

### 3.2.6 AC Conducted Emissions

**Procedure:**

The conducted emissions are measured in the shielded room with a spectrum analyzer in peak hold. Emissions closest to the limit are measured in the quasi-peak mode (QP) and average mode(AV) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation and Exerciser operation. The highest emissions relative to the limit are listed.

**Measurement Data: Comply**

- See next pages for actual measured spectrum plots.
- The test results were worst case with the EUT attached to I/O devices along with test setup photos showing attachment while conducted emission testing was taking place.

**Minimum Standard: FCC Part 15.207(a)/EN 55022**

Frequency Range (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

**Measurement Setup**

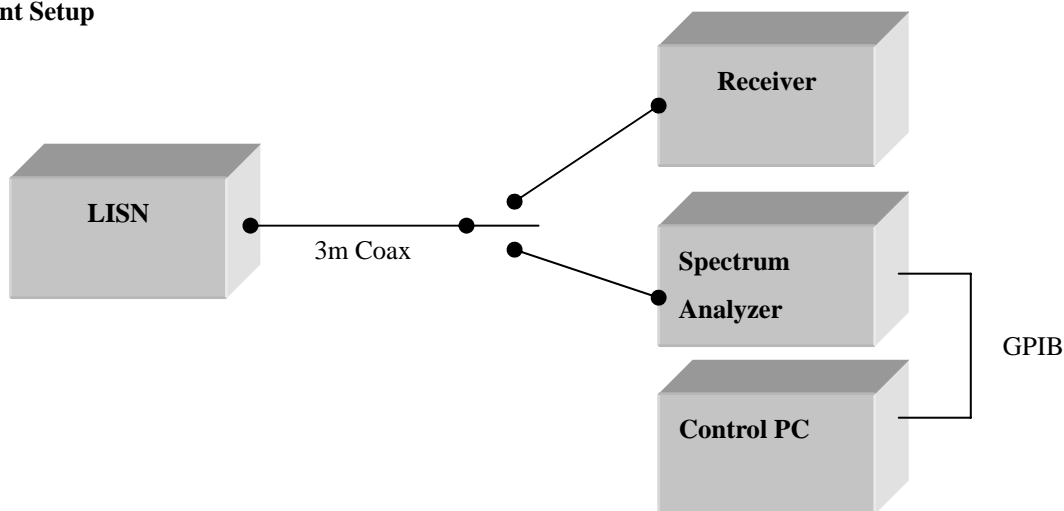
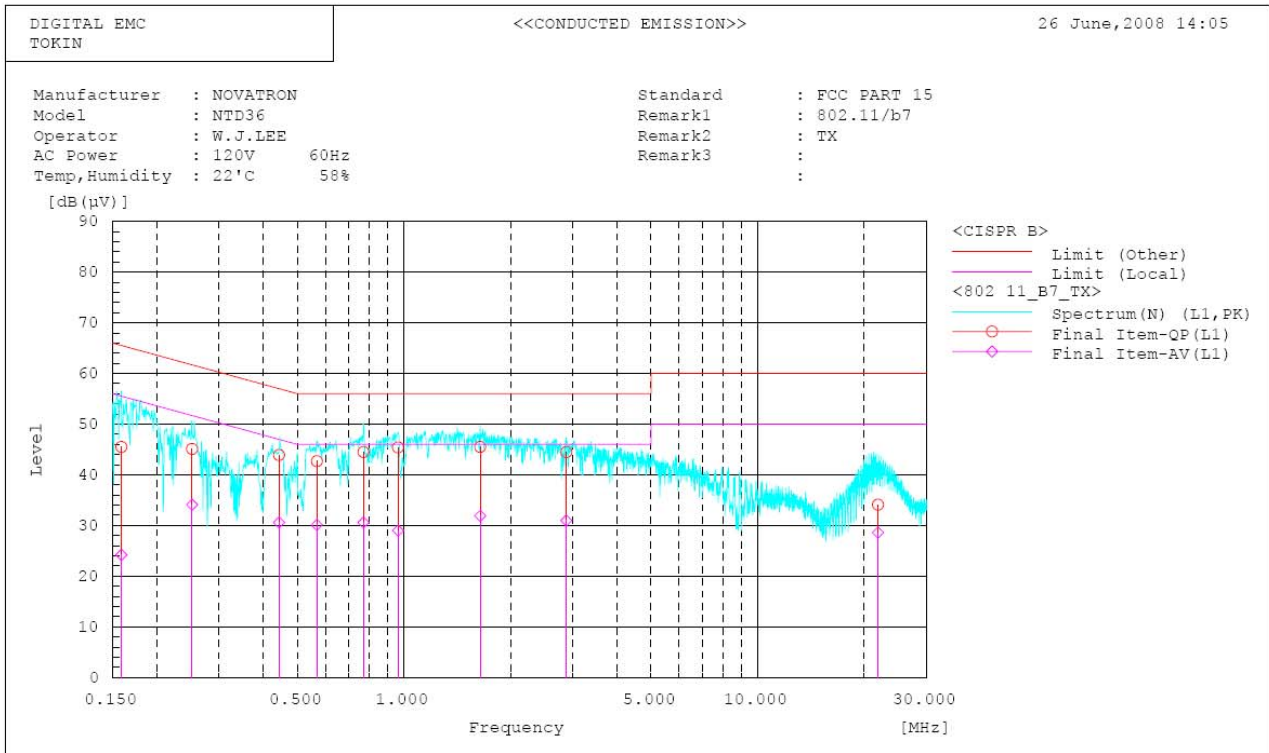
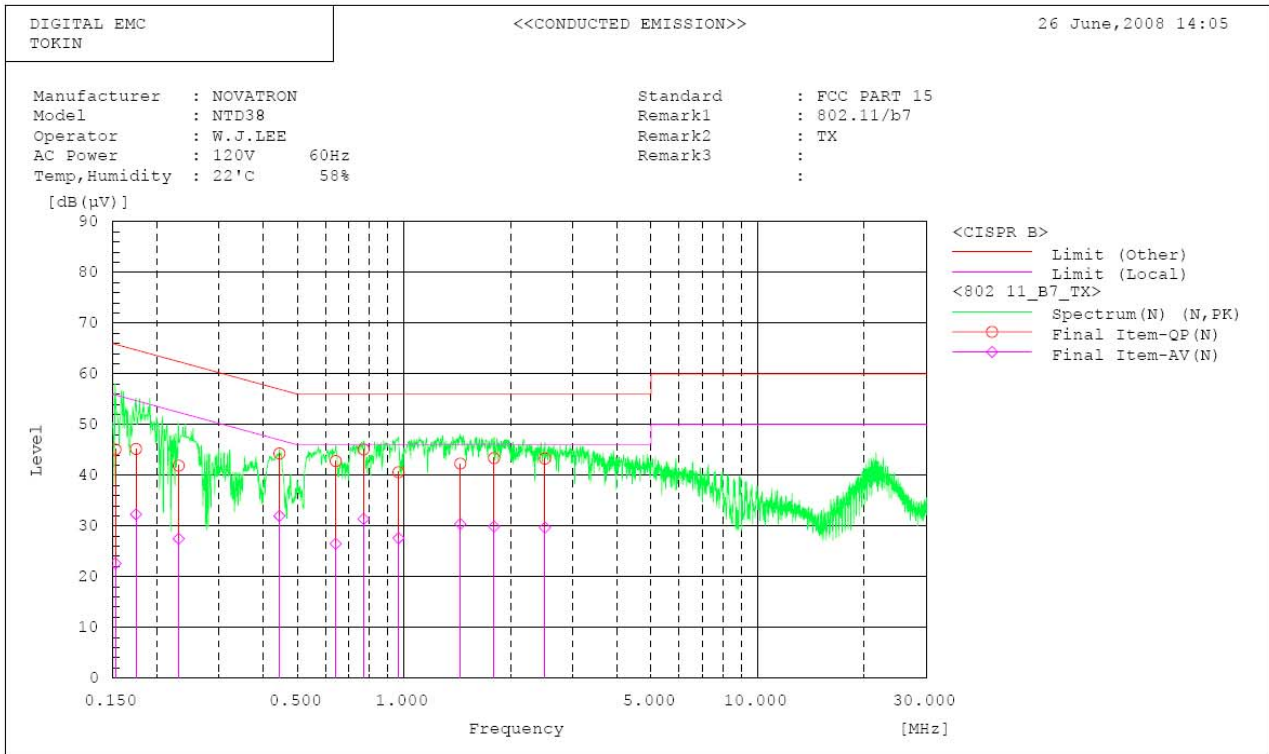


Figure 2: Measurement setup for AC Conducted Emission

### AC Conducted Emissions (802.11b Mode)



AC Conducted Emissions -DATA(802.11b Mode)

```

***** DIGITAL EMC *****
<<CONDUCTED EMISSION>>
26 June,2008 14:05

Standard      : FCC PART 15
Manufacturer  : NOVATRON
Model         : NTD38
Operator      : W.J.LEE
AC Power      : 120V    60Hz
Temp, Humidity : 22°C   58%
Remark1       : 802.11/b7
Remark2       : TX
Remark3       :
    
```

Final Result

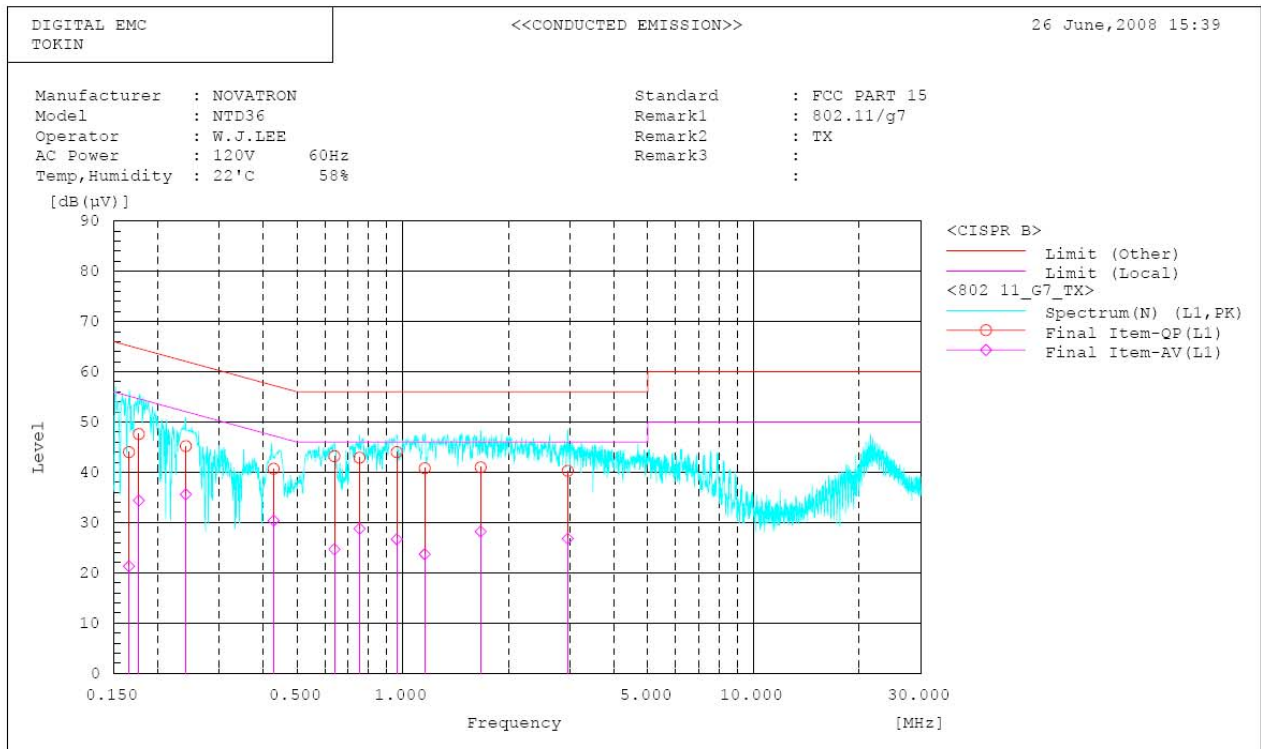
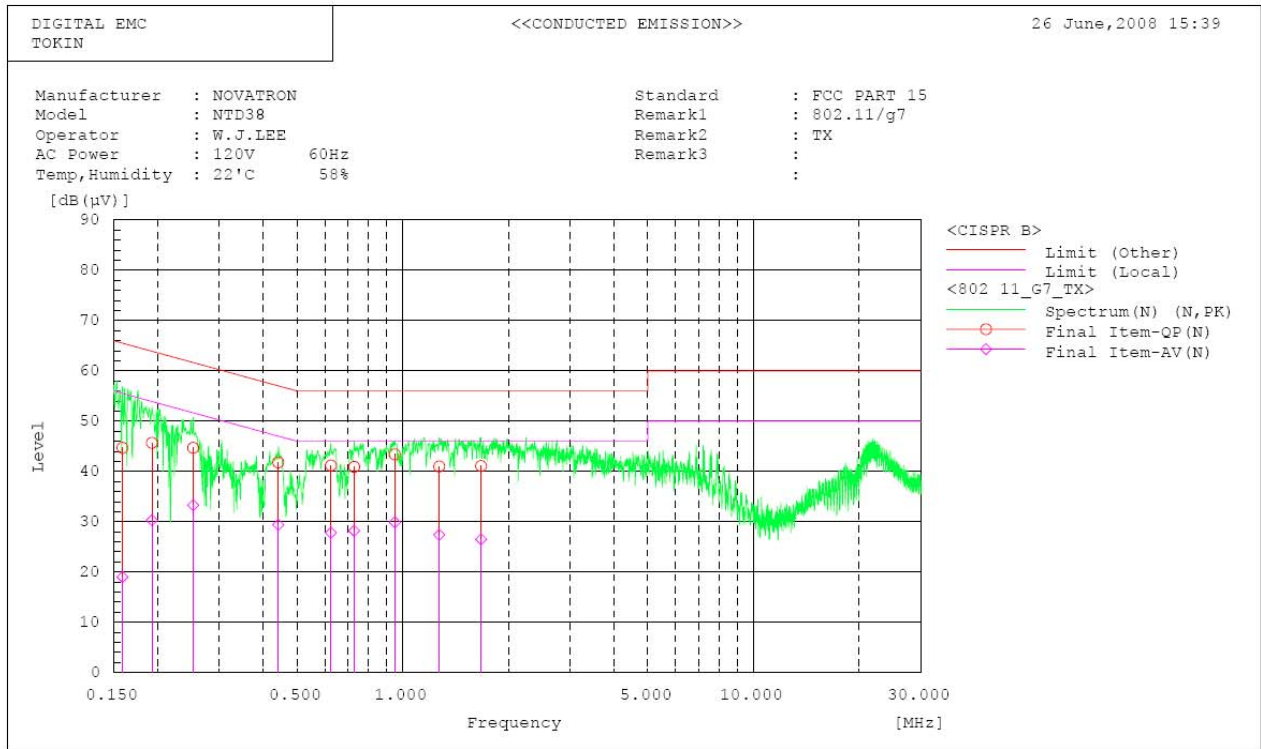
--- N Phase ---

No.	Frequency	Reading QP	Reading AV	c.f	Result QP	Result AV	Limit QP	Limit AV	Margin QP	Margin AV	Remark
	[MHz]	[dB(µV)]	[dB(µV)]		[dB(µV)]	[dB(µV)]	[dB(µV)]	[dB(µV)]	[dB]	[dB]	
1	0.153	45.0	22.5	0.1	45.1	22.6	65.8	55.8	20.7	23.2	
2	0.175	45.1	32.2	0.1	45.2	32.3	64.7	54.7	19.5	22.4	
3	0.231	41.8	27.4	0.1	41.9	27.5	62.4	52.4	20.5	24.9	
4	0.445	44.2	31.9	0.1	44.3	32.0	57.0	47.0	12.7	15.0	
5	0.642	42.7	26.4	0.1	42.8	26.5	56.0	46.0	13.2	19.5	
6	0.770	45.0	31.3	0.1	45.1	31.4	56.0	46.0	10.9	14.6	
7	0.966	40.4	27.4	0.2	40.6	27.6	56.0	46.0	15.4	18.4	
8	1.444	42.1	30.2	0.2	42.3	30.4	56.0	46.0	12.7	15.6	
9	1.799	43.2	29.7	0.2	43.4	29.9	56.0	46.0	12.6	16.1	
10	2.505	43.0	29.4	0.3	43.3	29.7	56.0	46.0	12.7	16.3	

--- L1 Phase ---

No.	Frequency	Reading QP	Reading AV	c.f	Result QP	Result AV	Limit QP	Limit AV	Margin QP	Margin AV	Remark
	[MHz]	[dB(µV)]	[dB(µV)]		[dB(µV)]	[dB(µV)]	[dB(µV)]	[dB(µV)]	[dB]	[dB]	
1	0.159	45.3	24.0	0.2	45.5	24.2	65.5	55.5	20.0	21.3	
2	0.252	44.9	33.9	0.2	45.1	34.1	61.7	51.7	16.6	17.6	
3	0.444	43.7	30.4	0.2	43.9	30.6	57.0	47.0	13.1	16.4	
4	0.568	42.4	29.8	0.3	42.7	30.1	56.0	46.0	13.3	15.9	
5	0.769	44.2	30.3	0.3	44.5	30.6	56.0	46.0	11.5	15.4	
6	0.963	45.1	28.7	0.3	45.4	29.0	56.0	46.0	10.6	17.0	
7	1.443	45.1	31.5	0.4	45.5	31.9	56.0	46.0	10.5	14.1	
8	2.080	44.1	30.6	0.4	44.5	31.0	56.0	46.0	11.5	15.0	
9	21.900	33.0	27.5	1.1	34.1	28.6	60.0	50.0	25.9	21.4	

### AC Conducted Emissions (802.11g Mode)



AC Conducted Emissions -DATA(802.11g Mode)

\*\*\*\*\* DIGITAL EMC \*\*\*\*\*  
 <<CONDUCTED EMISSION>>

26 June, 2008 15:39

Standard : FCC PART 15  
 Manufacturer : NOVATRON  
 Model : NTD38  
 Operator : W.J.LEE  
 AC Power : 120V 60Hz  
 Temp, Humidity : 22°C 58%  
 Remark1 : 802.11/g7  
 Remark2 : TX  
 Remark3 :

Final Result

--- N Phase ---

No.	Frequency	Reading QP	Reading AV	c.f	Result QP	Result AV	Limit QP	Limit AV	Margin QP	Margin AV	Remark
	[MHz]	[dB(µV)]	[dB(µV)]	[dB]	[dB(µV)]	[dB(µV)]	[dB(µV)]	[dB(µV)]	[dB]	[dB]	
1	0.159	44.6	18.9	0.1	44.7	19.0	65.5	55.5	20.8	36.5	
2	0.193	45.6	30.2	0.1	45.7	30.3	63.9	53.9	18.2	23.6	
3	0.253	44.6	33.2	0.1	44.7	33.3	61.7	51.7	17.0	18.4	
4	0.442	41.7	29.3	0.1	41.8	29.4	57.0	47.0	15.2	17.6	
5	0.625	41.1	27.7	0.1	41.2	27.8	56.0	46.0	14.8	18.2	
6	0.728	40.8	28.1	0.1	40.9	28.2	56.0	46.0	15.1	17.8	
7	0.950	43.2	29.7	0.2	43.4	29.9	56.0	46.0	12.6	16.1	
8	1.271	40.8	27.2	0.2	41.0	27.4	56.0	46.0	15.0	18.6	
9	1.673	40.9	26.3	0.2	41.1	26.5	56.0	46.0	14.9	19.5	

--- L1 Phase ---

No.	Frequency	Reading QP	Reading AV	c.f	Result QP	Result AV	Limit QP	Limit AV	Margin QP	Margin AV	Remark
	[MHz]	[dB(µV)]	[dB(µV)]	[dB]	[dB(µV)]	[dB(µV)]	[dB(µV)]	[dB(µV)]	[dB]	[dB]	
1	0.166	43.8	21.1	0.2	44.0	21.3	65.2	55.2	21.2	33.9	
2	0.177	47.4	34.2	0.2	47.6	34.4	64.6	54.6	17.0	20.2	
3	0.241	45.0	35.4	0.2	45.2	35.6	62.1	52.1	16.9	16.5	
4	0.429	40.5	30.2	0.2	40.7	30.4	57.3	47.3	16.6	16.9	
5	0.639	42.9	24.4	0.3	43.2	24.7	56.0	46.0	12.8	21.3	
6	0.754	42.6	28.5	0.3	42.9	28.8	56.0	46.0	13.1	17.2	
7	0.963	43.7	26.4	0.3	44.0	26.7	56.0	46.0	12.0	19.3	
8	1.157	40.5	23.4	0.3	40.8	23.7	56.0	46.0	15.2	22.3	
9	1.670	40.6	27.8	0.4	41.0	28.2	56.0	46.0	15.0	17.8	
10	2.955	39.9	26.4	0.4	40.3	26.8	56.0	46.0	15.7	19.2	

### 3.3 Receiver requirements

#### 3.3.1 AC Conducted Emissions (Receiver)

**Procedure:**

The conducted emissions are measured in the shielded room with a spectrum analyzer in peak hold. While the measurement, EUT had its receiving function. Emissions closest to the limit are measured in the quasi-peak mode (QP) and average mode(AV) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation and Exerciser operation. The highest emissions relative to the limit are listed.

**Measurement Data: Comply**

- See next pages for actual measured spectrum plots.
- The test results were worst case with the EUT attached to I/O devices along with test setup photos showing attachment while conducted emission testing was taking place.

**Minimum Standard: FCC Part 15.207(a)/EN 55022**

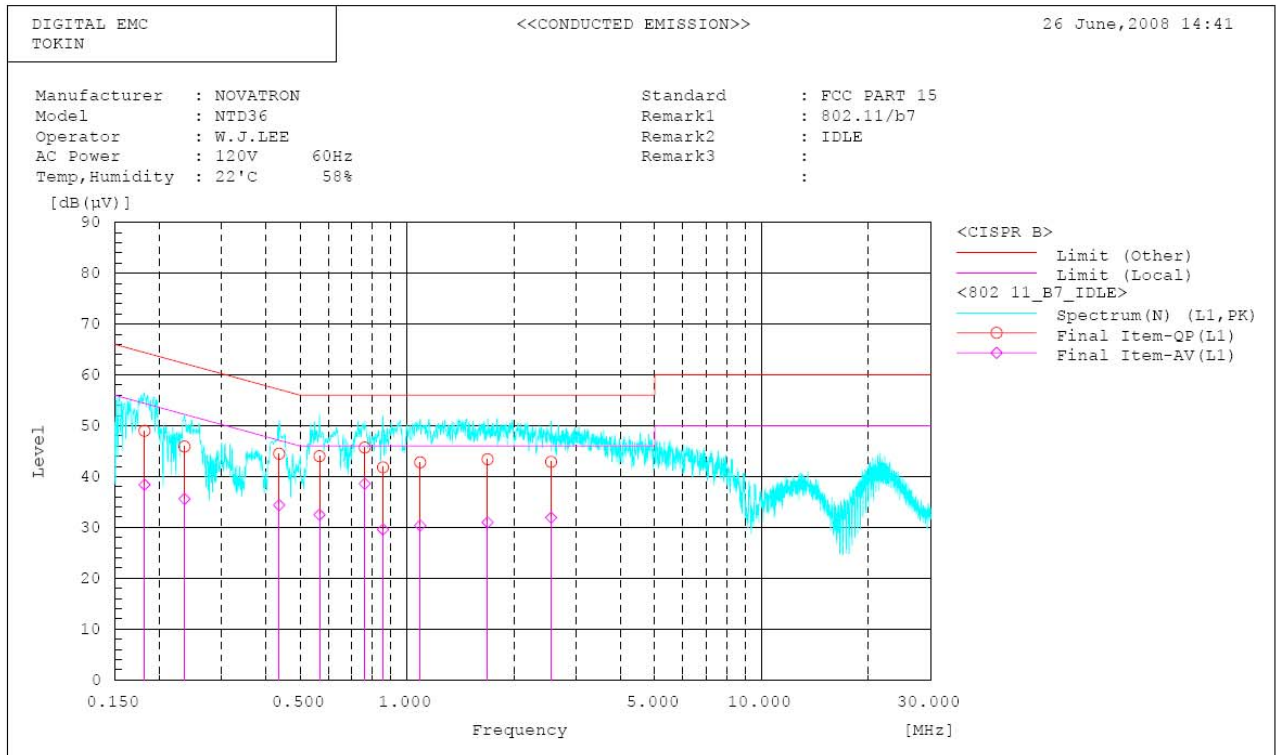
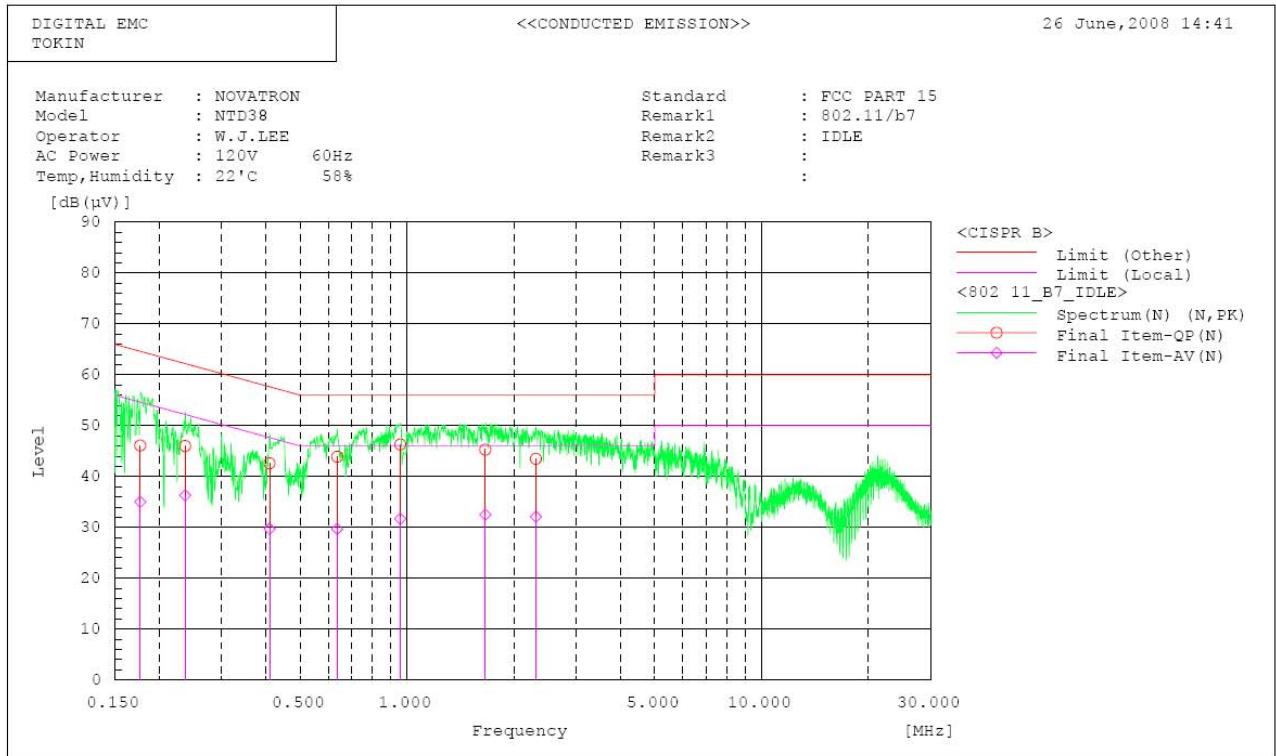
Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

\* Decreases with the logarithm of the frequency

**Measurement Setup**

Same as the Chapter 3.2.9 (Figure 2)

### AC Conducted Emissions (802.11b Receiver Mode)





AC Conducted Emissions -DATA(802.11b Receiver Mode)

\*\*\*\*\* DIGITAL EMC \*\*\*\*\*  
 <<CONDUCTED EMISSION>> 26 June, 2008 14:41

Standard : FCC PART 15  
 Manufacturer : NOVATRON  
 Model : NTD38  
 Operator : W.J.LEE  
 AC Power : 120V 60Hz  
 Temp, Humidity : 22°C 55%  
 Remark1 : 802.11/b7  
 Remark2 : IDLE  
 Remark3 :

Final Result

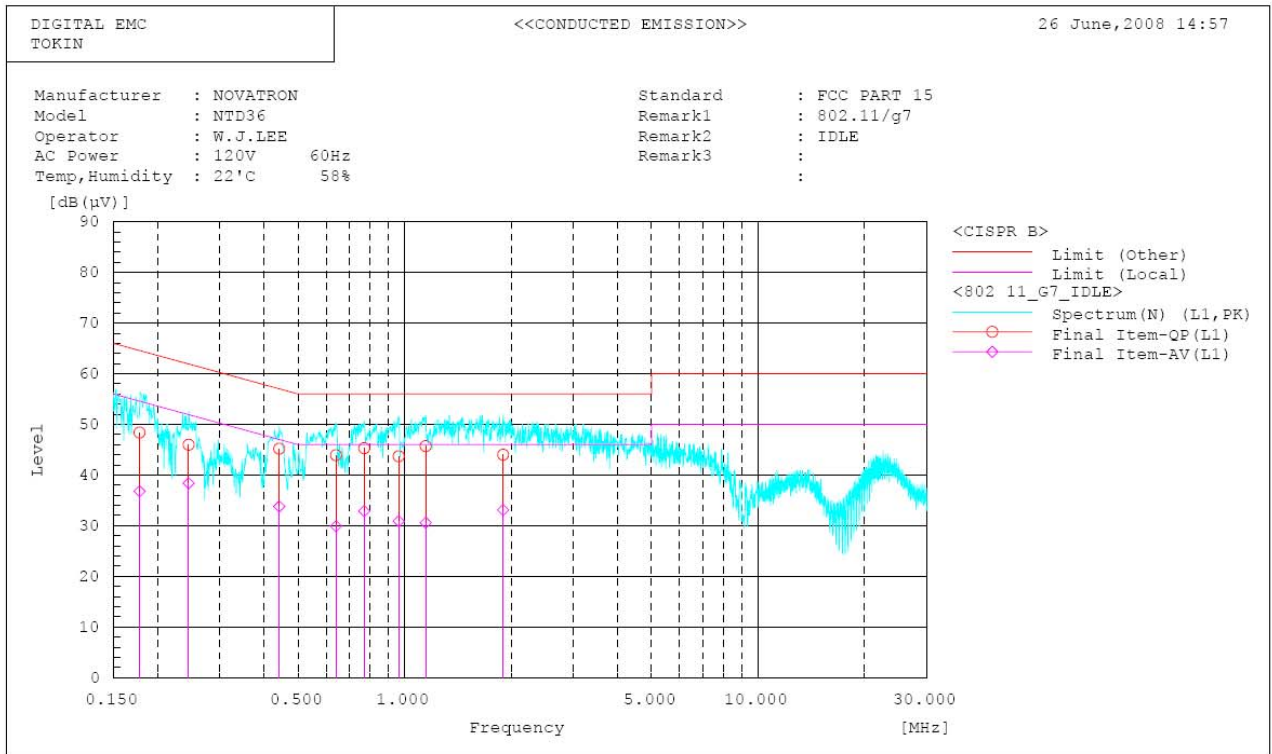
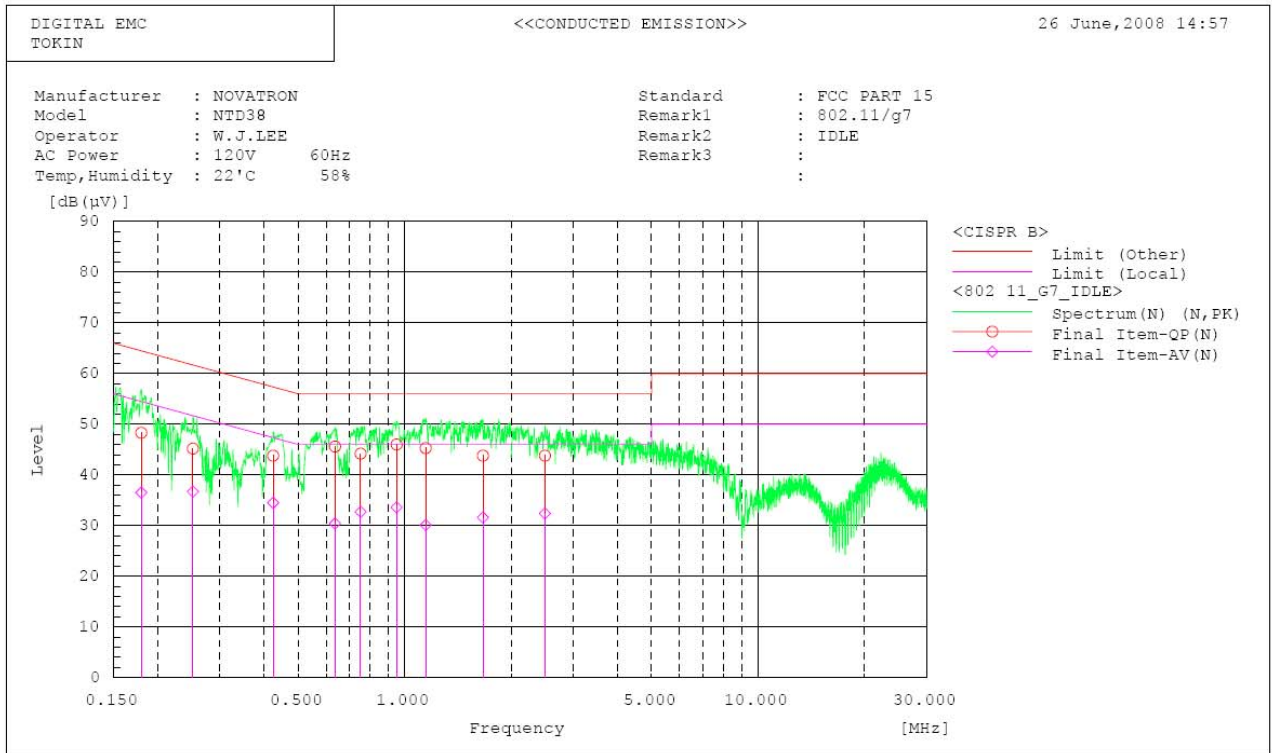
--- N Phase ---

No.	Frequency	Reading QP	Reading AV	c.f	Result QP	Result AV	Limit QP	Limit AV	Margin QP	Margin AV	Remark
	[MHz]	[dB(µV)]	[dB(µV)]	[dB]	[dB(µV)]	[dB(µV)]	[dB(µV)]	[dB(µV)]	[dB]	[dB]	
1	0.177	46.0	34.9	0.1	46.1	35.0	64.6	54.6	18.5	19.6	
2	0.237	45.9	36.2	0.1	46.0	36.3	62.2	52.2	16.2	15.9	
3	0.410	42.5	29.6	0.1	42.6	29.7	57.6	47.6	15.0	17.9	
4	0.636	43.8	29.6	0.1	43.9	29.7	56.0	46.0	12.1	16.3	
5	0.955	46.1	31.5	0.2	46.3	31.7	56.0	46.0	9.7	14.3	
6	1.664	45.1	32.3	0.2	45.3	32.5	56.0	46.0	10.7	13.5	
7	2.310	43.2	31.8	0.3	43.5	32.1	56.0	46.0	12.5	13.9	

--- L1 Phase ---

No.	Frequency	Reading QP	Reading AV	c.f	Result QP	Result AV	Limit QP	Limit AV	Margin QP	Margin AV	Remark
	[MHz]	[dB(µV)]	[dB(µV)]	[dB]	[dB(µV)]	[dB(µV)]	[dB(µV)]	[dB(µV)]	[dB]	[dB]	
1	0.182	48.8	38.2	0.2	49.0	38.4	64.4	54.4	15.4	16.0	
2	0.236	45.7	35.4	0.2	45.9	35.6	62.2	52.2	16.3	16.6	
3	0.436	44.3	34.2	0.2	44.5	34.4	57.1	47.1	12.6	12.7	
4	0.567	43.7	32.2	0.3	44.0	32.5	56.0	46.0	12.0	13.5	
5	0.761	45.4	38.3	0.3	45.7	38.6	56.0	46.0	10.3	7.4	
6	0.856	41.5	29.3	0.3	41.8	29.6	56.0	46.0	14.2	16.4	
7	1.090	42.5	30.1	0.3	42.8	30.4	56.0	46.0	13.2	15.6	
8	1.659	43.0	30.6	0.4	43.4	31.0	56.0	46.0	12.6	15.0	
9	2.550	42.5	31.5	0.4	42.9	31.9	56.0	46.0	13.1	14.1	

### AC Conducted Emissions (802.11g Receiver Mode)



AC Conducted Emissions -DATA(802.11g Receiver Mode)

\*\*\*\*\* DIGITAL EMC \*\*\*\*\*  
 <<CONDUCTED EMISSION>>

26 June, 2008 14:57

Standard : FCC PART 15  
 Manufacturer : NOVATRON  
 Model : NTD38  
 Operator : W.J.LEE  
 AC Power : 120V 60Hz  
 Temp, Humidity : 22°C 58%  
 Remark1 : 802.11/g7  
 Remark2 : IDLE  
 Remark3 :

Final Result

--- N Phase ---

No.	Frequency	Reading QP	Reading AV	c.f	Result QP	Result AV	Limit QP	Limit AV	Margin QP	Margin AV	Remark
	[MHz]	[dB(µV)]	[dB(µV)]	[dB]	[dB(µV)]	[dB(µV)]	[dB(µV)]	[dB(µV)]	[dB]	[dB]	
1	0.180	48.2	36.4	0.1	48.3	36.5	64.5	54.5	16.2	18.0	
2	0.252	45.1	36.6	0.1	45.2	36.7	61.7	51.7	16.5	15.0	
3	0.425	42.7	34.4	0.1	42.8	34.5	57.3	47.3	13.5	12.8	
4	0.636	45.5	30.3	0.1	45.6	30.4	56.0	46.0	10.4	15.6	
5	0.751	44.1	32.6	0.1	44.2	32.7	56.0	46.0	11.8	13.3	
6	0.950	45.8	33.4	0.2	46.0	33.6	56.0	46.0	10.0	12.4	
7	1.148	45.1	29.9	0.2	45.3	30.1	56.0	46.0	10.7	15.9	
8	1.667	43.6	31.4	0.2	43.8	31.6	56.0	46.0	12.2	14.4	
9	2.495	43.5	32.1	0.3	43.8	32.4	56.0	46.0	12.2	13.6	

--- I1 Phase ---

No.	Frequency	Reading QP	Reading AV	c.f	Result QP	Result AV	Limit QP	Limit AV	Margin QP	Margin AV	Remark
	[MHz]	[dB(µV)]	[dB(µV)]	[dB]	[dB(µV)]	[dB(µV)]	[dB(µV)]	[dB(µV)]	[dB]	[dB]	
1	0.178	48.2	36.6	0.2	48.4	36.8	64.6	54.6	16.2	17.8	
2	0.245	45.8	38.2	0.2	46.0	38.4	61.9	51.9	15.9	13.5	
3	0.442	45.0	33.6	0.2	45.2	33.8	57.0	47.0	11.8	13.2	
4	0.640	43.6	29.6	0.3	43.9	29.9	56.0	46.0	12.1	16.1	
5	0.769	45.0	32.6	0.3	45.3	32.9	56.0	46.0	10.7	13.1	
6	0.963	43.4	30.6	0.3	43.7	30.9	56.0	46.0	12.3	15.1	
7	1.148	45.4	30.3	0.3	45.7	30.6	56.0	46.0	10.3	15.4	
8	1.901	43.6	32.7	0.4	44.0	33.1	56.0	46.0	12.0	12.9	

### 3.3.2 Out of Band Emissions – Radiated (Receiver)

**Procedure:**

The EUT was placed on a 0.8m high wooden table inside a shielded enclosure. An antenna was placed near the EUT and measurements of frequencies and amplitudes of field strengths were recorded for reference during final measurements. For final radiated testing, measurements were performed in a OATS. Measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine worst-case orientation for maximum emissions.

The spectrum analyzer is set to:

Frequency Range = 30 MHz ~ 10<sup>th</sup> harmonic.

RBW = 120 kHz ( 30MHz ~ 1 GHz)

= 1 MHz (1 GHz ~ 10<sup>th</sup> harmonic )

VBW = 10Hz (Average), VBW ≥ RBW ( Peak)

Trace = max hold

Detector function = peak

Sweep = auto

**Measurement Data: Comply**

- Refer to the Next page
- The test results were worst case with the EUT attached to I/O devices along with test setup photos showing attachment while radiated testing was taking place.

**Minimum Standard: FCC Part 15.209(a)**

Frequency (MHz)	Limit (uV/m) @ 3m
30 ~ 88	100 **
88 ~ 216	150 **
216 ~ 960	200 **
Above 960	500

\*\* Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241

**Measurement Data: 802.11b Receiver**

Frequency	P	Reading	C.F	Result	Limit	Margin
30.400	V	41.05	-7.45	33.60	40.00	6.40
35.100	H	39.35	-8.95	30.40	40.00	9.60
109.700	V	39.09	-13.49	25.60	43.50	17.90
130.300	V	41.47	-10.87	30.60	43.50	12.90

Note . No other emissions were detected at a level greater than 20dB below limit.

**Measurement Data: 802.11g Receiver**

Frequency	P	Reading	C.F	Result	Limit	Margin
30.750	V	40.15	-7.55	32.60	40.00	7.40
35.100	V	39.35	-8.95	30.40	40.00	9.60
109.200	V	39.26	-13.56	25.70	43.50	17.80
130.000	V	41.40	-10.90	30.50	43.50	13.00

Note . No other emissions were detected at a level greater than 20dB below limit.

## APPENDIX

### TEST EQUIPMENT USED FOR TESTS

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment.

	Type	Manufacturer	Model	Cal.Due.Date (dd/mm/yy)	Next.Due.Date (dd/mm/yy)	S/N
01	Spectrum Analyzer	Agilent	E4404B	21/03/08	21/03/09	US41061134
02	Spectrum Analyzer	Agilent	E4440A	15/11/07	15/11/08	MY45304199
03	Spectrum Analyzer	H.P	8563E	09/10/07	09/10/09	3551A04634
04	Spectrum Analyzer	Rohde Schwarz	FSP	06/09/07	06/09/08	100385
05	Spectrum Analyzer	H.P	8591E	26/04/08	26/04/09	3649A05889
06	EMI TEST RECEIVER	R&S	ESU	11/01/08	11/01/09	100014
07	EMI TEST RECEIVER	R&S	ESCI	13/05/08	13/05/09	100364
08	Power Meter	H.P	EMP-442A	10/07/07	10/07/08	GB37170413
09	Power Sensor	H.P	8481A	11/07/07	11/07/08	3318A96566
10	Frequency Counter	H.P	5342A	06/09/07	06/09/08	2119A04450
11	Signal Generator	Rohde Schwarz	SMR20	02/04/08	02/04/09	101251
12	Signal Generator	H.P	ESG-3000A	10/07/07	10/07/08	US37230529
13	Vector Signal Generator	Rohde Schwarz	SMJ100A	17/01/08	17/01/09	100148
14	Audio Analyzer	H.P	8903B	10/07/07	10/07/08	3011A09448
15	Modulation Analyzer	H.P	8901B	14/07/07	14/07/08	3028A03029
16	Oscilloscope	Tektronix	TDS3052	02/11/07	02/11/08	B016821
17	8960 Series 10 Wireless Comms. Test Set	Agilent	E5515C	18/07/07	18/07/09	GB43461134
18	Universal Radio communication Tester	Rohde Schwarz	CMU 200	02/04/08	02/04/09	107631
19	Bluetooth Tester	TESCOM	TC-3000A	02/11/07	02/11/08	3000A4A0121
20	Power Splitter	WEINSCHEL	1593	05/10/07	05/10/08	332
21	Power Splitter	Anritsu	K241B	19/10/07	19/10/08	020611
22	BAND Reject Filter	Microwave Circuits	N0308372	18/10/07	18/10/08	3125-01DC0312
23	BAND Reject Filter	Wainwright	WRCG1750	18/10/07	18/10/08	SN2
24	AC Power supply	DAEKWANG	5KVA	20/03/08	20/03/09	N/A
25	DC Power Supply	H.P	6622A	20/03/08	20/03/09	465487
26	HORN ANT	ETS	3115	13/06/08	13/06/09	6419
27	HORN ANT	ETS	3115	09/10/07	09/10/08	21097
28	HORN ANT	A.H.Systems	SAS-574	13/06/08	13/06/09	154
29	HORN ANT	A.H.Systems	SAS-574	13/06/08	13/06/09	155

	Type	Manufacturer	Model	Cal.Due.Date (dd/mm/yy)	Next.Due.Date (dd/mm/yy)	S/N
30	Dipole Antenna	Schwarzbeck	VHA9103	19/12/07	19/12/08	2116
31	Dipole Antenna	Schwarzbeck	VHA9103	19/12/07	19/12/08	2117
32	Dipole Antenna	Schwarzbeck	UHA9105	20/12/07	20/12/08	2261
33	Dipole Antenna	Schwarzbeck	UHA9105	20/12/07	20/12/08	2262
34	TEMP & HUMIDITY Chamber	JISCO	J-RHC2	02/10/07	02/10/08	021031
35	Log Periodic Antenna	Schwarzbeck	UHALP9108A1	01/10/07	01/10/08	1098
36	Biconical Antenna	Schwarzbeck	VHA9103	01/10/07	01/10/08	2233
37	Digital Multimeter	H.P	34401A	20/03/08	20/03/09	3146A13475
38	Attenuator (10dB)	WEINSCHEL	23-10-34	05/10/07	05/10/08	BP4386
39	Attenuator (10dB)	WEINSCHEL	23-10-34	30/01/08	30/01/09	BP4387
40	High-Pass Filter	ANRITSU	MP526D	08/10/07	08/10/08	MP27756
41	Attenuator (3dB)	Agilent	8491B	12/07/07	12/07/08	58177
42	20dB Attenuator	Aeroflex/Weinschel	86-20-11	25/10/07	25/10/08	432
43	10dB Attenuator	Aeroflex/Weinschel	86-10-11	25/10/07	25/10/08	446
44	10dB Attenuator	Aeroflex/Weinschel	86-10-11	25/10/07	25/10/08	408
45	Type N Coaxial CIRCULATOR	NOVA MICROWAVE	0088CAN	05/07/07	05/07/08	788
46	Type N Coaxial CIRCULATOR	NOVA MICROWAVE	0185CAN	05/07/07	05/07/08	790
47	Type N Coaxial CIRCULATOR	NOVA MICROWAVE	0215CAN	05/07/07	05/07/08	112
48	Amplifier (25dB)	Agilent	8447D	21/05/08	21/05/09	2944A10144
49	Amplifier (30dB)	Agilent	8449B	25/10/07	25/10/08	3008A01590
50	Amplifier (22dB)	H.P	8447E	27/02/08	27/02/09	2945A02865
51	Position Controller	TOKIN	5901T	N/A	N/A	14173
52	Driver	TOKIN	5902T2	N/A	N/A	14174
53	RFI/FIELD Intensity Meter	Kyorits	KNW-2402	06/09/07	06/09/08	4N-170-3
54	LISN	Kyorits	KNW-407	30/08/07	30/08/08	8-317-8
55	LISN	Kyorits	KNW-242	06/10/07	06/10/08	8-654-15
56	CVCF	NF Electronic	4400	N/A	N/A	344536 4420064
57	Software	ToYo EMI	EP5/RE	N/A	N/A	Ver 2.0.800
58	Software	ToYo EMI	EP5/CE	N/A	N/A	Ver 2.0.801
59	Software	AUDIX	e3	N/A	N/A	Ver 3.0
60	Software	Agilent	Benchlink	N/A	N/A	A.01.09 021211