

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

## INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

**Product Name:** Juno T41/5

**Brand Name:** Trimble

**Marketing Name:** RH42G

**Model No.:** JUNO/T41/5-BWC2RFG

**Model Difference:** N/A

**FCC ID:** S9E-JUNO41WN

**Report No.:** ER/2015/60002

**Issue Date:** Jun. 26, 2015

**FCC Rule Part:** §15.247, Cat: DTS

**Prepared for:** Trimble Navigation Limited  
345 SW Avery Avenue, Corvallis, OR 97333  
SGS Taiwan Ltd.  
Electronics & Communication Laboratory

**Prepared by:** No.134, Wu Kung Road, New Taipei Industrial  
Park, Wuku District, New Taipei City, Taiwan  
24803



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f (886-2) 2298-0488

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## VERIFICATION OF COMPLIANCE

**Applicant:** Trimble Navigation Limited  
345 SW Avery Avenue, Corvallis, OR 97333

**Product Name:** Juno T41/5

**Brand Name:** Trimble

**Marketing Name:** RH42G

**Model No.:** JUNO/T41/5-BWC2RFG

**Model Difference:** N/A

**FCC ID:** S9E-JUNO41WN

**Report Number:** ER/2015/60002

**Date of test:** Jun. 03, 2015 ~ Jun. 18, 2015

**Date of EUT Received:** Jun. 03, 2015

## We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2009 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

Test By:

Curry Chen

Date

Jun. 26, 2015

Curry Chen / Engineer

Prepared By:

Violetta Tang

Date

Jun. 26, 2015

Violetta Tang / Clerk

Approved By:

Jim Chang

Date

Jun. 26, 2015

Jim Chang / Asst. Manager

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## Revision History

Report Number	Revision	Description	Issue Date
ER/2015/60002	Rev.00	Initial creation of document	Jun. 26, 2015

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## 1 GENERAL INFORMATION

### 1.1 Product description

General:

Product Name:	Juno T41/5	
Brand Name:	Trimble	
Marketing Name:	RH42G	
Model No.:	JUNO/T41/5-BWC2RFG	
Model Difference:	N/A	
Hardware Version:	V9	
Software Version:	1.0.8(Build 396)	
Data Cable (USB):	Model No.: A9136939, Supplier: Sinbon	
Power Supply:	3.7Vdc Rechargeable Li-ion Battery or 5Vdc from AC/DC Adapter	
	Battery:	Model No.: S11GD103A, Supplier: LICO
	Adapter:	Model No.: PSA10F-050Q, Supplier: PHIHONG TECHNOLOGY CO.,

WLAN 2.4GHz:

Wi-Fi	Frequency Range	Channels	Rated Power	Modulation Technology
11b/g	2412-2462	11	b: 19.48dBm g: 21.87dBm	DSSS, OFDM
11n	HT20 2412-2462	11	HT20: 21.76dBm	OFDM
Antenna Designation:		PIFA Antenna, Gain: 2.9dBi		
Modulation type:		CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM		
Transition Rate:		802.11 b: up to 11 Mbps; 802.11 g: up to 54 Mbps 802.11 n 20MHz: up to 72.2Mbps		

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## 1.2 Product Feature of Equipment Under Test

The equipment under Test (Hereafter Called: EUT) is Juno T41/5 supporting, GSM / WCDMA / CDMA, Wi-Fi 802.11bgn, Bluetooth with RFID features, and below is details of information

Product Feature	
Product Name:	Juno T41/5
Brand Name:	Trimble
Marketing Name:	RH42G
Model No.:	JUNO/T41/5-BWC2RFG
Model Difference:	N/A
FCC ID	S9E-JUNO41WN
GSM Operating Band(s)	GSM 850 / 1900MHz
GPRS / EGPRS Multi Slot Class	Class 12
WCDMA Operating Band(s)	FDD Band II / V
CDMA / EVDO Operating Band(s)	BC0 / BC1 / BC10
Wi-Fi Specification	802.11b/g/n
Bluetooth Version	V2.1+EDR
RFID Specification	RFID

**Note:** The above EUT information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

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### 1.3 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

FCC KDB 558074 D01 DTS Meas. Guidance V03r03

ANSI C63.10:2009

Note:

1. All test items have been performed and record as per the above standards.
2. The composite system is compliance with FCC Subpart B is authorized under the certification procedure.
3. The EUT was placed 0.8m height for frequency above 1GHz in accordance with ANSI C63.10:2009

### 1.4 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan. (TAF code 0513)

FCC Registration Numbers are: 990257 (Wuku)

Canada Registration Number: 4620A-5.

### 1.5 Special Accessories

There are no special accessories used while test was conducted.

### 1.6 Equipment Modifications

There was no modification incorporated into the EUT.

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## 2 SYSTEM TEST CONFIGURATION

### 2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

### 2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

### 2.3 Test Procedure

#### 2.3.1 Conducted Emissions

The EUT is placed on a turn table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz. The CISPR Quasi-Peak and Average detector mode is employed according to §15.107. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

#### 2.3.2 Radiated Emissions

The EUT is placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 0.8 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

### 2.4 Measurement Results Explanation Example

#### For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

#### Note:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Following shows an offset computation example with cable loss 1dB and 10dB attenuator.

$$\text{Offset} = \text{RF cable loss (dB)} + \text{attenuation factor(dB)} = 1 + 10 = 11(\text{dB})$$

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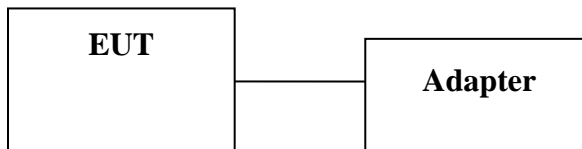
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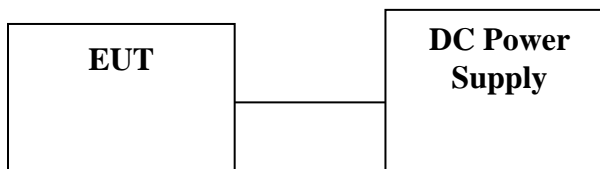
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## 2.5 Configuration of Tested System

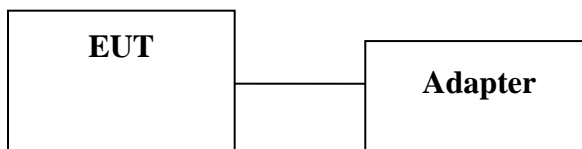
**Fig. 2-1 Radiated Emission**



**Fig. 2-2 Conducted (Antenna Port) Configuration**



**Fig. 2-3 AC Power Line Conducted Emission**



**Table 2-1 Equipment Used in Tested System**

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WLAN Test Software	N/A	N/A	N/A	N/A	N/A
2.	DC Power Supply	HP	E3640A	KR93300208	N/A	N/A

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### 3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	Compliant
§15.247(b) (3)	Peak Output Power	Compliant
§15.247(a)(2)	6dB Bandwidth	Compliant
§15.247(d)	Conducted Band Edge and Spurious Emission	Compliant
§15.247(d)	Radiated Band Edge and Spurious Emission	Compliant
§15.247(e)	Power Spectral Density	Compliant
§15.203 §15.247(b)	Antenna Requirement	Compliant

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## 4 DESCRIPTION OF TEST MODES

### 4.1 Operated in 2400 ~ 2483.5MHz Band

11 channels are provided for 802.11b, 802.11g and 802.11n HT20

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
1	2412 MHz	7	2442 MHz
2	2417 MHz	8	2447 MHz
3	2422 MHz	9	2452 MHz
4	2427 MHz	10	2457 MHz
5	2432 MHz	11	2462 MHz
6	2437 MHz		

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## 4.2 The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.
3. Investigation has been done on all the possible configurations for searching the worst case.

### RADIATED EMISSION TEST:

RADIATED EMISSION TEST (BELOW 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11g	1 to 11	1,6,11	OFDM	6	MAIN
RADIATED EMISSION TEST (ABOVE 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11b	1 to 11	1, 6, 11	DSSS	1	MAIN
802.11g	1 to 11	1, 6, 11	OFDM	6	MAIN
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	6.5	MAIN

#### Note:

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for 802.11b/g/n WLAN Transmitter for channel Low, Mid and High, the worst case E2 position was reported.

### ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11b	1 to 11	1, 6, 11	DSSS	1	MAIN
802.11g	1 to 11	1, 6, 11	OFDM	6	MAIN
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	6.5	MAIN

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## 5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
Peak Output Power	+/- 0.84 dB
6dB Bandwidth	+/- 51.33 Hz
100 KHz Bandwidth Of Frequency Band Edges	+/- 0.84 dB
Peak Power Density	+/- 1.3 dB
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC= +/- 0.2%

Radiated Spurious Emission:

Measurement uncertainty (Polarization : <b>Vertical</b> )	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

Measurement uncertainty (Polarization : <b>Horizontal</b> )	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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## 6 CONDUCTED EMISSION TEST

### 6.1 Standard Applicable

According to §15.207, frequency range within 150kHz to 30MHz shall not exceed the limit table as below.

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Note 1.The lower limit shall apply at the transition frequencies 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

### 6.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESC17	100760	05/04/2015	05/03/2016
LISN	SCHWARZBECK	NSLK 8127	8127-649	05/15/2015	05/14/2016
LISN	FCC	FCC-LISN-50/250 -25-2-01	04034	03/13/2015	03/12/2016
Coaxial Cables	N/A	WK CE Cable	N/A	11/26/2014	11/25/2015

### 6.3 EUT Setup

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI 63.10:2009.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

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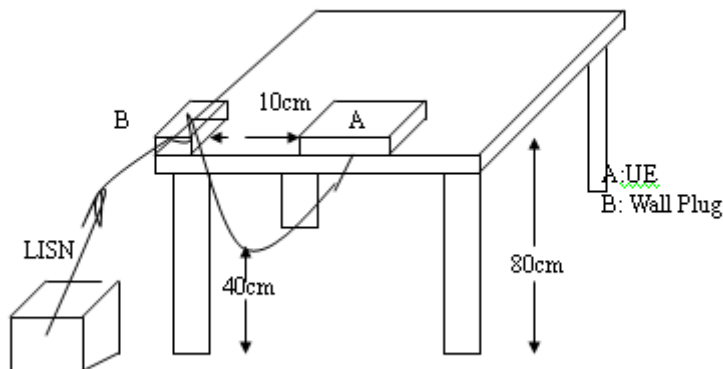
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## 6.4 Test SET-UP (Block Diagram of Configuration)



## 6.5 Measurement Procedure

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all phases of power being supplied by given UE are completed

## 6.6 Measurement Result

Note: Refer to next page for measurement data and plots.

Note2: The \* reveals the worst-case results that closet to the limit

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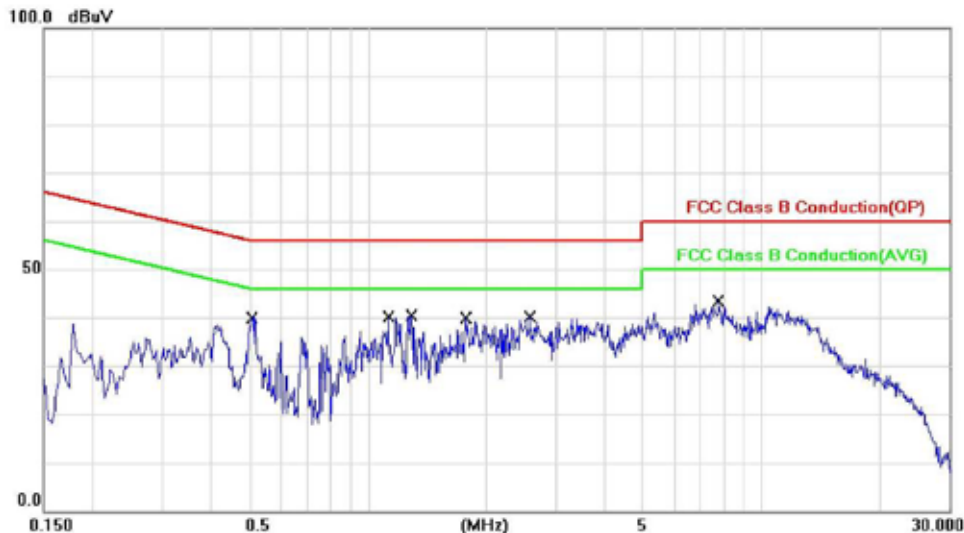


## AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation mode			Test Date:	Jun. 18, 2015
Temperature:	24	Humidity:	66 %	Test By:	Marcus
				Phase:	L1

Site: ConductionRoom	Phase: L1	Temperature: 24 °C
Limit: FCC Class B Conduction(QP)	Power: AC 120V/60Hz	Humidity: 66%
Mode: Operation		
Note:		

### ConductedEmission



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.5073	37.30	0.04	37.34	56.00	-18.66	QP	
2 *		0.5073	29.30	0.04	29.34	46.00	-16.66	AVG	
3		1.1260	32.00	0.05	32.05	56.00	-23.95	QP	
4		1.1260	21.10	0.05	21.15	46.00	-24.85	AVG	
5		1.2904	36.00	0.06	36.06	56.00	-19.94	QP	
6		1.2904	24.40	0.06	24.46	46.00	-21.54	AVG	
7		1.7730	33.80	0.07	33.87	56.00	-22.13	QP	
8		1.7730	23.80	0.07	23.87	46.00	-22.13	AVG	
9		2.5580	34.10	0.09	34.19	56.00	-21.81	QP	
10		2.5580	23.00	0.09	23.09	46.00	-22.91	AVG	
11		7.7400	35.70	0.24	35.94	60.00	-24.06	QP	
12		7.7400	23.70	0.24	23.94	50.00	-26.06	AVG	

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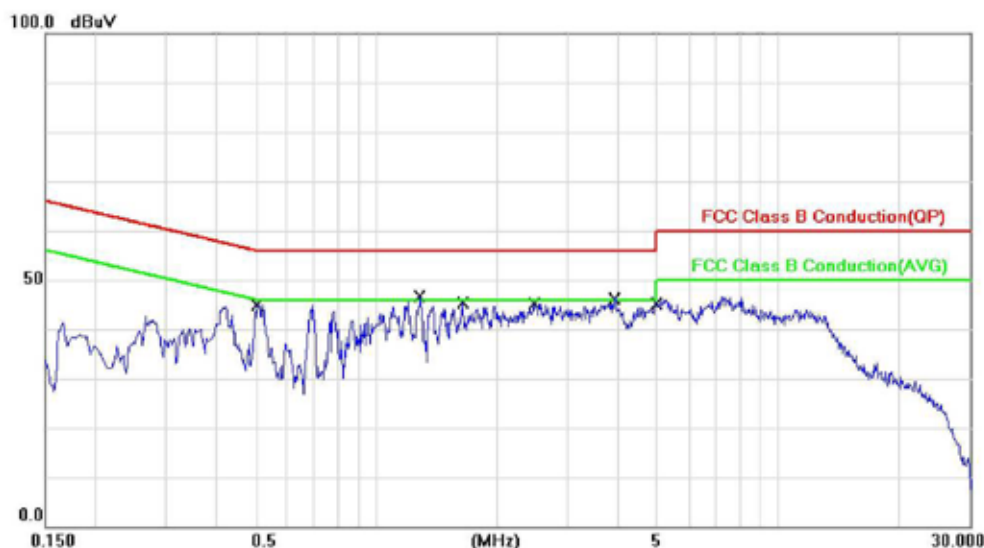
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Operation Mode:	Operation mode			Test Date:	Jun. 18, 2015
Temperature:	24	Humidity:	66 %	Test By:	Marcus
				Phase:	N

Site: ConductionRoom Phase: **N** Temperature: 24 °C  
Limit: FCC Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 66%  
Mode: Operation  
Note:

### Conducted Emission



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.5070	42.30	0.06	42.36	56.00	-13.64	QP	
2 *		0.5070	34.20	0.06	34.26	46.00	-11.74	AVG	
3		1.2857	41.90	0.08	41.98	56.00	-14.02	QP	
4		1.2857	31.70	0.08	31.78	46.00	-14.22	AVG	
5		1.6290	38.20	0.08	38.28	56.00	-17.72	QP	
6		1.6290	27.00	0.08	27.08	46.00	-18.92	AVG	
7		2.4645	39.60	0.11	39.71	56.00	-16.29	QP	
8		2.4645	28.60	0.11	28.71	46.00	-17.29	AVG	
9		3.8870	39.80	0.13	39.93	56.00	-16.07	QP	
10		3.8870	27.90	0.13	28.03	46.00	-17.97	AVG	
11		4.9854	39.40	0.16	39.56	56.00	-16.44	QP	
12		4.9854	27.10	0.16	27.26	46.00	-18.74	AVG	

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## 7 DUTY CYCLE OF TEST SIGNAL

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.

All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

### Formula:

$$\text{Duty Cycle} = \text{Ton} / (\text{Ton} + \text{Toff})$$

### Measurement Procedure:

1. Set span = Zero
2. RBW = 8MHz
3. VBW = 8MHz,
4. Detector = Peak

### Duty Cycle:

	Duty Cycle	Duty Factor (dB)
802.11b	99.20%	0.03
802.11g	93.82%	0.28
802.11n_20	93.83%	0.28

$$\text{Duty Cycle Factor: } 10 * \log (1/0.992) = 0.03$$

$$\text{Duty Cycle Factor: } 10 * \log (1/0.938) = 0.28$$

$$\text{Duty Cycle Factor: } 10 * \log (1/0.938) = 0.28$$

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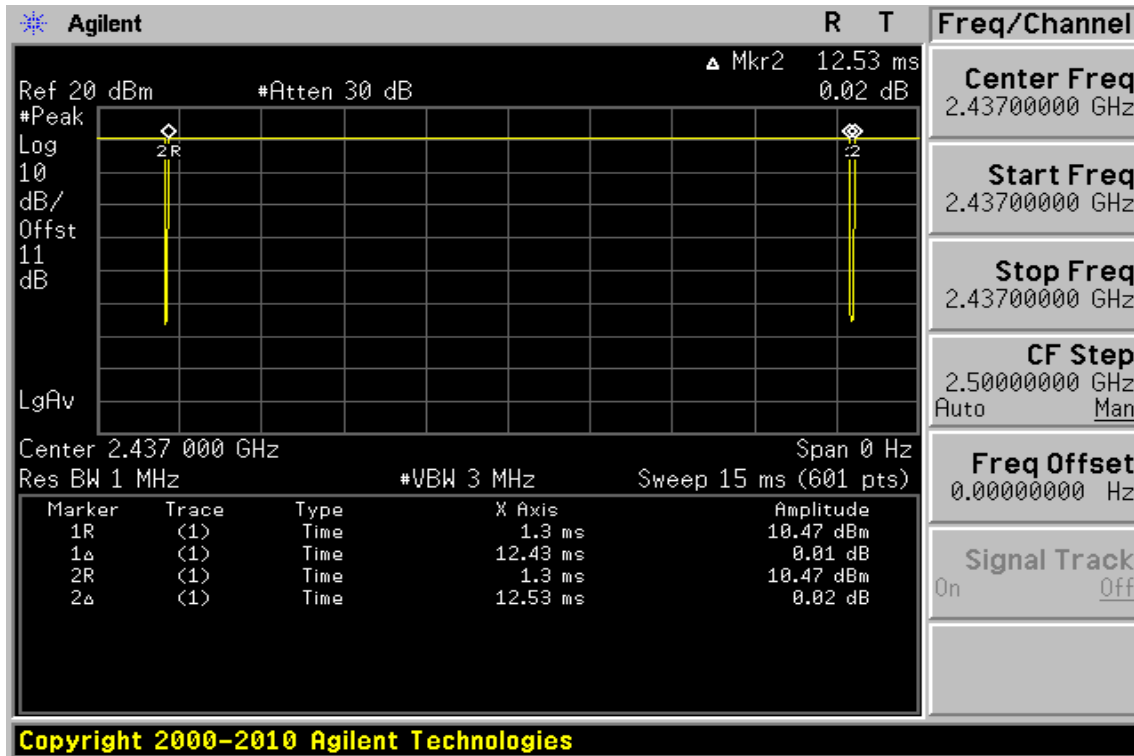
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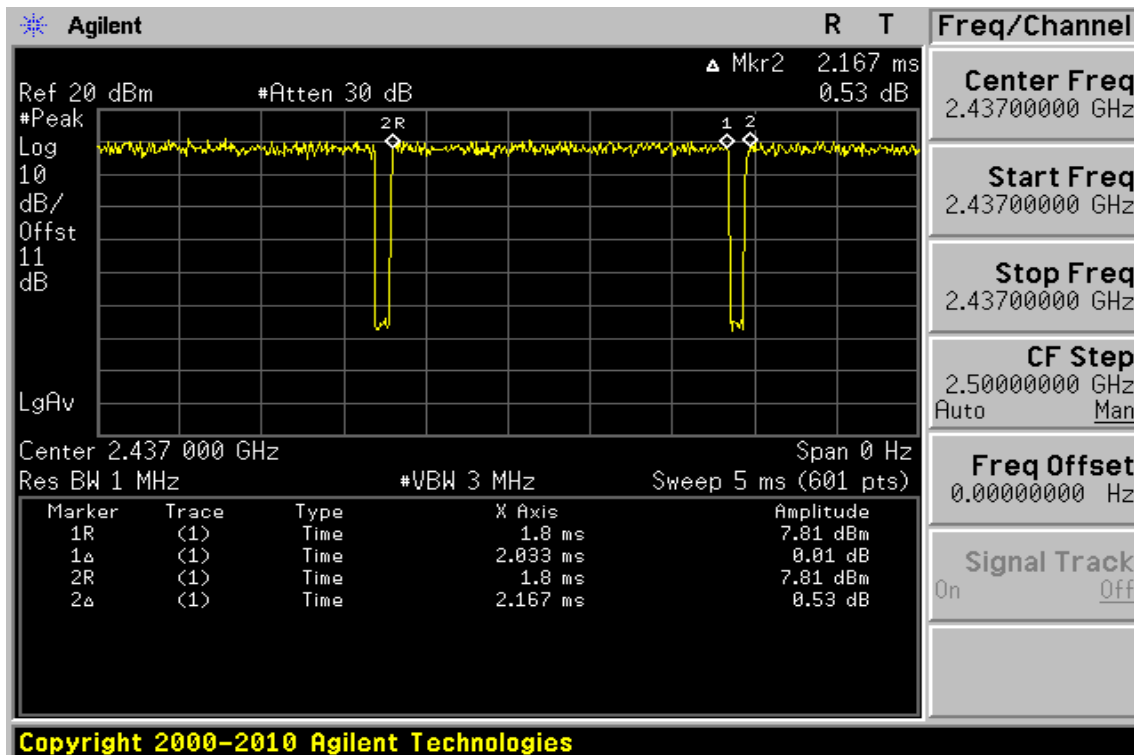
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## 7.1 DUTY CYCLE TEST SIGNAL Measurement Result

802.11 b



802.11 g



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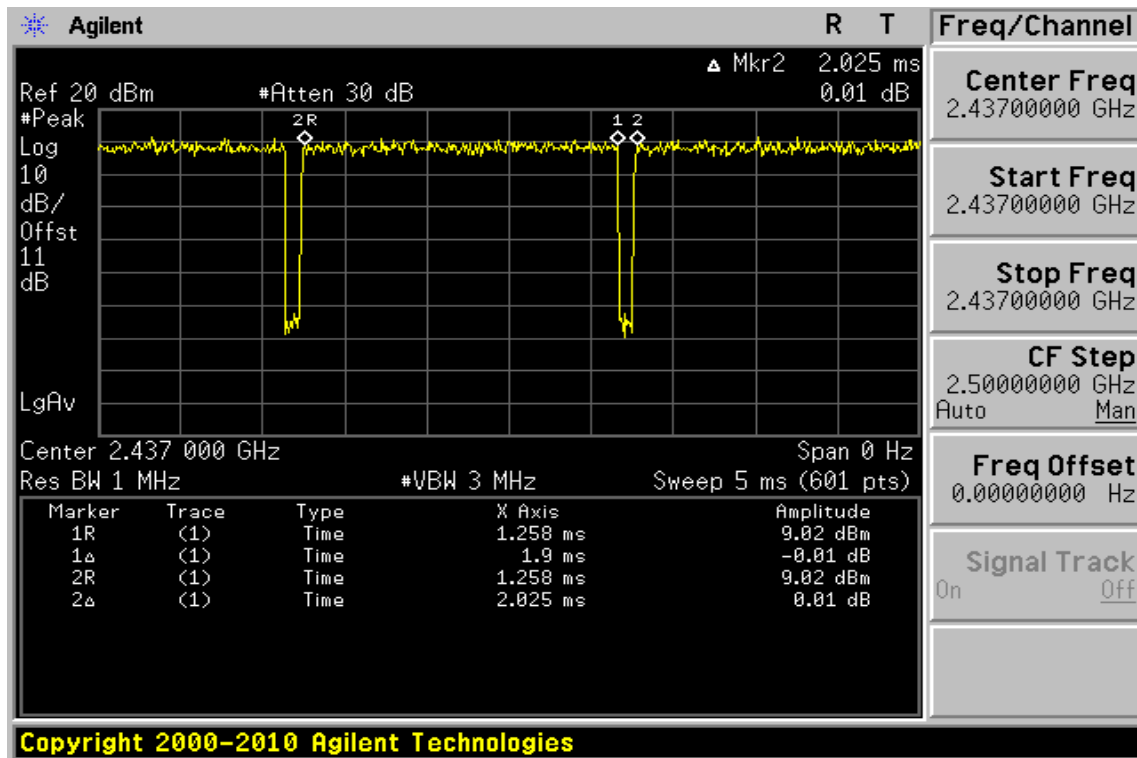
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## 802.11 n\_20 MHz



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## 8 PEAK OUTPUT POWER MEASUREMENT

### 8.1 Standard Applicable

For systems using digital modulation in the 2400-2483.5 MHz bands, the limit for peak output power is 1Watt.

If the transmitting antenna of directional gain greater than 6dBi are used the peak output power form the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6dBi.

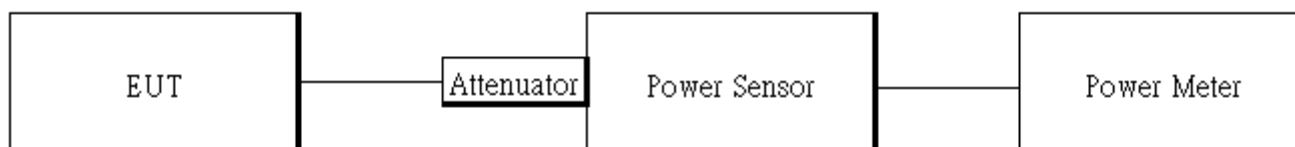
In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of Antenna exceeds 6dBi.

### 8.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2495A	1005007	12/20/2014	12/19/2015
Power Sensor	Anritsu	MA2411B	917032	12/20/2014	12/19/2015
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2015	01/01/2016
Attenuator	Mini-Circuit	BW-S10W2+	002	01/02/2015	01/01/2016

### 8.3 Test Set-up

Power Meter:



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#### 8.4 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance V03r03.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter .

##### Power Meter:

It is used as the auxiliary test equipment to conduct the output power measurement.

4. Record the max. Reading as observed from Spectrum or Power Meter.
5. Repeat above procedures until all frequency of interest measured was complete.

#### 8.5 Measurement Result

##### 802.11b

CH	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit
1	2412	1	<b>19.48</b>	88.72	1 Watt = 30 dBm
6	2437	1	19.41	87.30	1 Watt = 30 dBm
11	2462	1	19.38	86.70	1 Watt = 30 dBm

CH	Frequency (MHz)	Data Rate	Avg. Output Power (dBm)	Avg. Output Power (mW)	Limit
1	2412	1	16.20	41.69	1 Watt = 30 dBm
6	2437	1	16.27	42.36	1 Watt = 30 dBm
11	2462	1	16.24	42.07	1 Watt = 30 dBm

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## 802.11g

CH	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit
1	2412	6	21.87	153.82	1 Watt = 30 dBm
6	2437	6	21.55	142.89	1 Watt = 30 dBm
11	2462	6	21.81	151.71	1 Watt = 30 dBm

CH	Frequency (MHz)	Data Rate	Avg. Output Power (dBm)	Avg. Output Power (mW)	Limit
1	2412	6	12.15	16.41	1 Watt = 30 dBm
6	2437	6	14.23	26.49	1 Watt = 30 dBm
11	2462	6	11.82	15.21	1 Watt = 30 dBm

## 802.11n\_HT20

CH	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit
1	2412	MCS0	21.76	149.97	1 Watt = 30 dBm
6	2437	MCS0	21.59	144.21	1 Watt = 30 dBm
11	2462	MCS0	21.32	135.52	1 Watt = 30 dBm

CH	Frequency (MHz)	Data Rate	Avg. Output Power (dBm)	Avg. Output Power (mW)	Limit
1	2412	MCS0	12.14	16.37	1 Watt = 30 dBm
6	2437	MCS0	14.46	27.93	1 Watt = 30 dBm
11	2462	MCS0	11.13	12.97	1 Watt = 30 dBm

*\* Note: The duty cycle factor is compensated to obtain the maximum value of measurement in average.*

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## 9 6dB BANDWIDTH

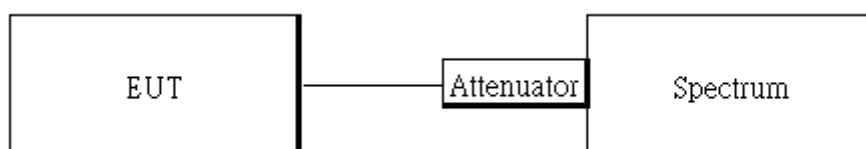
### 9.1 Standard Applicable

The minimum 6 dB bandwidth shall be at least 500 kHz.

### 9.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY51100003	01/29/2015	01/28/2016
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2015	01/01/2016
Attenuator	Mini-Circuit	BW-S10W2+	002	01/02/2015	01/01/2016

### 9.3 Test Set-up



### 9.4 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance V03r03.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = 100 kHz, VBW = 3\*RBW, Span = 30M/50MHz, Detector=Peak, Sweep=auto.
4. Mark the peak frequency and -6dB (upper and lower) frequency.
5. Repeat above procedures until all frequency of interest measured was complete.

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## 9.5 Measurement Result

Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
802.11b			
2412	9076	> 500	PASS
2437	9071	> 500	PASS
2462	8590	> 500	PASS
802.11g			
2412	15197	> 500	PASS
2437	13848	> 500	PASS
2462	15174	> 500	PASS
802.11n_HT20			
2412	15010	> 500	PASS
2437	15173	> 500	PASS
2462	15131	> 500	PASS

\* Note: The arrow “->” reveals X decibel level

\*Refer to next page for plots

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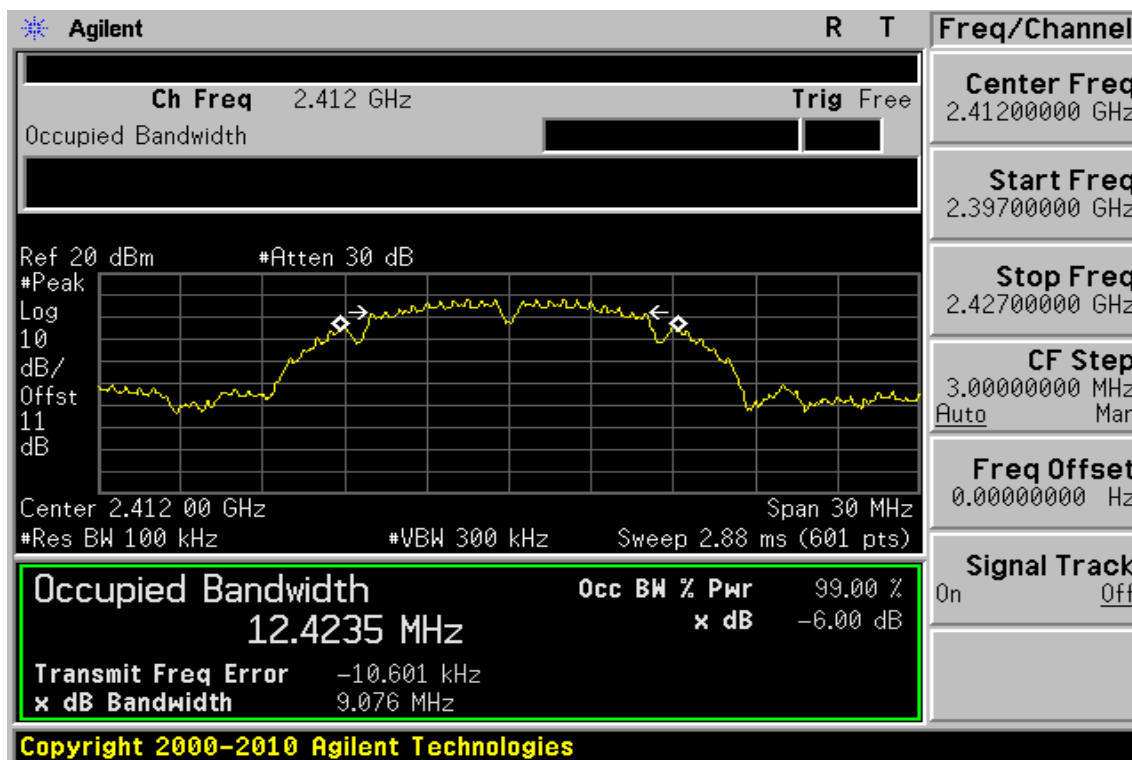
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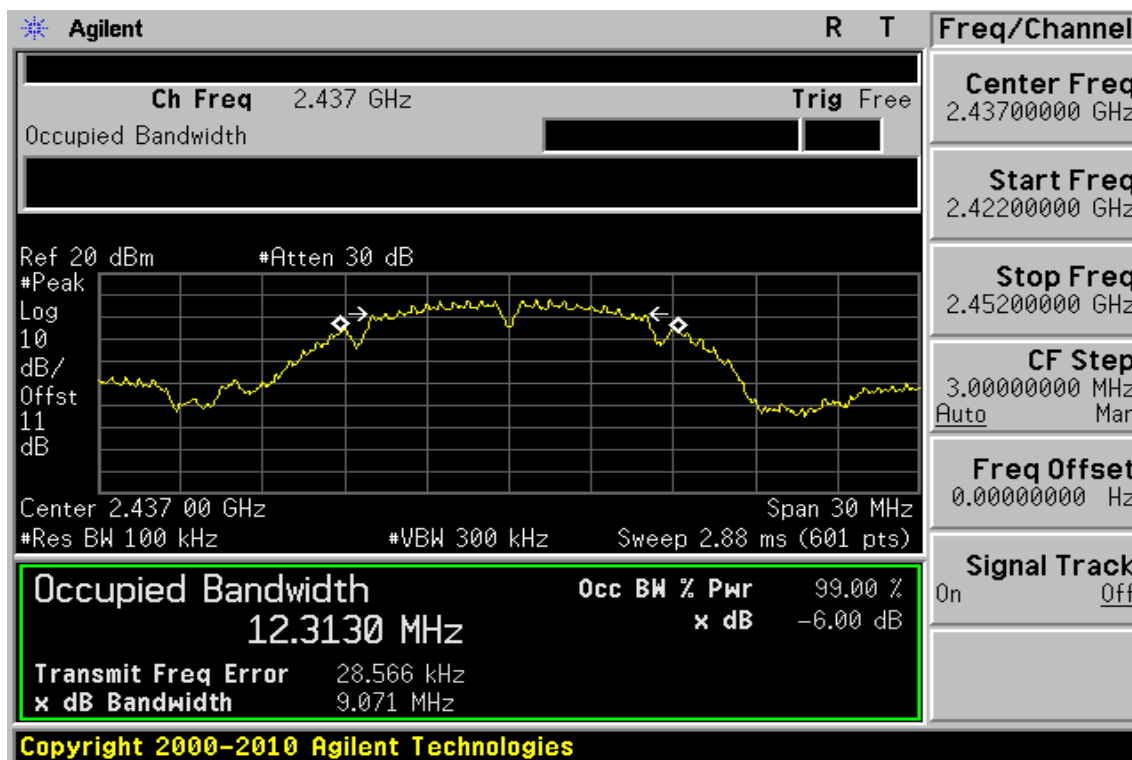
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## 802.11b

### 6dB Band Width Test Data CH-Low



### 6dB Band Width Test Data CH-Mid



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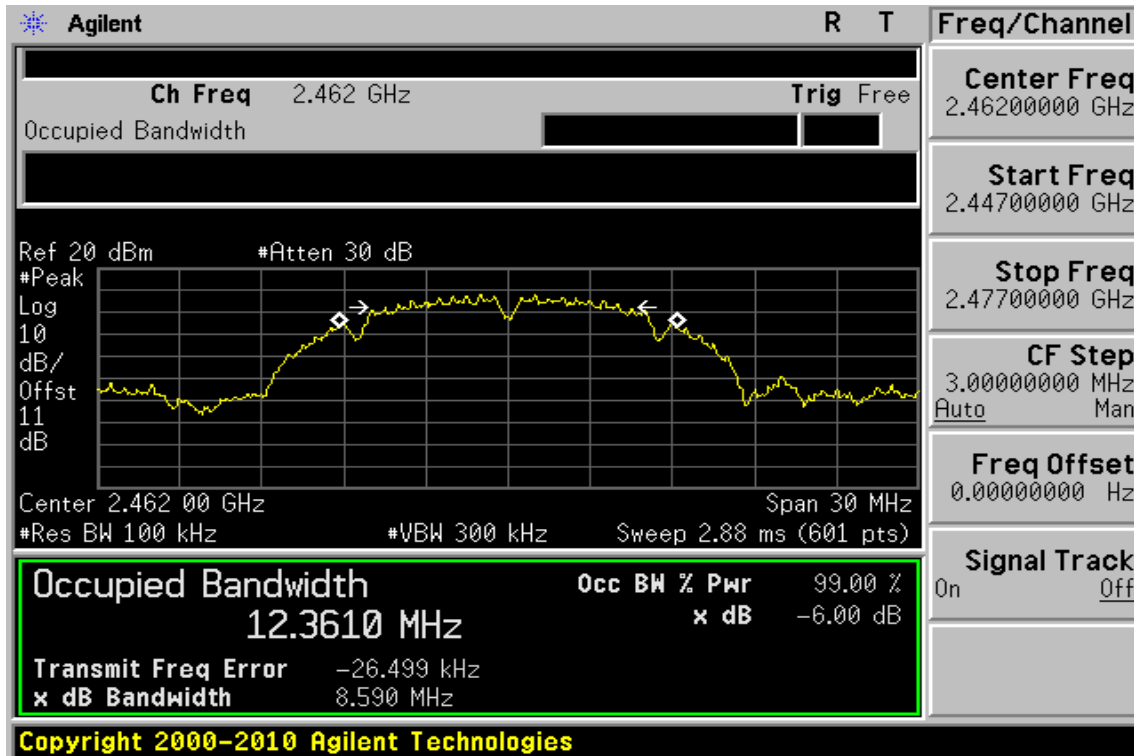
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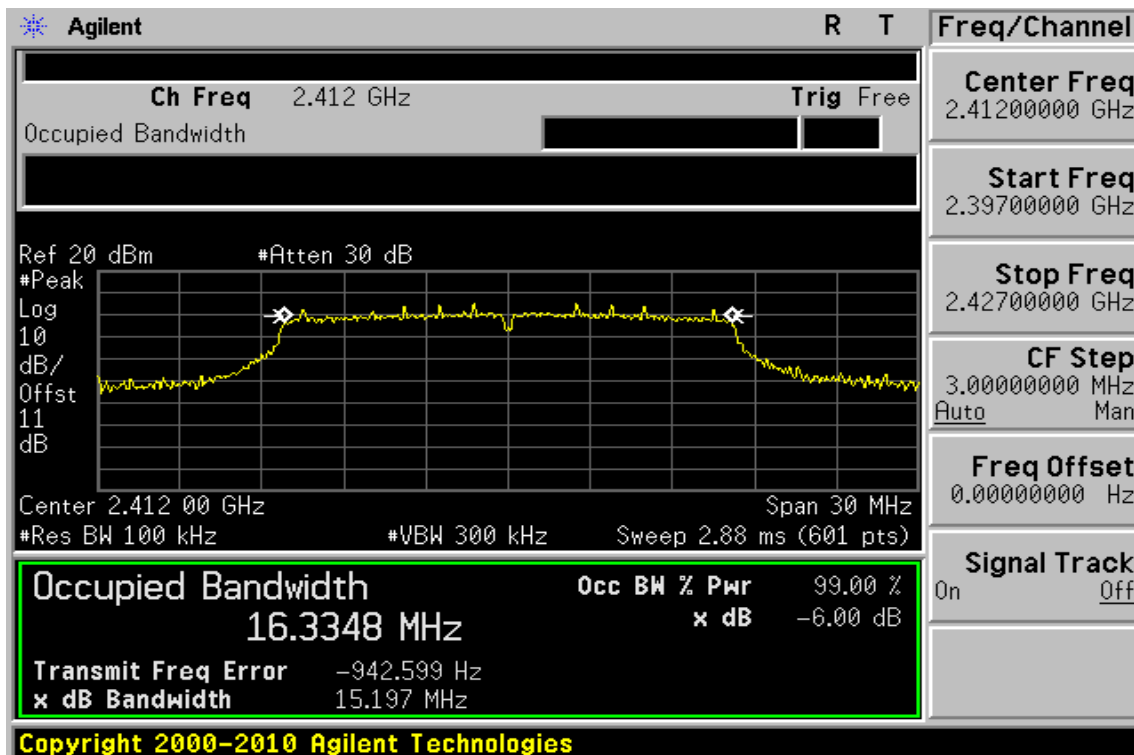
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## 6dB Band Width Test Data CH-High



## 802.11g

## 6dB Band Width Test Data CH-Low



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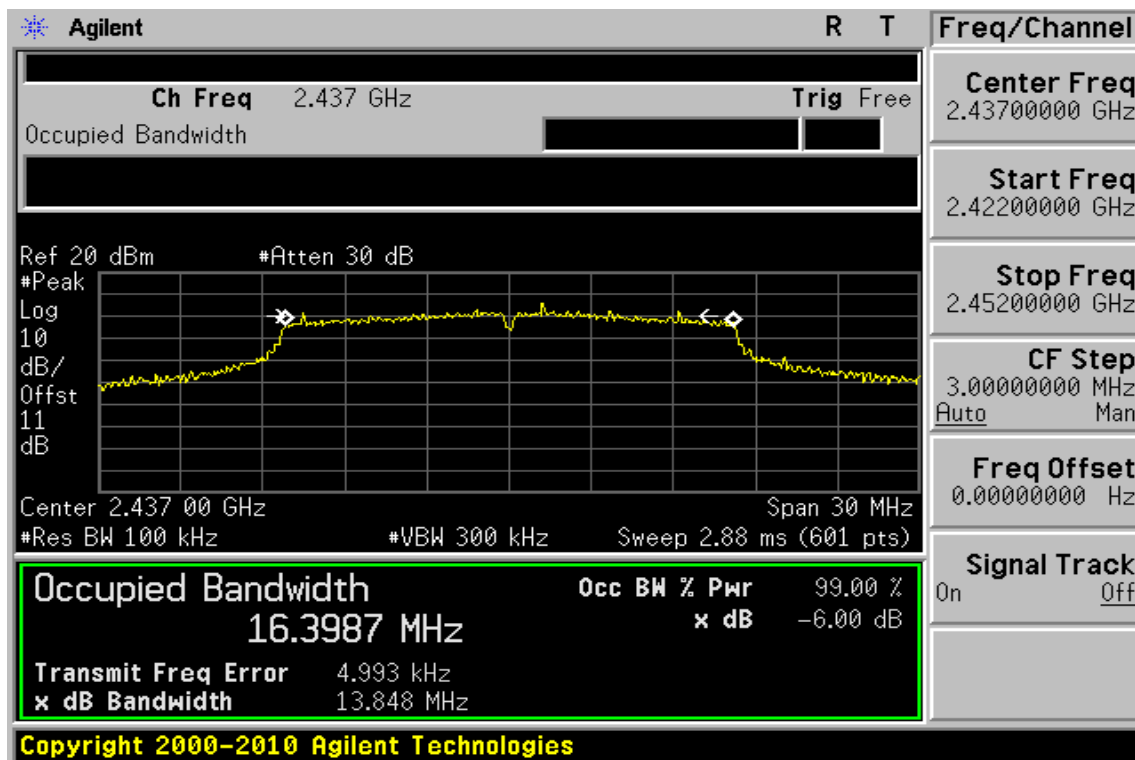
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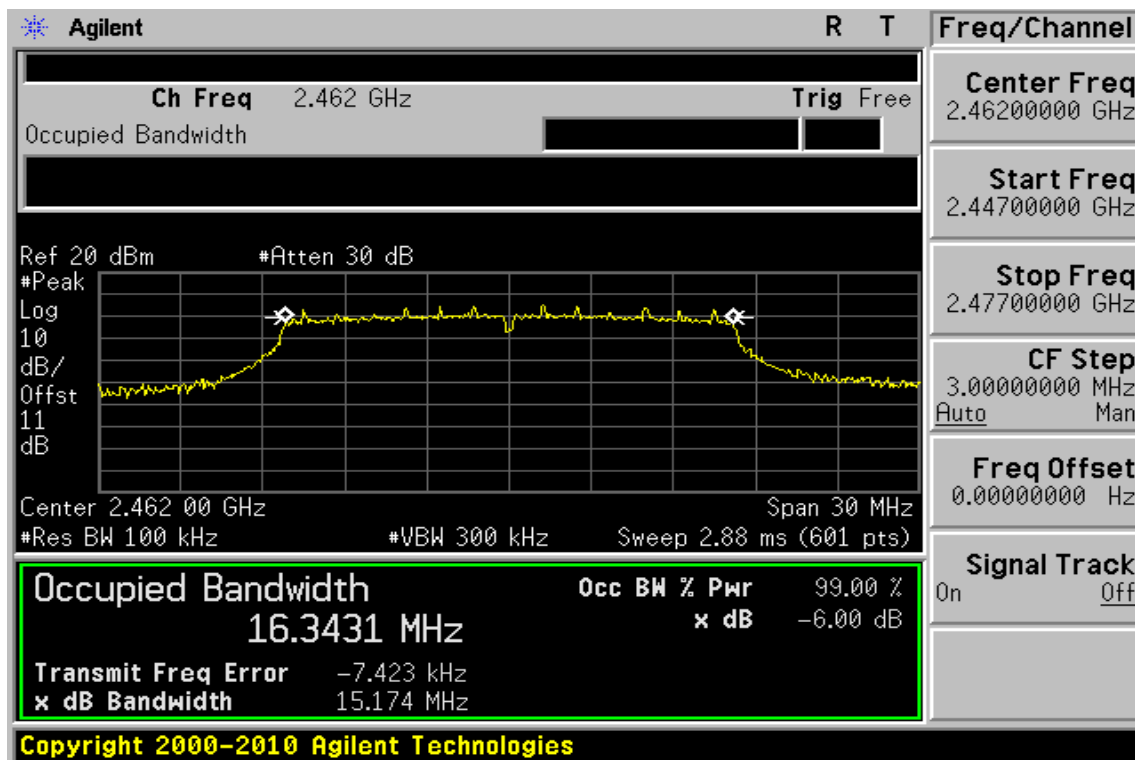
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## 6dB Band Width Test Data CH-Mid



## 6dB Band Width Test Data CH-High



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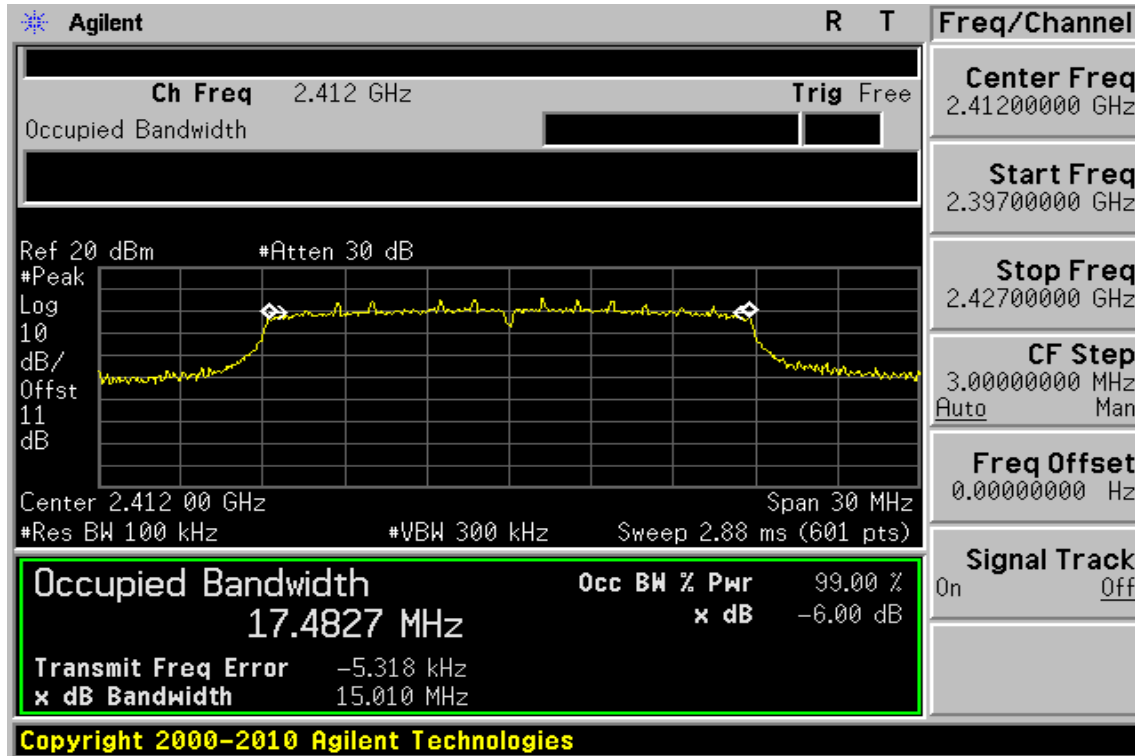
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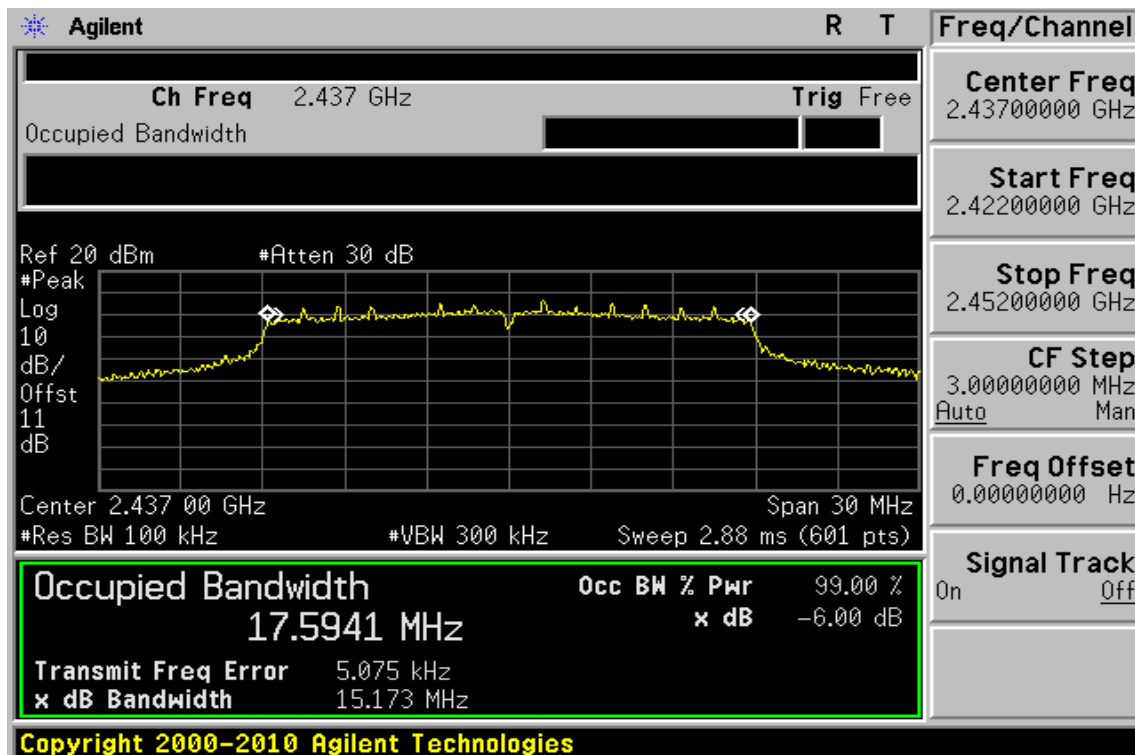
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## 802.11n\_20M

### 6dB Band Width Test Data CH-Low



### 6dB Band Width Test Data CH-Mid



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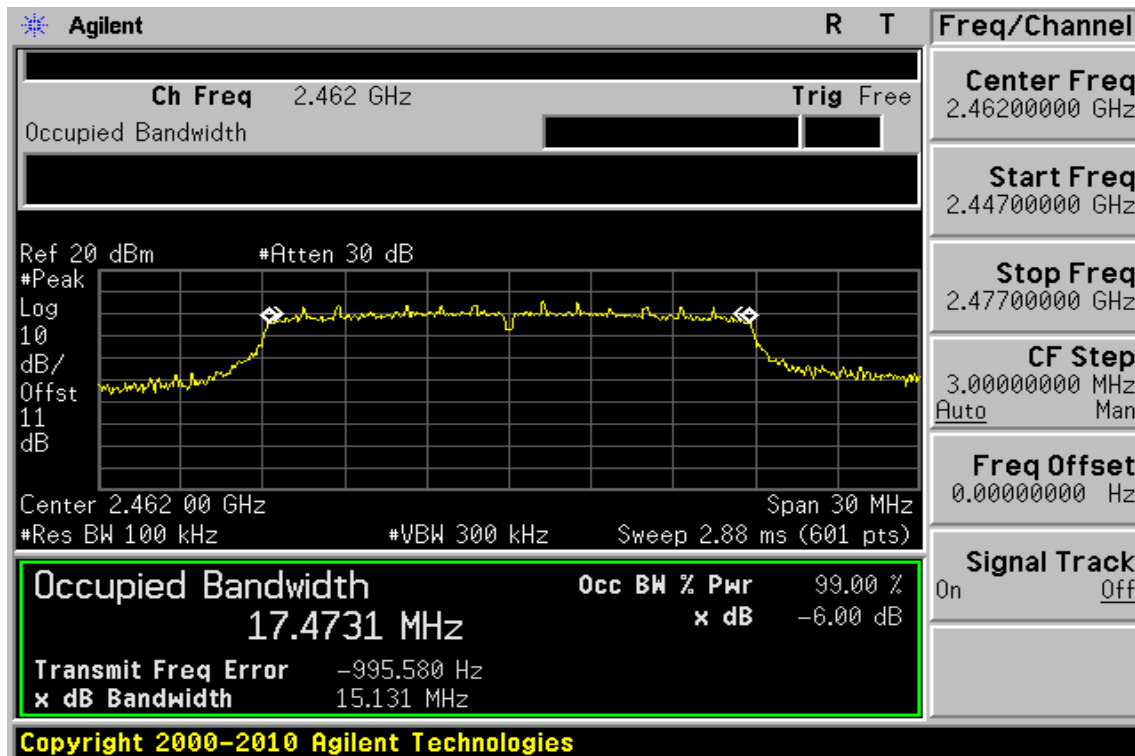
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## 6dB Band Width Test Data CH-High



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## 10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

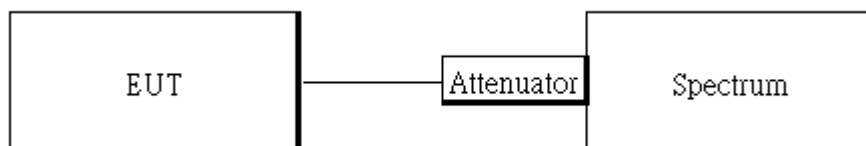
### 10.1 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. 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).

### 10.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY51100003	01/29/2015	01/28/2016
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2015	01/01/2016
Attenuator	Mini-Circuit	BW-S10W2+	002	01/02/2015	01/01/2016

### 10.3 Test SET-UP



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### 10.3.1 Measurement Procedure

#### Conducted Band Edge:

1. To connect Antenna Port of EUT to Spectrum.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance V03r03.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. Set start to edge frequency, and stop frequency of spectrum analyzer so as to encompass the spectrum to be examined.
5. Set the spectrum analyzer as RBW, VBW=300KHz, Detector = Peak, Sweep = auto
6. Mark the highest reading of the emission as the reference level measurement.
7. Set DL as the limit = reading on marker 1 – 20dBm
8. Marker on frequency, 2.3999GHz and 2.4836GHz, and examine shall 100 KHz immediately outside the authorized (2400~2483.5) be attenuated by 20dB at least relative to the maximum emission of power.
9. Repeat above procedures until all default test channel (low, middle, and high) was complete.

#### Conducted Spurious Emission:

1. To connect Antenna Port of EUT to Spectrum
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance V03r03.
3. Set RBW = 100K & VBW  $\geq$  300K, Detector = Peak, Sweep = Auto.
4. Allow trace to fully stabilize.
5. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
6. Repeat above procedures until all default test channel measured were complete.

### 10.4 Measurement Result

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

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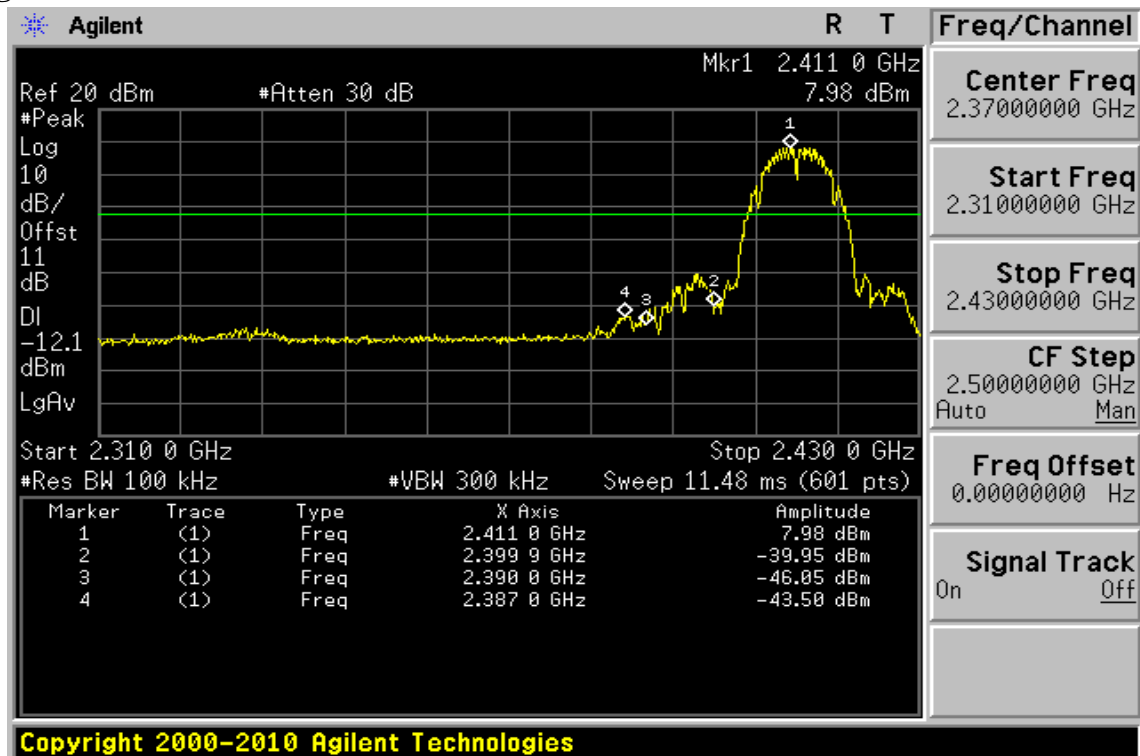
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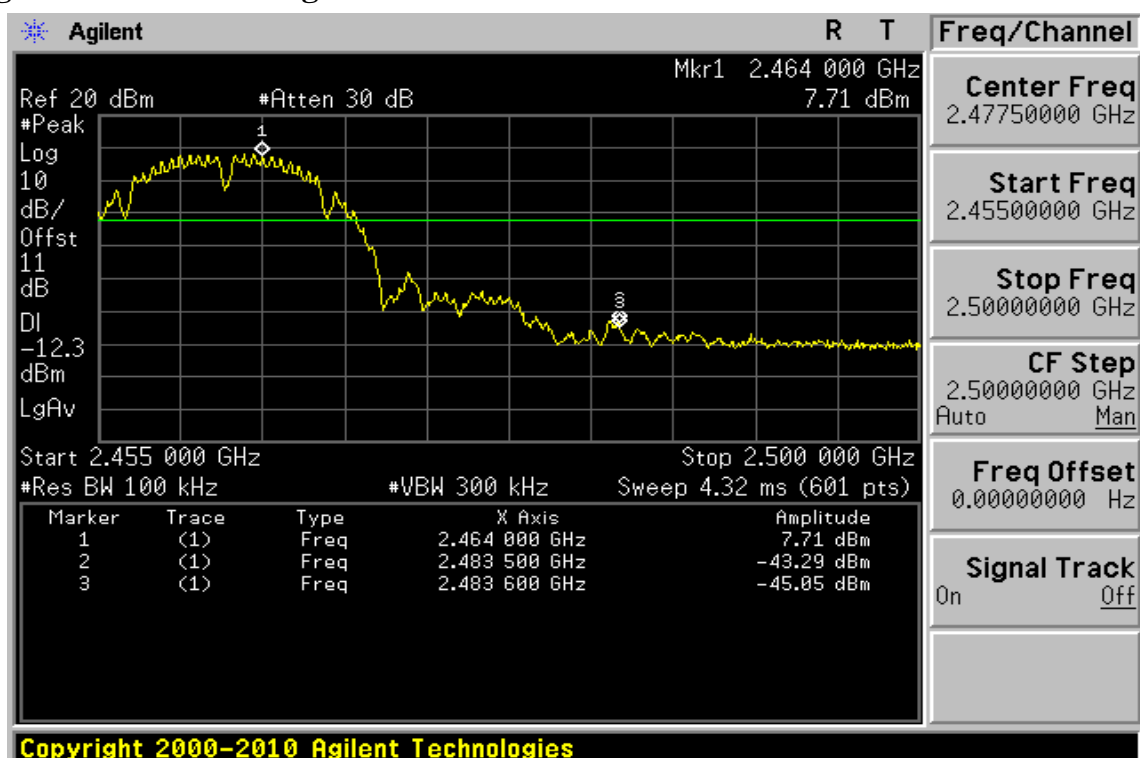
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## 802.11b

## Band Edges Test Data CH-Low



## Band Edges Test Data CH-High



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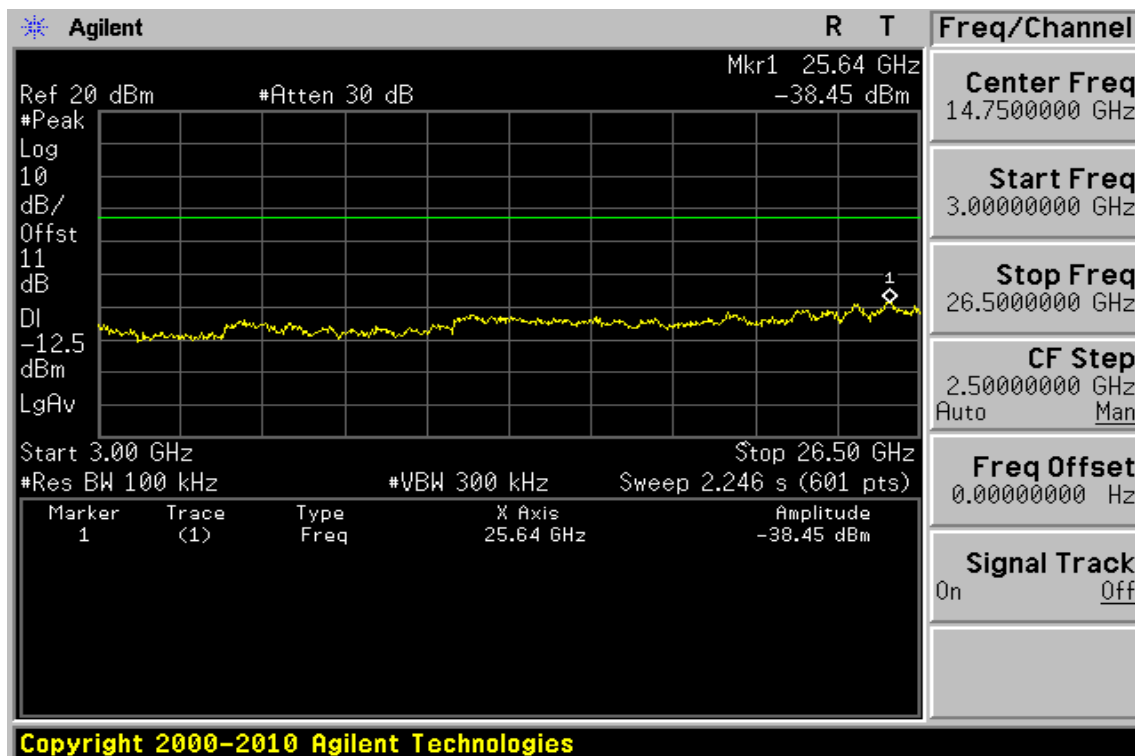
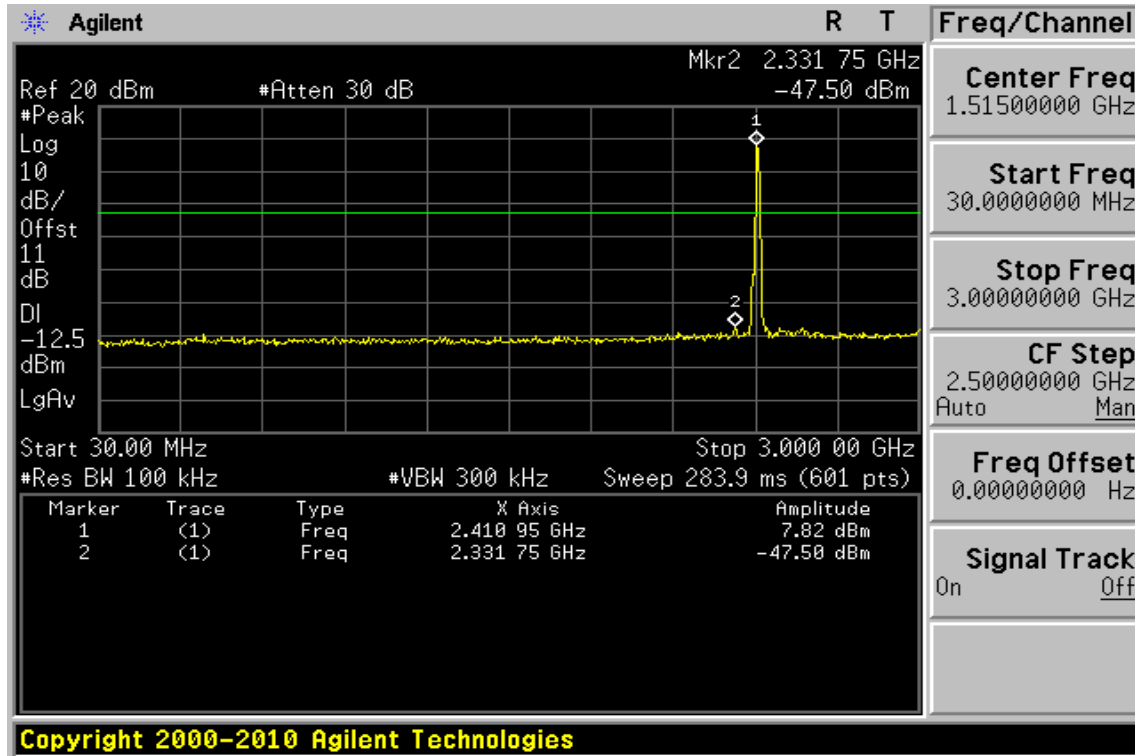
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## 802.11b

### Spurious Emission Test Data CH-Low



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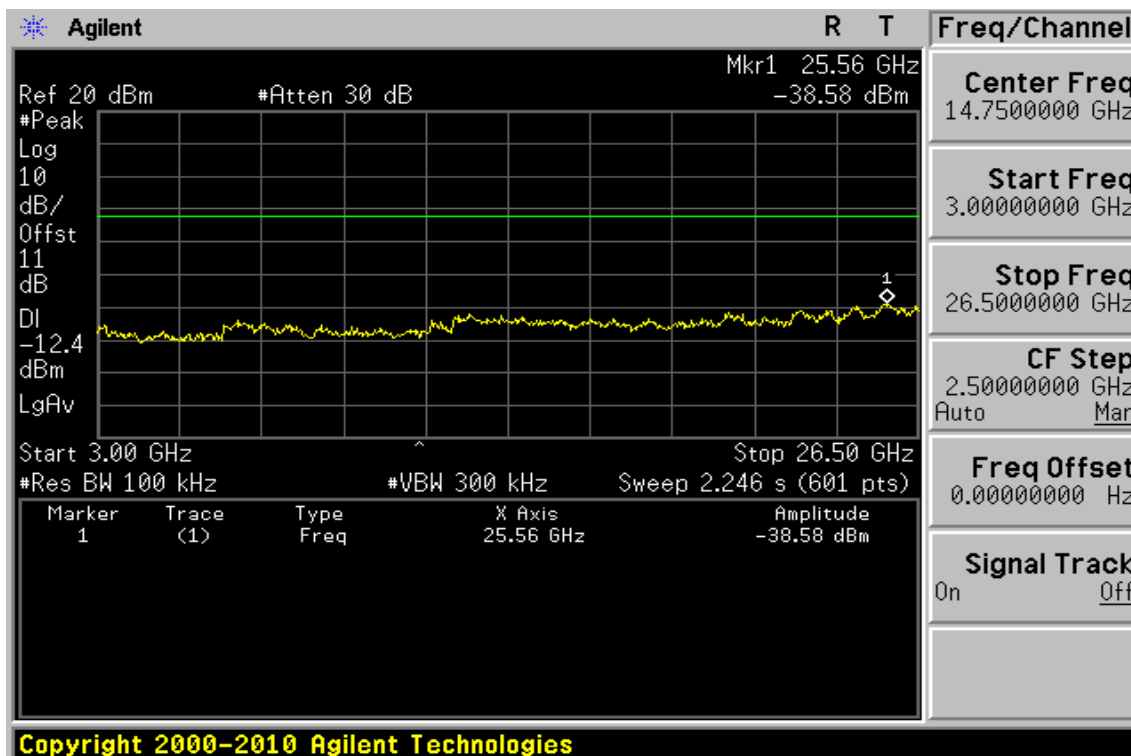
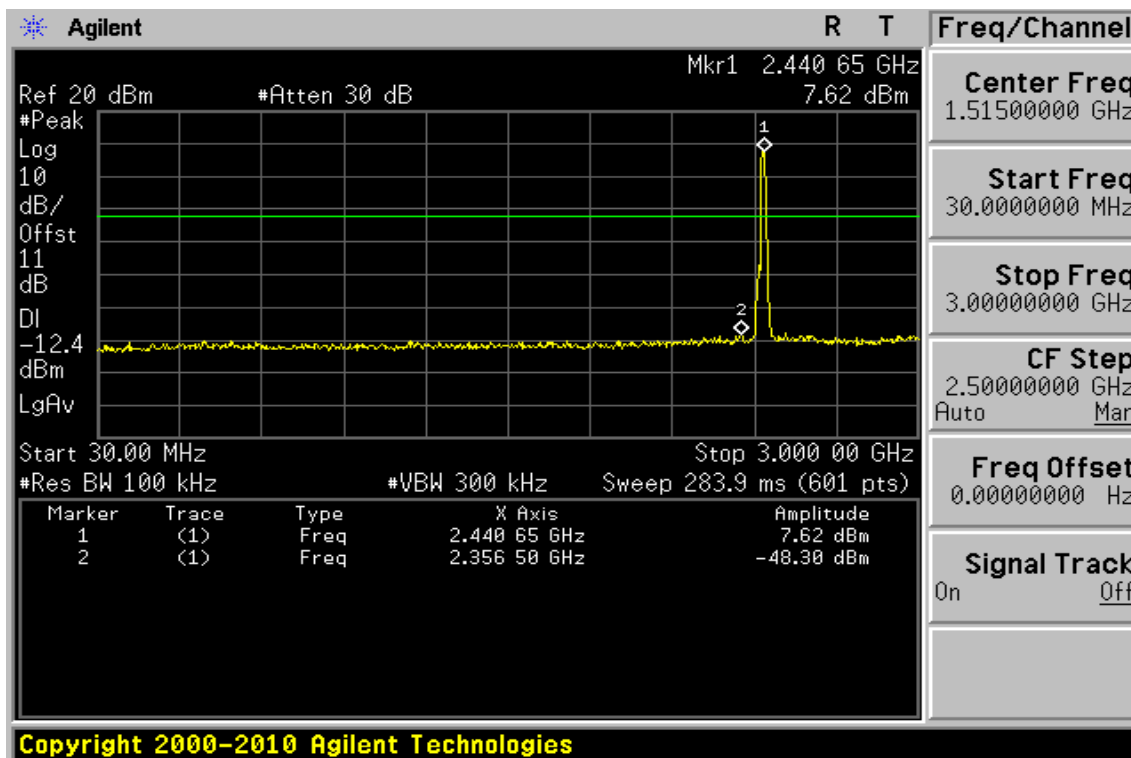
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## Spurious Emission Test Data CH-Mid



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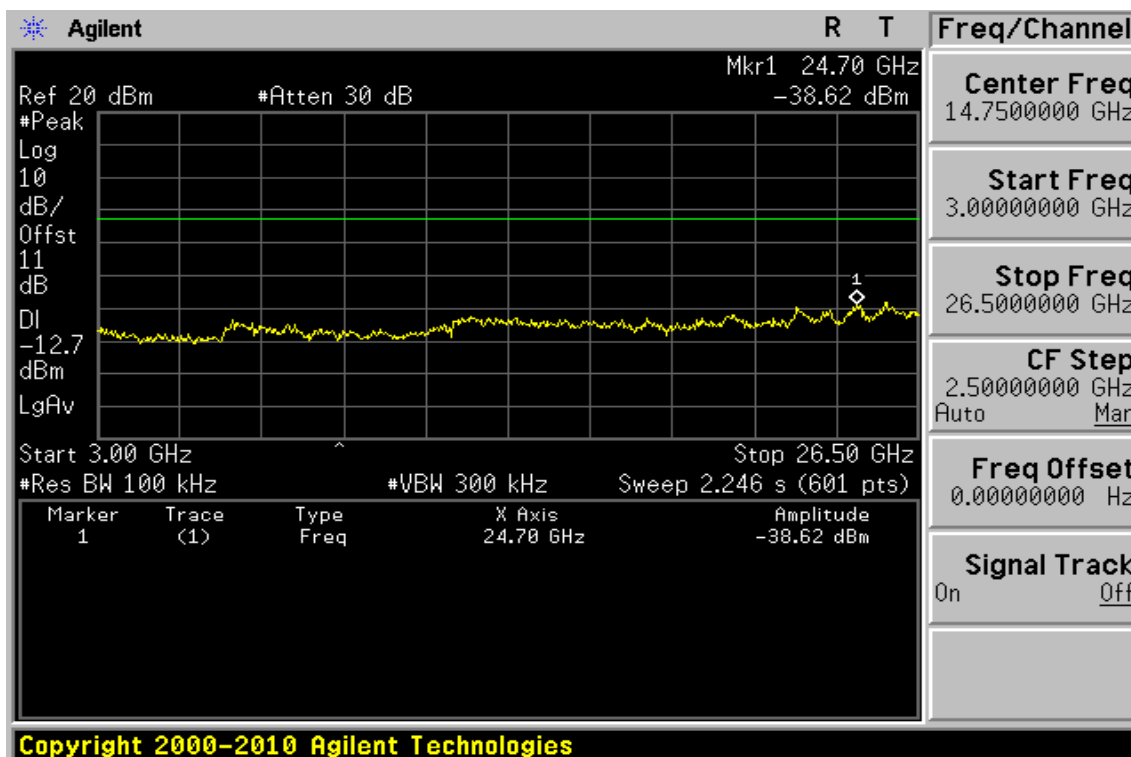
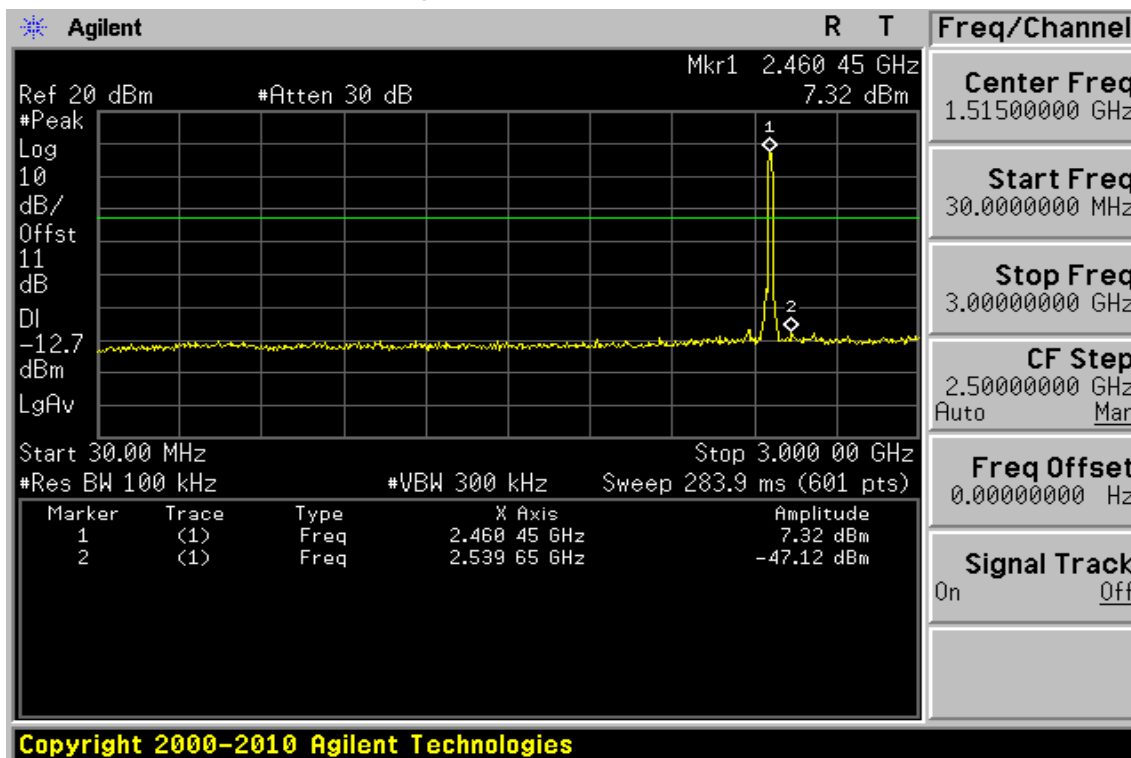
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## Spurious Emission Test Data CH-High



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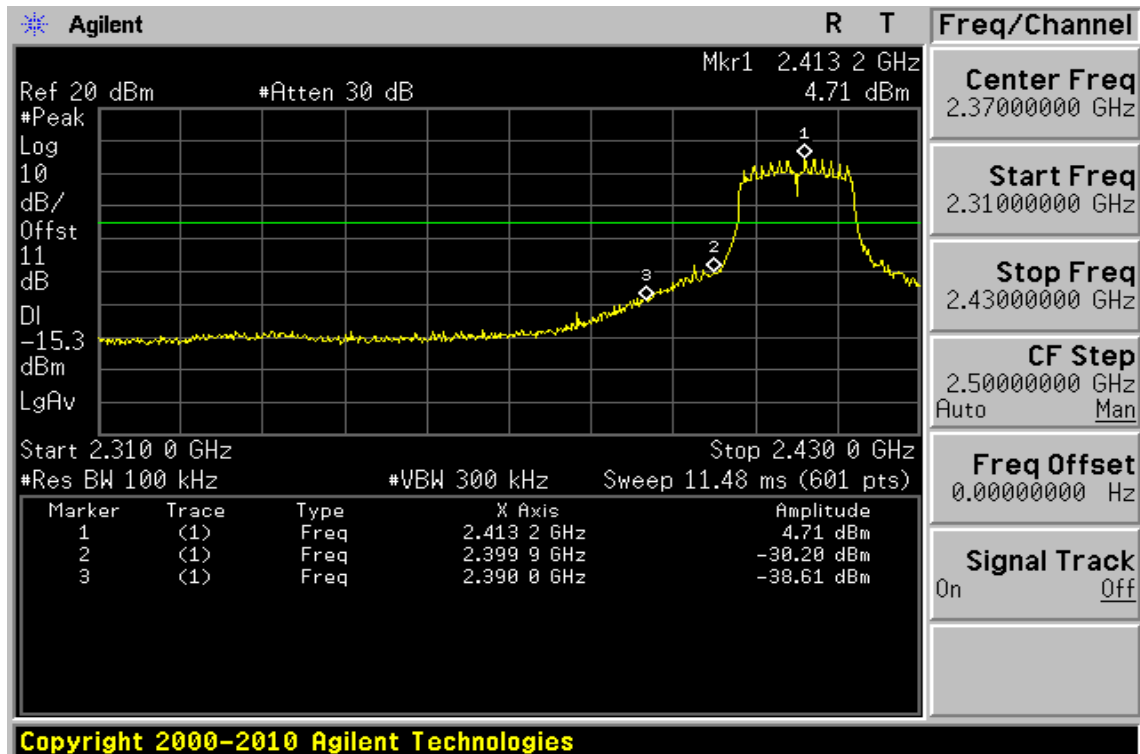
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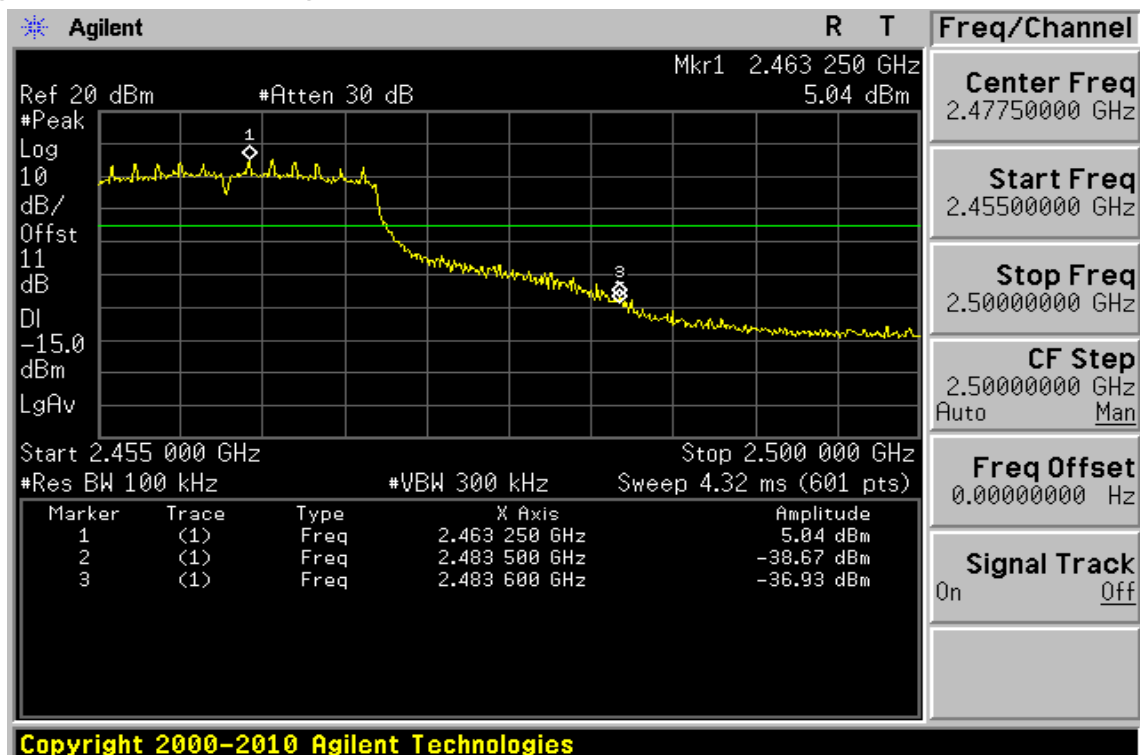
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## 802.11g

## Band Edges Test Data CH-Low



## Band Edges Test Data CH-High



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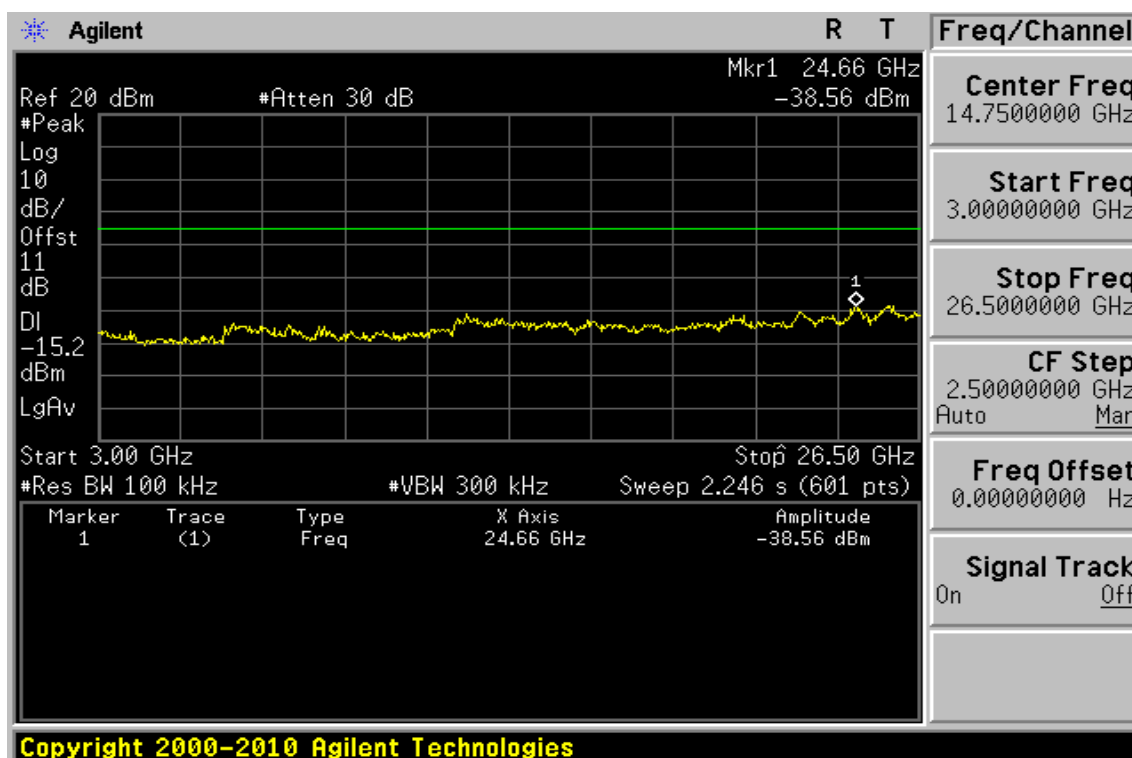
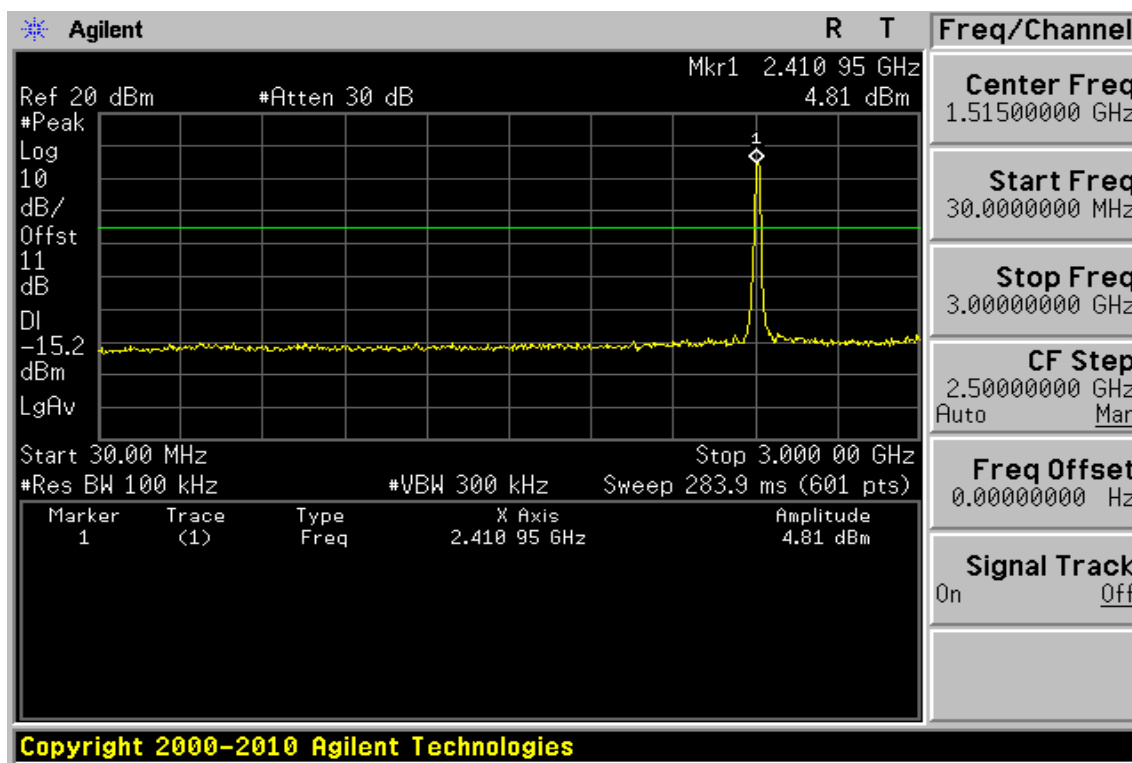
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## 802.11g

### Spurious Emission Test Data CH-Low



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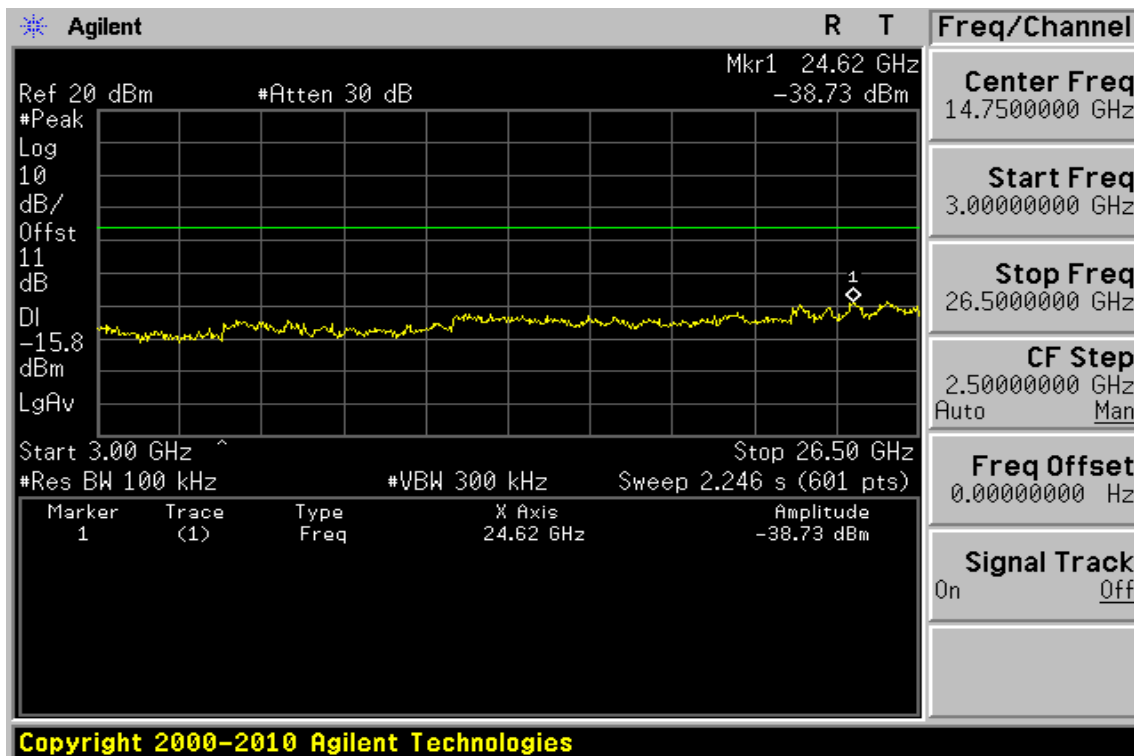
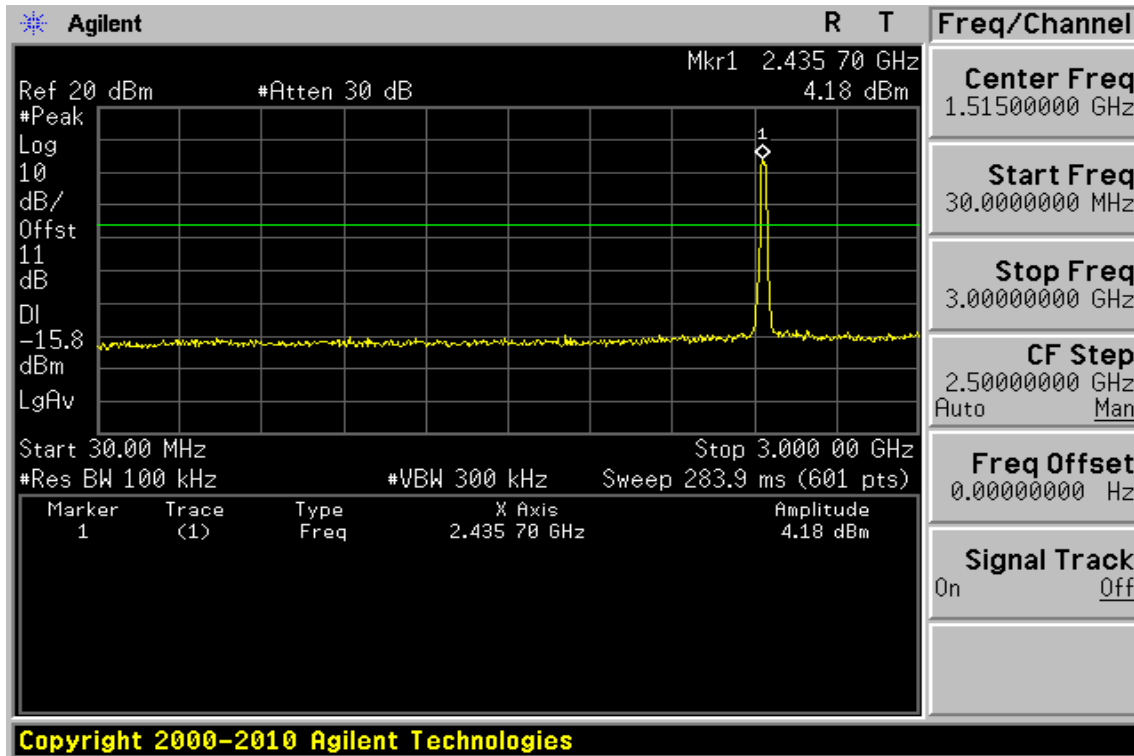
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## Spurious Emission Test Data CH-Mid



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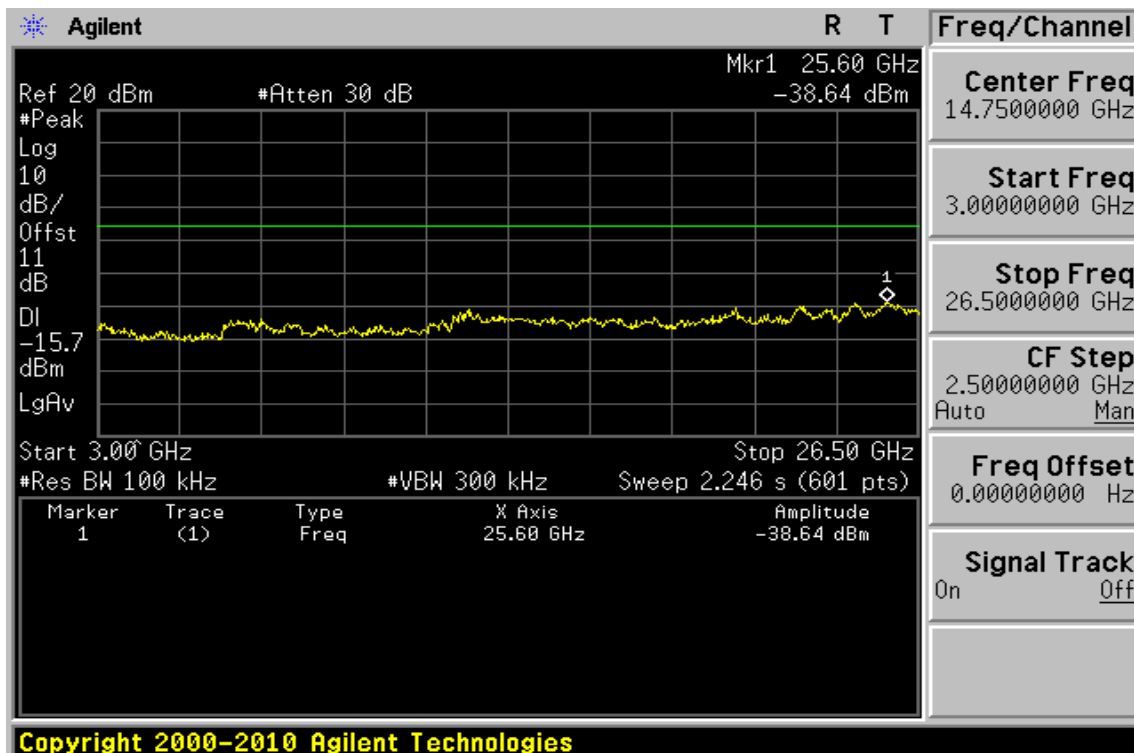
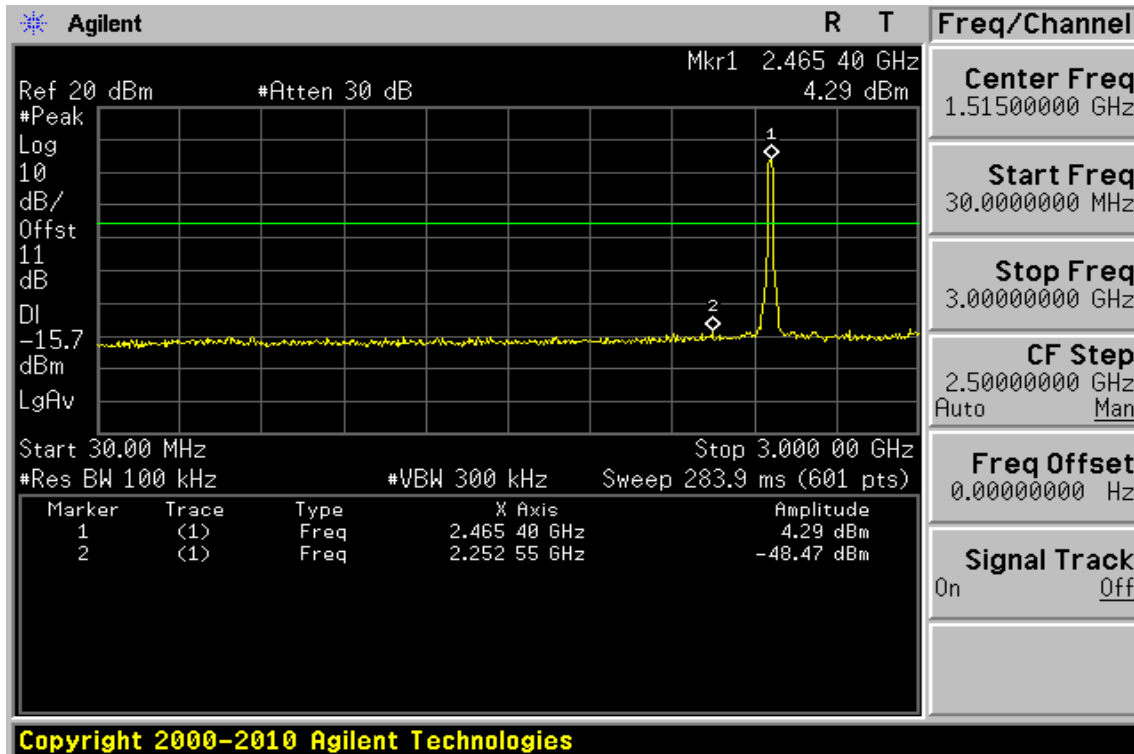
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## Spurious Emission Test Data CH-High



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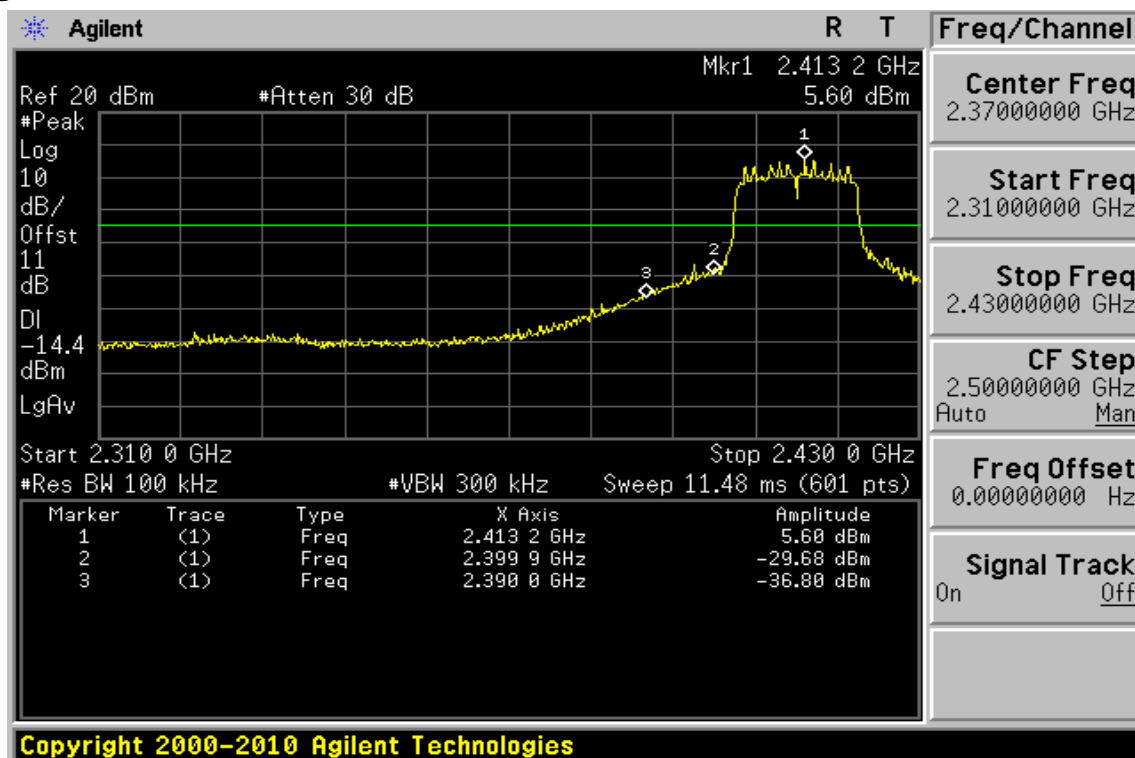
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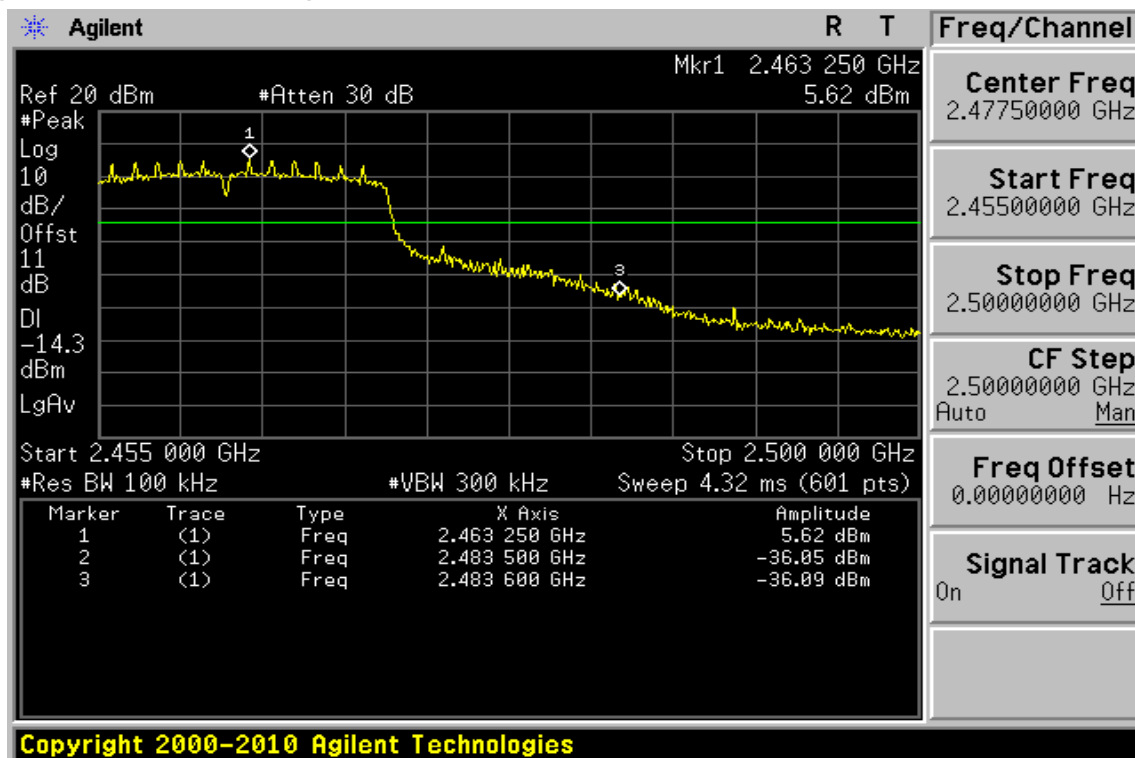
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## 802.11n\_HT20

## Band Edges Test Data CH-Low



## Band Edges Test Data CH-High



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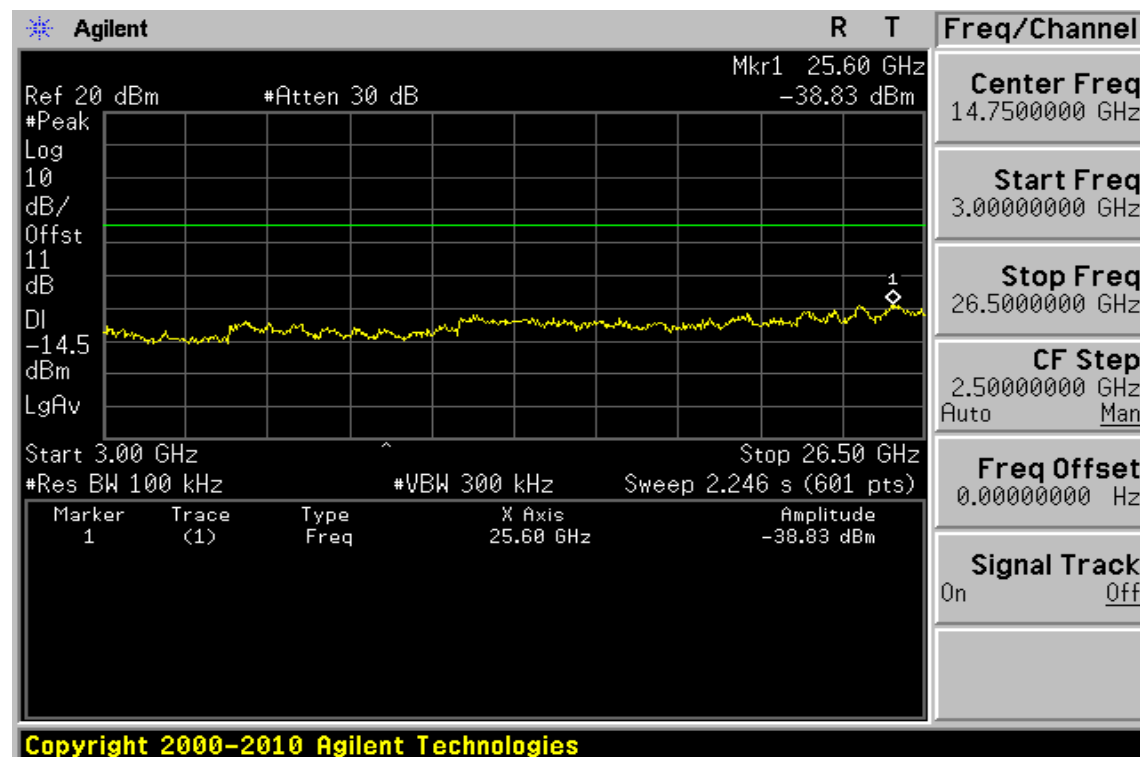
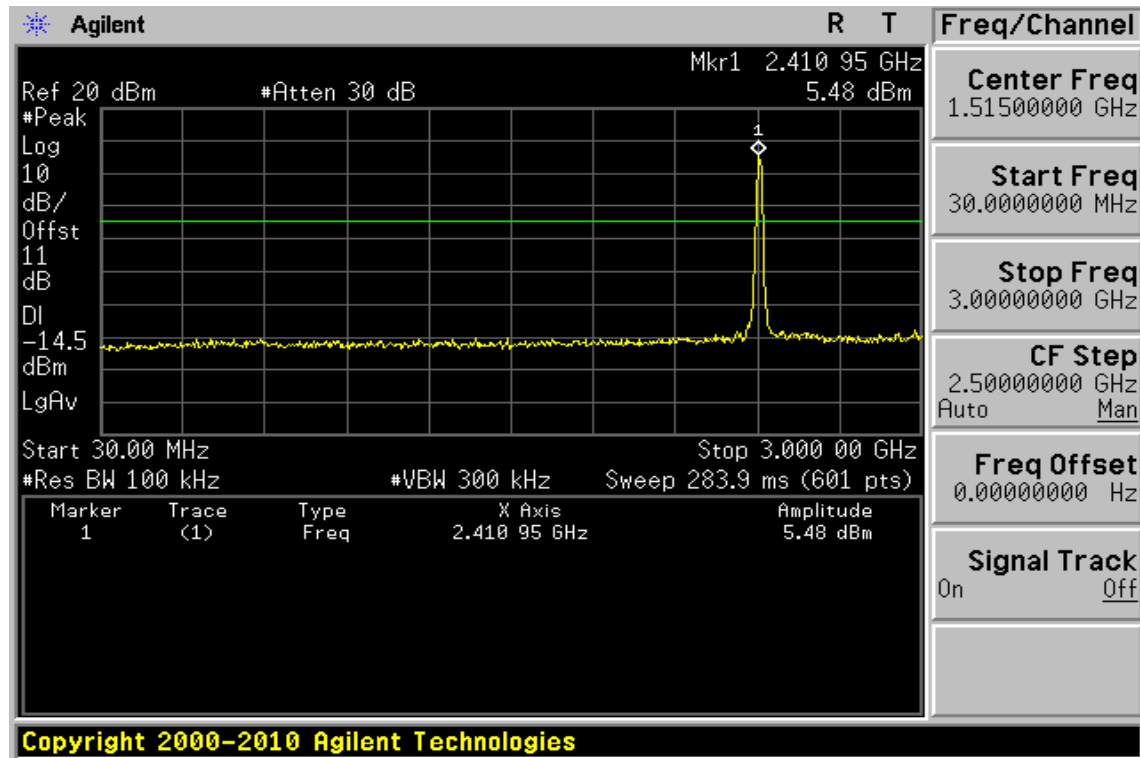
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## 802.11n\_HT20

### Spurious Emission Test Data CH-Low



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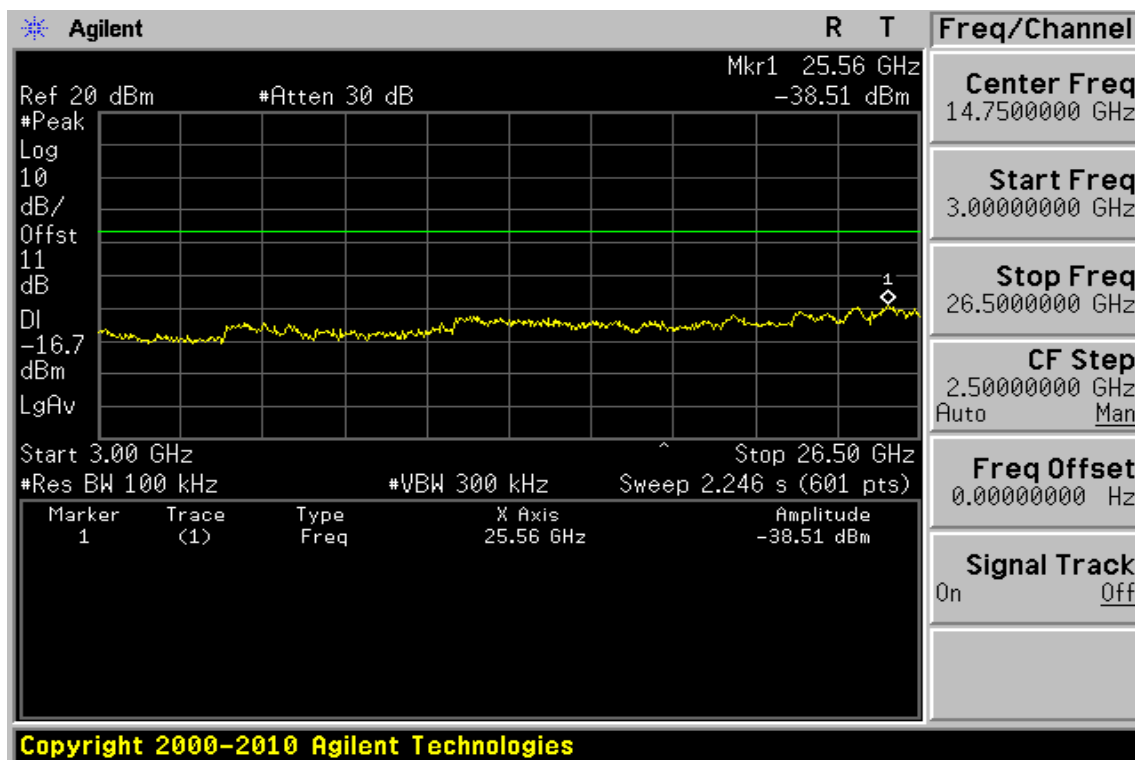
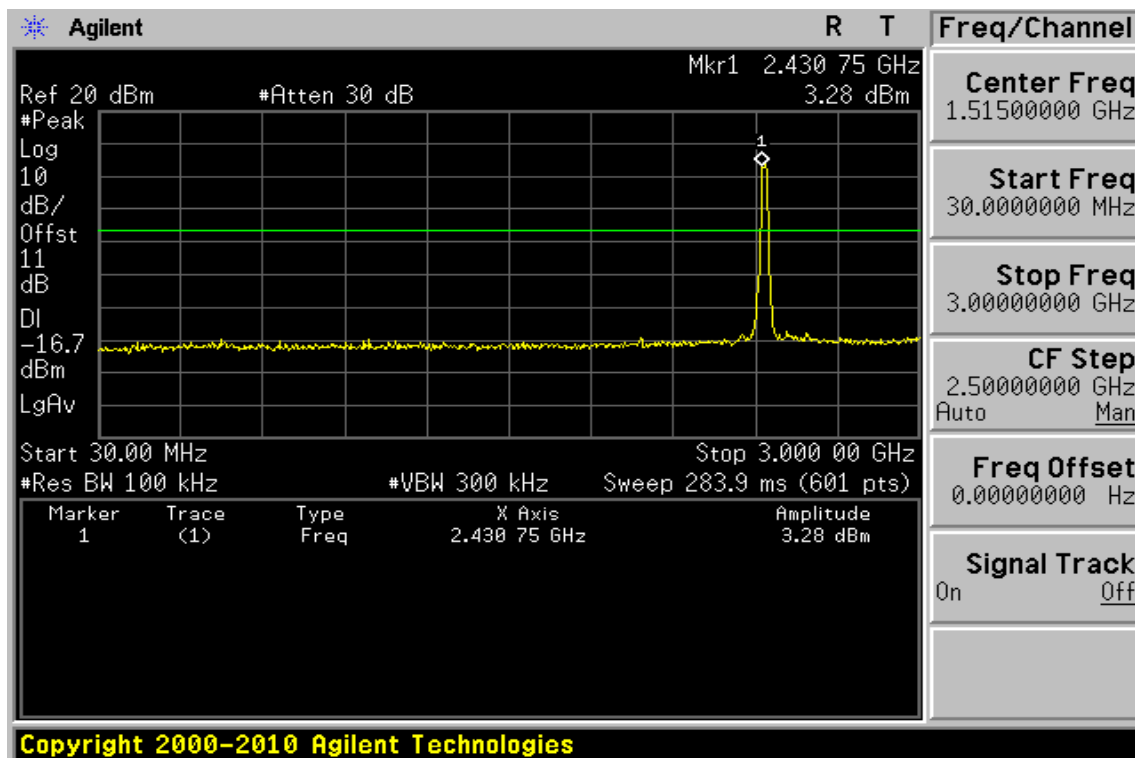
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## Spurious Emission Test Data CH-Mid



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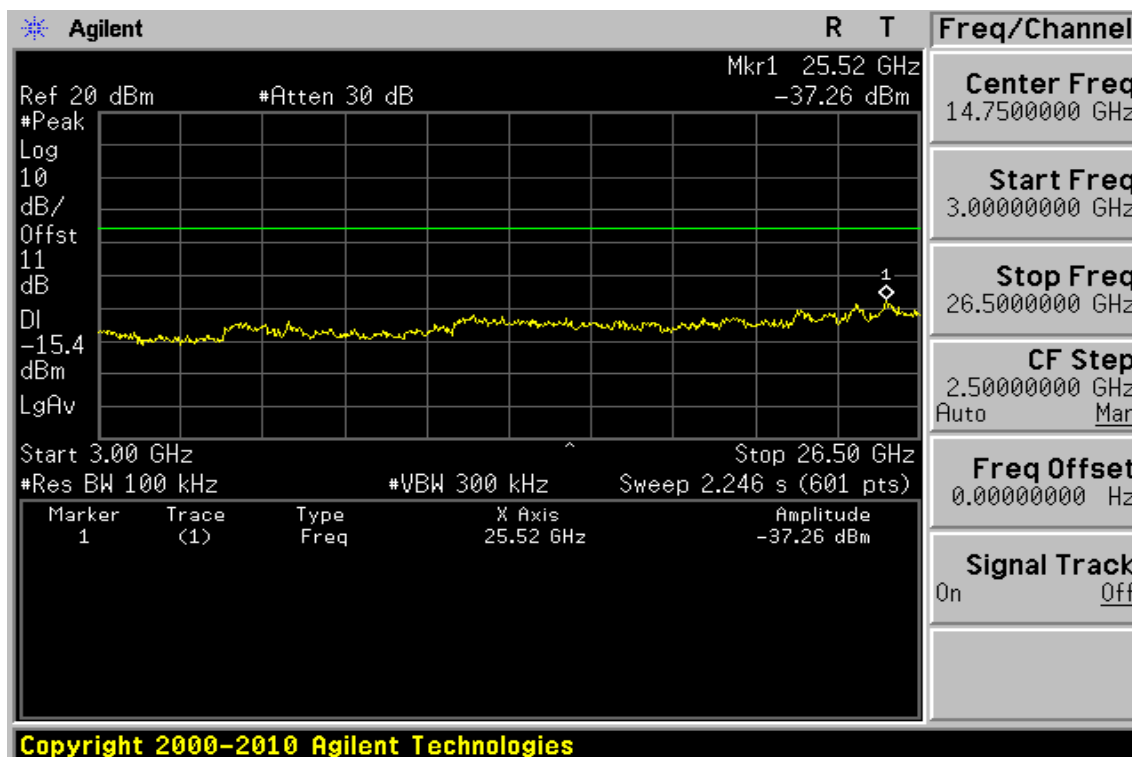
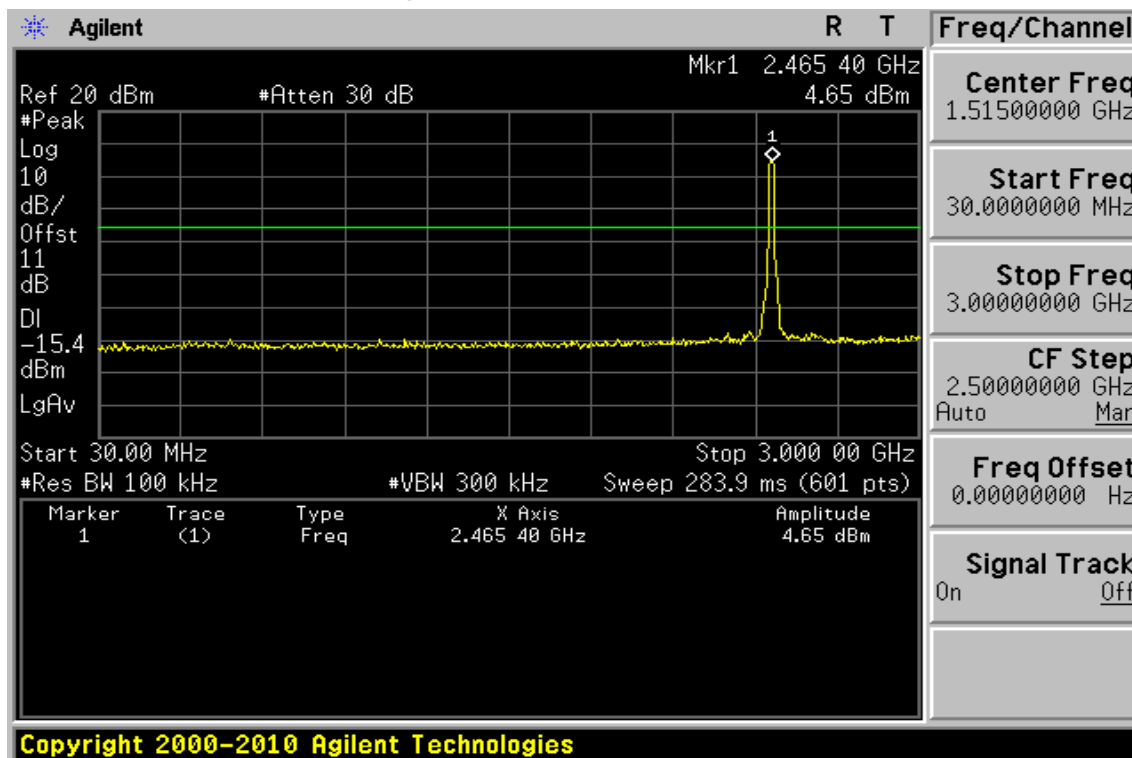
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## Spurious Emission Test Data CH-High



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## 11 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

### 11.1 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands must also comply with the §15.209 limit as below.

And according to §15.33(a) (1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(KHz)	300
0.490-1.705	24000/F(KHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

**Note:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBμV/m) = 20 log Emission level (dBμV/m)

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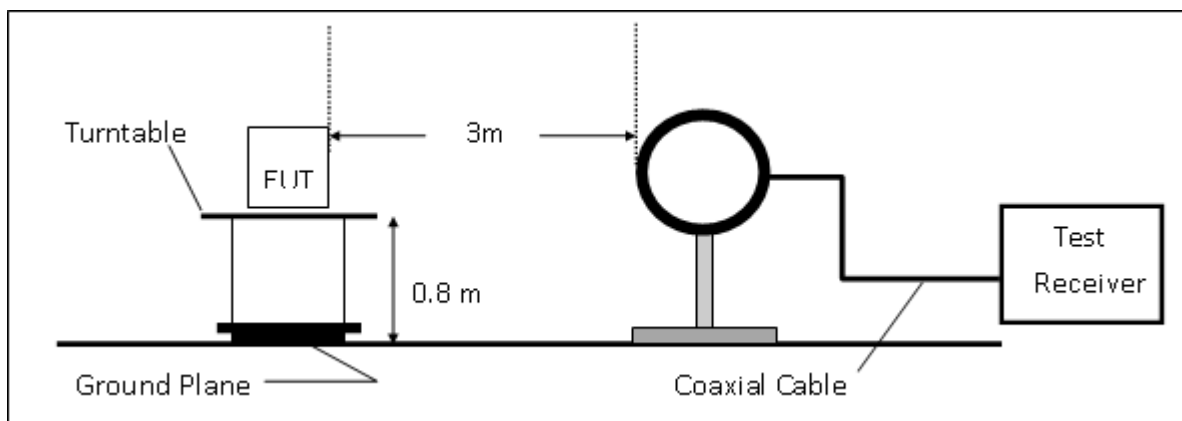
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## 11.2 Measurement Equipment Used:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESC17	100760	05/04/2015	05/03/2016
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	12/22/2014	12/21/2015
Spectrum Analyzer	R&S	FSV-30	101398	10/07/2014	10/06/2015
Loop Antenna	ETS.LINDGREN	6502	00148045	07/03/2014	07/02/2015
Bilog Antenna	SCHWAZBECK	VULB9168	378	12/23/2014	12/22/2015
Horn antenna	ETS.LINDGREN	3117	123995	05/05/2015	05/04/2016
Horn Antenna	Schwarzbeck	BBHA9170	184	12/25/2014	12/24/2015
Pre-Amplifier	Agilent	8447D	2944A07676	01/02/2015	01/01/2016
Pre-Amplifier	Agilent	8449B	3008A00578	01/02/2015	01/01/2016
Pre-Amplifier	EMC Instruments Corp.	EMC184045	980135	01/02/2015	01/01/2016
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M2	01/02/2015	01/01/2016
Attenuator	Mini-Circuit	BW-S10W2+	004	01/02/2015	01/01/2016
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	HD	MA240-N	240/657	N.C.R	N.C.R
Controller	HD	HD100	N/A	N.C.R	N.C.R
Low Loss Cable	Huber Suhner	966_Rx	9	01/02/2015	01/01/2016

## 11.3 Test SET-UP

### (A) Radiated Emission Test Set-UP Frequency Below 30MHz.



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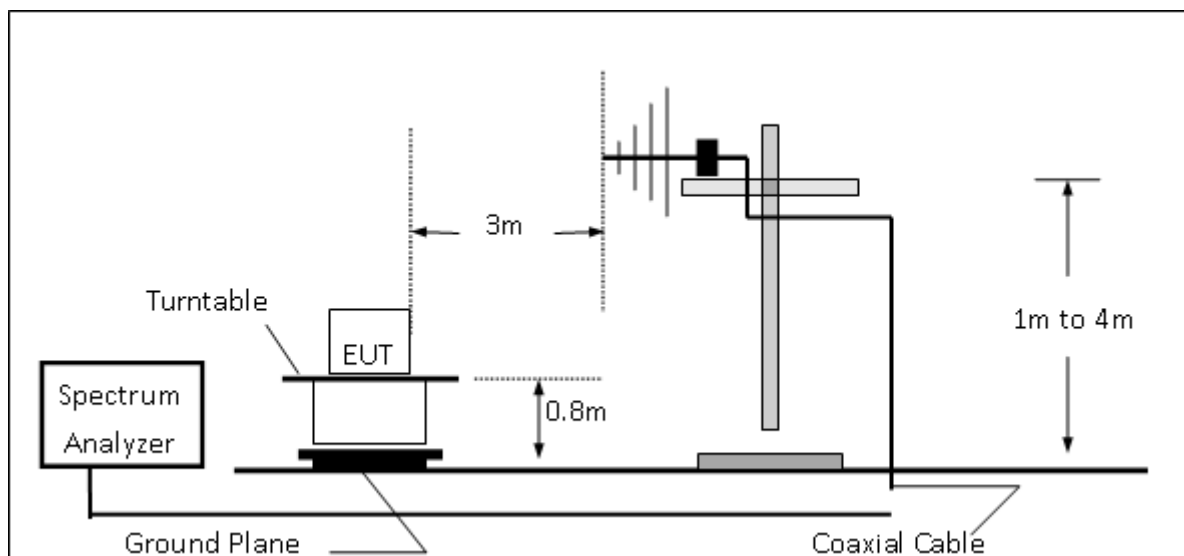
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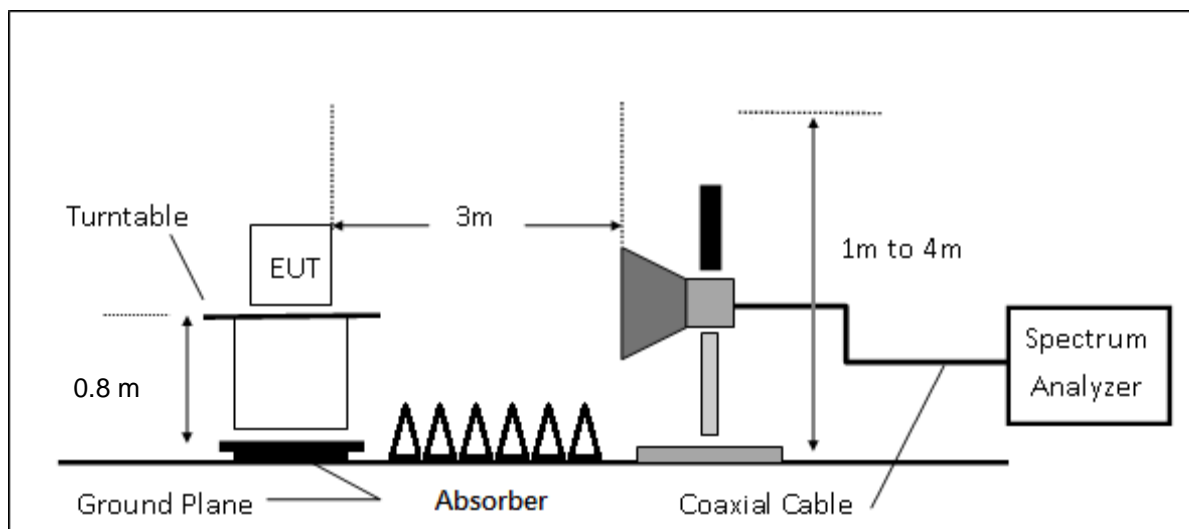
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(B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



(C) Radiated Emission Test Set-UP Frequency Over 1 GHz



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### 11.3.1 Measurement Procedure

1. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance V03r03.
2. The EUT was placed on a turn table with 0.8m for frequency < 1GHz and 0.8m for frequency > 1GHz above ground plane.
3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
5. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna.
6. Set the spectrum analyzer as RBW=120 kHz and VBW=300 kHz for Peak Detector (PK) and Quasi-peak (QP) at frequency below 1 GHz.
7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency above 1 GHz.
8. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW ≥ 1/T (Duty cycle < 98%) for Average Detector at frequency above 1 GHz.
9. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
10. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
11. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. On spectrum, change spectrum mode in linear display mode, and reduce VBW = 10Hz if average reading is measured.
12. Repeat above procedures until all default test channel measured were complete.

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## 11.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

### Note :

“F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

## 11.5 Test Results of Radiated Spurious Emissions form 9 KHz to 30 MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) was not reported.

## 11.6 Measurement Result

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

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**Radiated Band Edge Measurement Result (802.11b)**

Operation Band	:802.11 b	Test Date	:2015-06-16
Fundamental Frequency	:2412 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:Bandedge LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
2390.00	E	Average	37.33	5.16	42.49	54.00	-11.51
2390.00	E	Peak	47.19	5.16	52.35	74.00	-21.65

Operation Band	:802.11 b	Test Date	:2015-06-16
Fundamental Frequency	:2412 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:Bandedge LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
2390.00	E	Average	47.02	5.16	52.18	54.00	-1.82
2390.00	E	Peak	54.85	5.16	60.01	74.00	-13.99

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Operation Band	:802.11 b	Test Date	:2015-06-15
Fundamental Frequency	:2462 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:Bandedge HIGH	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Average	39.12	6.01	45.13	54.00	-8.87
2483.50	E	Peak	47.27	6.01	53.28	74.00	-20.72

Operation Band	:802.11 b	Test Date	:2015-06-15
Fundamental Frequency	:2462 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:Bandedge HIGH	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Average	45.73	6.01	51.74	54.00	-2.26
2483.50	E	Peak	52.79	6.01	58.80	74.00	-15.20

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**Radiated Band Edge Measurement Result (802.11g)**

Operation Band	:802.11 g	Test Date	:2015-06-16
Fundamental Frequency	:2412 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:Bandedge LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
2390.00	E	Average	39.56	5.16	44.72	54.00	-9.28
2390.00	E	Peak	57.98	5.16	63.14	74.00	-10.86

Operation Band	:802.11 g	Test Date	:2015-06-16
Fundamental Frequency	:2412 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:Bandedge LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
2390.00	E	Average	47.19	5.16	52.35	54.00	-1.65
2390.00	E	Peak	67.07	5.16	72.23	74.00	-1.77

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Operation Band	:802.11 g	Test Date	:2015-06-16
Fundamental Frequency	:2462 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:Bandedge HIGH	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Average	36.38	6.01	42.39	54.00	-11.61
2483.50	E	Peak	58.38	6.01	64.39	74.00	-9.61

Operation Band	:802.11 g	Test Date	:2015-06-16
Fundamental Frequency	:2462 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:Bandedge HIGH	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Average	42.17	6.01	48.18	54.00	-5.82
2483.50	E	Peak	65.70	6.01	71.71	74.00	-2.29

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**Radiated Band Edge Measurement Result (802.11\_HT20)**

Operation Band	:802.11 n20M	Test Date	:2015-06-16
Fundamental Frequency	:2412 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:Bandedge LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Average	41.18	5.16	46.34	54.00	-7.66
2390.00	E	Peak	59.08	5.16	64.24	74.00	-9.76

Operation Band	:802.11 n20M	Test Date	:2015-06-16
Fundamental Frequency	:2412 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:Bandedge LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Average	48.45	5.16	53.61	54.00	-0.39
2390.00	E	Peak	67.97	5.16	73.13	74.00	-0.87

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Operation Band	:802.11 n20M	Test Date	:2015-06-16
Fundamental Frequency	:2462 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:Bandedge HIGH	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Average	35.07	6.01	41.08	54.00	-12.92
2483.50	E	Peak	56.04	6.01	62.05	74.00	-11.95

Operation Band	:802.11 n20M	Test Date	:2015-06-16
Fundamental Frequency	:2462 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:Bandedge HIGH	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Average	43.23	6.01	49.24	54.00	-4.76
2483.50	E	Peak	66.43	6.01	72.44	74.00	-1.56

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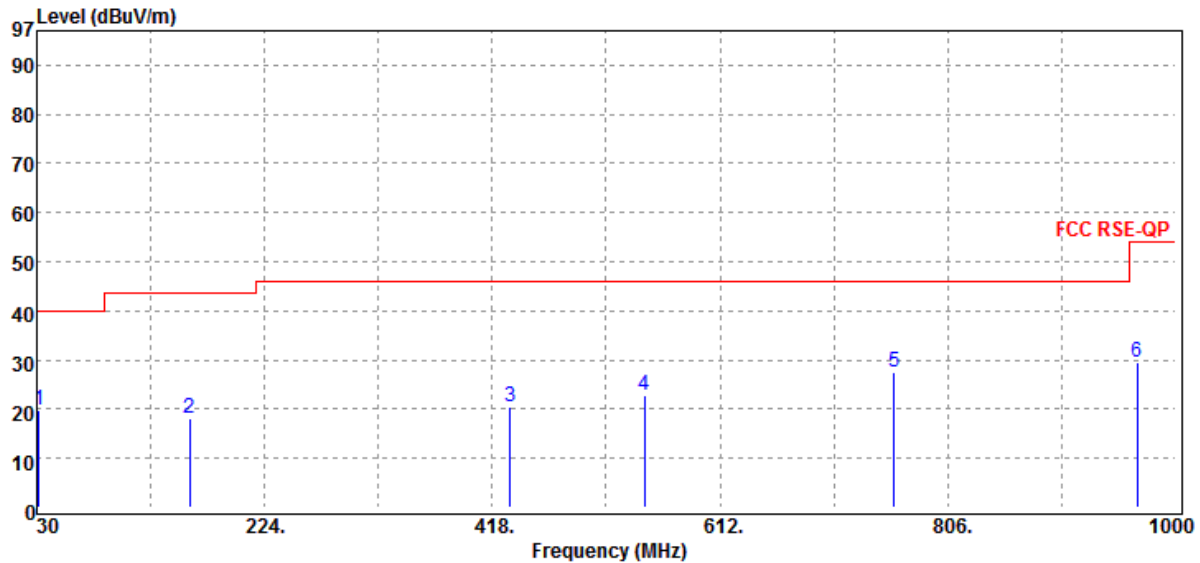
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## Radiated Spurious Emission Measurement Result

### Below 1GHz Worst-Case Data:

Operation Band	:802.11 g	Test Date	:2015-06-15
Fundamental Frequency	:2412 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:TX LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
31.94	S	Peak	30.08	-10.22	19.86	40.00	-20.14
159.98	S	Peak	27.08	-8.81	18.27	43.50	-25.23
433.52	S	Peak	26.25	-5.82	20.43	46.00	-25.57
547.98	S	Peak	26.84	-4.04	22.80	46.00	-23.20
760.41	S	Peak	26.38	1.11	27.49	46.00	-18.51
967.02	S	Peak	25.97	3.67	29.64	54.00	-24.36

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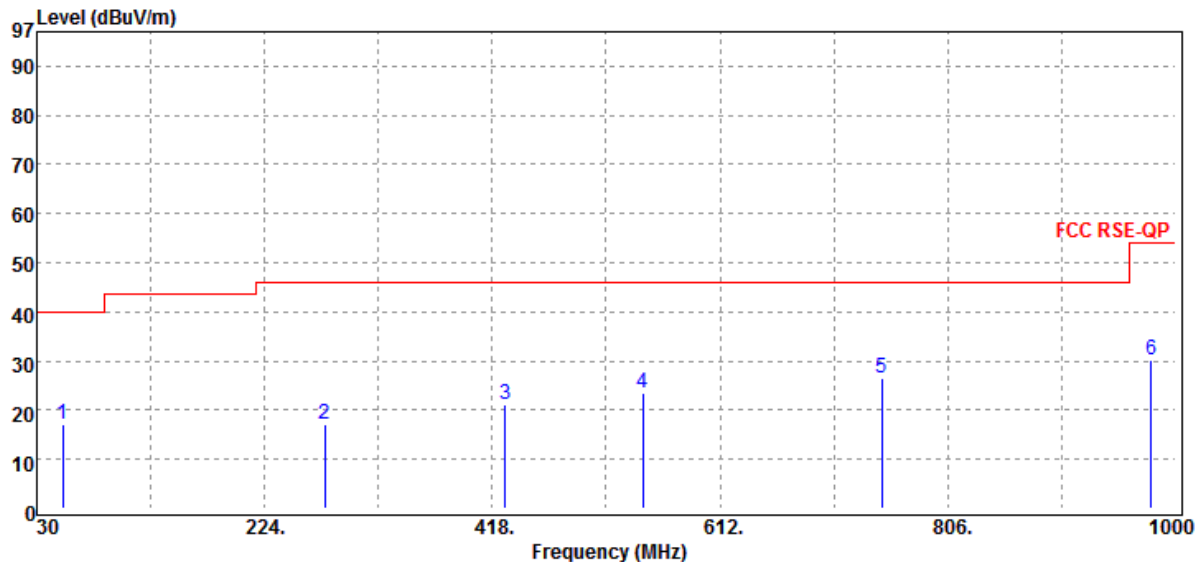
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Operation Band	:802.11 g	Test Date	:2015-06-15
Fundamental Frequency	:2412 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:TX LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
		PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
52.31	S	Peak	26.60	-9.57	17.03	40.00	-22.97
275.41	S	Peak	25.64	-8.66	16.98	46.00	-29.02
428.67	S	Peak	26.75	-5.75	21.00	46.00	-25.00
546.04	S	Peak	27.46	-4.02	23.44	46.00	-22.56
749.74	S	Peak	26.39	0.27	26.66	46.00	-19.34
979.63	S	Peak	26.75	3.42	30.17	54.00	-23.83

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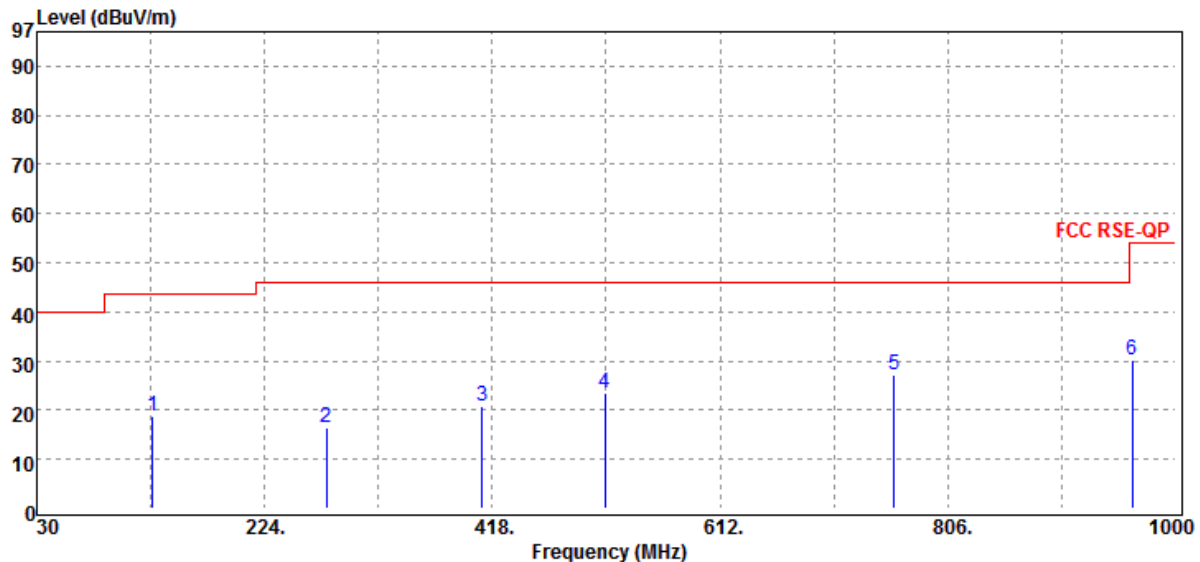
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f (886-2) 2298-0488

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Operation Band	:802.11 g	Test Date	:2015-06-15
Fundamental Frequency	:2437 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:TX MID	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
		PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
128.94	S	Peak	29.35	-10.59	18.76	43.50	-24.74
276.38	S	Peak	25.19	-8.60	16.59	46.00	-29.41
409.27	S	Peak	26.56	-5.87	20.69	46.00	-25.31
514.03	S	Peak	28.03	-4.52	23.51	46.00	-22.49
760.41	S	Peak	26.09	1.11	27.20	46.00	-18.80
963.14	S	Peak	26.66	3.70	30.36	54.00	-23.64

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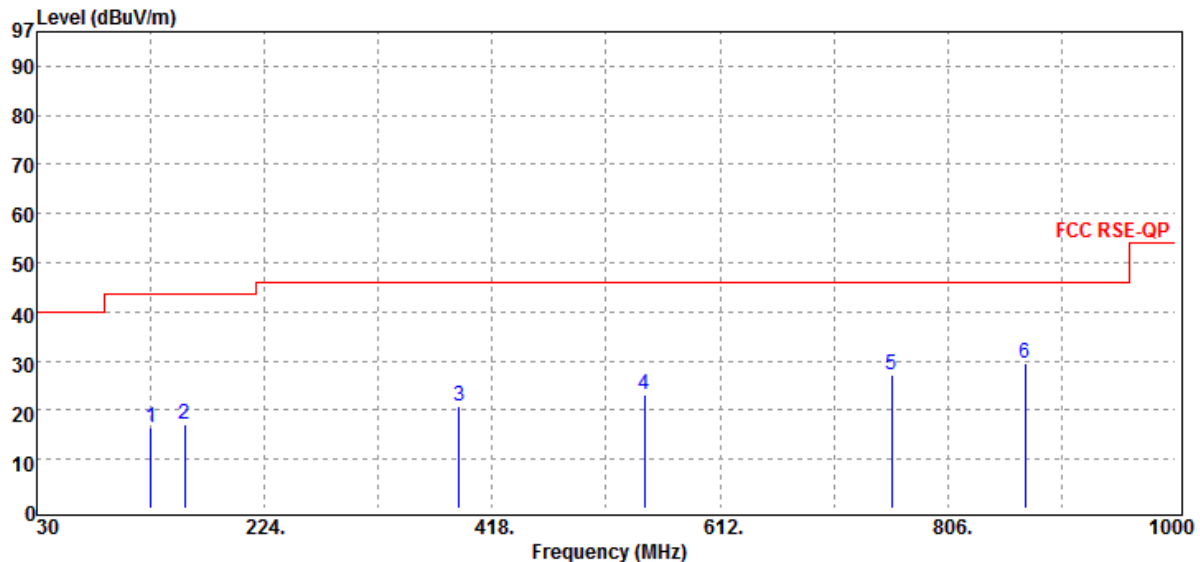
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Operation Band	:802.11 g	Test Date	:2015-06-15
Fundamental Frequency	:2437 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:TX MID	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
		PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
127.00	S	Peak	27.15	-10.73	16.42	43.50	-27.08
156.10	S	Peak	26.19	-8.98	17.21	43.50	-26.29
389.87	S	Peak	27.05	-6.15	20.90	46.00	-25.10
547.98	S	Peak	27.13	-4.04	23.09	46.00	-22.91
758.47	S	Peak	26.02	1.02	27.04	46.00	-18.96
871.96	S	Peak	27.19	2.51	29.70	46.00	-16.30

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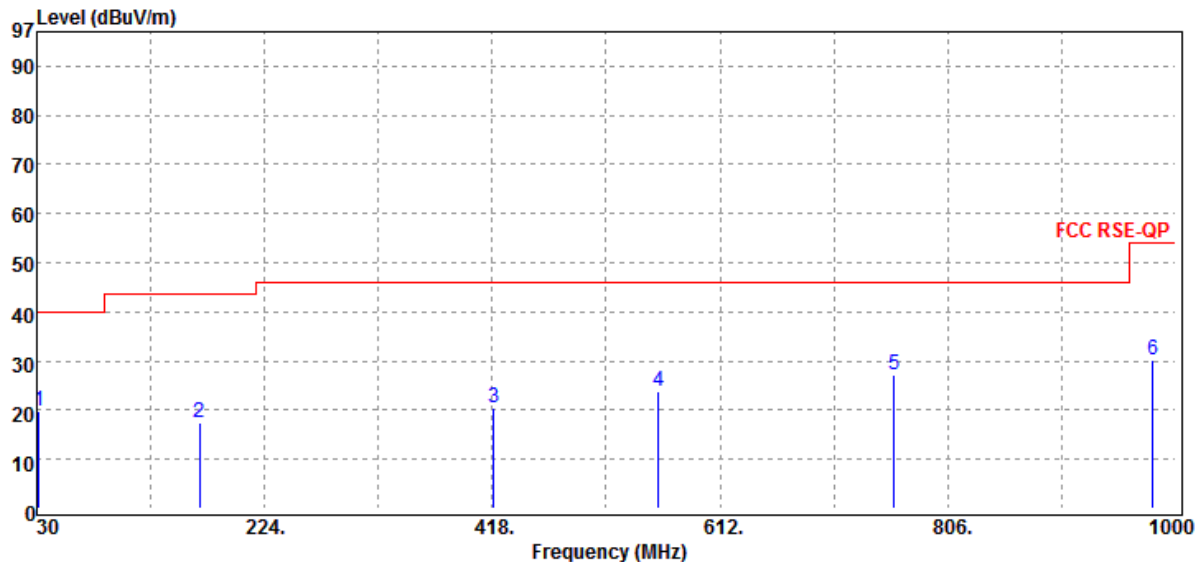
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Operation Band	:802.11 g	Test Date	:2015-06-15
Fundamental Frequency	:2462 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:TX HIGH	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
		PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
31.94	S	Peak	30.14	-10.22	19.92	40.00	-20.08
168.71	S	Peak	26.44	-9.14	17.30	43.50	-26.20
418.97	S	Peak	26.22	-5.68	20.54	46.00	-25.46
559.62	S	Peak	27.75	-3.82	23.93	46.00	-22.07
760.41	S	Peak	25.92	1.11	27.03	46.00	-18.97
980.60	S	Peak	26.70	3.41	30.11	54.00	-23.89

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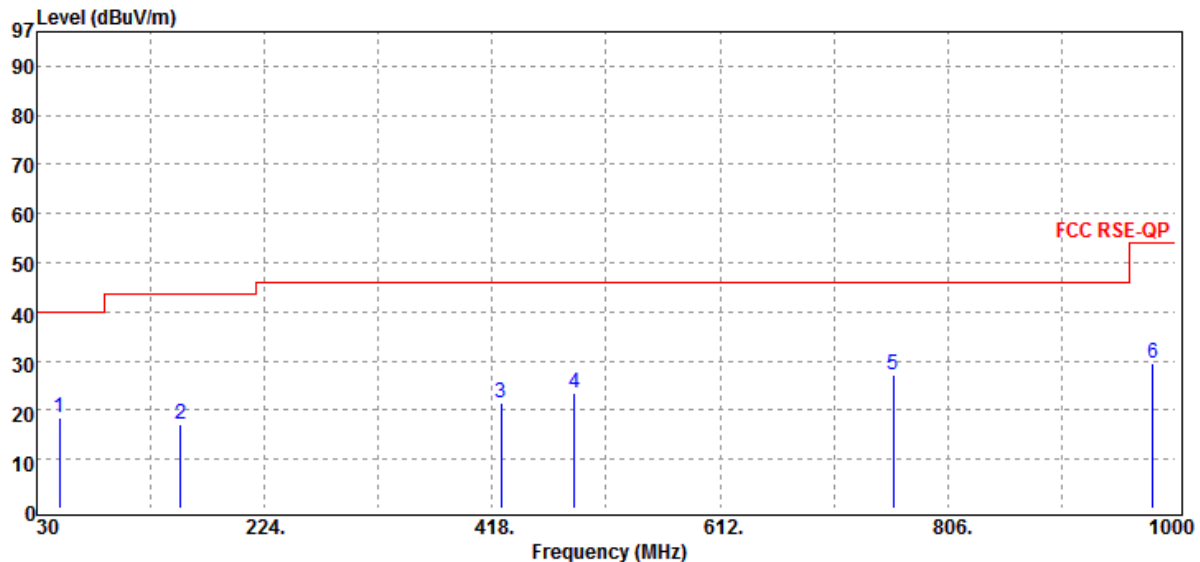
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Operation Band	:802.11 g	Test Date	:2015-06-15
Fundamental Frequency	:2462 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:TX HIGH	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
		PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
49.40	S	Peak	27.74	-9.37	18.37	40.00	-21.63
152.22	S	Peak	26.36	-9.18	17.18	43.50	-26.32
425.76	S	Peak	27.19	-5.72	21.47	46.00	-24.53
487.84	S	Peak	27.94	-4.34	23.60	46.00	-22.40
759.44	S	Peak	26.15	1.07	27.22	46.00	-18.78
980.60	S	Peak	26.22	3.41	29.63	54.00	-24.37

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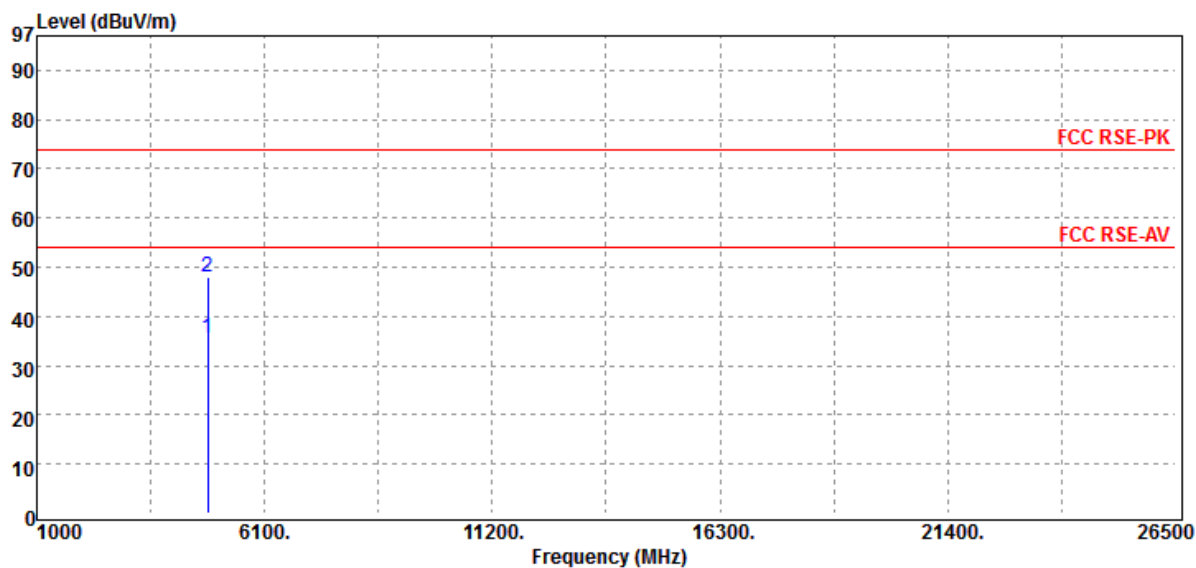
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## Radiated Spurious Emission Measurement Result

### Above 1GHz Worst-Case Data:

Operation Band	:802.11 b	Test Date	:2015-06-15
Fundamental Frequency	:2412 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:TX LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
		PK/QP/AV	dB $\mu$ V		dB $\mu$ V/m	dB $\mu$ V/m	
4824.00	H	Average	25.88	9.63	35.51	54.00	-18.49
4824.00	H	Peak	38.33	9.63	47.96	74.00	-26.04

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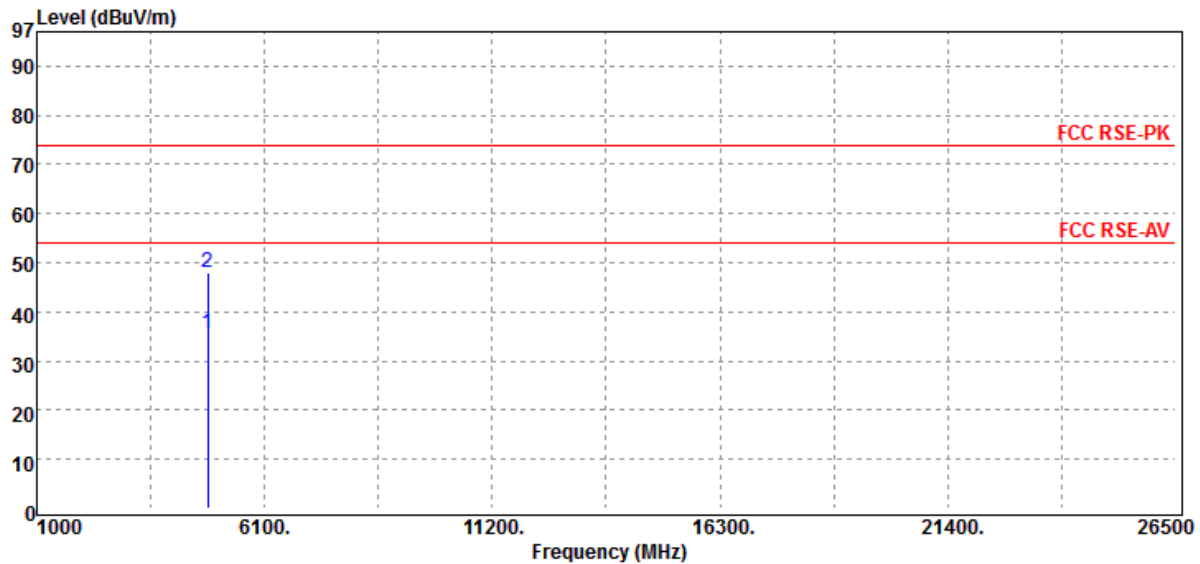
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Operation Band	:802.11 b	Test Date	:2015-06-15
Fundamental Frequency	:2412 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:TX LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
4824.00	H	Average	25.96	9.63	35.59	54.00	-18.41
4824.00	H	Peak	38.42	9.63	48.05	74.00	-25.95

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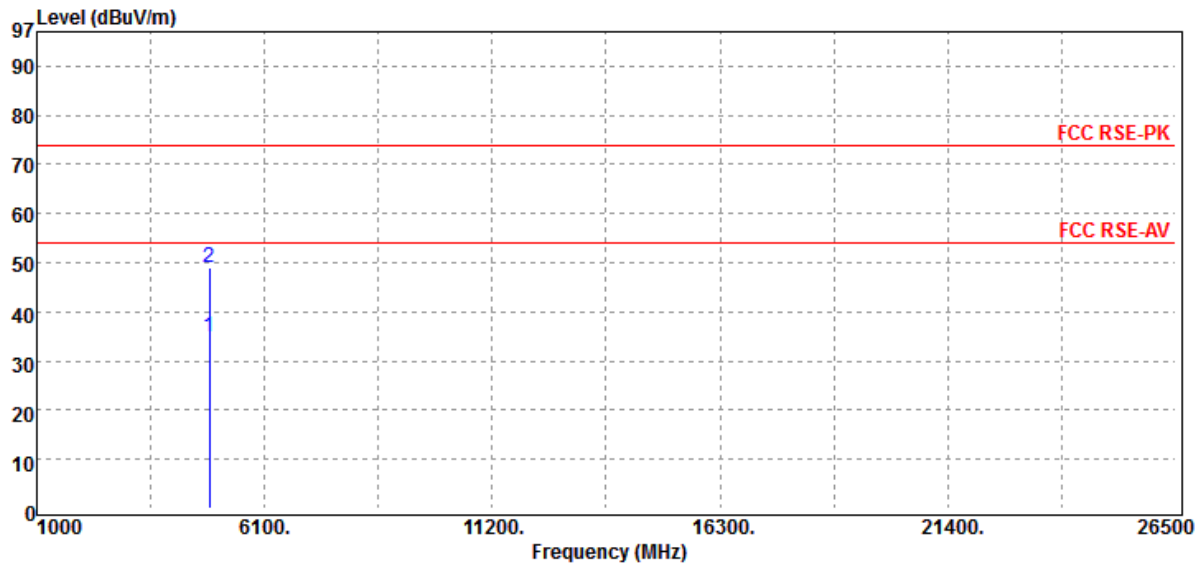
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Operation Band	:802.11 b	Test Date	:2015-06-15
Fundamental Frequency	:2437 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:TX MID	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
4874.00	H	Average	25.22	9.85	35.07	54.00	-18.93
4874.00	H	Peak	39.29	9.85	49.14	74.00	-24.86

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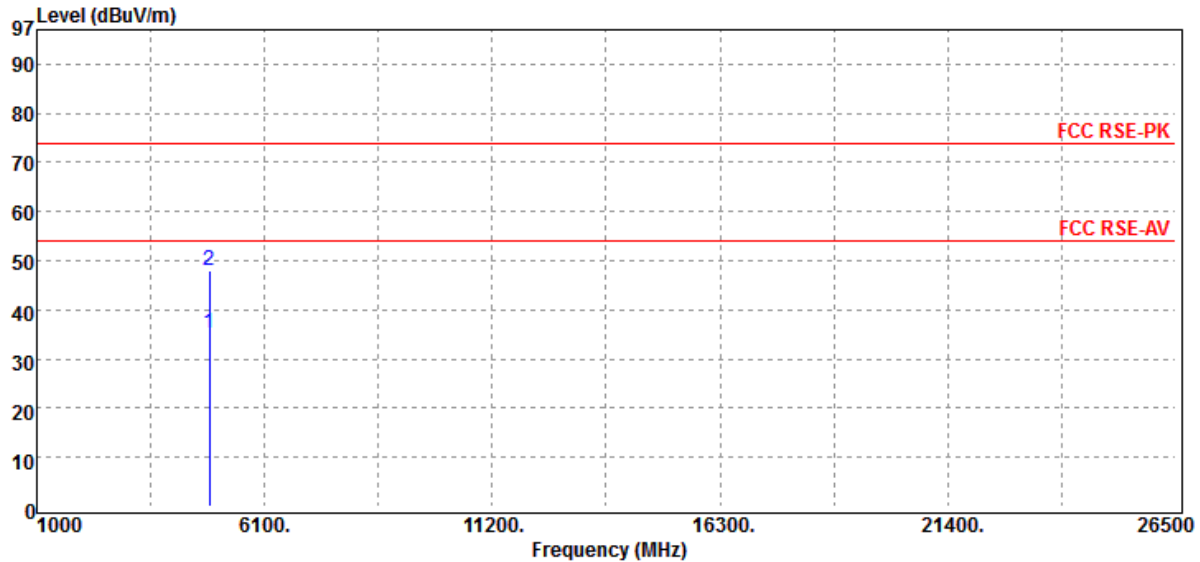
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EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
4874.00	H	Average	25.45	9.85	35.30	54.00	-18.70
4874.00	H	Peak	38.03	9.85	47.88	74.00	-26.12

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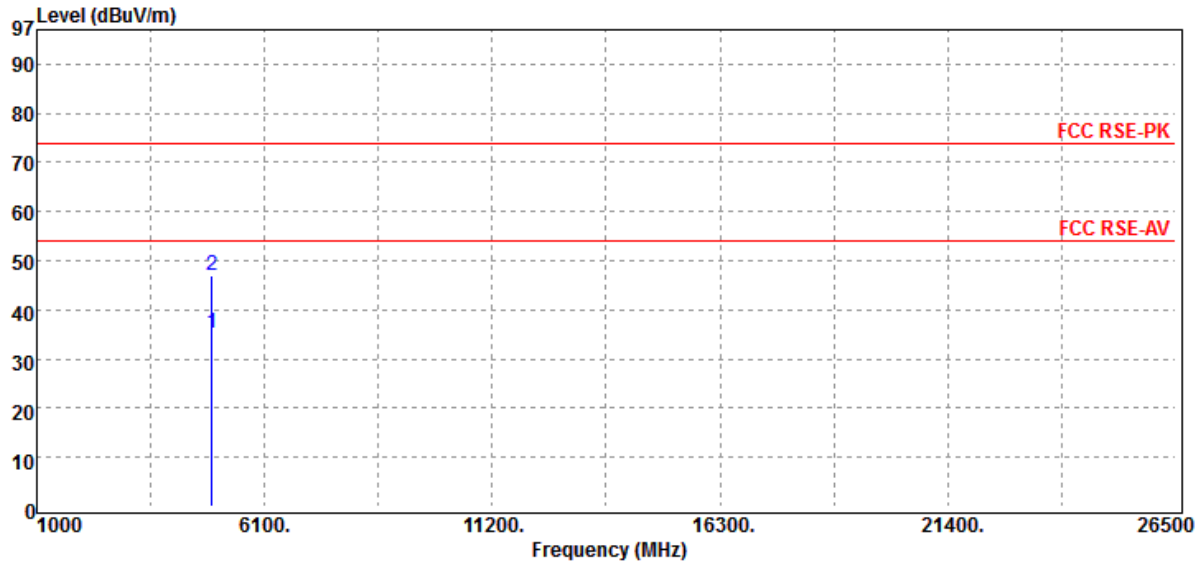
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Operation Mode	:TX HIGH	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
4924.00	H	Average	25.32	9.86	35.18	54.00	-18.82
4924.00	H	Peak	37.03	9.86	46.89	74.00	-27.11

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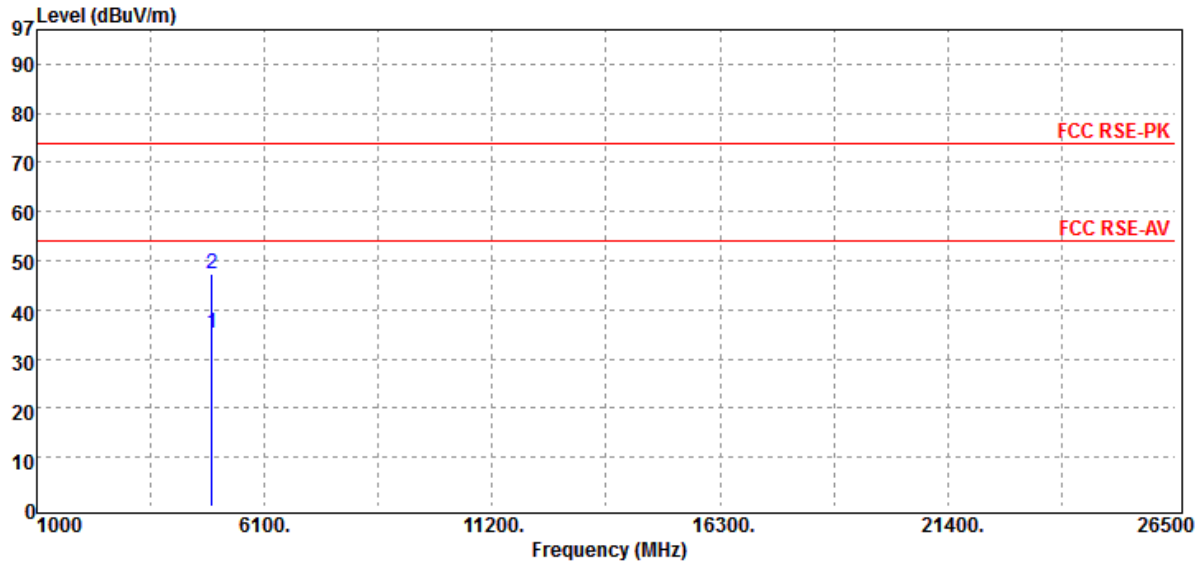
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Operation Mode	:TX HIGH	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
4924.00	H	Average	25.46	9.86	35.32	54.00	-18.68
4924.00	H	Peak	37.61	9.86	47.47	74.00	-26.53

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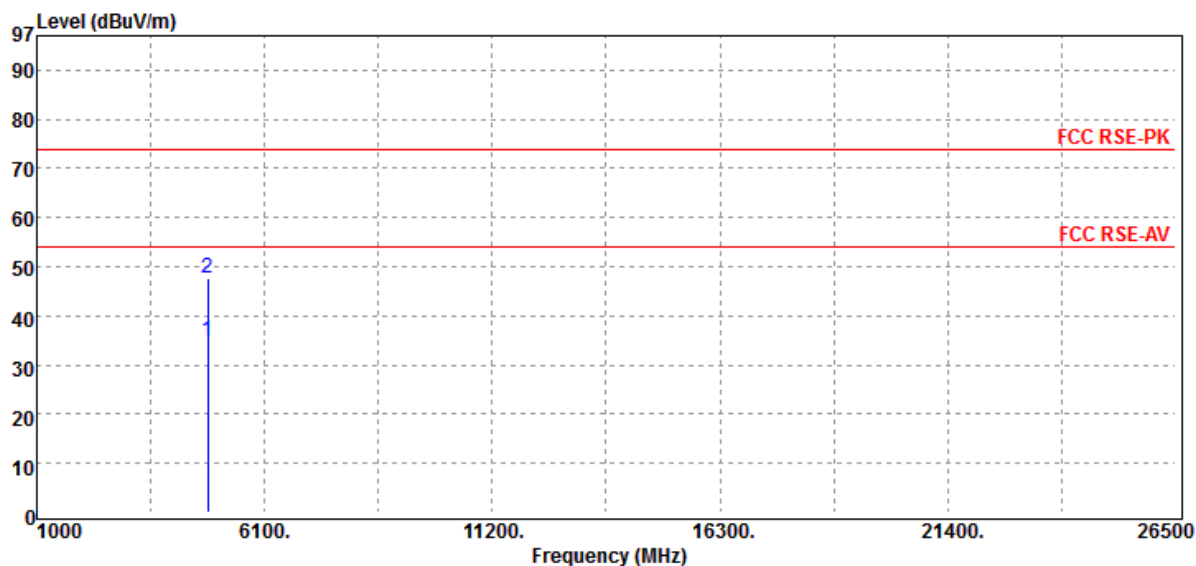
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## Radiated Spurious Emission Measurement Result (802.11 g)

Operation Band	:802.11 g	Test Date	:2015-06-15
Fundamental Frequency	:2412 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:TX LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4824.00	H	Average	25.14	9.63	34.77	54.00	-19.23
4824.00	H	Peak	38.13	9.63	47.76	74.00	-26.24

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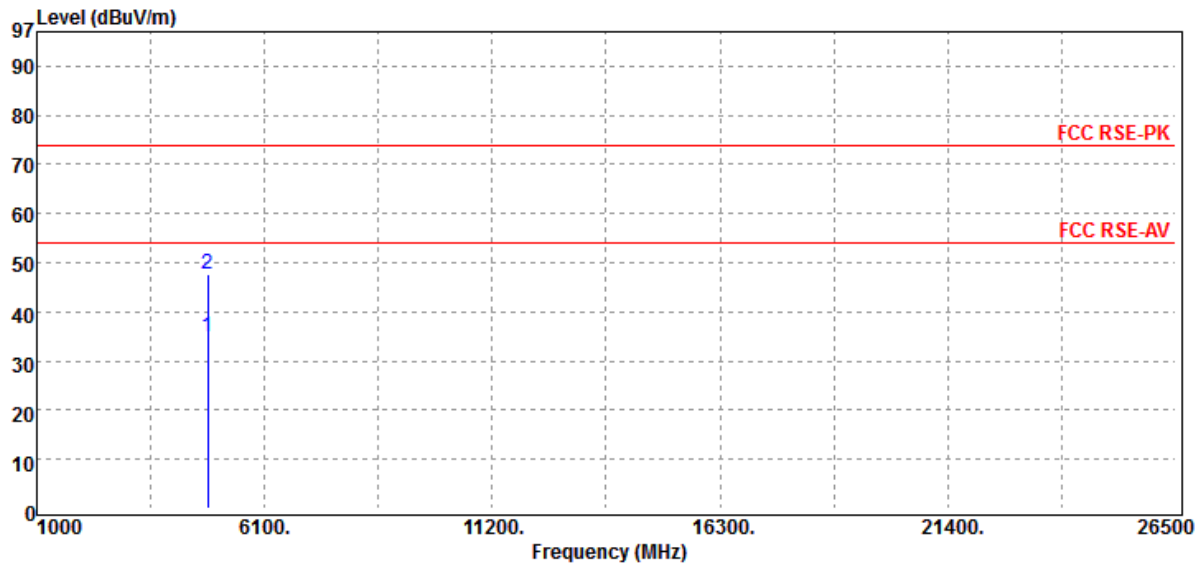
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Operation Band	:802.11 g	Test Date	:2015-06-15
Fundamental Frequency	:2412 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:TX LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
4824.00	H	Average	25.33	9.63	34.96	54.00	-19.04
4824.00	H	Peak	37.94	9.63	47.57	74.00	-26.43

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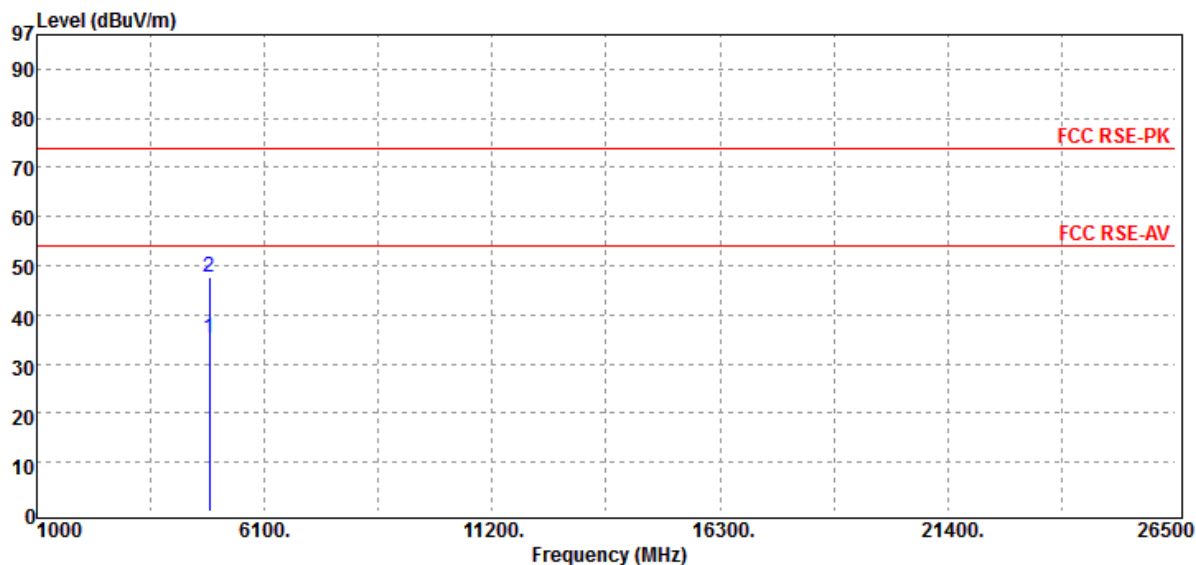
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Operation Band	:802.11 g	Test Date	:2015-06-15
Fundamental Frequency	:2437 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:TX MID	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
4874.00	H	Average	25.47	9.85	35.32	54.00	-18.68
4874.00	H	Peak	37.92	9.85	47.77	74.00	-26.23

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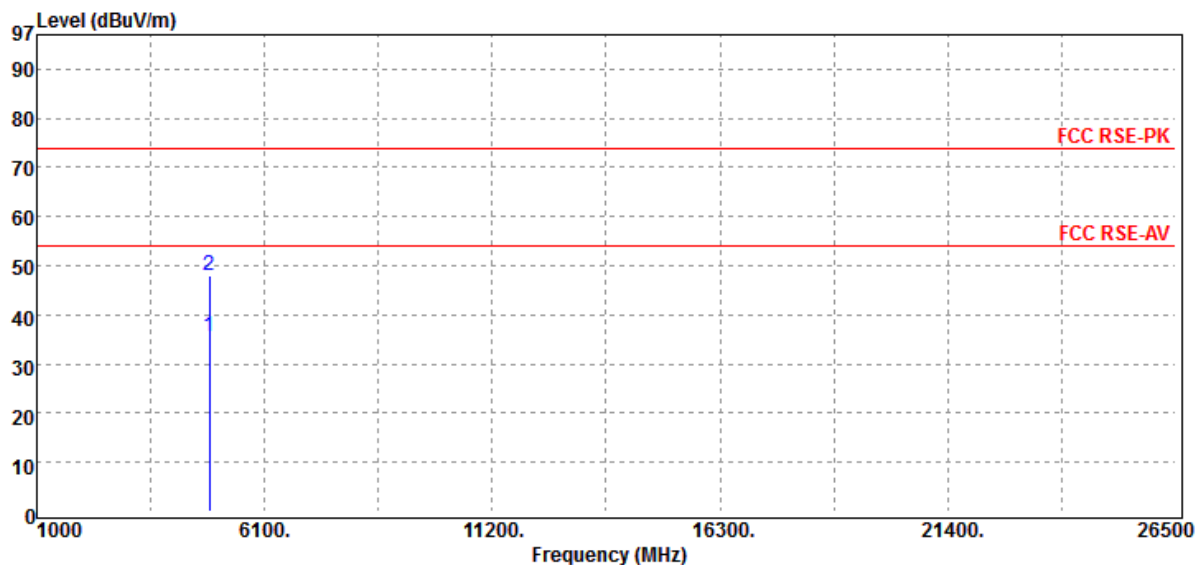
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Operation Band	:802.11 g	Test Date	:2015-06-15
Fundamental Frequency	:2437 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:TX MID	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
4874.00	H	Average	25.62	9.85	35.47	54.00	-18.53
4874.00	H	Peak	38.13	9.85	47.98	74.00	-26.02

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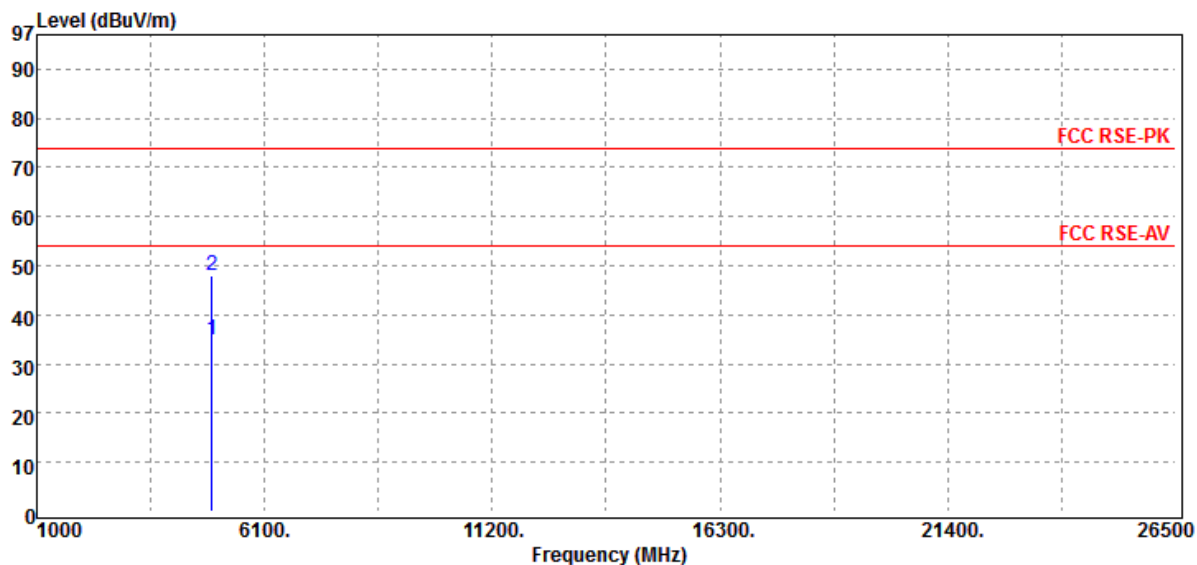
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Operation Band	:802.11 g	Test Date	:2015-06-15
Fundamental Frequency	:2462 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:TX HIGH	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
4924.00	H	Average	25.19	9.86	35.05	54.00	-18.95
4924.00	H	Peak	38.00	9.86	47.86	74.00	-26.14

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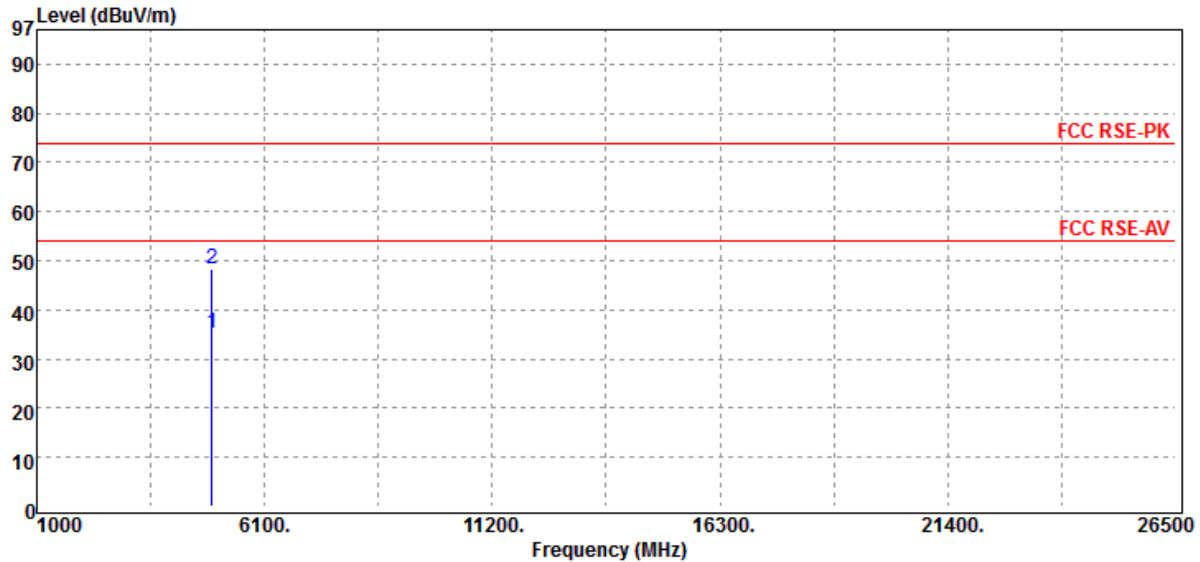
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Operation Band	:802.11 g	Test Date	:2015-06-15
Fundamental Frequency	:2462 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:TX HIGH	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
4924.00	H	Average	25.36	9.86	35.22	54.00	-18.78
4924.00	H	Peak	38.53	9.86	48.39	74.00	-25.61

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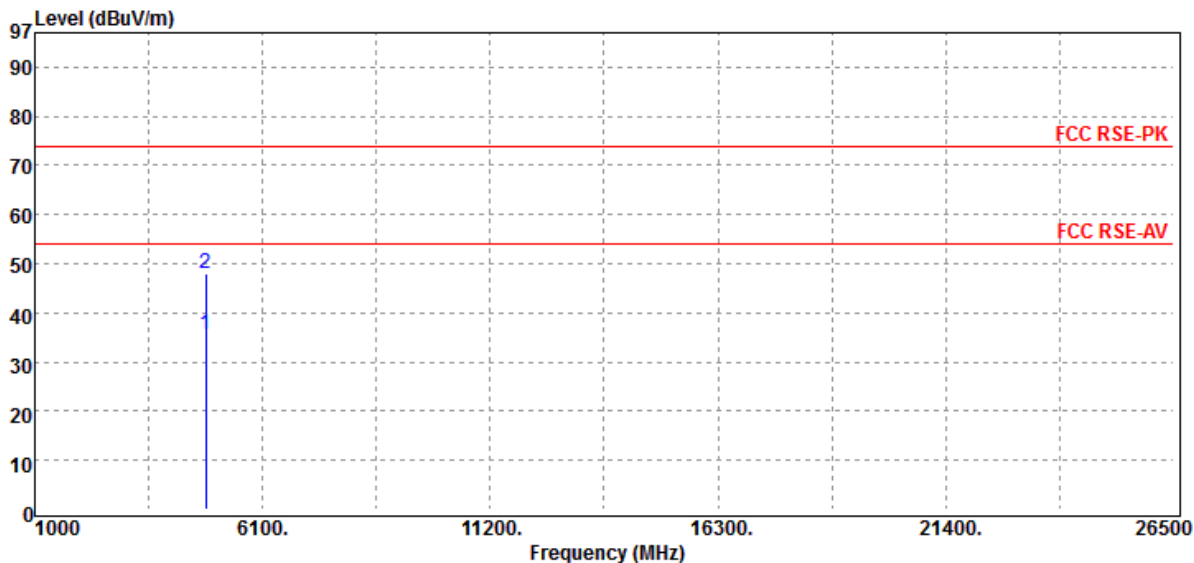
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## Radiated Spurious Emission Measurement Result (802.11\_HT20)

Operation Band	:802.11 n20M	Test Date	:2015-06-15
Fundamental Frequency	:2412 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:TX LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4824.00	H	Average	25.83	9.63	35.46	54.00	-18.54
4824.00	H	Peak	38.22	9.63	47.85	74.00	-26.15

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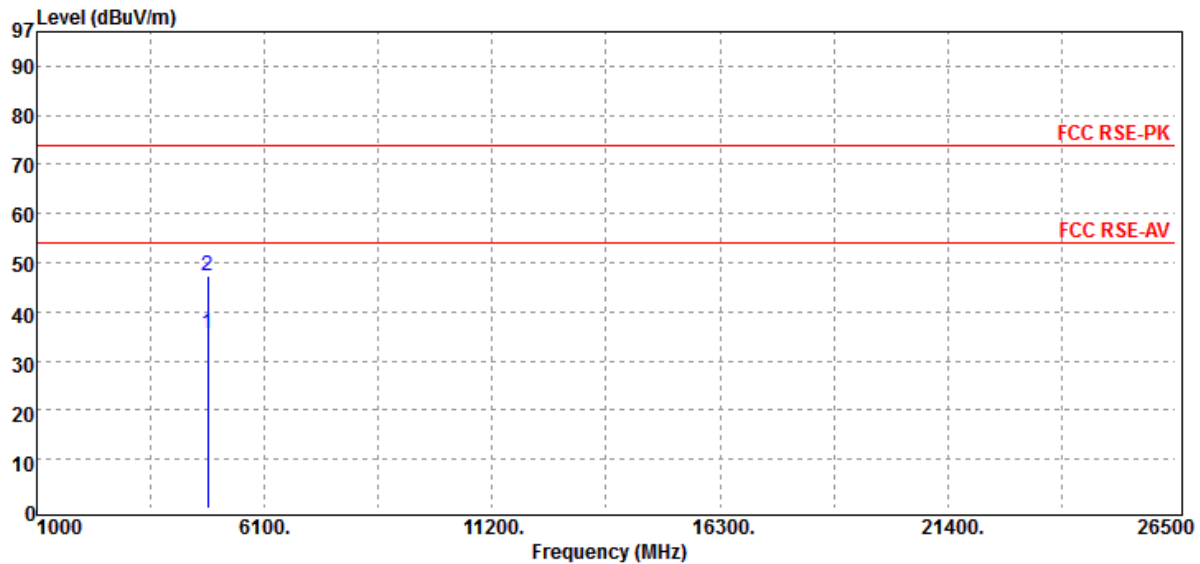
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Operation Band	:802.11 n20M	Test Date	:2015-06-15
Fundamental Frequency	:2412 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:TX LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
4824.00	H	Average	25.91	9.63	35.54	54.00	-18.46
4824.00	H	Peak	37.67	9.63	47.30	74.00	-26.70

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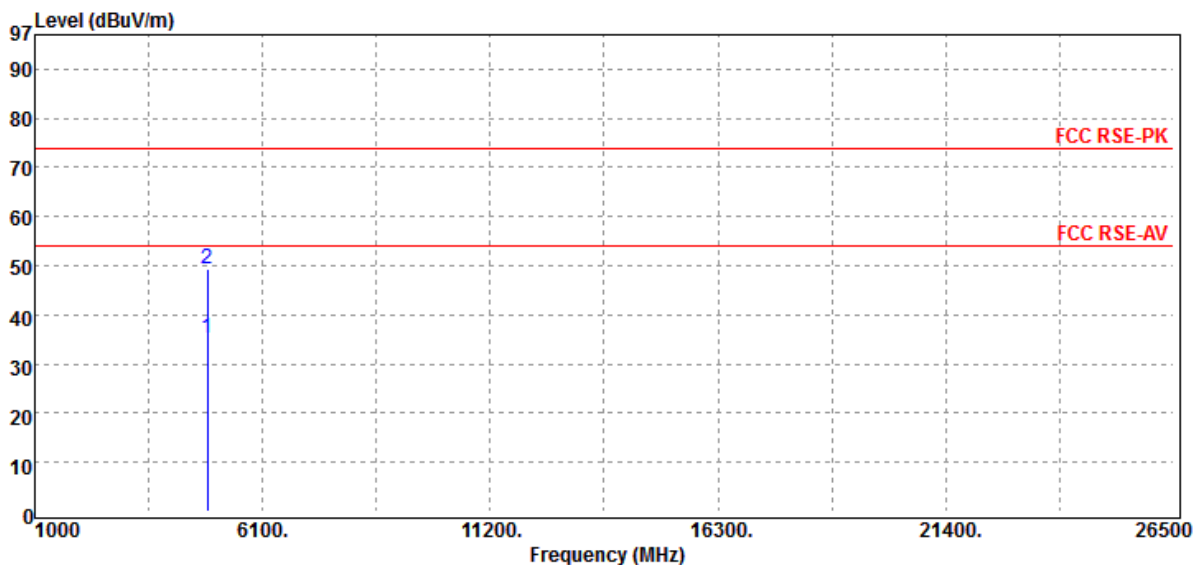
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Operation Band	:802.11 n20M	Test Date	:2015-06-15
Fundamental Frequency	:2437 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:TX MID	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
4874.00	H	Average	25.55	9.85	35.40	54.00	-18.60
4874.00	H	Peak	39.37	9.85	49.22	74.00	-24.78

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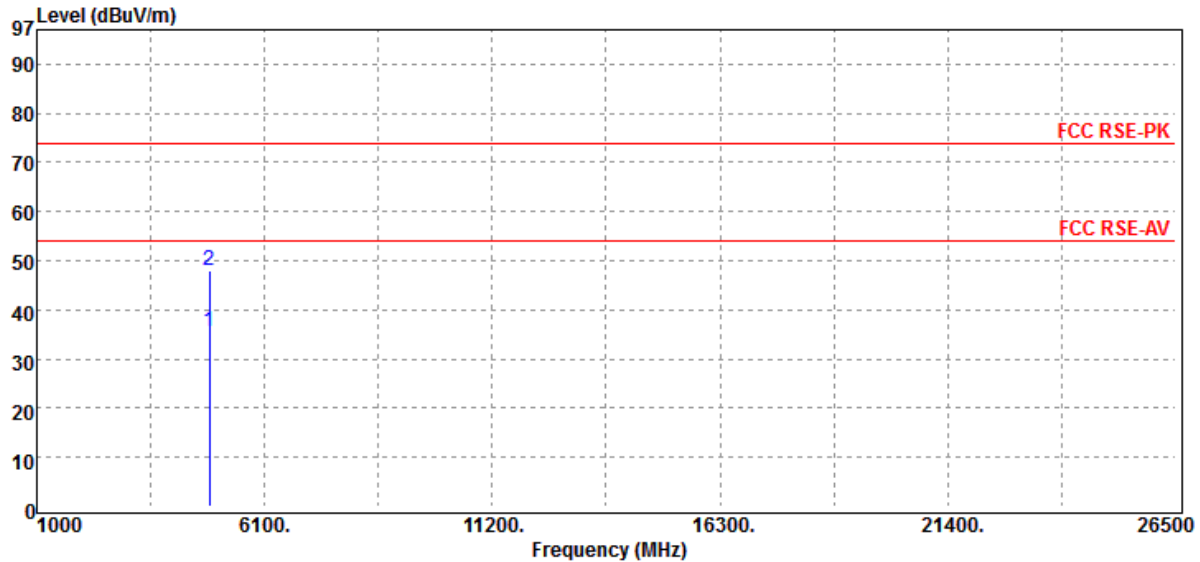
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Operation Band :802.11 n20M  
Fundamental Frequency :2437 MHz  
Operation Mode :TX MID  
EUT Pol. :E2 Plane

Test Date :2015-06-15  
Temp./Humi. :21 deg\_C / 61 RH  
Engineer :Tin  
Measurement Antenna Pol. :HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
4874.00	H	Average	25.62	9.85	35.47	54.00	-18.53
4874.00	H	Peak	38.24	9.85	48.09	74.00	-25.91

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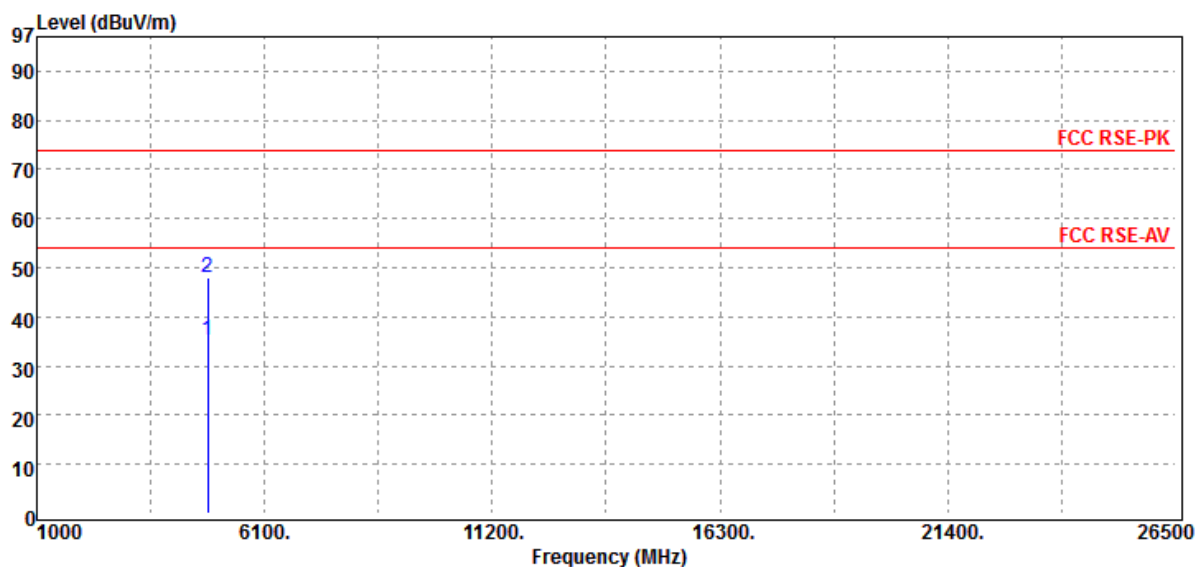
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Operation Band	:802.11 n20M	Test Date	:2015-06-15
Fundamental Frequency	:2462 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:TX HIGH	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
4824.00	H	Average	25.72	9.63	35.35	54.00	-18.65
4824.00	H	Peak	38.32	9.63	47.95	74.00	-26.05

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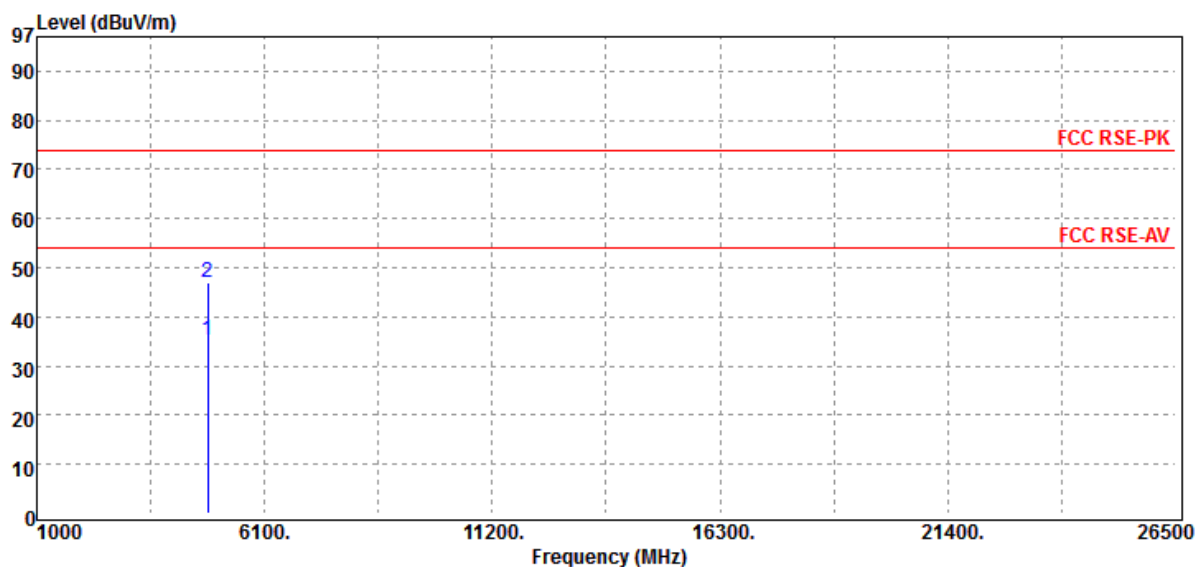
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Operation Band	:802.11 n20M	Test Date	:2015-06-15
Fundamental Frequency	:2462 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:TX HIGH	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
4824.00	H	Average	25.73	9.63	35.36	54.00	-18.64
4824.00	H	Peak	37.25	9.63	46.88	74.00	-27.12

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## 12 PEAK POWER SPECTRAL DENSITY

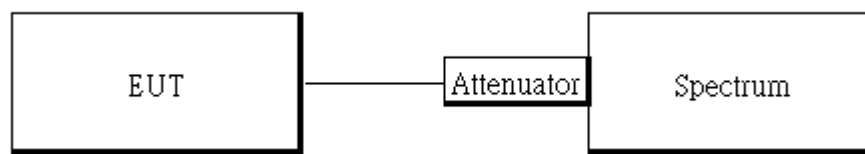
### 12.1 Standard Applicable

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

### 12.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY51100003	01/29/2015	01/28/2016
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2015	01/01/2016
Attenuator	Mini-Circuit	BW-S10W2+	002	01/02/2015	01/01/2016

### 12.3 Test Set-up



### 12.4 Measurement Procedure

1. Set analyzer center frequency to DTS channel center frequency.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance V03r03.
3. Set the span to 1.5 times the DTS channel bandwidth.
4. Set the RBW  $\geq 3$  kHz.
5. Set the VBW  $\geq 3 \times$  RBW.
6. Detector = peak.
7. Sweep time = auto couple.
8. Trace mode = max hold.
9. Allow trace to fully stabilize.
10. Use the peak marker function to determine the maximum amplitude level.
11. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

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## 12.5 Measurement Result

Frequency (MHz)	RF Power Density (dBm)	Maximum Limit (dBm)	Result
802.11b			
2412	-6.01	8	PASS
2437	-6.47	8	PASS
2462	-6.67	8	PASS
802.11g			
2412	-10.36	8	PASS
2437	-9.27	8	PASS
2462	-11.38	8	PASS
802.11n_HT20			
2412	-10.08	8	PASS
2437	-9.88	8	PASS
2462	-10.49	8	PASS

*\*Refer to next page for plots*

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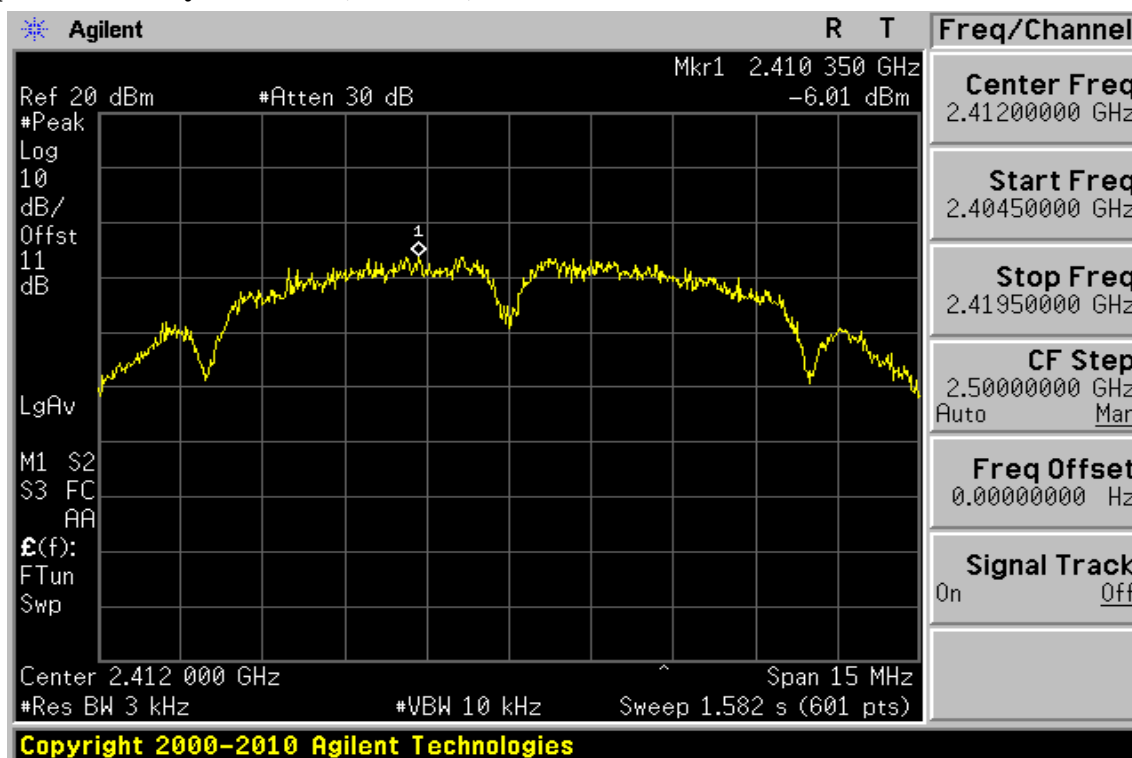
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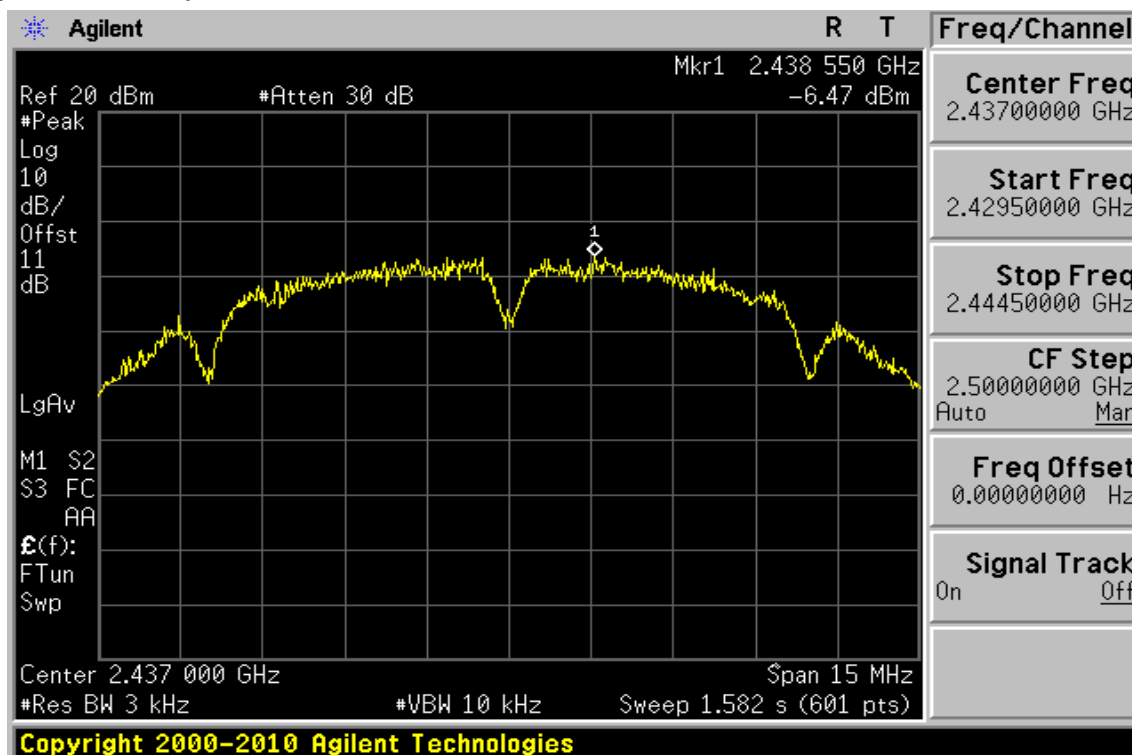
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## 802.11b

### Power Spectral Density Test Plot (CH-Low)



### Power Spectral Density Test Plot (CH-Mid)



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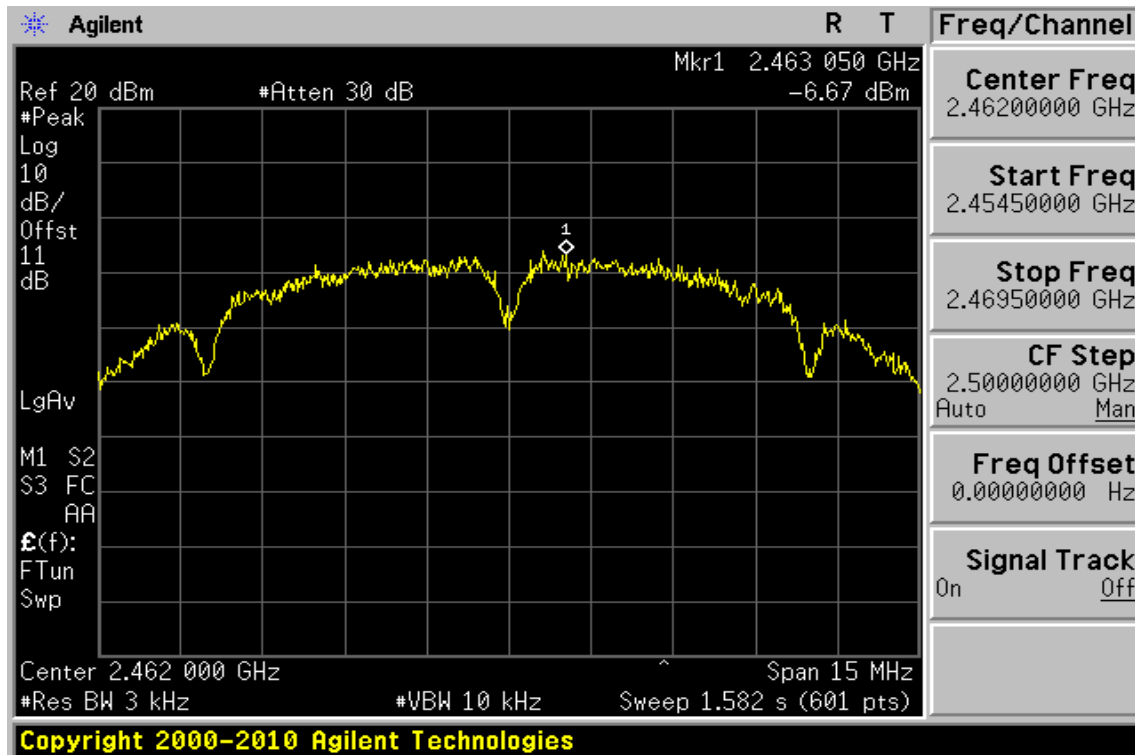
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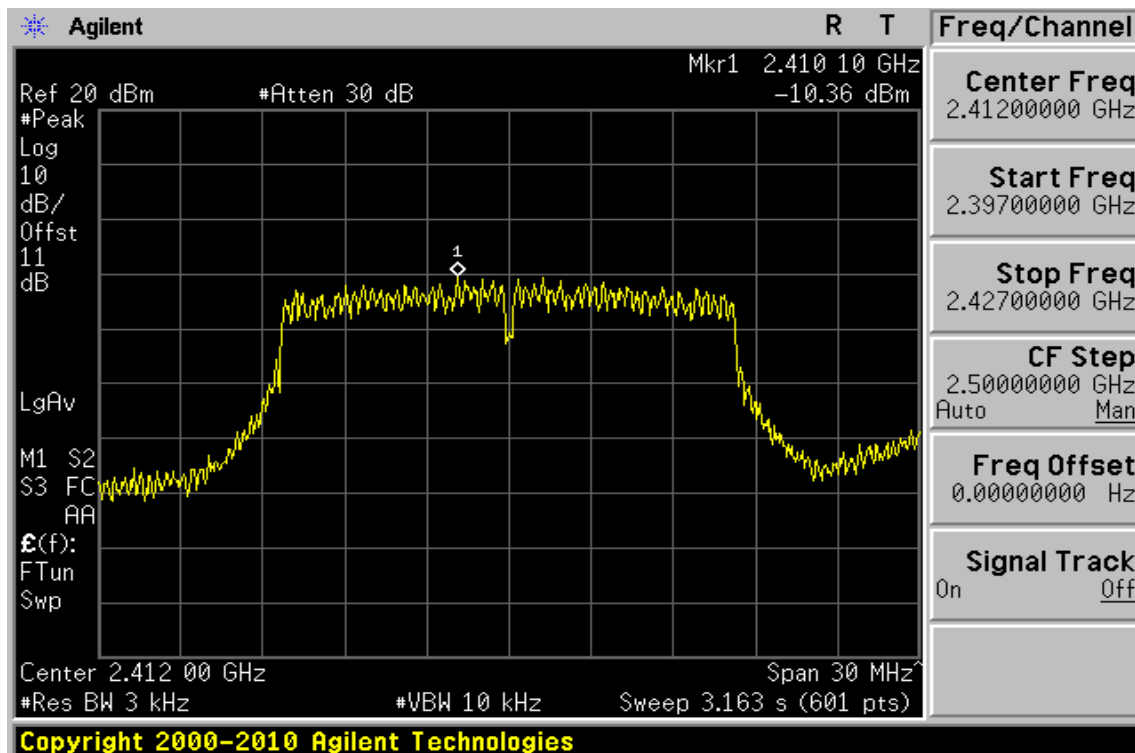
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## Power Spectral Density Test Plot (CH-High)



802.11g

## Power Spectral Density Test Plot (CH-Low)



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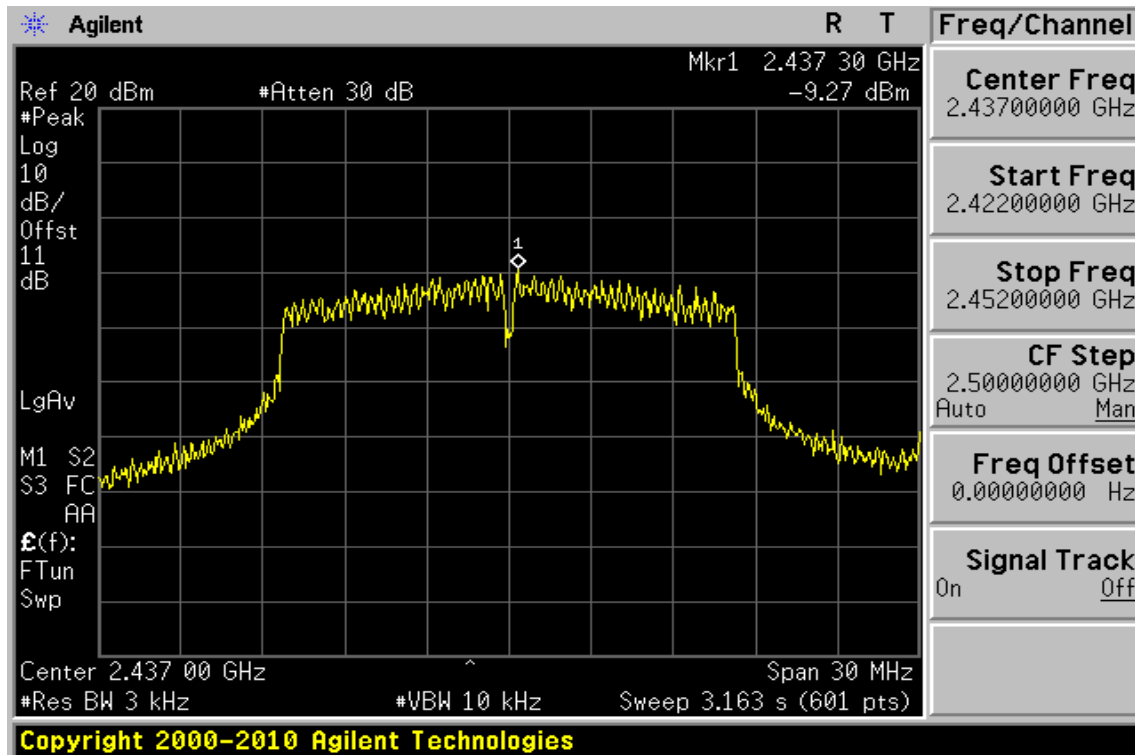
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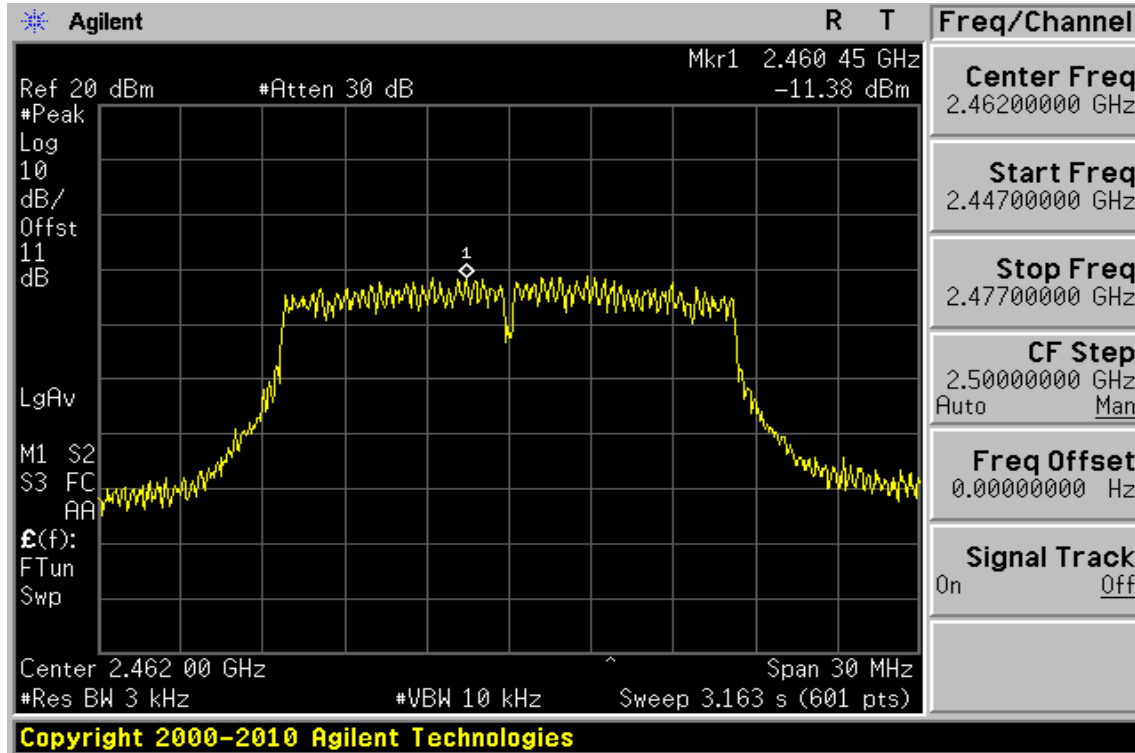
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## Power Spectral Density Test Plot (CH-Mid)



## Power Spectral Density Test Plot (CH-High)



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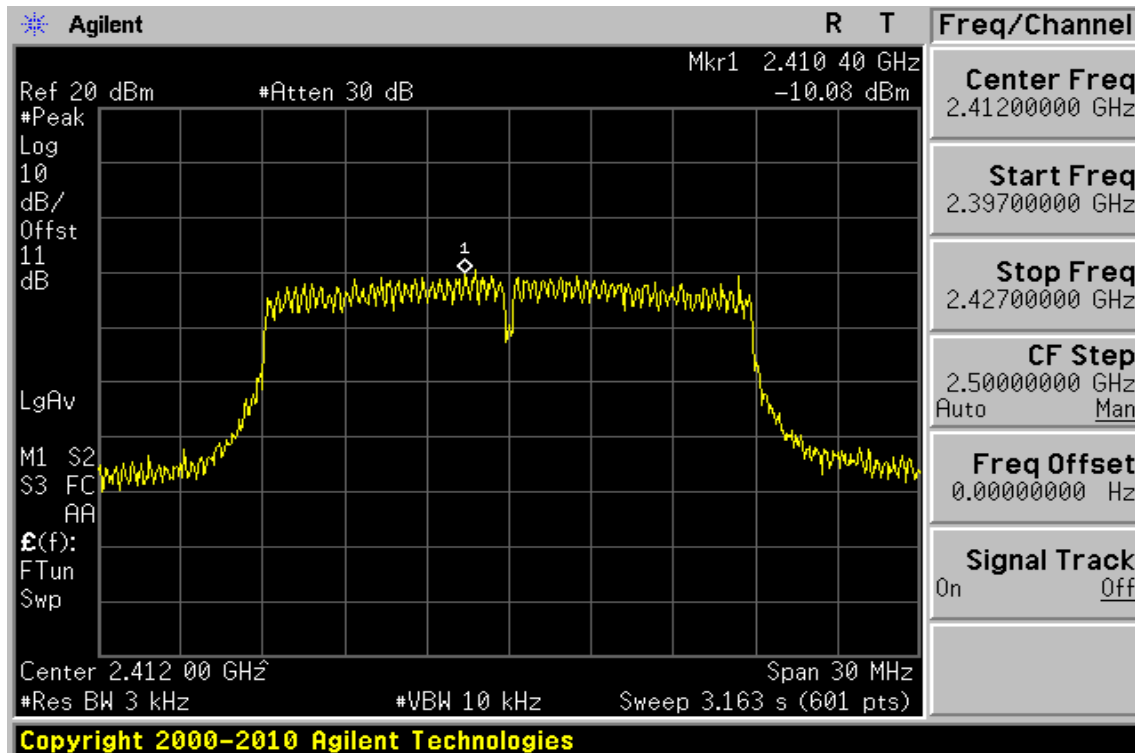
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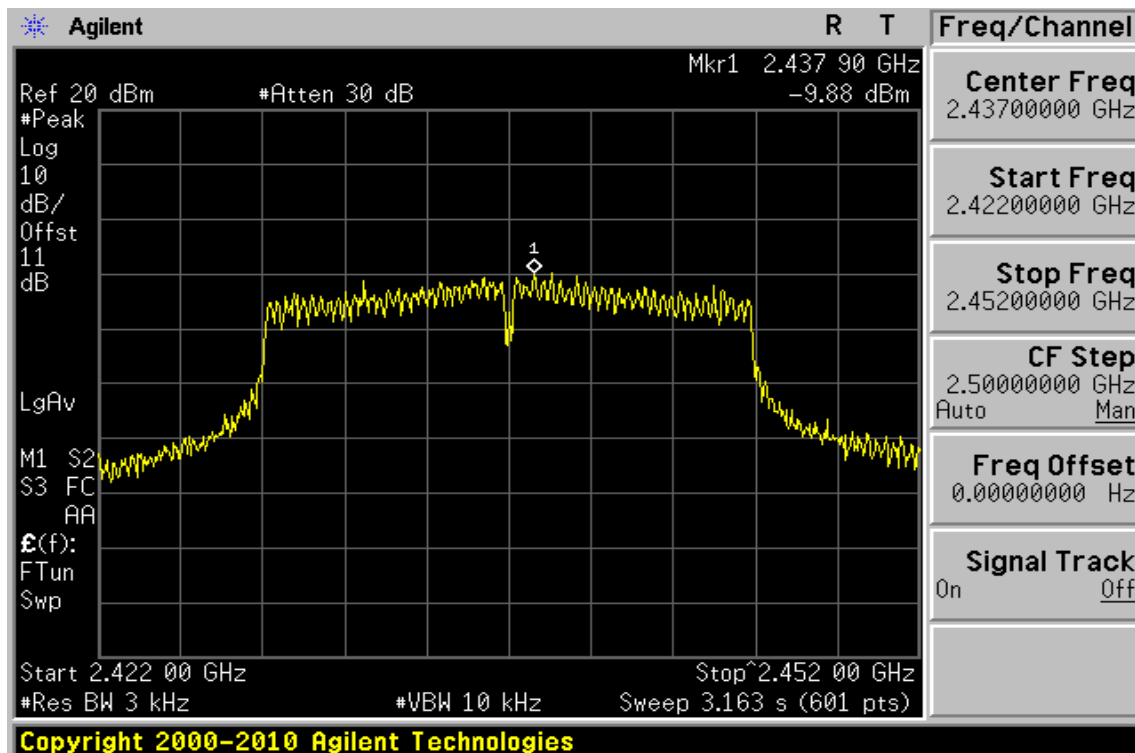
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## 802.11n\_HT20

### Power Spectral Density Test Plot (CH-Low)



### Power Spectral Density Test Plot (CH-Mid)



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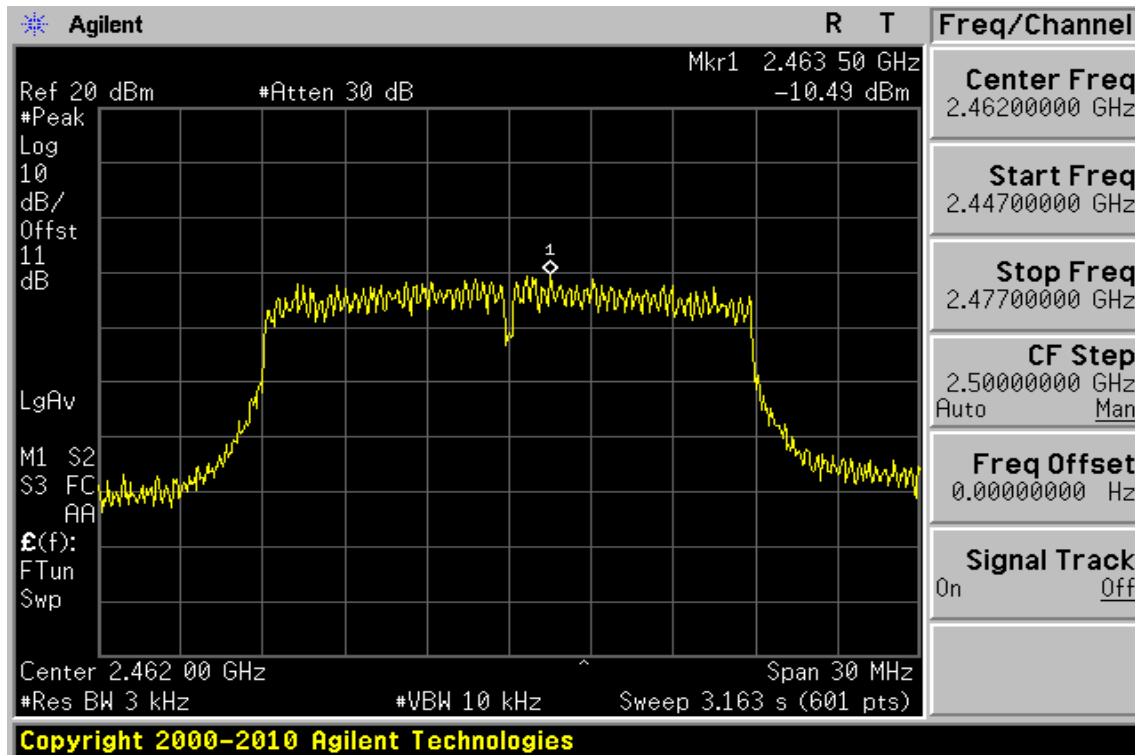
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## Power Spectral Density Test Plot (CH-High)



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## 13 ANTENNA REQUIREMENT

### 13.1 Standard Applicable

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

If the transmitting antenna is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi.

In case of point-to-point operation, the power shall be reduced by the one dB for every 3 dB that the directional gain of antenna exceeds 6dBi.

### 13.2 Antenna Connected Construction

An embedded-in antenna design is used.

The antenna connector is designed with unique type RF connector and no consideration of replacement. Please see EUT photo and antenna spec. for details.

The antenna gain is less than 6dBi. Therefore, it is not necessary to reduce maximum output power limit.

*~ End of Report ~*

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No.134,WuKungRoad,NewTaipeiIndustrialPark,WukuDistrict,NewTaipeiCity,Taiwan24803/新北市五股區新北產業園區五工路 134 號

t (886-2) 2299-3279

f (886-2) 2298-0488

[www.tw.sgs.com](http://www.tw.sgs.com)

Member of SGS Group