

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT**INTENTIONAL RADIATOR CERTIFICATION TO
FCC PART 15 SUBPART C REQUIREMENT**

OF

Product Name: WLAN USB module

Brand Name: N/A

Model No.: 44.P30R3.MW1;
44.P30x3.xxx (x=0~9, A~Z, Blank)

Model Different: Different name for market segmentation

FCC ID: W5344P30R3MW1

Report No.: ER/2013/40006

Issue Date: Apr. 30, 2013

FCC Rule Part: §15.247, Cat: DTS

Prepared for: HiTi Digital, Inc.
9F, No.225, Sec. 3, Beixin Rd., Xindian Dist.,
New Taipei City, Taiwan

Prepared by: SGS Taiwan Ltd.
Electronics & Communication Laboratory
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VERIFICATION OF COMPLIANCE

Applicant: HiTi Digital, Inc.
 9F, No.225, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City, Taiwan

Product Name: WLAN USB module

Brand Name: N/A

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 44.P30x3.xxx (x=0~9, A~Z, Blank)

Model Difference: Different name for market segmentation

FCC ID: W5344P30R3MW1

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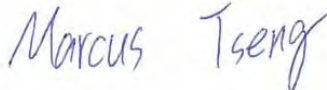
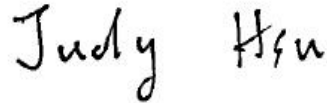

Date of test: Apr. 10, 2013 ~ Apr. 25, 2013

Date of EUT Received: Apr. 10, 2013

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 C63.4:2009, the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.247.

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

Test By:		Date	Apr. 30, 2013
	_____ <i>Marcus Tseng / Engineer</i>		
Prepared By:		Date	Apr. 30, 2013
	_____ <i>Judy Hsu / Clerk</i>		
Approved By:		Date	Apr. 30, 2013
	_____ <i>Jim Chang / Supervisor</i>		

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Version

Version No.	Date	Description
00	Apr. 30, 2013	Initial creation of document

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1 GENERAL INFORMATION

General:

Product Name:	WLAN USB module
Brand Name:	N/A
Model No.:	44.P30R3.MW1; 44.P30x3.xxx (x=0~9, A~Z, Blank)
Model Difference:	Different name for market segmentation
Hardware Version:	289G1M4920-B0
Software Version:	00-029400-01
Power Supply:	5Vdc by DC Power Supply

WLAN 802.11 b/g/n:

Wi-Fi	Frequency Range	Channels	Rated Power	Modulation Technology
11b/g	2412-2462	11	b: 19.65dBm g: 23.17dBm	DSSS, OFDM
11n	HT20 2412-2462	11	n: 21.22dBm	OFDM
11n	HT40 2422-2452	9	n: 21.55dBm	OFDM
Antenna Designation:			Chip Antenna, 0.5dBi	
Modulation type:			CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM	
Transition Rate:			802.11 b: 1/2/5.5/11 Mbps; 802.11 g: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 72.2Mbps 802.11 n_40MHz: 15 –135Mbps	

This report applies for WLAN, and complies with FCC rule part 15C.

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1.1 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: W5344P30R3MW1** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules. The composite system (digital device) is compliance with Subpart B is authorized under a DoC procedure.

1.2 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4: 2009. Radiated testing was performed at an antenna to EUT distance 3 meters.

Tested in accordance with Oct 2012 KDB558074 D01 V02 for compliance to FCC 47CFR 15.247 requirements.

1.3 Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei Country, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2009. FCC Registration Number are: 990257 and 236194, Canada Registration Number: 4620A-4.

The 10 m Open Area Test Sites located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 29, Pau-Tou-Tsuo Valley Chia-Pau Tsuen, Linkou Hsiang, Taipei county, which is constructed and calibrated to meet the CISPR 22/EN 55022 requirements. SGS Site No. 1(3 & 10 meters) and FCC Registration Number: 94644.

1.4 Special Accessories

Not available for this EUT intended for grant.

1.5 Equipment Modifications

Not available for this EUT intended for grant.

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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

The EUT (Transmitter) was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 7.3.1 of ANSI C63.4-2009. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and Average detector mode.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. 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. according to the requirements in Section 8 and 13 of ANSI C63.4-2009.

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2.4 Configuration of Tested System

Fig. 2-1 Conducted / Radiated Emission Configuration

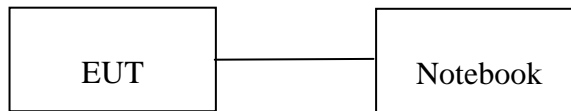


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	Notebook	DELL	E5400	3704625136	N/A	N/A
2.	WLAN Software	Realtek	N/A	0.0028.1102.2011	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)	100 KHz Bandwidth Of Frequency Band Edges	Compliant
§15.247(d)	Spurious Emission	Compliant
§15.247(e)	Peak Power Density	Compliant
§15.203	Antenna Requirement	Compliant

4 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.

Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

802.11 b mode: Channel low (2412MHz) 、mid (2437MHz) and high (2462MHz) with 1Mbps lowest data rate are chosen for full testing.

802.11 g mode: Channel low (2412MHz) 、mid (2437MHz) and high (2462MHz) with 6Mbps lowest data rate are chosen for full testing.

802.11 n mode(20M): Channel low (2412MHz) 、mid (2437MHz) and high (2462MHz) with 6.5Mbps lowest data rate are chosen for full testing.

802.11 n mode(40M): Channel low (2422MHz) 、mid (2437MHz) and high (2452MHz) with 13.5 Mbps data rate are chosen for conducted power testing.

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 E1 position was reported.

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5 MEASUREMENT UNCERTAINTY FOR FIELD STRENGTH OF SPURIOUS RADIATION

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

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

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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

- The lower limit shall apply at the transition frequencies
- 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	ESCI7	100759	05/20/2011	05/19/2013
EMI Receiver	R&S	ESCS 30	828985/004	09/23/2012	09/22/2013
LISN	Rolf-Heine	NNB-2/16Z	99012	03/23/2013	03/22/2014
LISN	FCC	FCC-LISN-50/250-25-2-01	04034	03/23/2013	03/22/2014
Coaxial Cables	N/A	WK CE Cable	N/A	01/05/2013	01/04/2014

6.3 EUT Setup:

- The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4-2009.
- The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- The LISN was connected with 120Vac/60Hz power source.

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6.4 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 frequency measured were complete.

6.5 Measurement Result:

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

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

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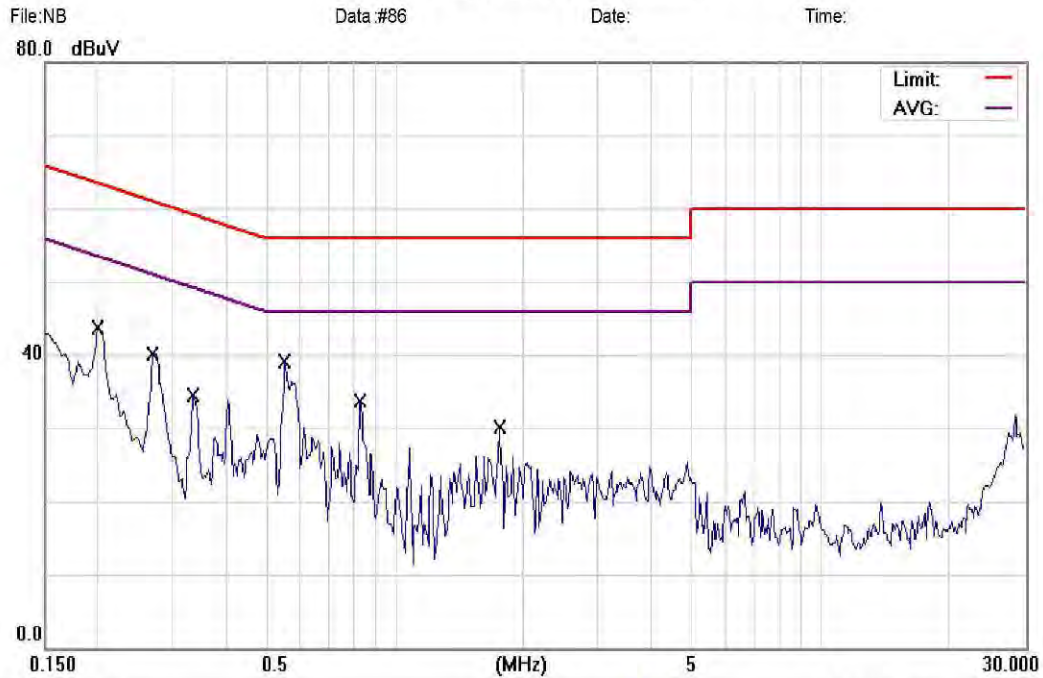
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AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation Mode	Test Date:	Apr. 17, 2013
Temperature:	26 °C	Humidity:	60 %
		Test By:	Marcus

Conducted Emission Measurement



Site: ConductionRoom	Phase: L1	Temperature: 24 °C
Limit: FCC Class B Conduction(QP)	Power: AC 120V/60Hz	Humidity: 60%
EUT: WLAN USB module	Distance:	
M/N: 44.P30x3.xxx (x=0~9, A~Z, Blank)		
Mode: Operationmode		
Note:		

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.2000	43.62	0.12	43.74	63.61	-19.87	QP	
2		0.2700	40.01	0.12	40.13	61.12	-20.99	QP	
3		0.3350	34.45	0.12	34.57	59.33	-24.76	QP	
4	*	0.5500	39.08	0.12	39.20	56.00	-16.80	QP	
5		0.8300	33.56	0.12	33.68	56.00	-22.32	QP	
6		1.7600	29.88	0.15	30.03	56.00	-25.97	QP	

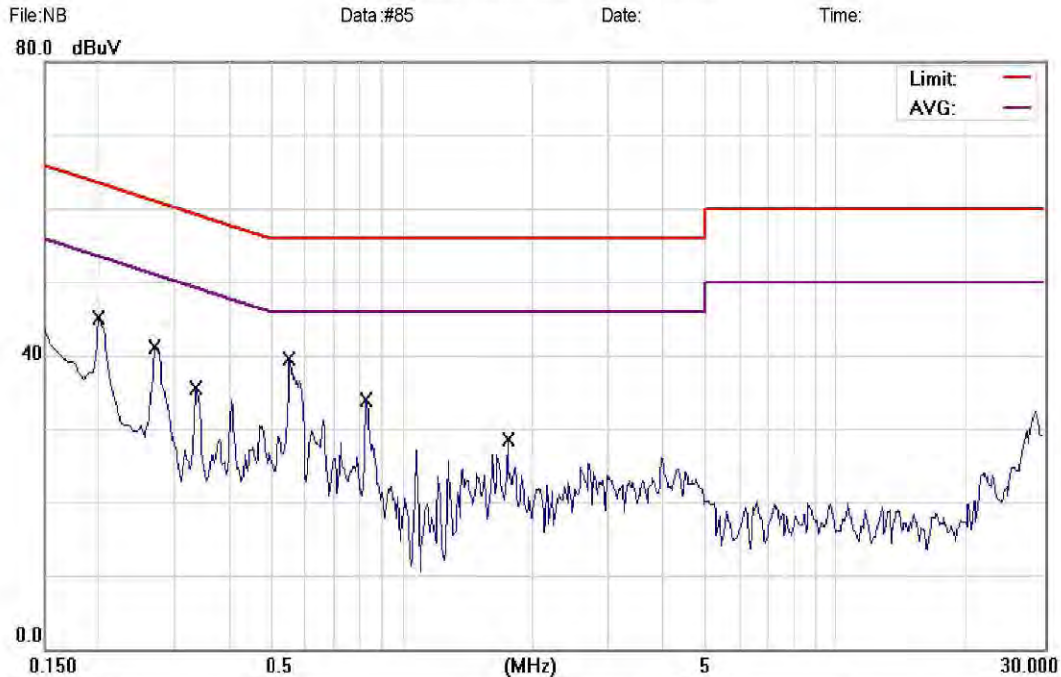
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Conducted Emission Measurement



Site: ConductionRoom Phase: **N** Temperature: 24 °C
 Limit: FCC Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 60%
 EUT: WLAN USB module Distance:
 M/N: 44.P30x3.xxx (x=0~9, A~Z, Blank)
 Mode: Operationmode
 Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.2000	44.91	0.13	45.04	63.61	-18.57	QP	
2		0.2700	40.93	0.13	41.06	61.12	-20.06	QP	
3		0.3350	35.40	0.12	35.52	59.33	-23.81	QP	
4	*	0.5500	39.32	0.12	39.44	56.00	-16.56	QP	
5		0.8300	33.72	0.13	33.85	56.00	-22.15	QP	
6		1.7600	28.30	0.15	28.45	56.00	-27.55	QP	

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7 PEAK OUTPUT POWER MEASUREMENT

7.1 Standard Applicable:

According to §15.247 (b)

(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

(1) Fixed point-to-point operation:

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

(ii) Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted output power.

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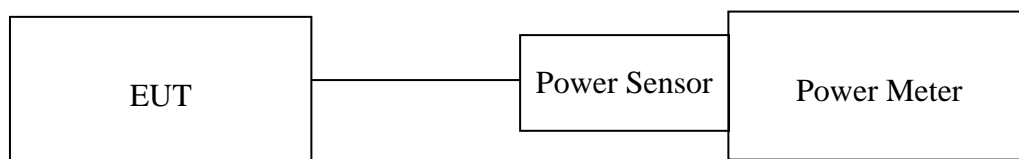
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7.2 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Sensor	Anritsu	ML2495A	1005007	02/08/2012	02/07/2014
Power Meter	Anritsu	MA2411B	917032	02/08/2012	02/07/2014
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2013	04/14/2014
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/15/2013	03/14/2014
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2013	02/27/2014
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2013	01/04/2014
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2013	02/27/2014
Splitter	Agilent	11636B	N/A	02/28/2013	02/27/2014

7.3 Test Set-up:



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7.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter or spectrum. (**Peak power setting on spectrum:** Channel power function, RBW = 1MHz, VBW = 3MHz, Span: 30/60MHz, Detector =peak, Sweep = Auto. Setting on spectrum is adjusted based on the mandatory procedure in 8.1.2 Option2 of the KDB558074). Power Meter is used as the auxiliary test equipment to conduct the output power measurement. 8.1.3 option 3 in KDB558074 is followed.

Avg. power setting on Spectrum: Channel power function, RBW = 1MHz, VBW = 3MHz, , Span:30/60MHz, Detector =Avg., Trace avg.=100, Sweep = Auto, Setting on spectrum is adjusted based on the mandatory procedure in 8.2.1 Option1 of the KDB558074). Power Meter is used as the auxiliary test equipment to conduct the output power measurement. 8.2.3 option 3 in KDB558074 is followed.

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

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7.5 Measurement Result:

802.11b

Cable loss = 0		Peak Power Output					Required Limit
CH	Frequency (MHz)	Data Rate					
		1	2	5.5	11		
1	2412	19.61	19.58	19.55	19.44	1 Watt = 30 dBm	
6	2437	19.65	19.56	19.47	19.40	1 Watt = 30 dBm	
11	2462	19.62	19.55	19.46	19.42	1 Watt = 30 dBm	
Cable loss = 0		Average Power Output					Required Limit
CH	Frequency (MHz)	Data Rate					
		1	2	5.5	11		
1	2412	16.99	16.84	16.77	16.65	1 Watt = 30 dBm	
6	2437	17.01	16.89	16.82	16.78	1 Watt = 30 dBm	
11	2462	16.97	16.85	16.81	16.73	1 Watt = 30 dBm	

802.11g

Cable loss = 0		Peak Power Output								Required Limit
CH	Frequency (MHz)	Data Rate								
		6	9	12	18	24	36	48	54	
1	2412	23.15	23.11	23.02	22.95	22.88	22.82	22.77	22.74	1 Watt = 30 dBm
6	2437	23.17	23.11	23.02	22.96	22.92	22.87	22.82	22.79	1 Watt = 30 dBm
11	2462	23.13	23.08	23.02	22.97	22.90	22.88	22.82	22.76	1 Watt = 30 dBm
Cable loss = 0		Average Power Output								Required Limit
CH	Frequency (MHz)	Data Rate								
		6	9	12	18	24	36	48	54	
1	2412	14.97	14.91	14.87	14.81	14.74	14.66	14.58	14.53	1 Watt = 30 dBm
6	2437	15.00	14.92	14.87	14.82	14.76	14.71	14.66	14.62	1 Watt = 30 dBm
11	2462	14.95	14.90	14.84	14.80	14.73	14.66	14.62	14.55	1 Watt = 30 dBm

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802.11n_20M

Cable loss = 0		Peak Power Output								Required Limit
CH	Frequency (MHz)	Data Rate								
		6.5	13	19.5	26	39	52	58.5	65	
1	2412	21.19	21.11	21.02	21.00	20.96	20.91	20.85	20.79	1 Watt = 30 dBm
6	2437	21.22	21.17	21.11	21.05	21.00	20.88	20.86	20.82	1 Watt = 30 dBm
11	2462	21.17	21.12	21.15	21.10	21.02	20.95	20.87	20.81	1 Watt = 30 dBm
Cable loss = 0		Average Power Output								Required Limit
CH	Frequency (MHz)	Data Rate								
		6.5	13	19.5	26	39	52	58.5	65	
1	2412	12.98	12.88	12.82	12.77	12.66	12.63	12.58	12.51	1 Watt = 30 dBm
6	2437	13.00	12.89	12.85	12.81	12.74	12.66	12.62	12.56	1 Watt = 30 dBm
11	2462	12.96	12.88	12.81	12.74	12.66	12.54	12.46	12.40	1 Watt = 30 dBm

802.11n_40M

Cable loss = 0		Peak Power Output								Required Limit
CH	Frequency (MHz)	Data Rate								
		6.5	13	19.5	26	39	52	58.5	65	
1	2422	21.46	21.41	21.33	21.25	21.21	21.15	21.09	21.01	1 Watt = 30 dBm
6	2437	21.34	21.30	21.22	21.15	21.10	21.02	20.99	20.91	1 Watt = 30 dBm
11	2452	21.55	21.48	21.42	21.33	21.28	21.25	21.21	21.11	1 Watt = 30 dBm
Cable loss = 0		Average Power Output								Required Limit
CH	Frequency (MHz)	Data Rate								
		6.5	13	19.5	26	39	52	58.5	65	
1	2422	12.95	12.90	12.85	12.81	12.74	12.66	12.59	12.52	1 Watt = 30 dBm
6	2437	13.00	12.95	12.88	12.80	12.75	12.69	12.62	12.58	1 Watt = 30 dBm
11	2452	12.99	12.93	12.88	12.85	12.80	12.74	12.66	12.58	1 Watt = 30 dBm

*Note: Offset 10.5 dB

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8 6dB BANDWIDTH

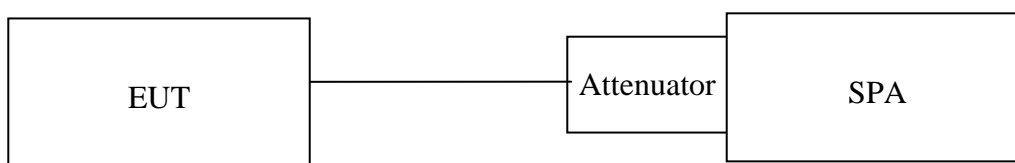
8.1 Standard Applicable:

According to §15.247(a)(2), Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500kHz.

8.2 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Sensor	Anritsu	ML2495A	1005007	02/08/2012	02/07/2014
Power Meter	Anritsu	MA2411B	917032	02/08/2012	02/07/2014
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2013	04/14/2014
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/15/2013	03/14/2014
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2013	02/27/2014
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2013	01/04/2014
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2013	02/27/2014
Splitter	Agilent	11636B	N/A	02/28/2013	02/27/2014

8.3 Test Set-up:



8.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. 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, Sweep=auto, the setting on spectrum is adjusted based on the procedure as guide in 7.1 option 1 of KDB558074.
4. Mark the peak frequency and -6dB (upper and lower) frequency.
5. Repeat above procedures until all frequency measured was complete.

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8.5 Measurement Result:

802.11b

Frequency (MHz)	Bandwidth (MHz)	Bandwidth (KHz)	Result
2412	10.118	> 500	PASS
2437	10.094	> 500	PASS
2462	10.128	> 500	PASS

802.11g

Frequency (MHz)	Bandwidth (MHz)	Bandwidth (KHz)	Result
2412	16.604	> 500	PASS
2437	16.614	> 500	PASS
2462	16.577	> 500	PASS

802.11n_20M

Frequency (MHz)	Bandwidth (MHz)	Bandwidth (KHz)	Result
2412	17.857	> 500	PASS
2437	17.824	> 500	PASS
2462	17.816	> 500	PASS

802.11n_40M

Frequency (MHz)	Bandwidth (MHz)	Bandwidth (KHz)	Result
2412	36.530	> 500	PASS
2437	36.495	> 500	PASS
2462	36.496	> 500	PASS

**Offset 10.5dB*

Note: Refer to next page for plots.

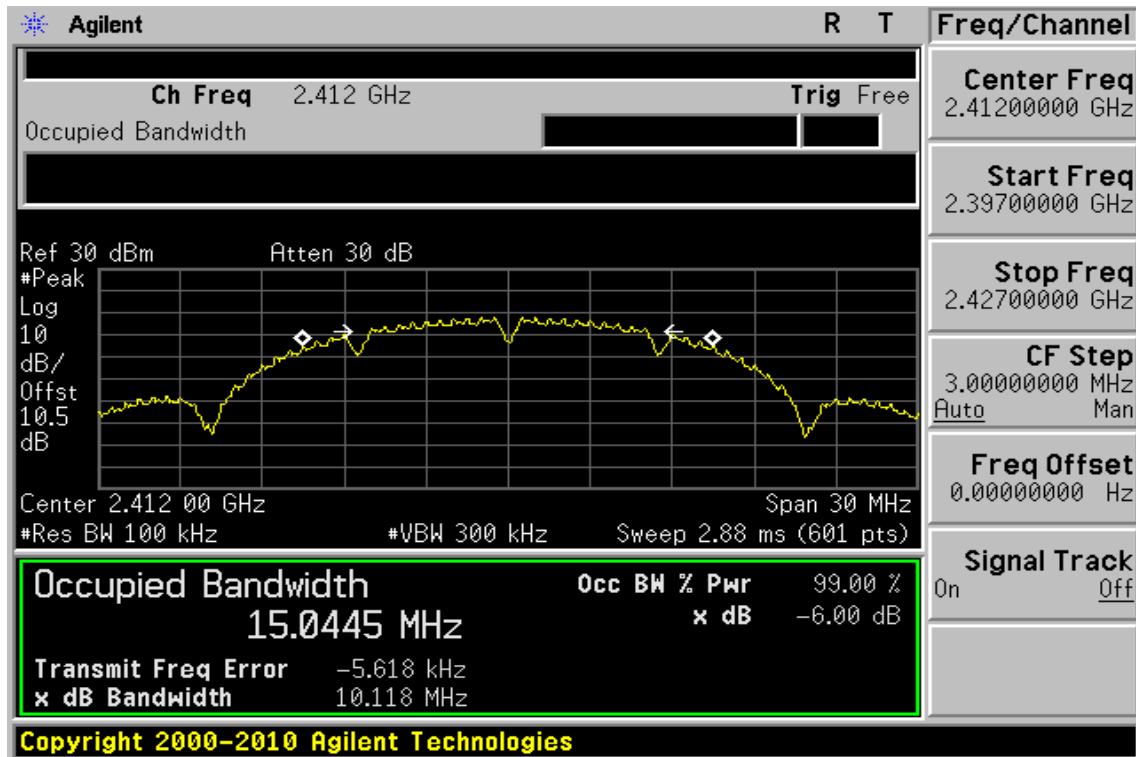
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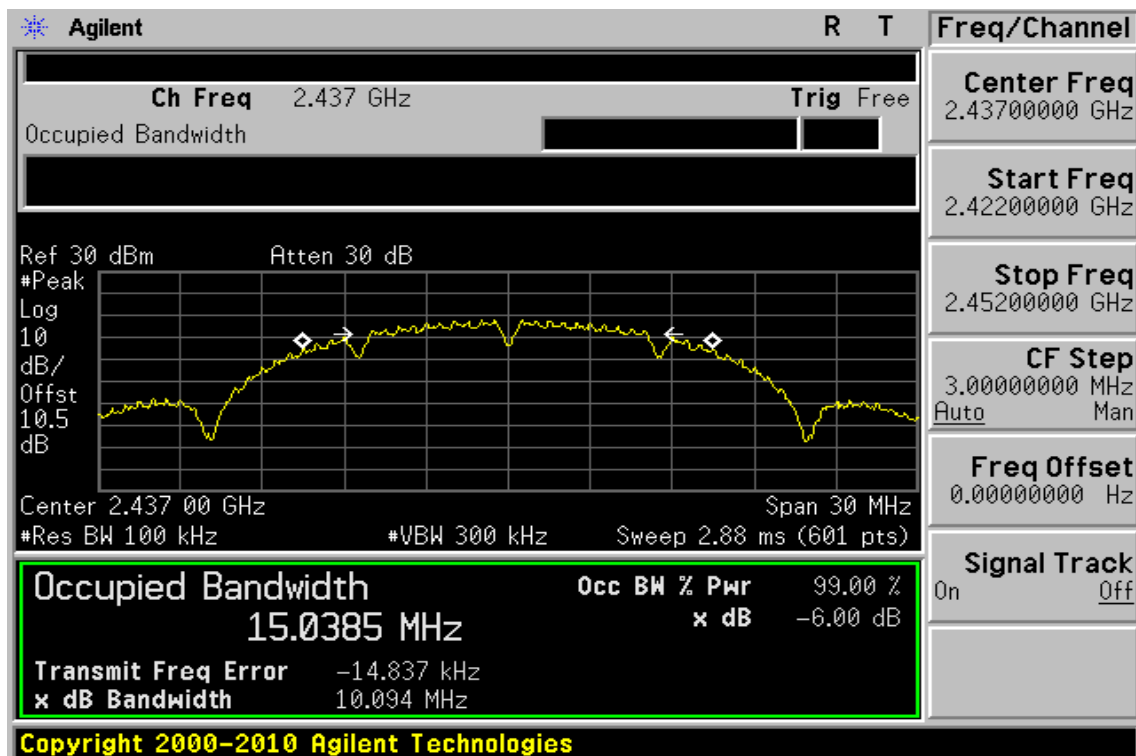
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802.11b

6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



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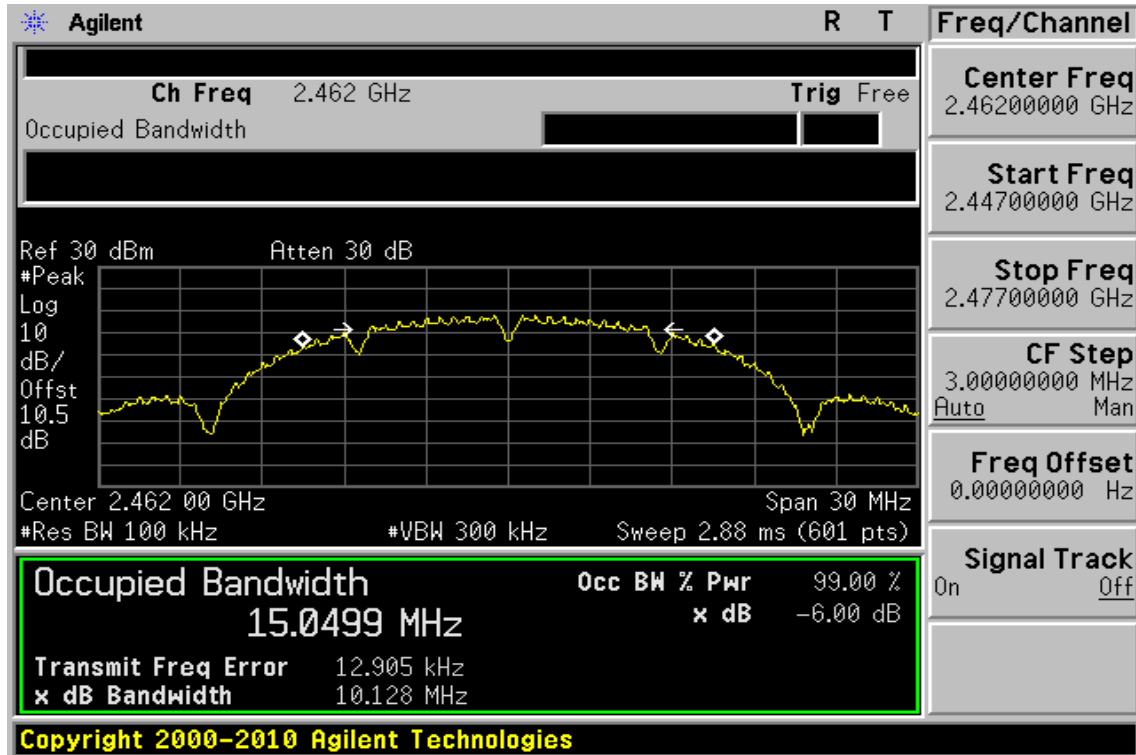
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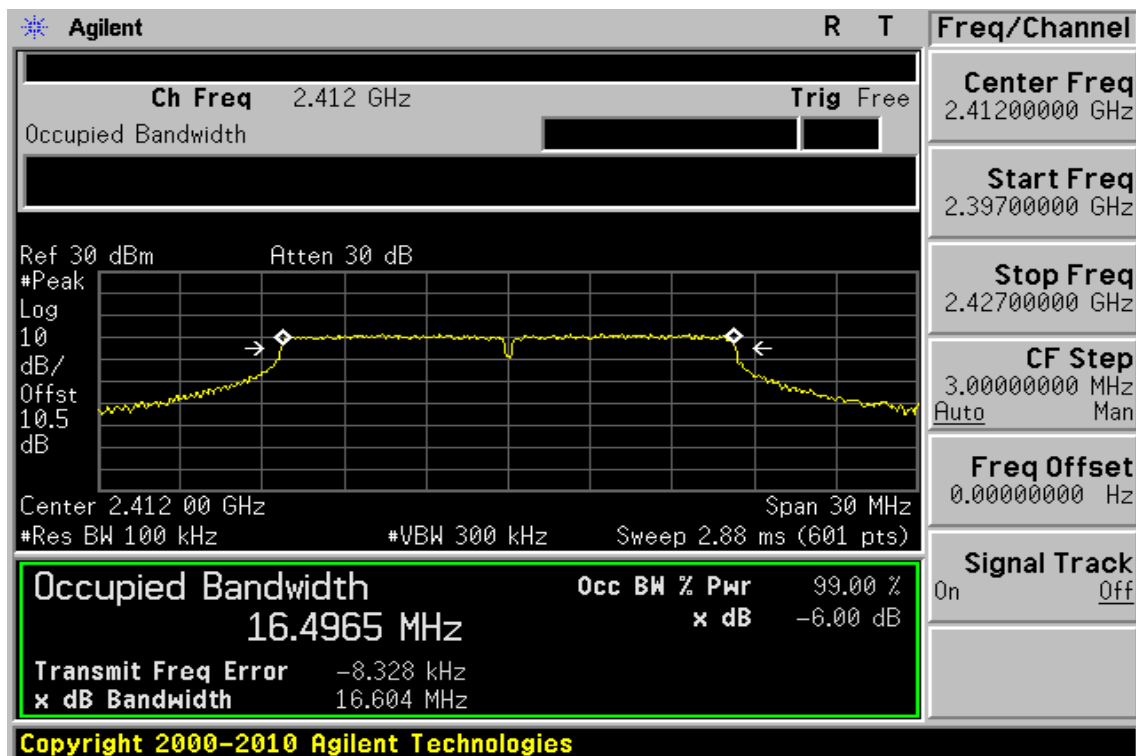
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6dB Band Width Test Data CH-High



802.11g

6dB Band Width Test Data CH-Low



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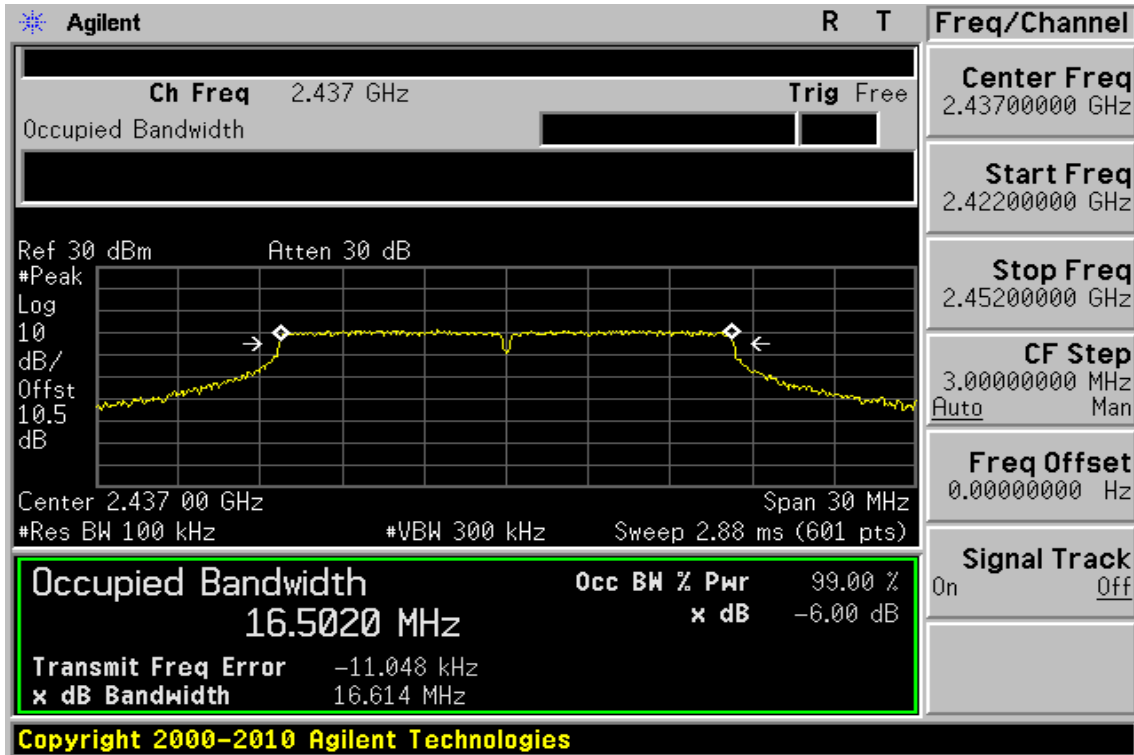
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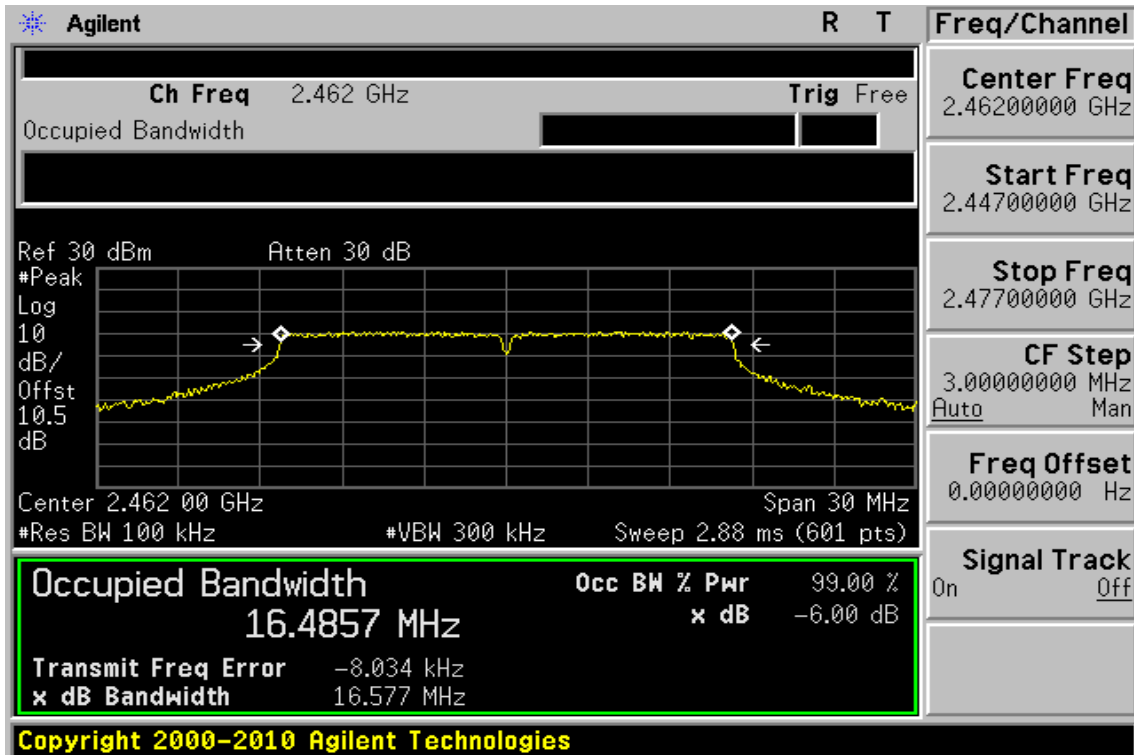
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6dB Band Width Test Data CH-Mid



6dB Band Width Test Data CH-High



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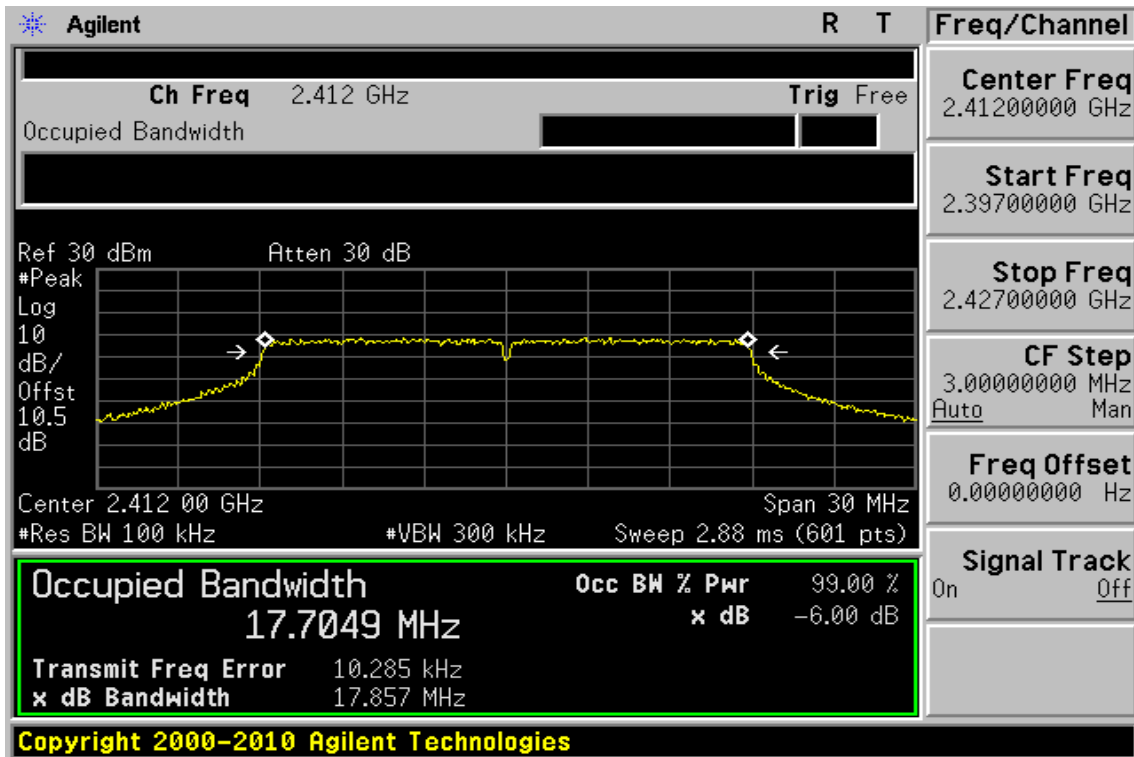
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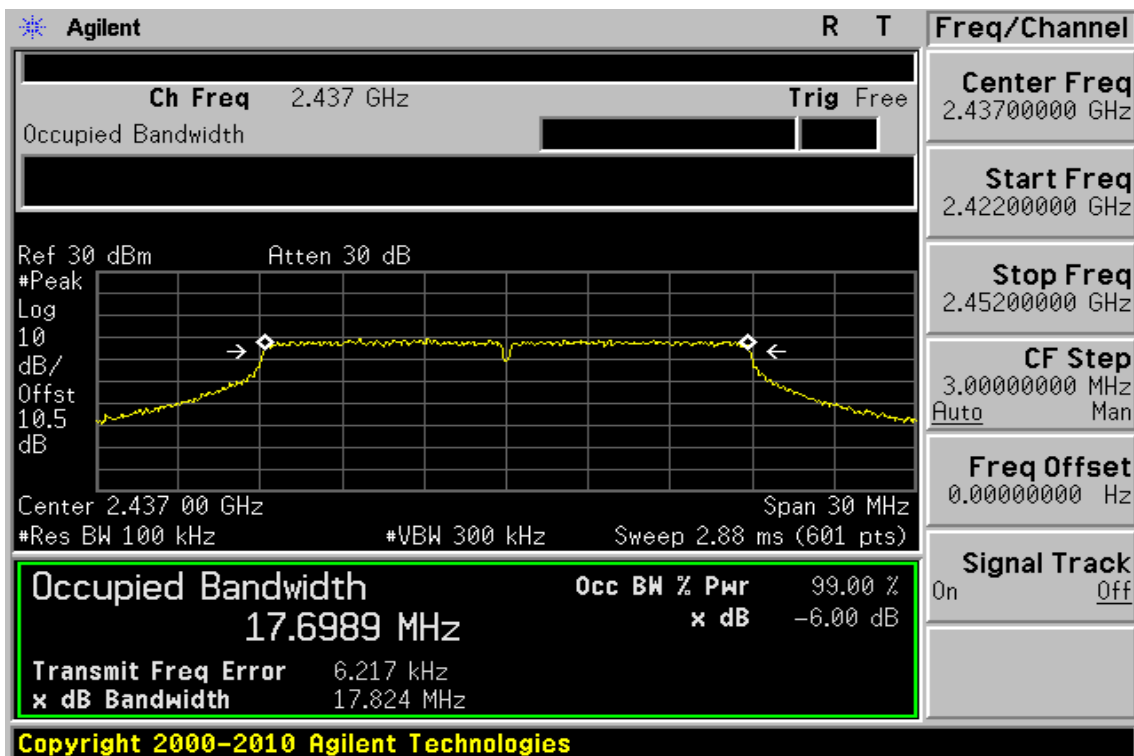
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802.11n_20M

6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



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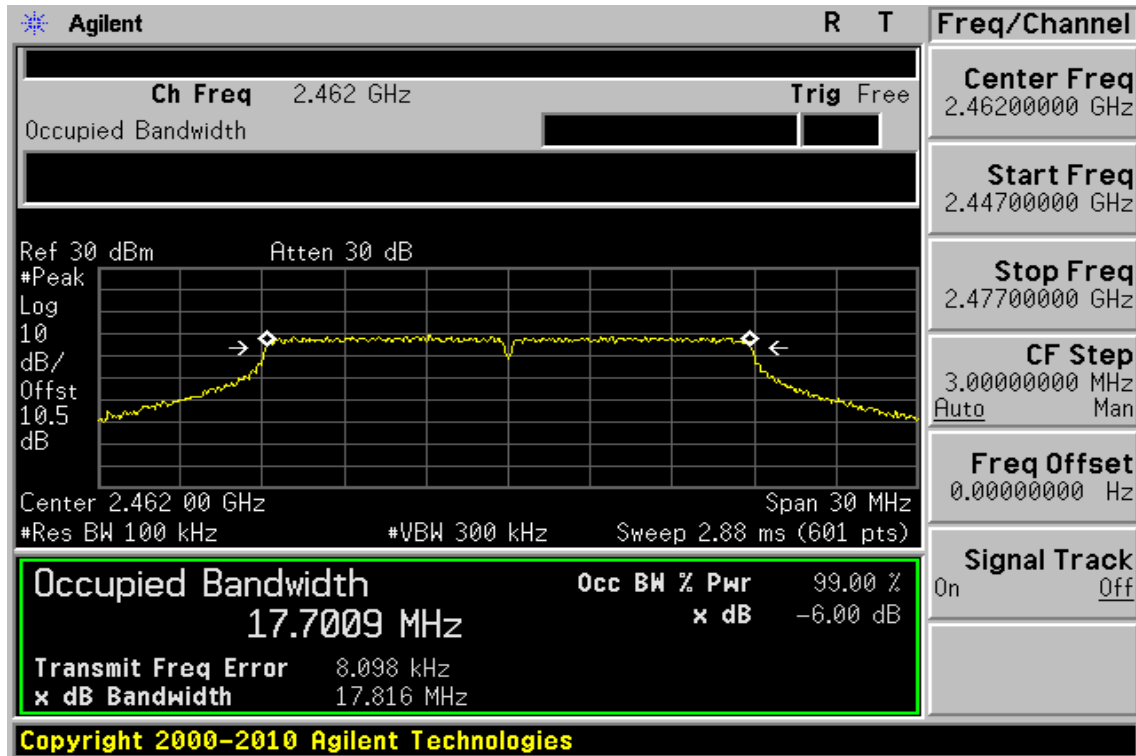
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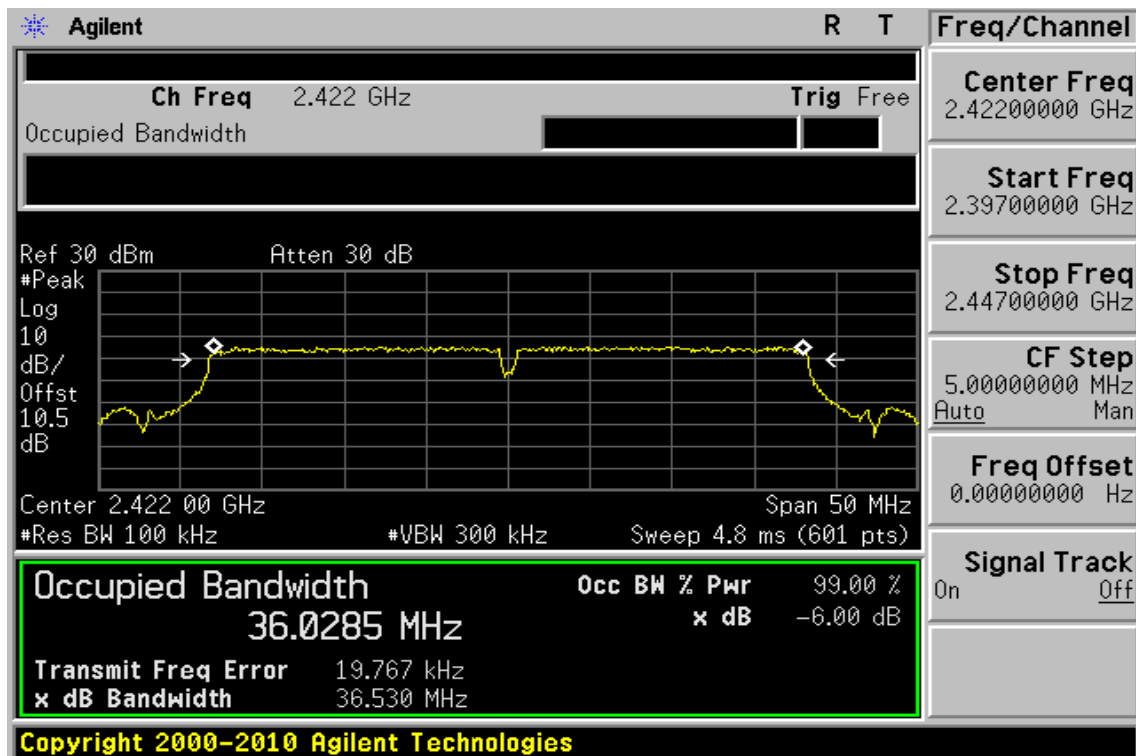
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6dB Band Width Test Data CH-High



802.11n_40M

6dB Band Width Test Data CH-Low



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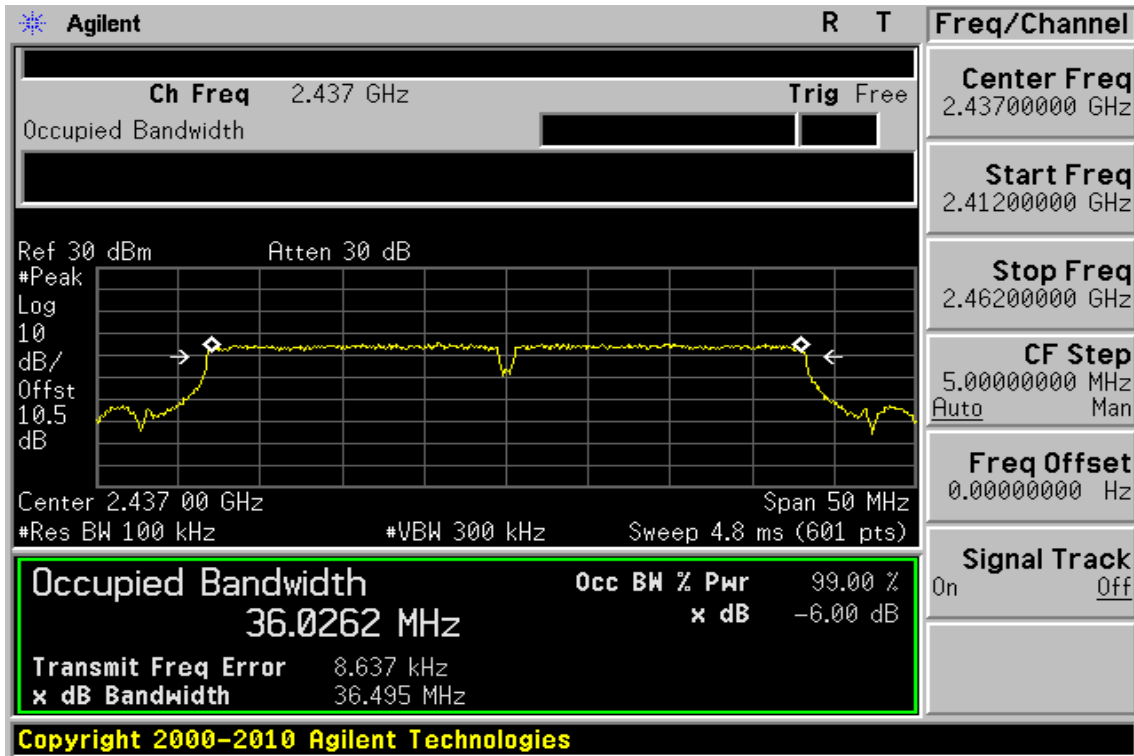
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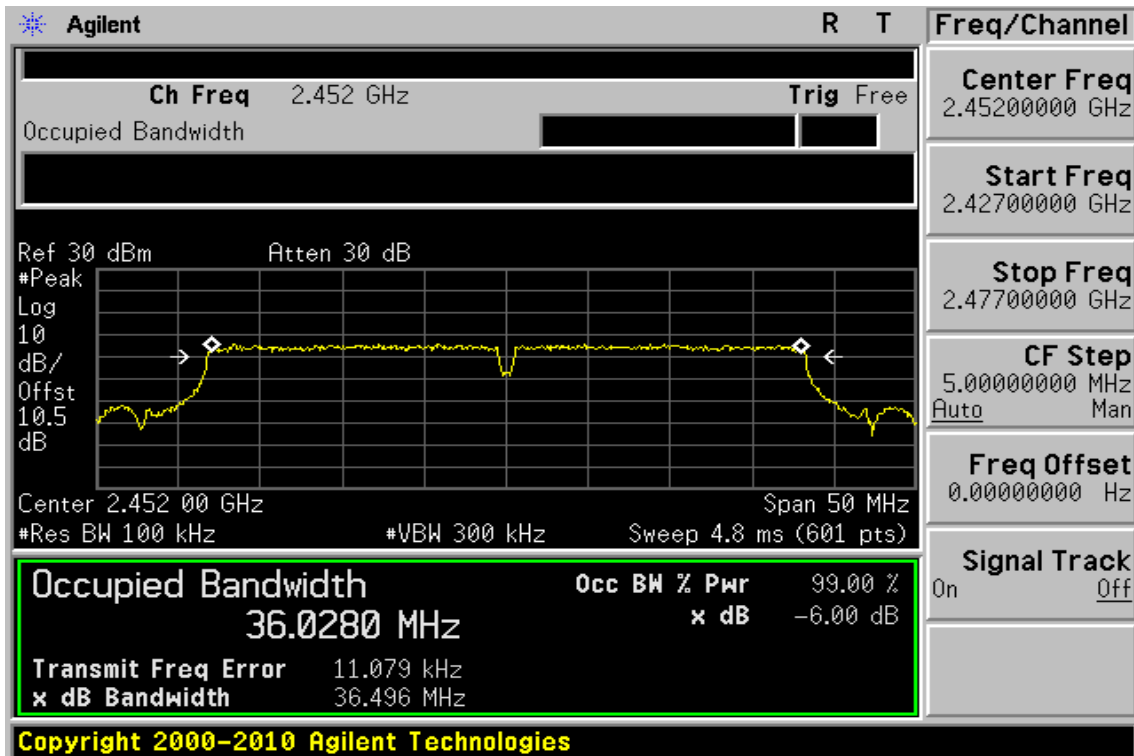
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6dB Band Width Test Data CH-Mid



6dB Band Width Test Data CH-High



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9 100KHZ BANDWIDTH OF BAND EDGES MEASUREMENT

9.1 Standard Applicable:

According to §15.247(d), in any 100 KHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power, 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).

9.2 Measurement Equipment Used:

9.2.1 Conducted Emission at antenna port:

Refer to section 7.2 for details.

9.2.2 Radiated emission:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESC17	100759	05/20/2011	05/19/2013
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2013	04/14/2014
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	02/06/2013	02/07/2014
Spectrum Analyzer	R&S	FSV-30	101398	10/18/2011	10/17/2013
Bilog Antenna	SCHWAZBECK	VULB9168	378	01/10/2012	01/09/2014
Horn antenna	ETS.LINDGREN	3117	123995	05/19/2011	05/18/2013
Horn Antenna	Schwarzbeck	BBHA9170	185	07/11/2011	07/10/2013
Pre-Amplifier	Agilent	8447D	2944A07676	01/04/2013	01/03/2014
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	01/04/2013	01/03/2014
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M2	02/28/2013	02/28/2014
Attenuator	Mini-Circuit	BW-S10W2+	004	02/28/2013	02/27/2014
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	01/04/2013	01/03/2014
3m Site NSA	SGS	966 chamber	N/A	07/15/2012	07/14/2013

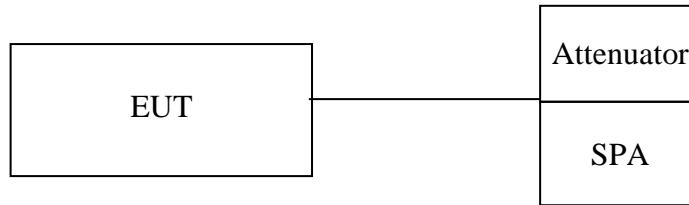
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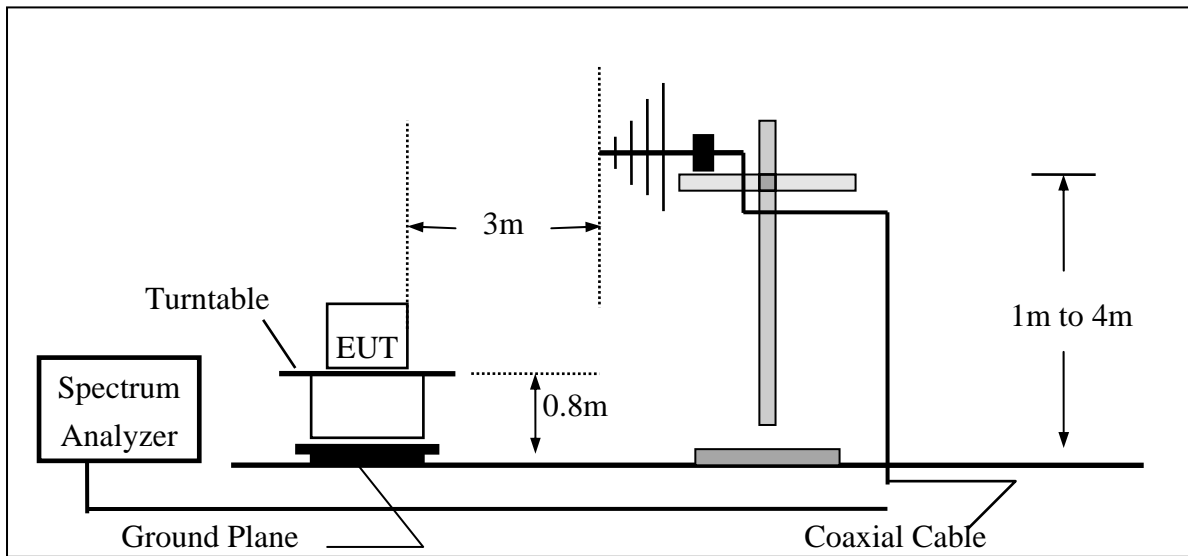
9.3 Test SET-UP:

9.3.1 Conducted Emission at antenna port:

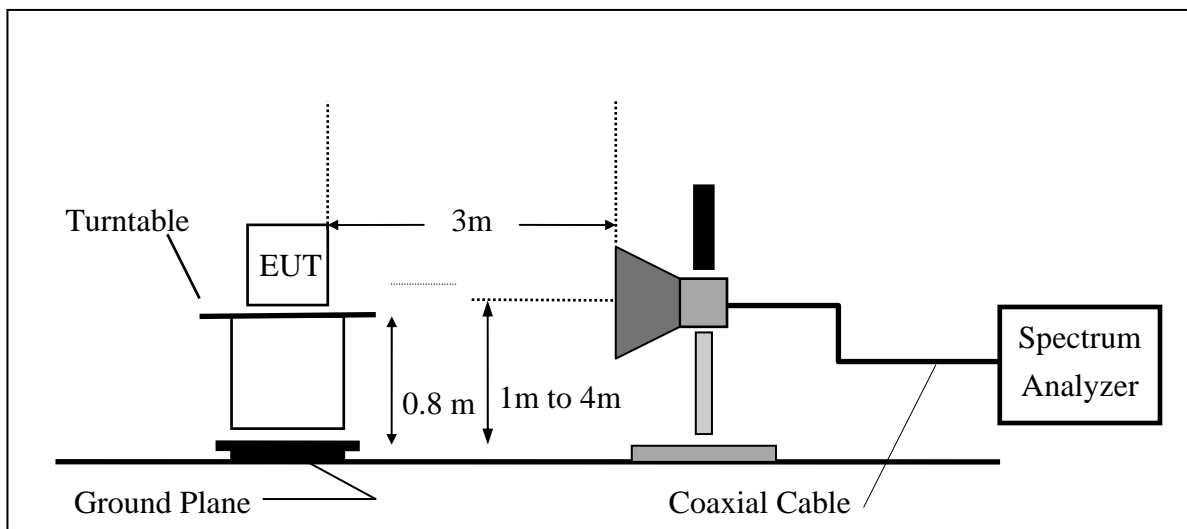


9.3.2 Radiated emission:

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



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



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9.4 Measurement Procedure:

Unwanted Emissions into Non-Restricted Frequency Bands, Measurement Procedure followed by 10.1 of KDB558074

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set start to edge frequency, and stop frequency of spectrum analyzer so as to encompass the spectrum to be examined.
4. Set the spectrum analyzer as RBW, VBW=100KHz, Detector = Peak, Sweep = auto
5. Mark the highest reading of the emission as the reference level measurement.
6. Set DL as the limit = reading on marker 1 – 20dBm
7. 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.
8. Repeat above procedures until all default test channel (low, middle, and high) was complete.

Unwanted Emission falling into Restricted Frequency Bands, Measurement Procedure followed by 10.1 of KDB558074:

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
4. 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.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. On spectrum, following 8.1.2, and RBW = 1MHz, & Marker 2390MHz, and 2483.5MHz (Peak Measurement). Average Measurement: following 8.2 with the modification span to 1MHz, & RBW = 1MHz and peak marker function to obtain the highest reading on 2390, and 2483.5MHz.
8. Repeat above procedures until all default test channel (low, middle, and high) was complete

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9.5 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	

9.6 Measurement Result:

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

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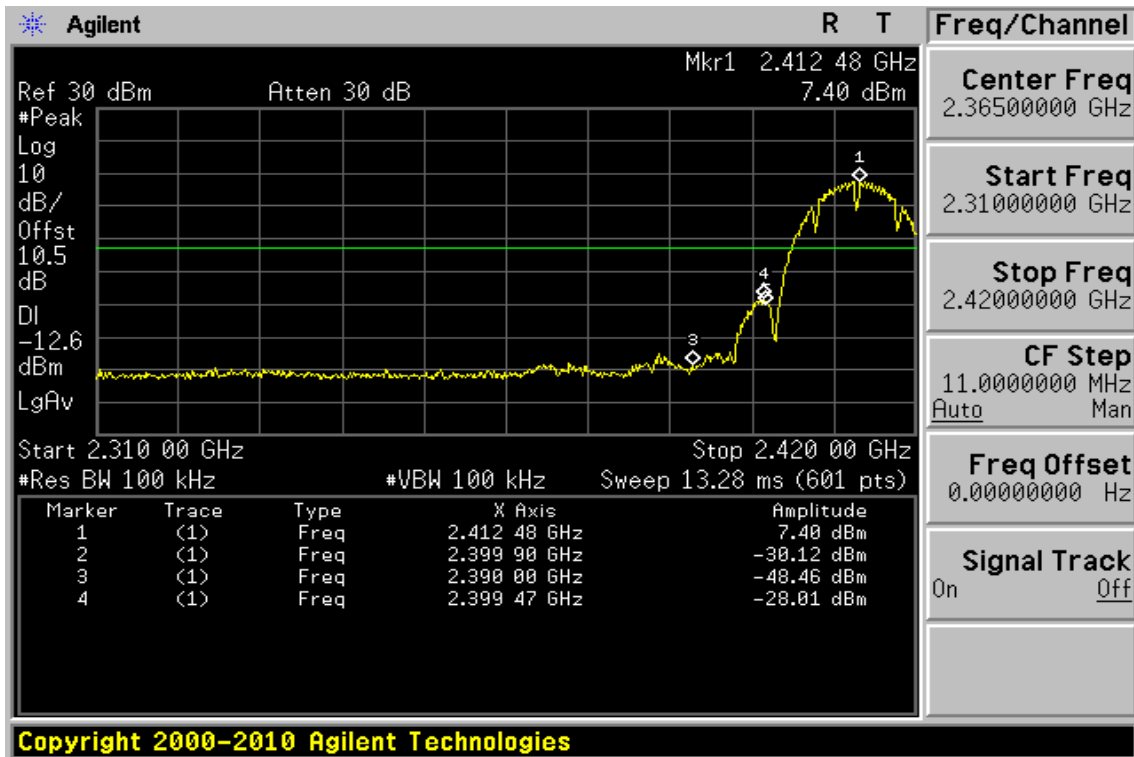
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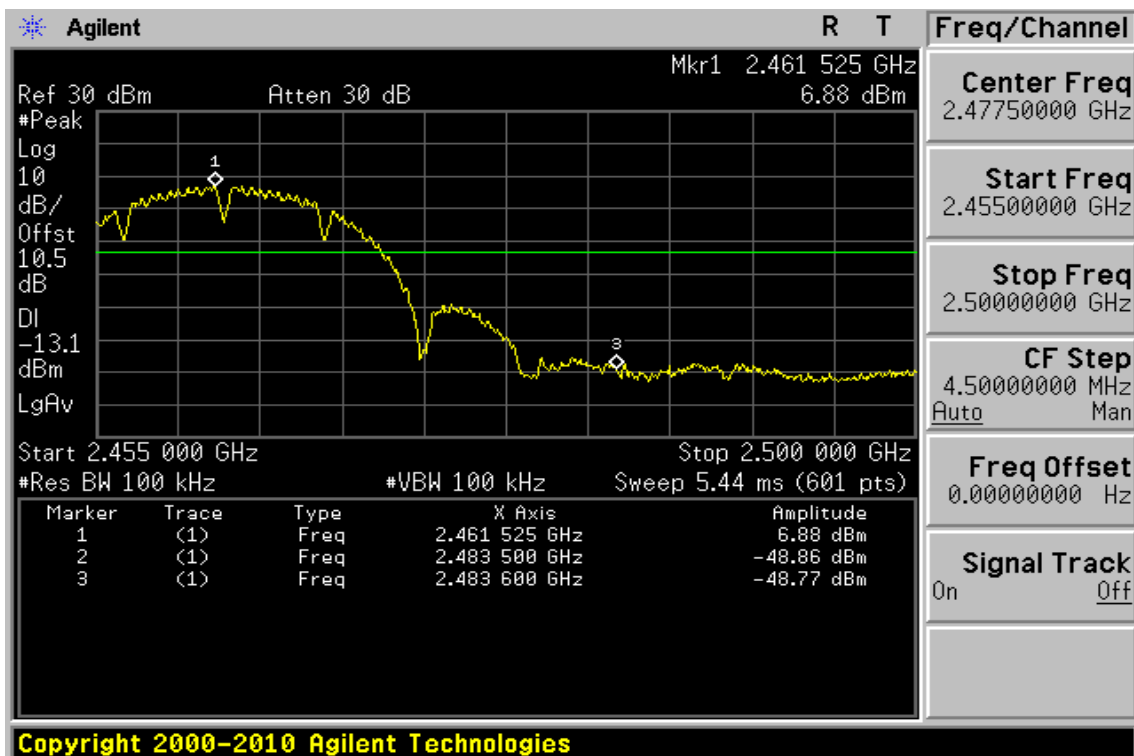
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Band Edges Test Data CH-Low



Band Edges Test Data CH-High



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Radiated Emission: 802.11 b mode

Operation Band	:802.11 b	Test Date	:2013-04-15
Fundamental Frequency	:2412MHz	Temp./Humi.	:23deg_C/60RH
Operation Mode	:Bandedge LOW	Engineer	:Nick
EUT Pol.	:E1 Plan	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	40.54	2.12	42.66	54.00	-11.34
2390.00	E	Peak	53.04	2.12	55.16	74.00	-18.84

Operation Band	:802.11 b	Test Date	:2013-04-15
Fundamental Frequency	:2412MHz	Temp./Humi.	:23deg_C/60RH
Operation Mode	:Bandedge LOW	Engineer	:Nick
EUT Pol.	:E1 Plan	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	40.87	2.74	43.61	54.00	-10.39
2390.00	E	Peak	53.56	2.74	56.30	74.00	-17.70

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.

“---” : denotes Noise Floor.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

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Operation Band :802.11 b Test Date :2013-04-15
 Fundamental Frequency :2462MHz Temp./Humi. :23deg_C/60RH
 Operation Mode :Bandedge HIGH Engineer :Nick
 EUT Pol. :E1 Plan 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	42.80	2.53	45.33	54.00	-8.67
2483.50	E	Peak	53.61	2.53	56.14	74.00	-17.86

Operation Band :802.11 b Test Date :2013-04-15
 Fundamental Frequency :2462MHz Temp./Humi. :23deg_C/60RH
 Operation Mode :Bandedge HIGH Engineer :Nick
 EUT Pol. :E1 Plan 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	45.30	3.56	48.86	54.00	-5.14
2483.50	E	Peak	54.77	3.56	58.33	74.00	-15.67

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.

“---“ : denotes Noise Floor.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

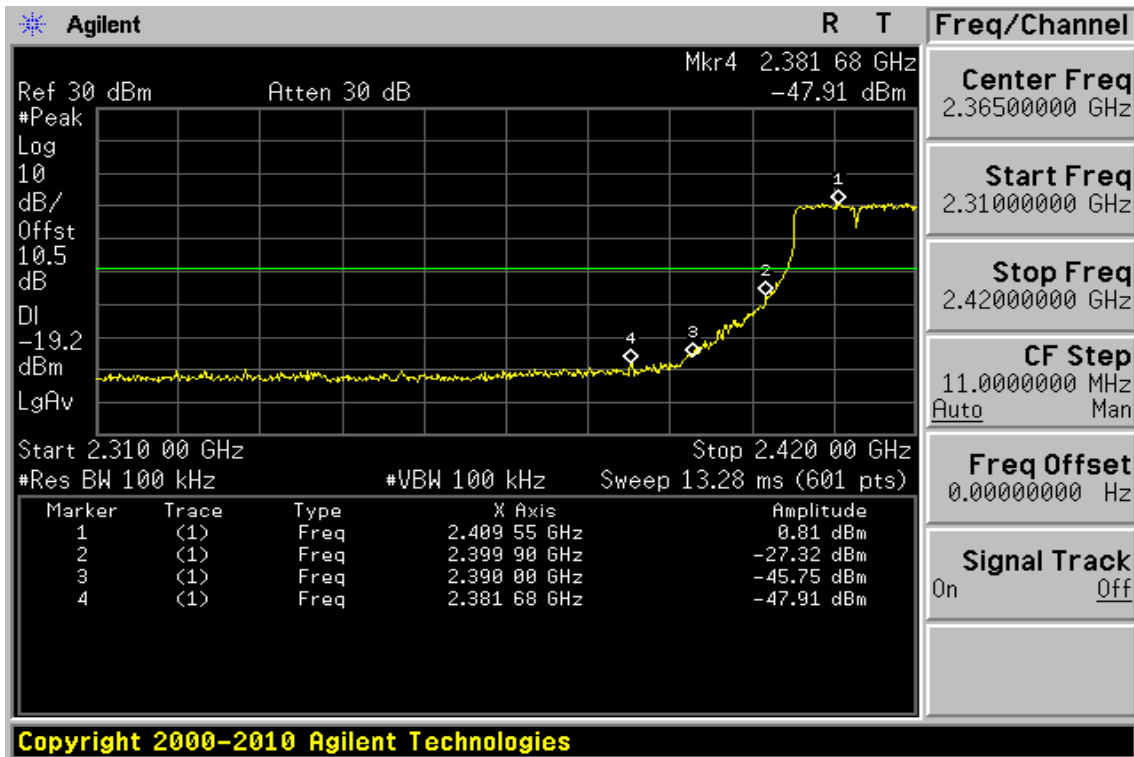
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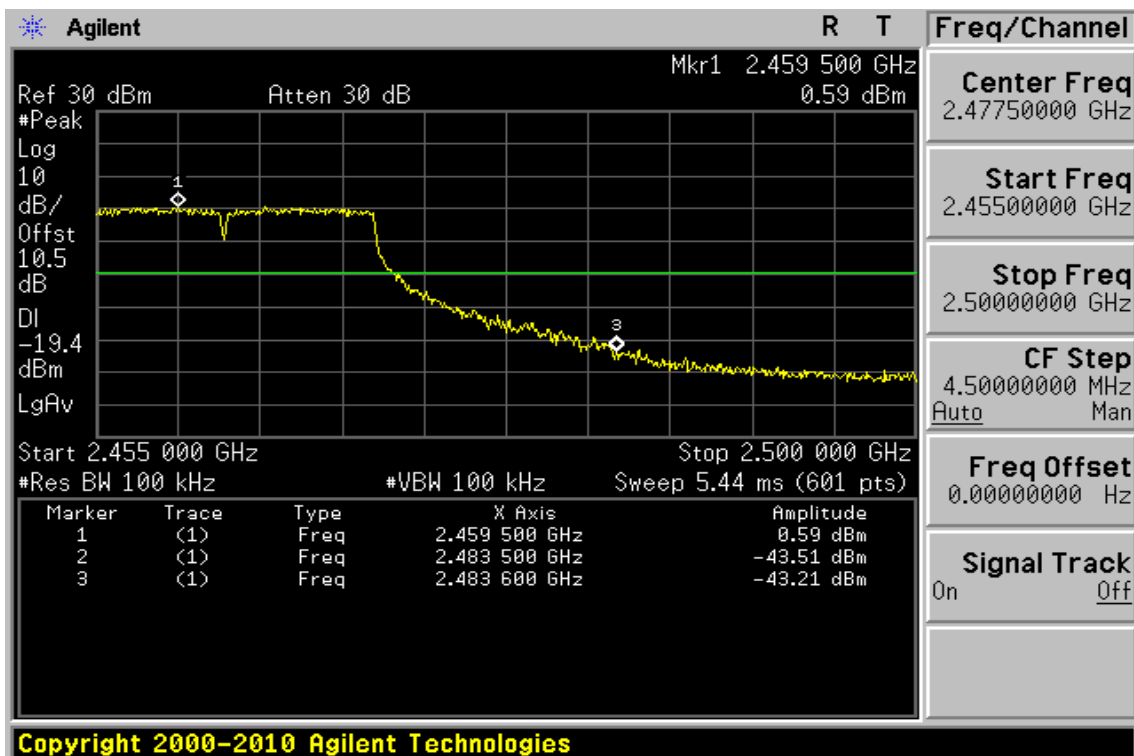
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802.11g

Band Edges Test Data CH-Low



Band Edges Test Data CH-High



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Radiated Emission: 802.11 g mode

Operation Band :802.11 g Test Date :2013-04-15
 Fundamental Frequency :2412MHz Temp./Humi. :23deg_C/60RH
 Operation Mode :Bandedge LOW Engineer :Nick
 EUT Pol. :E1 Plan 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	44.02	2.12	46.14	54.00	-7.86
2390.00	E	Peak	64.68	2.12	66.80	74.00	-7.20

Operation Band :802.11 g Test Date :2013-04-15
 Fundamental Frequency :2412MHz Temp./Humi. :23deg_C/60RH
 Operation Mode :Bandedge LOW Engineer :Nick
 EUT Pol. :E1 Plan 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	48.67	2.74	51.41	54.00	-2.59
2390.00	E	Peak	67.21	2.74	69.95	74.00	-4.05

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.

“---“ : denotes Noise Floor.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

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Operation Band :802.11 g Test Date :2013-04-15
 Fundamental Frequency :2462MHz Temp./Humi. :23deg_C/60RH
 Operation Mode :Bandedge HIGH Engineer :Nick
 EUT Pol. :E1 Plan 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	48.09	2.53	50.62	54.00	-3.38
2483.50	E	Peak	64.21	2.53	66.74	74.00	-7.26

Operation Band :802.11 g Test Date :2013-04-15
 Fundamental Frequency :2462MHz Temp./Humi. :23deg_C/60RH
 Operation Mode :Bandedge HIGH Engineer :Nick
 EUT Pol. :E1 Plan 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	50.01	3.56	53.57	54.00	-0.43
2483.50	E	Peak	66.10	3.56	69.66	74.00	-4.34

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.

“---“ : denotes Noise Floor.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

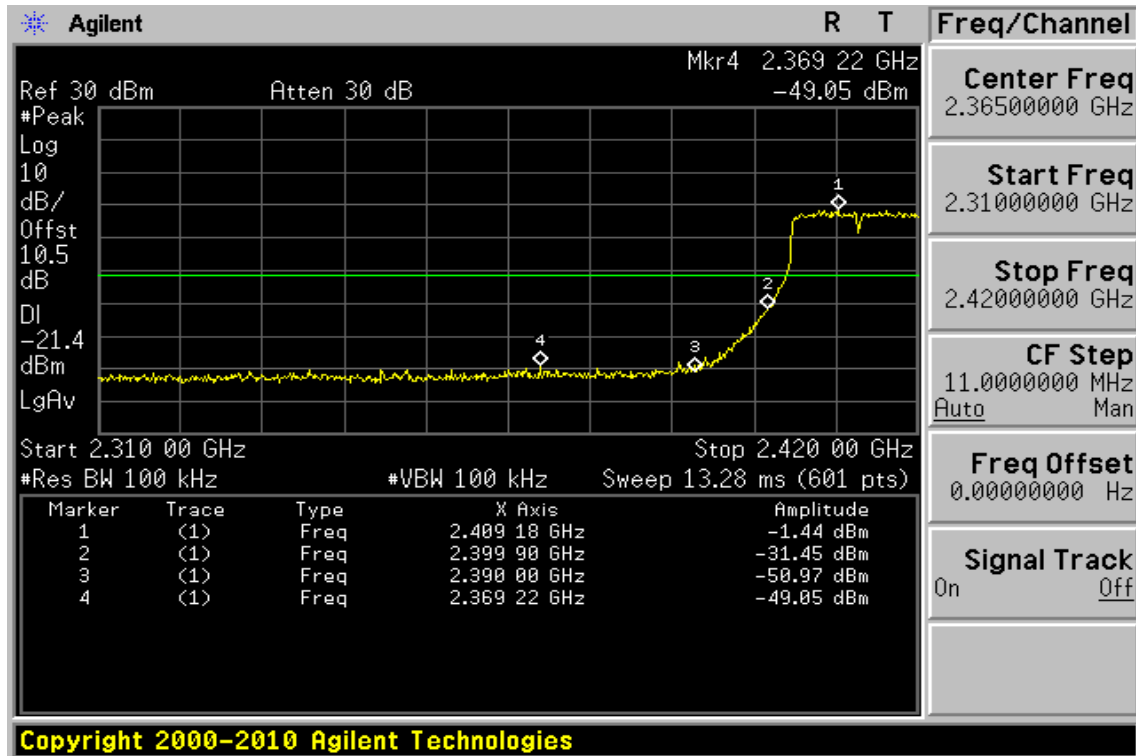
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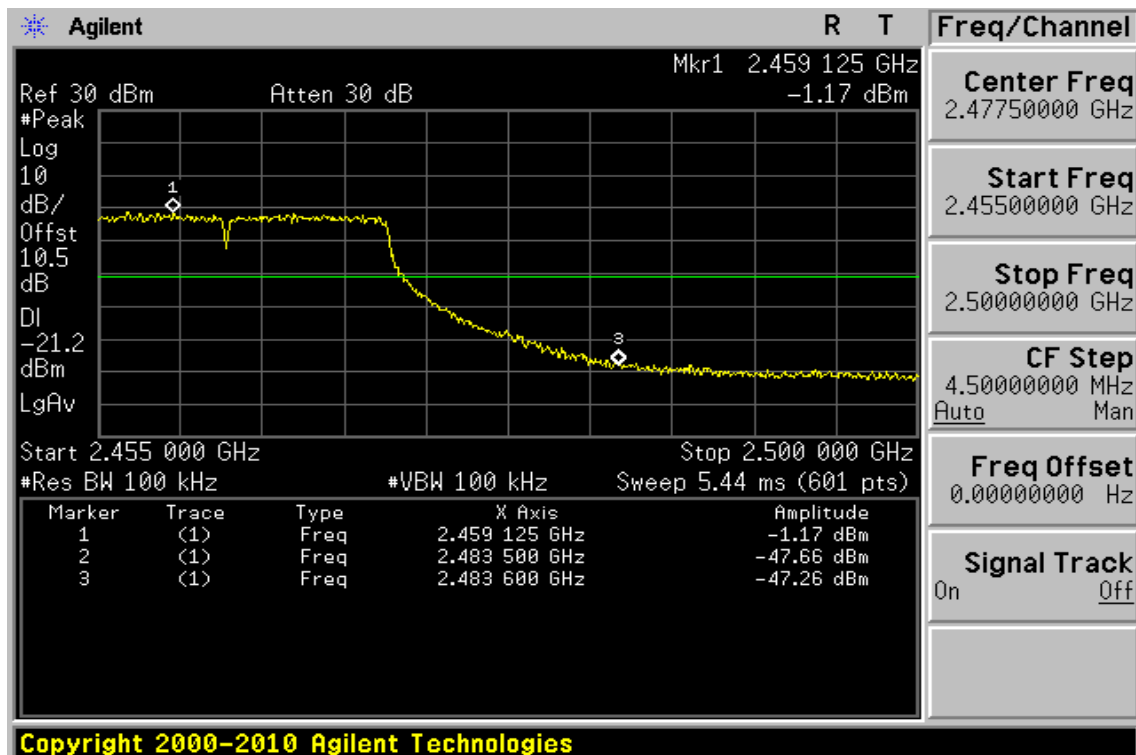
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802.11n_20M

Band Edges Test Data CH-Low



Band Edges Test Data CH-High



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Radiated Emission: 802.11 n_20M mode

Operation Band	:802.11 n20M	Test Date	:2013-04-15
Fundamental Frequency	:2412MHz	Temp./Humi.	:23deg_C/60RH
Operation Mode	:Bandedge LOW	Engineer	:Nick
EUT Pol.	:E1 Plan	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	40.61	2.12	42.73	54.00	-11.27
2390.00	E	Peak	53.57	2.12	55.69	74.00	-18.31

Operation Band	:802.11 n20M	Test Date	:2013-04-15
Fundamental Frequency	:2412MHz	Temp./Humi.	:23deg_C/60RH
Operation Mode	:Bandedge LOW	Engineer	:Nick
EUT Pol.	:E1 Plan	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	43.13	2.74	45.87	54.00	-8.13
2390.00	E	Peak	62.89	2.74	65.63	74.00	-8.37

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.

“---“ : denotes Noise Floor.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

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Operation Band :802.11 n20M Test Date :2013-04-15
 Fundamental Frequency :2462MHz Temp./Humi. :23deg_C/60RH
 Operation Mode :Bandedge HIGH Engineer :Nick
 EUT Pol. :E1 Plan 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	45.51	2.53	48.04	54.00	-5.96
2483.50	E	Peak	63.22	2.53	65.75	74.00	-8.25

Operation Band :802.11 n20M Test Date :2013-04-15
 Fundamental Frequency :2462MHz Temp./Humi. :23deg_C/60RH
 Operation Mode :Bandedge HIGH Engineer :Nick
 EUT Pol. :E1 Plan 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	47.85	3.56	51.41	54.00	-2.59
2483.50	E	Peak	65.27	3.56	68.83	74.00	-5.17

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.

“---“ : denotes Noise Floor.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

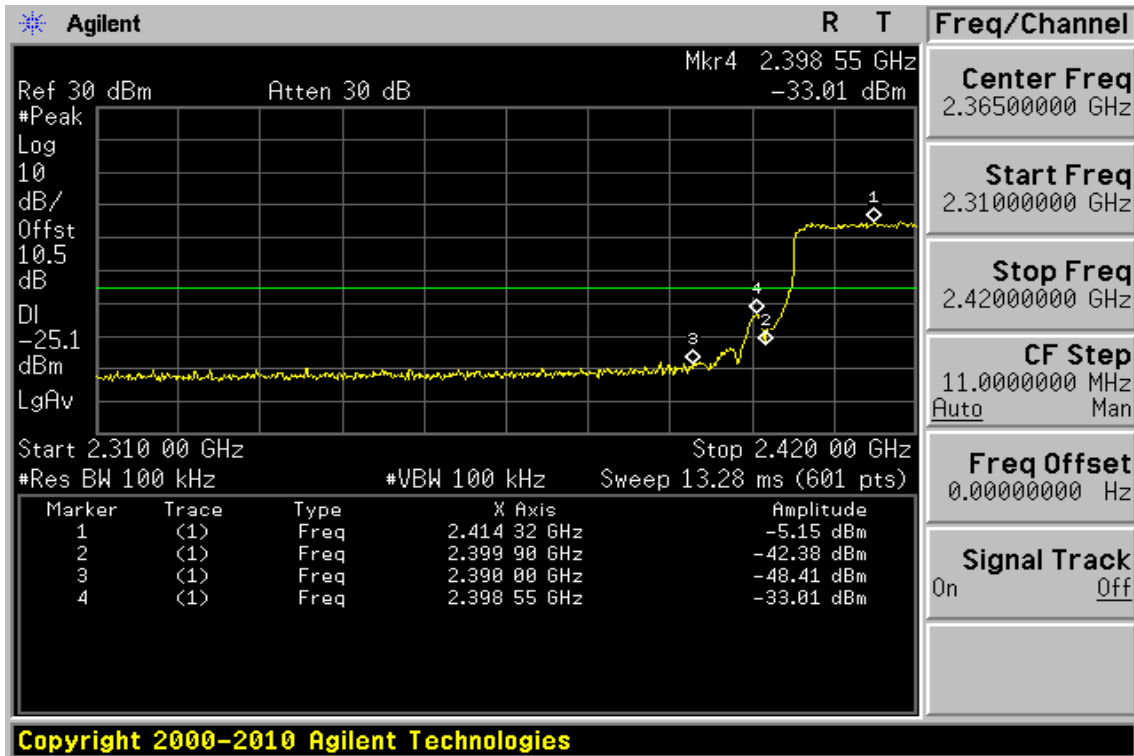
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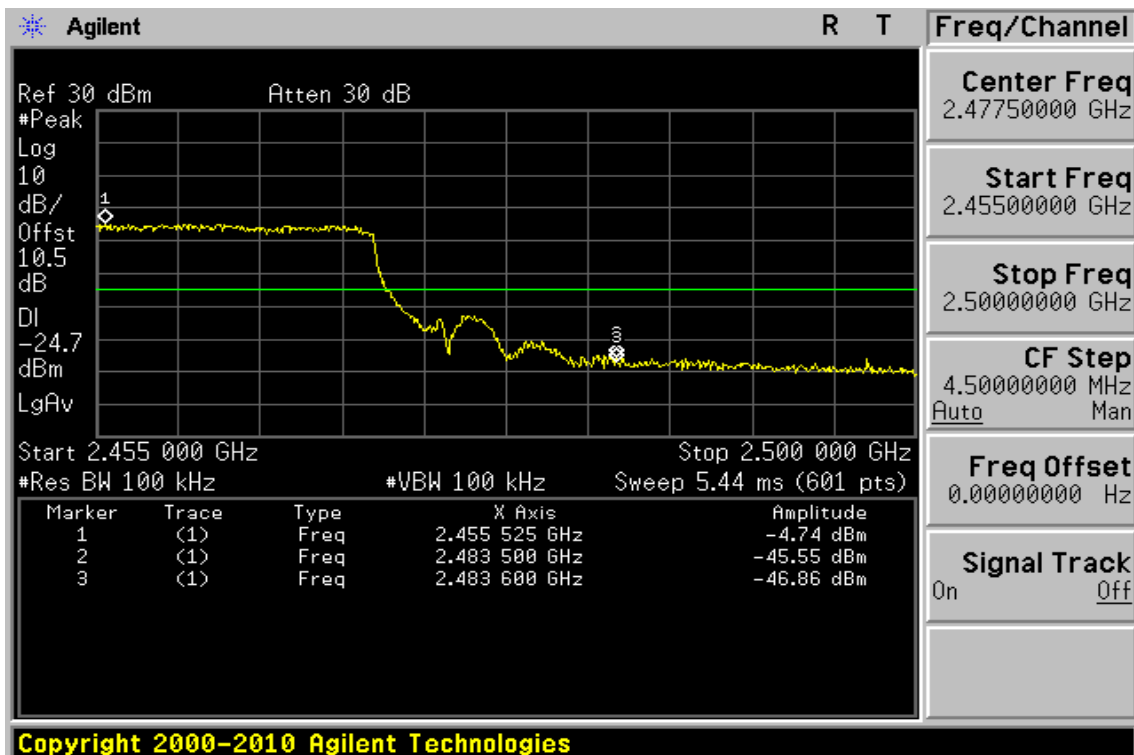
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802.11n_40M

Band Edges Test Data CH-Low



Band Edges Test Data CH-High



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Radiated Emission: 802.11 n_40M mode

Operation Band	:802.11 n40M	Test Date	:2013-04-15
Fundamental Frequency	:2422MHz	Temp./Humi.	:23deg_C/60RH
Operation Mode	:Bandedge LOW	Engineer	:Nick
EUT Pol.	:E1 Plan	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	40.82	2.12	42.94	54.00	-11.06
2390.00	E	Peak	54.15	2.12	56.27	74.00	-17.73

Operation Band	:802.11 n40M	Test Date	:2013-04-15
Fundamental Frequency	:2422MHz	Temp./Humi.	:23deg_C/60RH
Operation Mode	:Bandedge LOW	Engineer	:Nick
EUT Pol.	:E1 Plan	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	44.30	2.74	47.04	54.00	-6.96
2390.00	E	Peak	58.48	2.74	61.22	74.00	-12.78

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.

“---“ : denotes Noise Floor.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

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Operation Band :802.11 n40M Test Date :2013-04-15
 Fundamental Frequency :2452MHz Temp./Humi. :23deg_C/60RH
 Operation Mode :Bandedge HIGH Engineer :Nick
 EUT Pol. :E1 Plan 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	46.12	2.53	48.65	54.00	-5.35
2483.50	E	Peak	61.01	2.53	63.54	74.00	-10.46

Operation Band :802.11 n40M Test Date :2013-04-15
 Fundamental Frequency :2452MHz Temp./Humi. :23deg_C/60RH
 Operation Mode :Bandedge HIGH Engineer :Nick
 EUT Pol. :E1 Plan 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	47.47	3.56	51.03	54.00	-2.97
2483.50	E	Peak	63.04	3.56	66.60	74.00	-7.40

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.

“---“ : denotes Noise Floor.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

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10 SPURIOUS RADIATED EMISSION TEST

10.1 Standard Applicable

According to §15.247(d),

Emission at antenna port:

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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Radiated Spurious Emission

Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

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.

10.2 Measurement Equipment Used:

10.2.1 Conducted Emission at antenna port:

Refer to section 7.2 for details.

10.2.2 Radiated emission:

Refer to section 9.2.2 for details.

10.3 Test SET-UP:

10.3.1 Conducted Emission at antenna port:

Refer to section 8.3 for details.

10.3.2 Radiated emission:

Refer to section 9.3.2 for details.

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10.4 Measurement Procedure:

Radiated Emission:

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
4. 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.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. Repeat above procedures until all frequency measured were complete.

Conducted Emission:

1. To connect Antenna Port of EUT to Spectrum.
2. Set RBW = 100K & VBW = 100K on Spectrum.
3. Sweep the frequency to determine spurious emission as seen on spectrum from span of 30 to 3G, 3G to 8G, 8G to 13G, 13G to 18G and 18G to 26.5GHz
4. Via Software, combine 5 spans of frequency range into one plot

10.5 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	

10.6 Measurement Result:

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

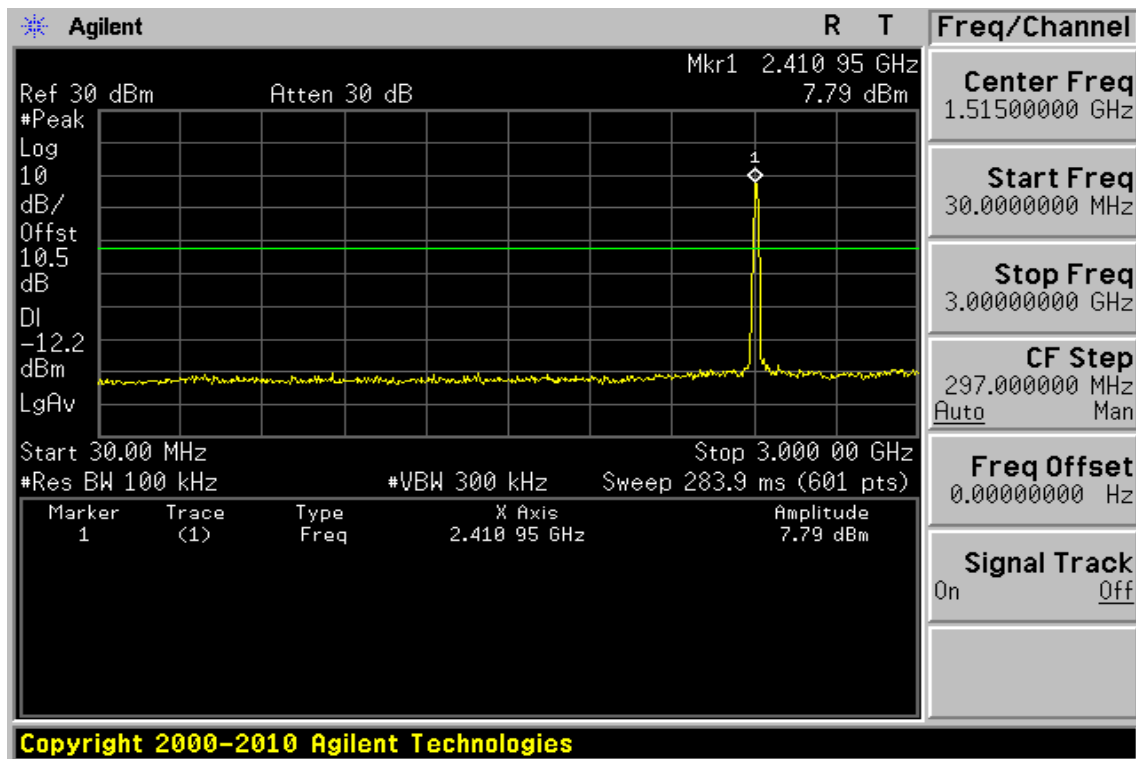
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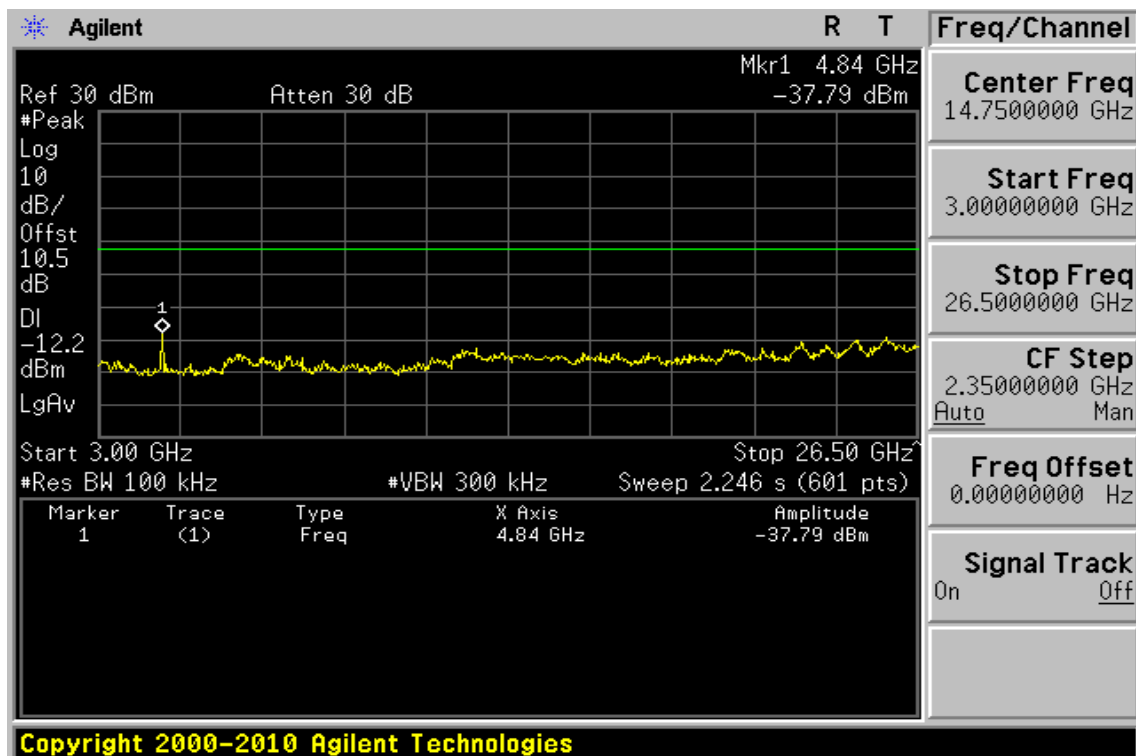
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Conducted Spurious Emission Measurement Result (802.11b)

Ch Low 30MHz – 3GHz



Ch Low 3GHz – 26.5GHz

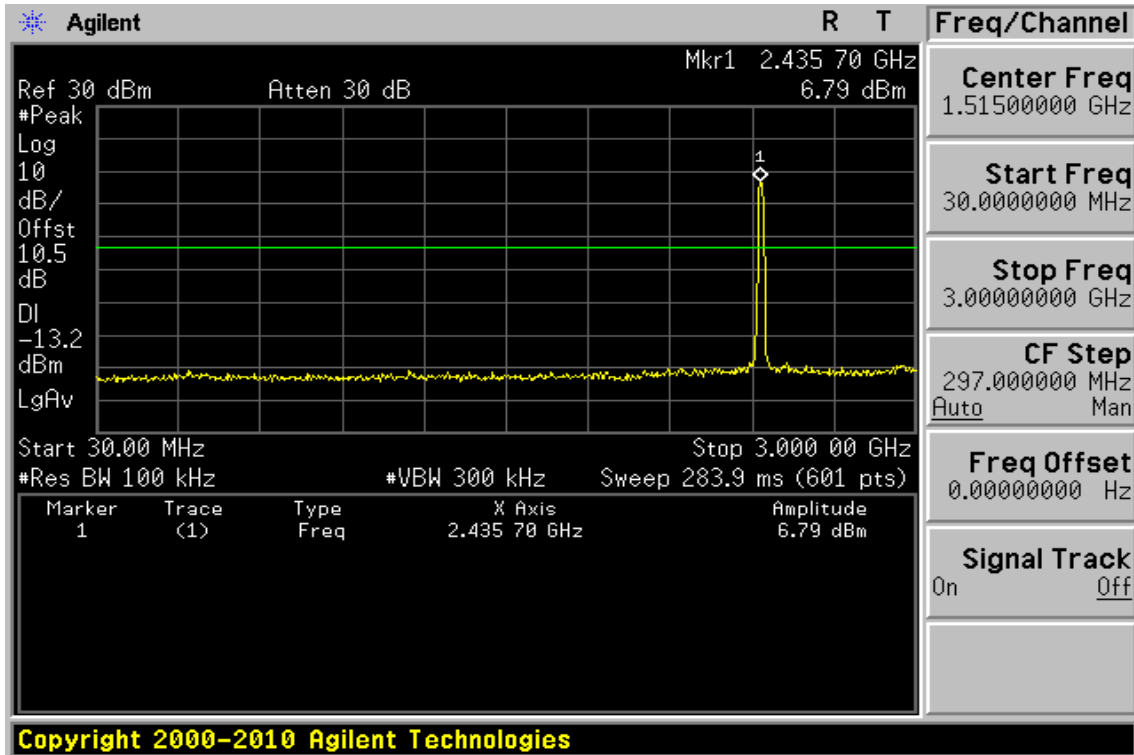


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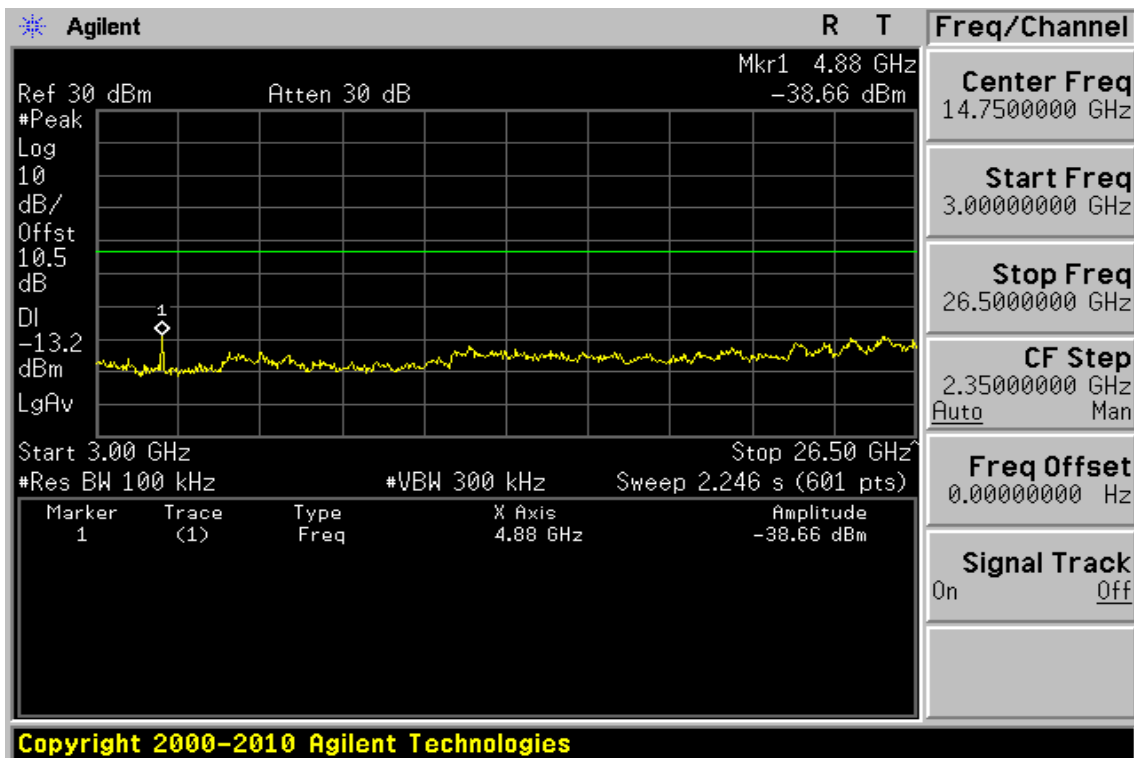
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Ch Mid 30MHz – 3GHz



Ch Mid 3GHz – 26.5GHz



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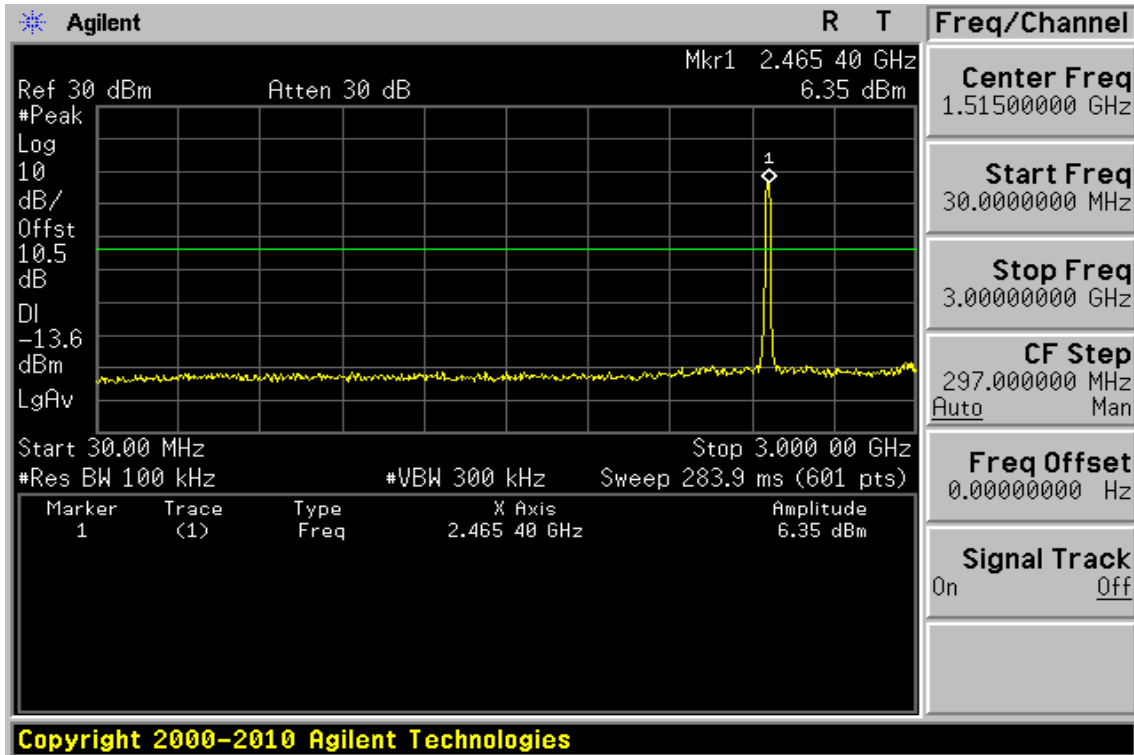
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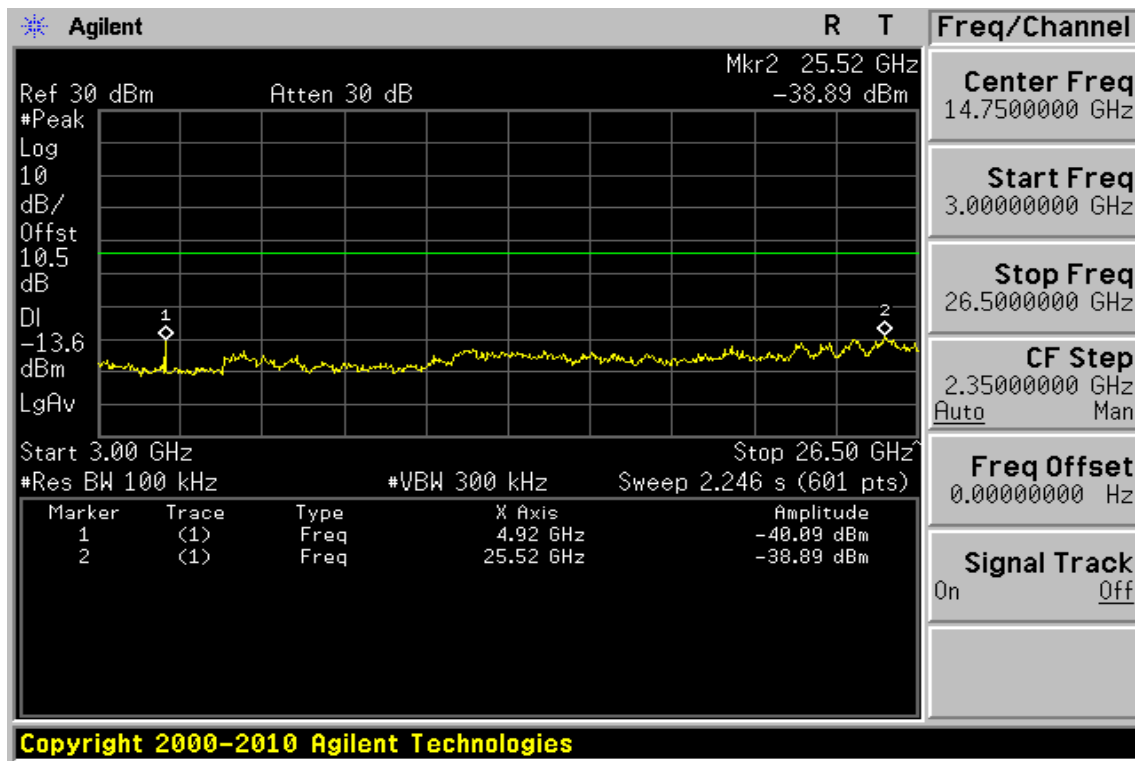
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Ch High 30MHz – 3GHz



Ch High 3GHz – 26.5GHz



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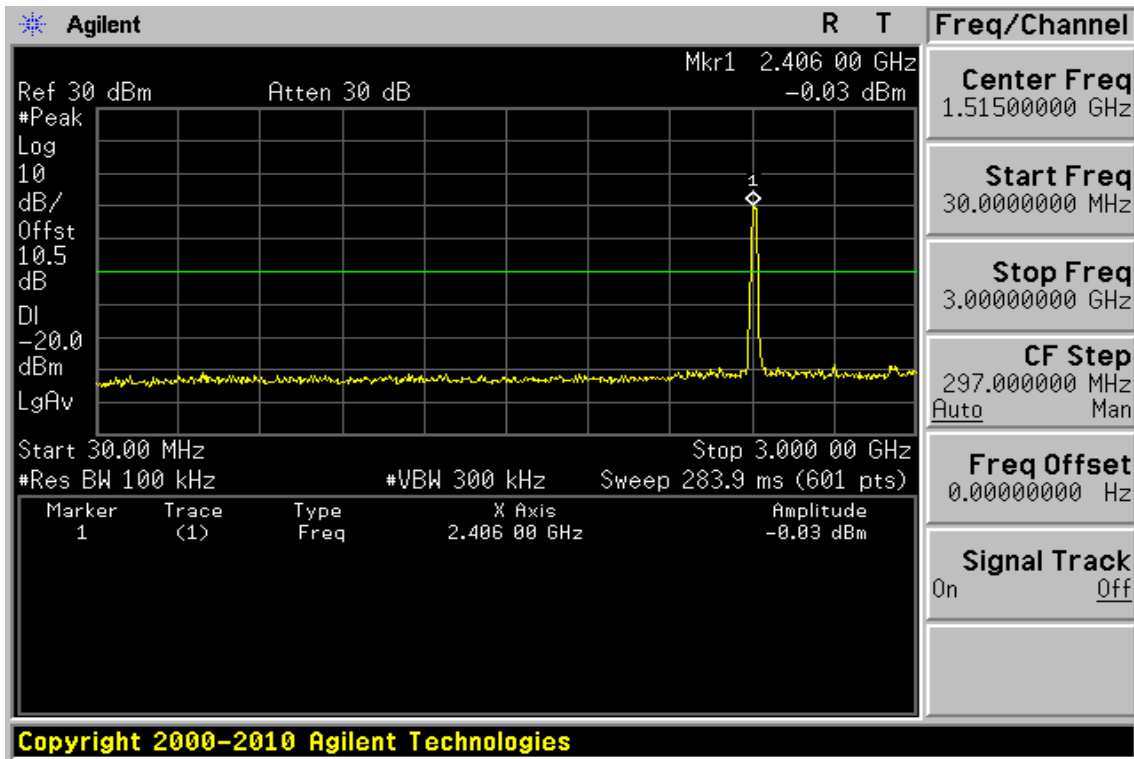
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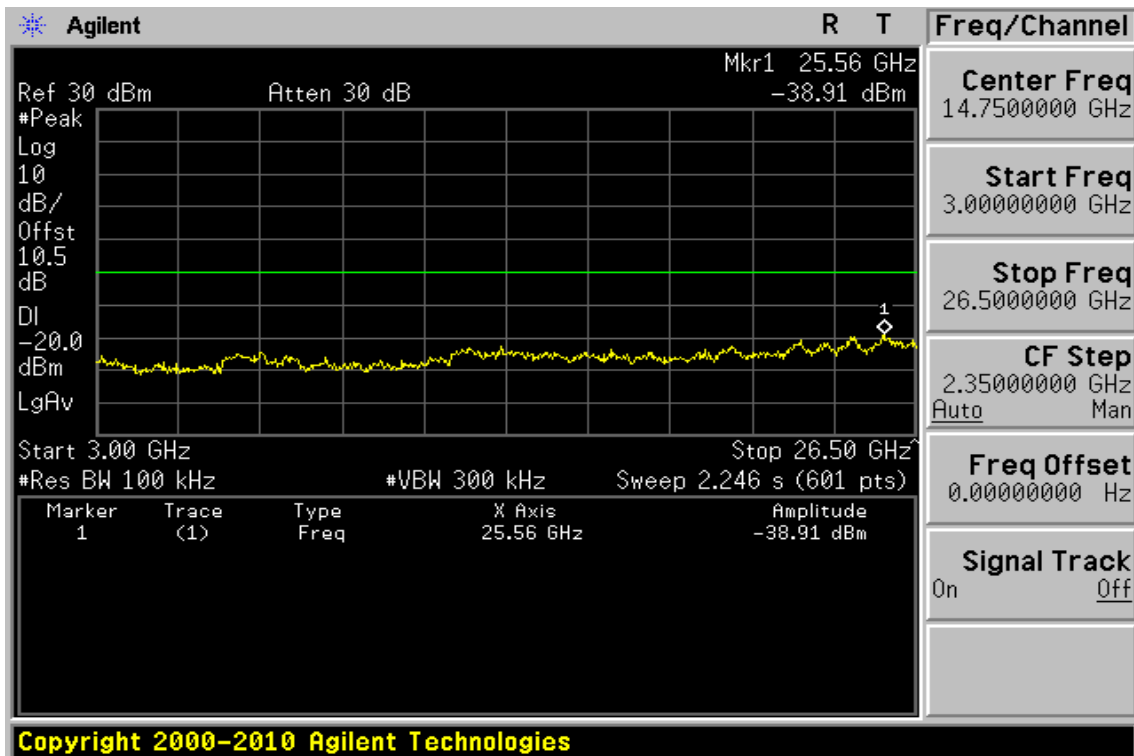
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Conducted Spurious Emission Measurement Result (802.11g)

Ch Low 30MHz – 3GHz



Ch Low 3GHz – 26.5GHz

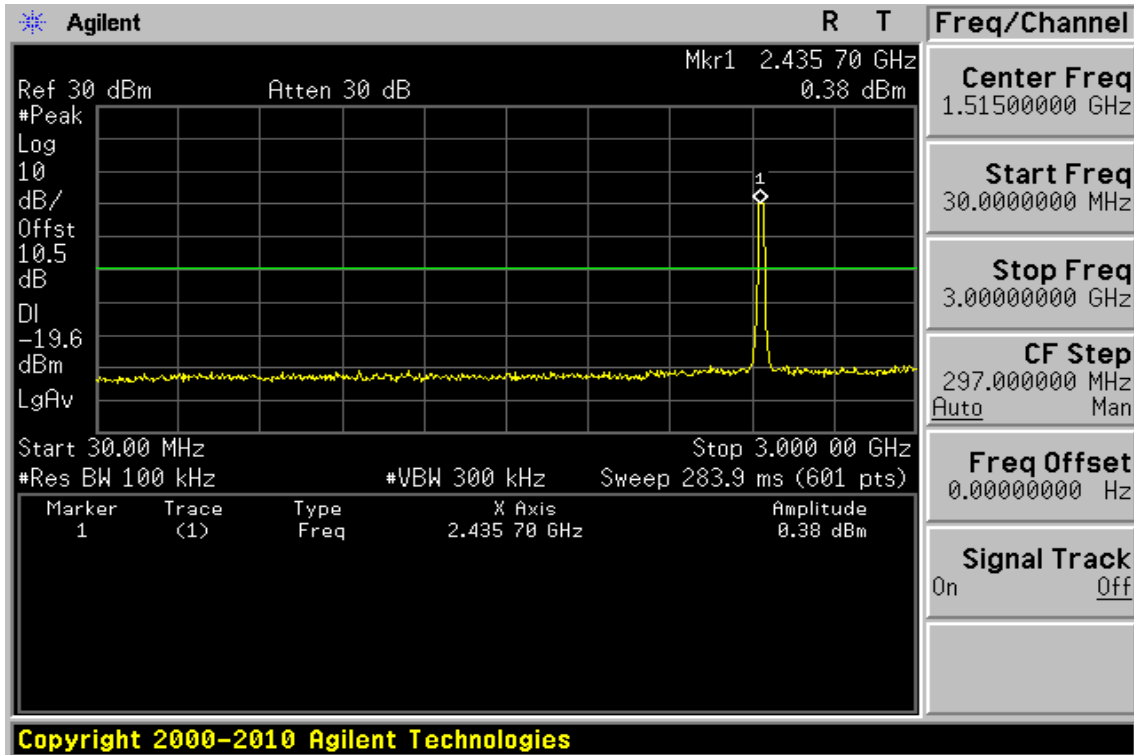


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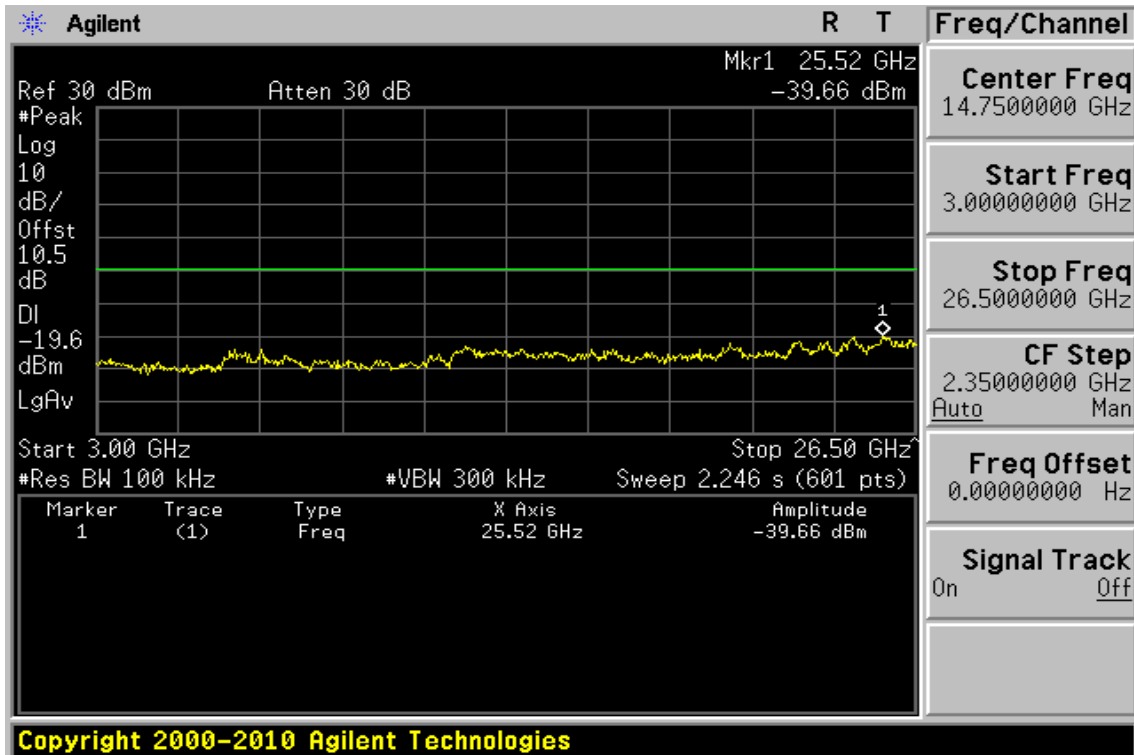
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Ch Mid 30MHz – 3GHz



Ch Mid 3GHz – 26.5GHz



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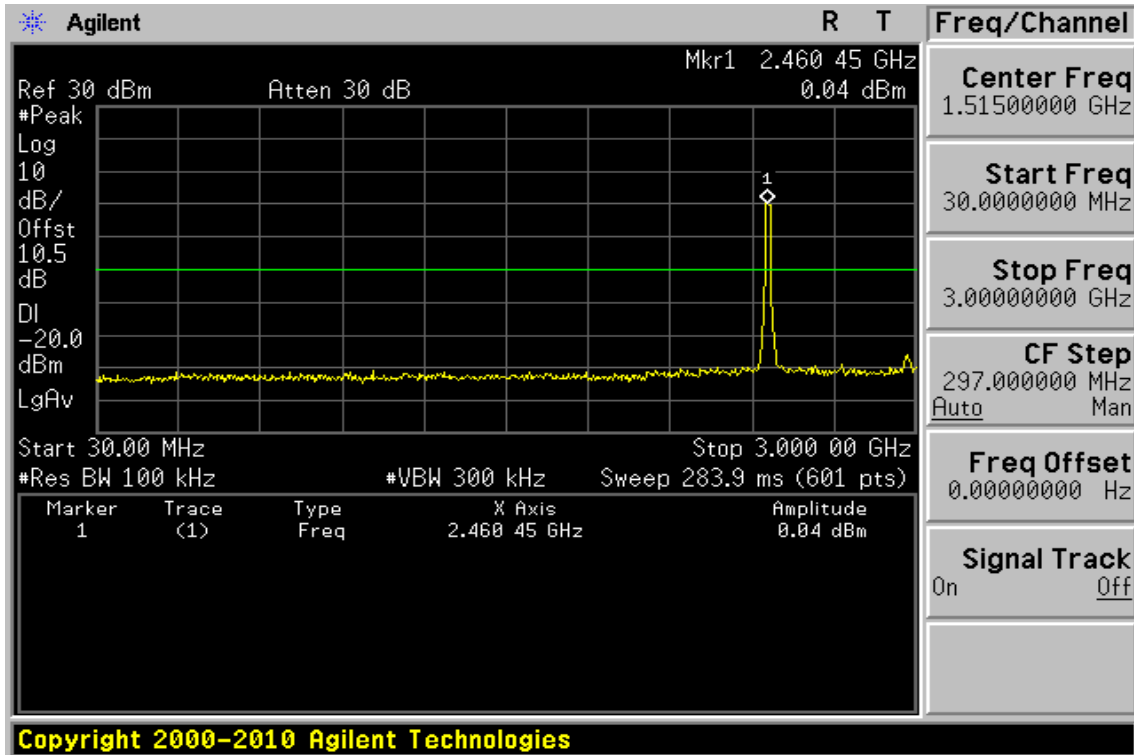
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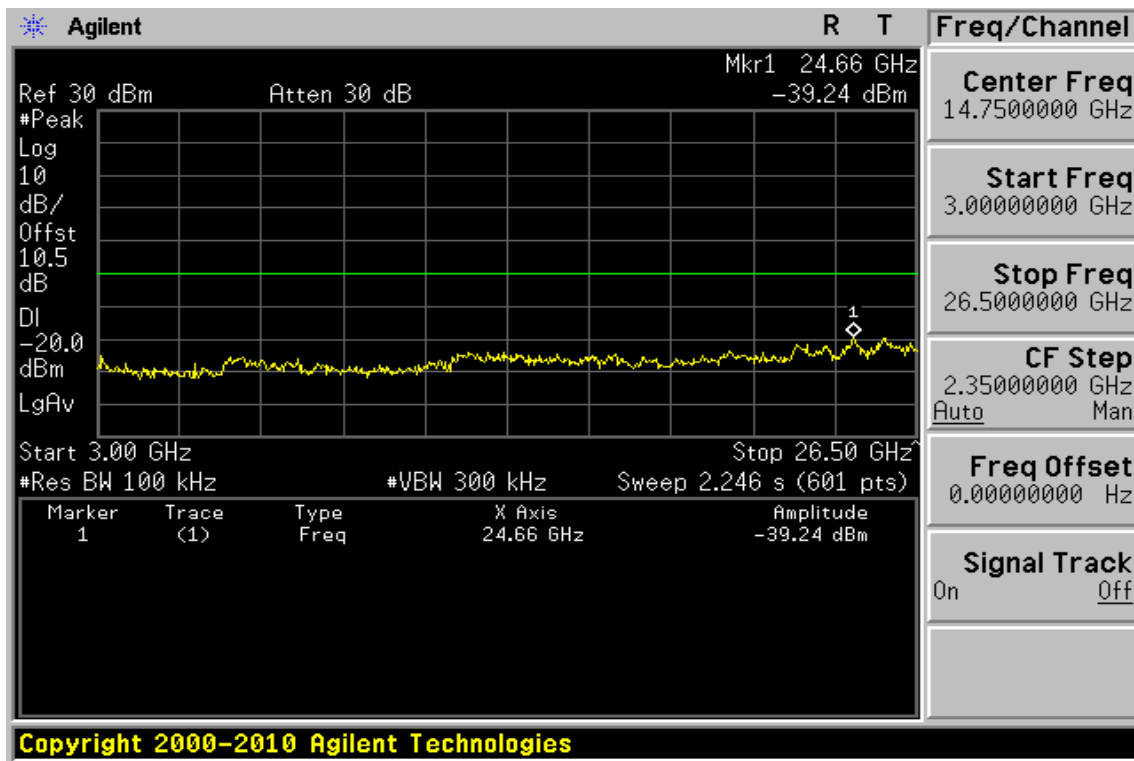
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Ch High 30MHz – 3GHz



Ch High 3GHz – 26.5GHz



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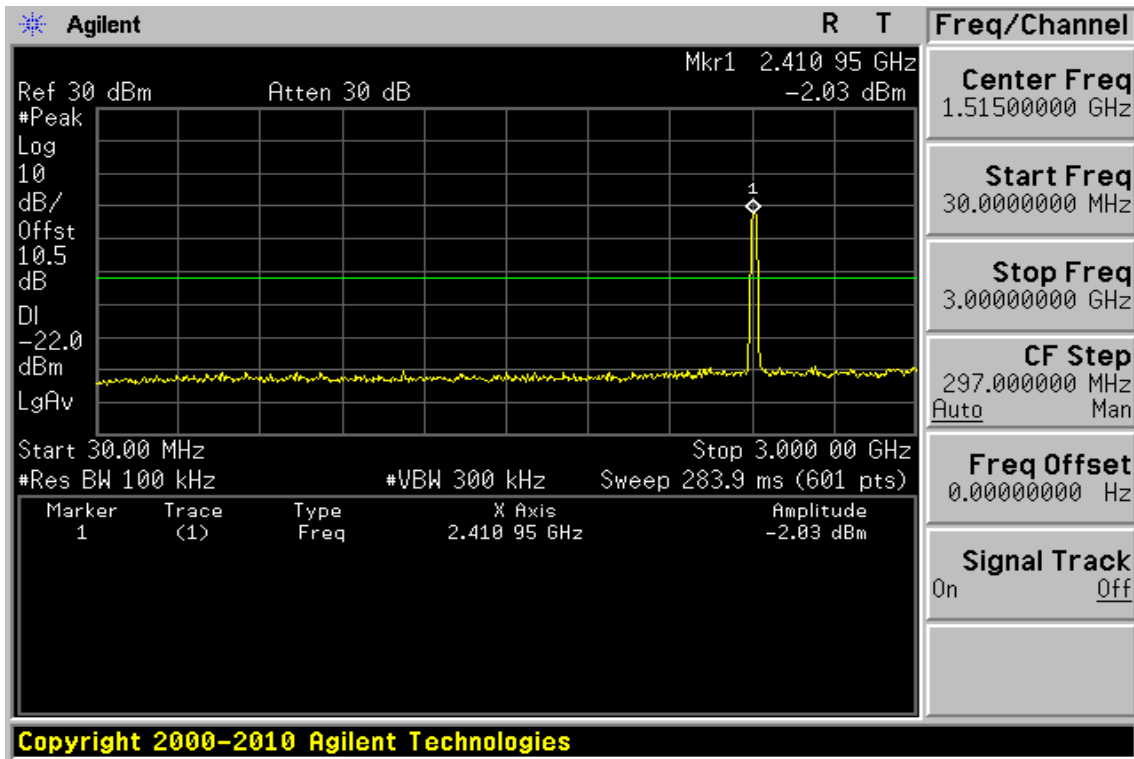
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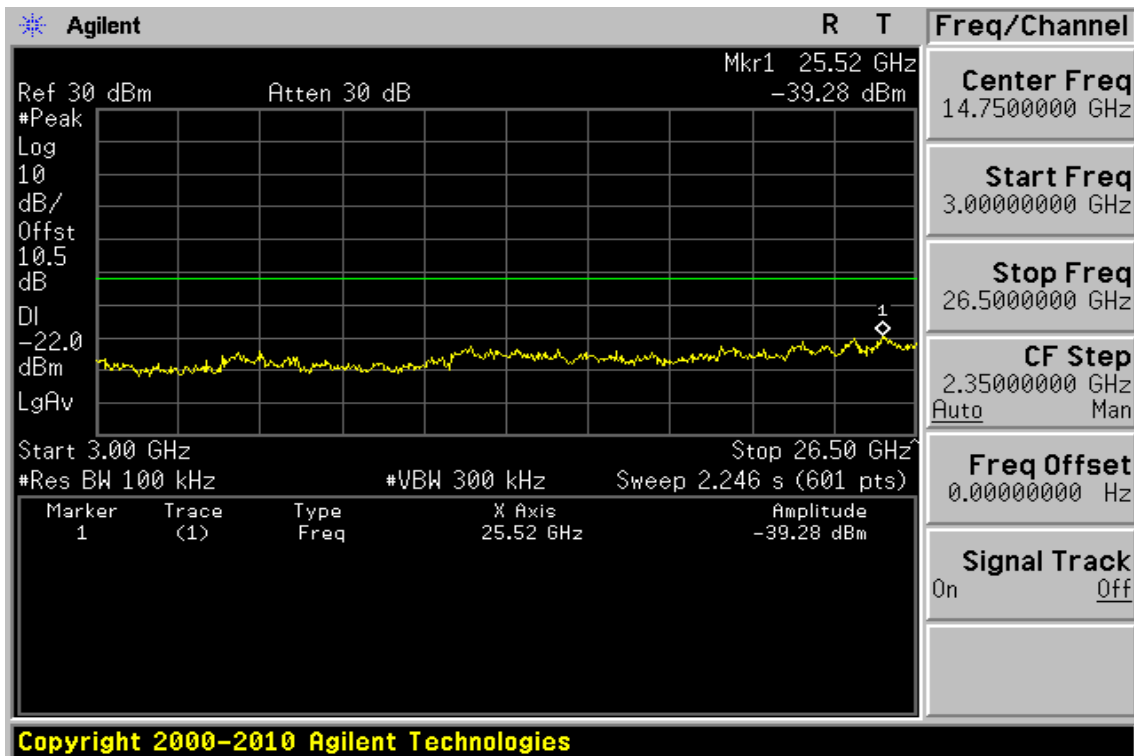
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Conducted Spurious Emission Measurement Result (802.11n_20M)

Ch Low 30MHz – 3GHz



Ch Low 3GHz – 26.5GHz



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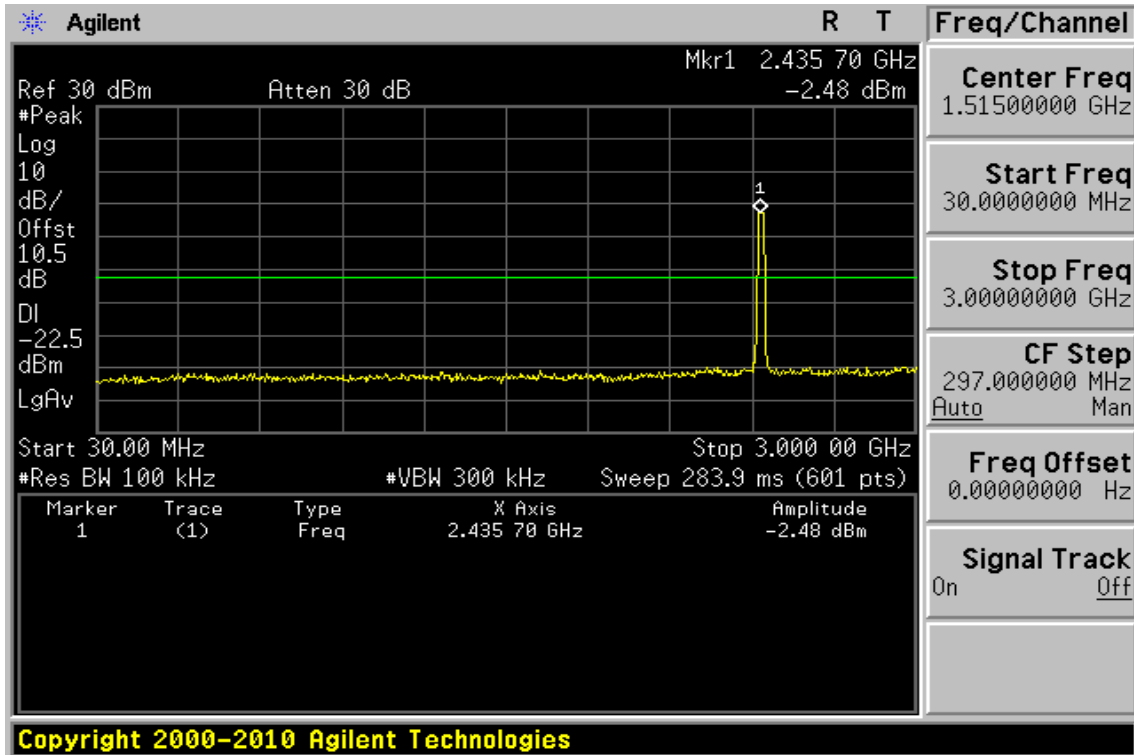
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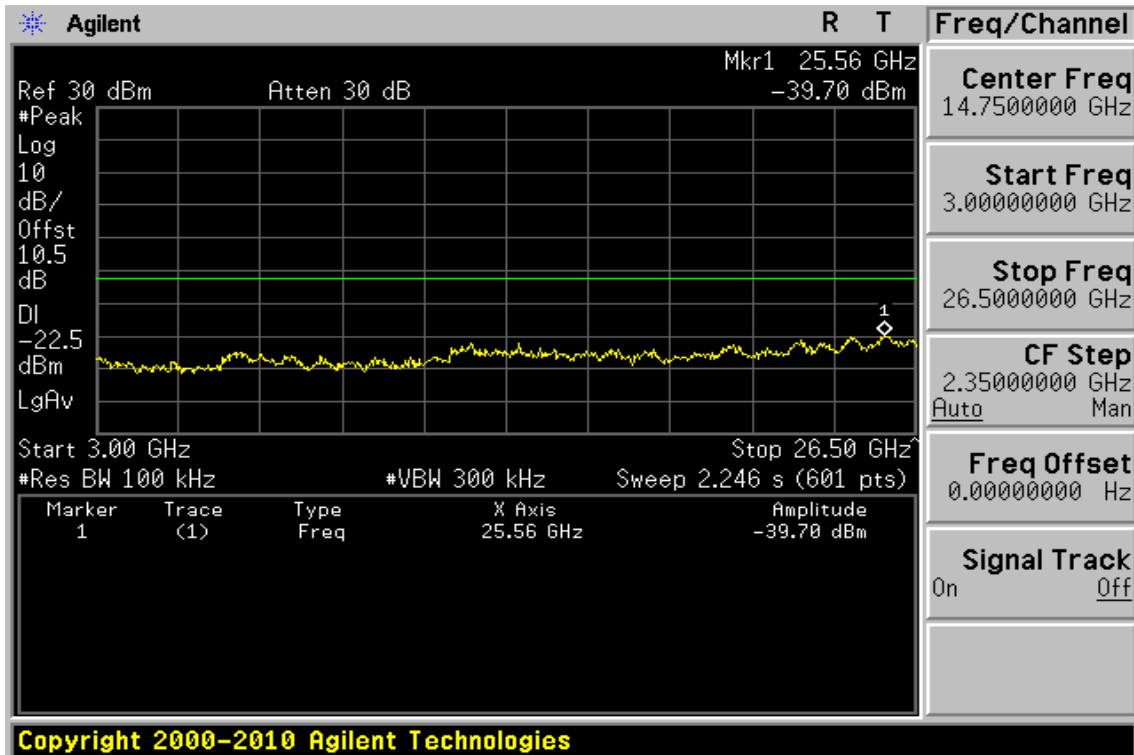
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Ch Mid 30MHz – 3GHz



Ch Mid 3GHz – 26.5GHz



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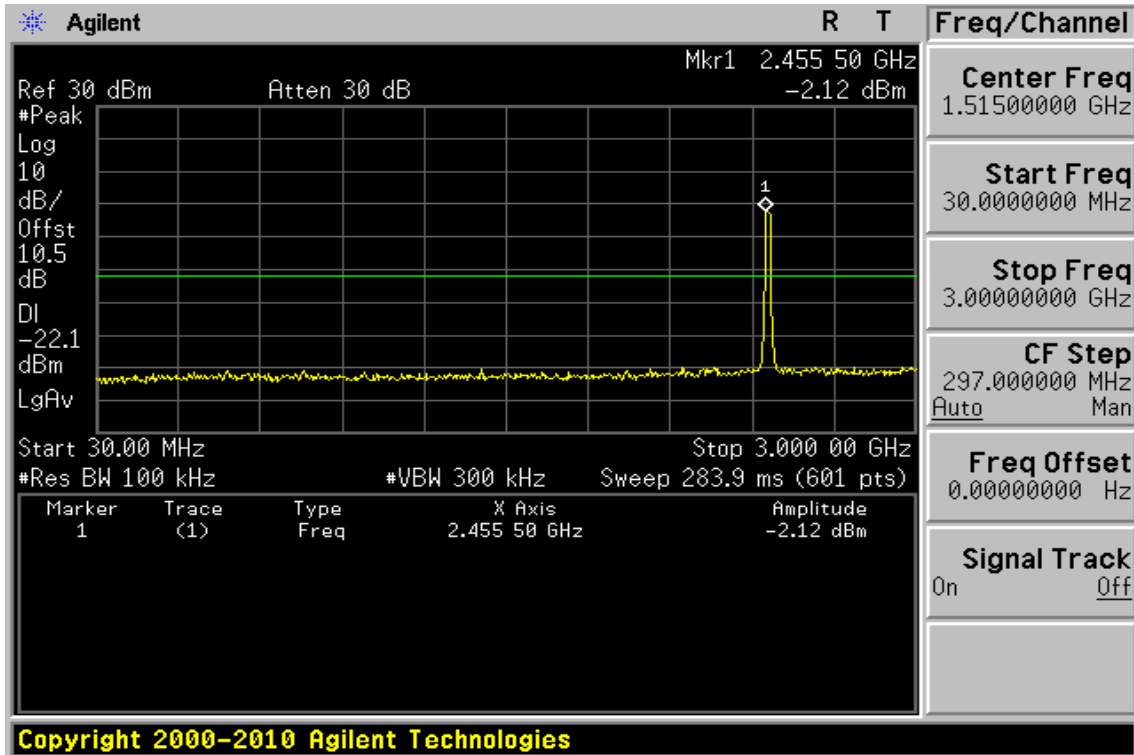
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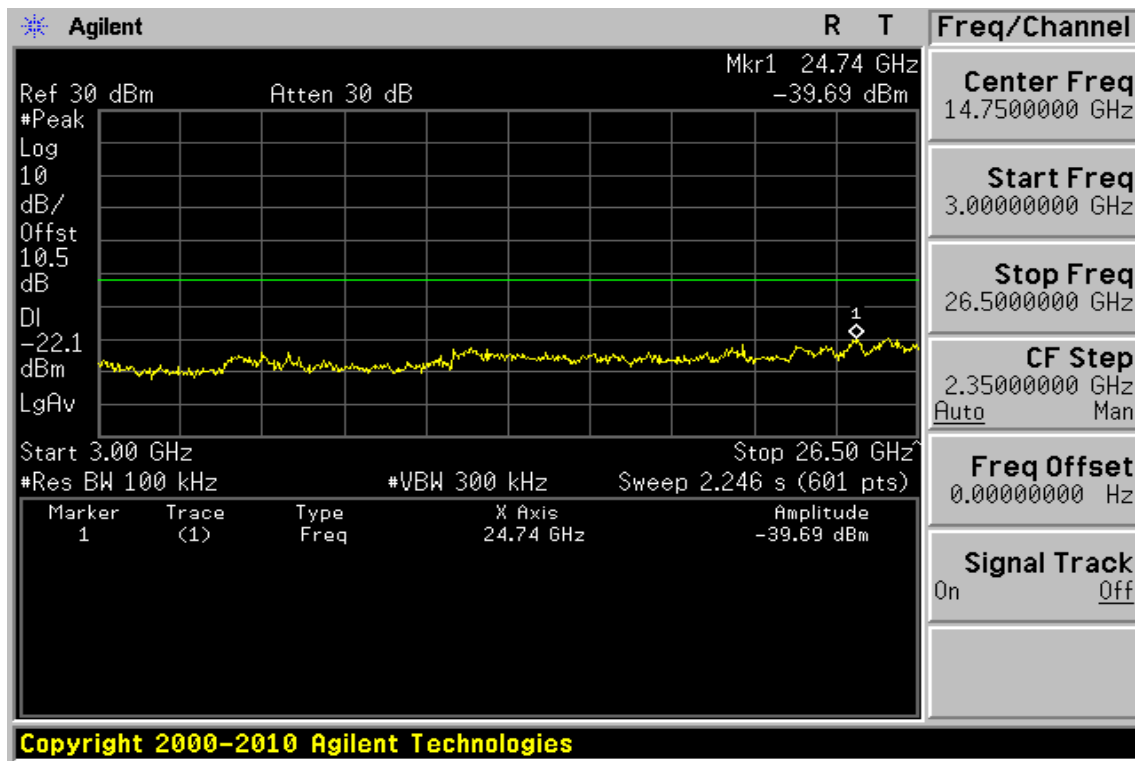
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Ch High 30MHz – 3GHz



Ch High 3GHz – 26.5GHz



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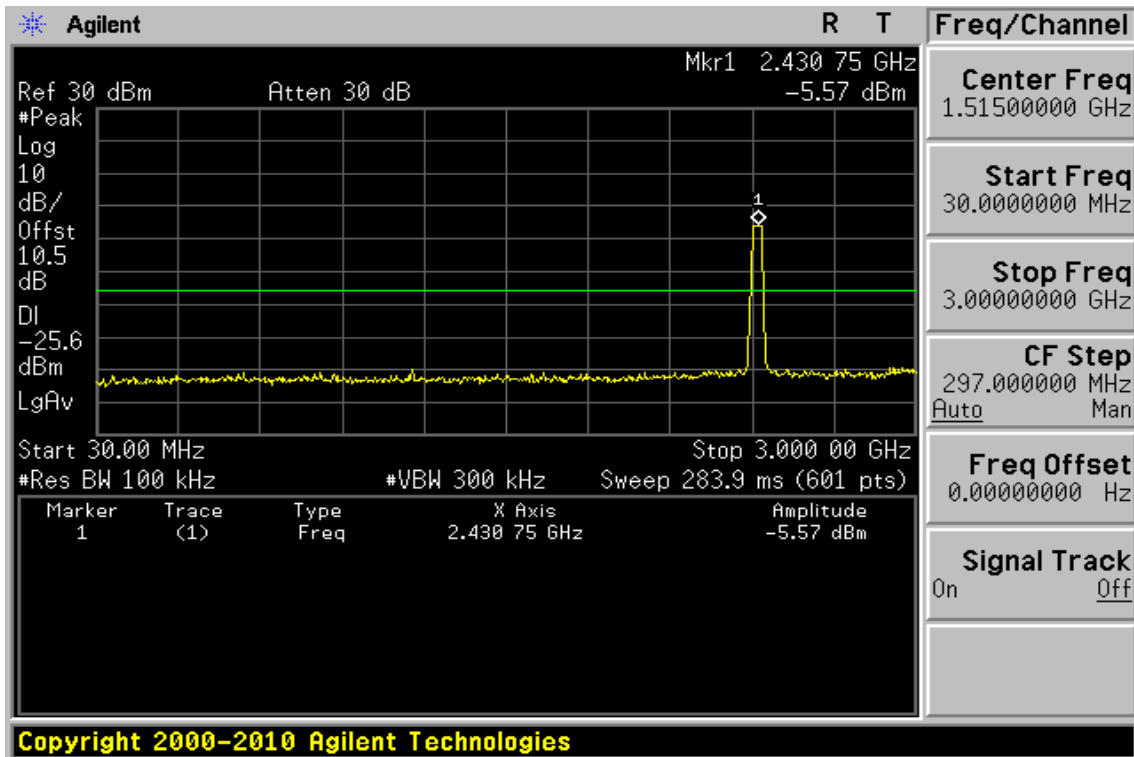
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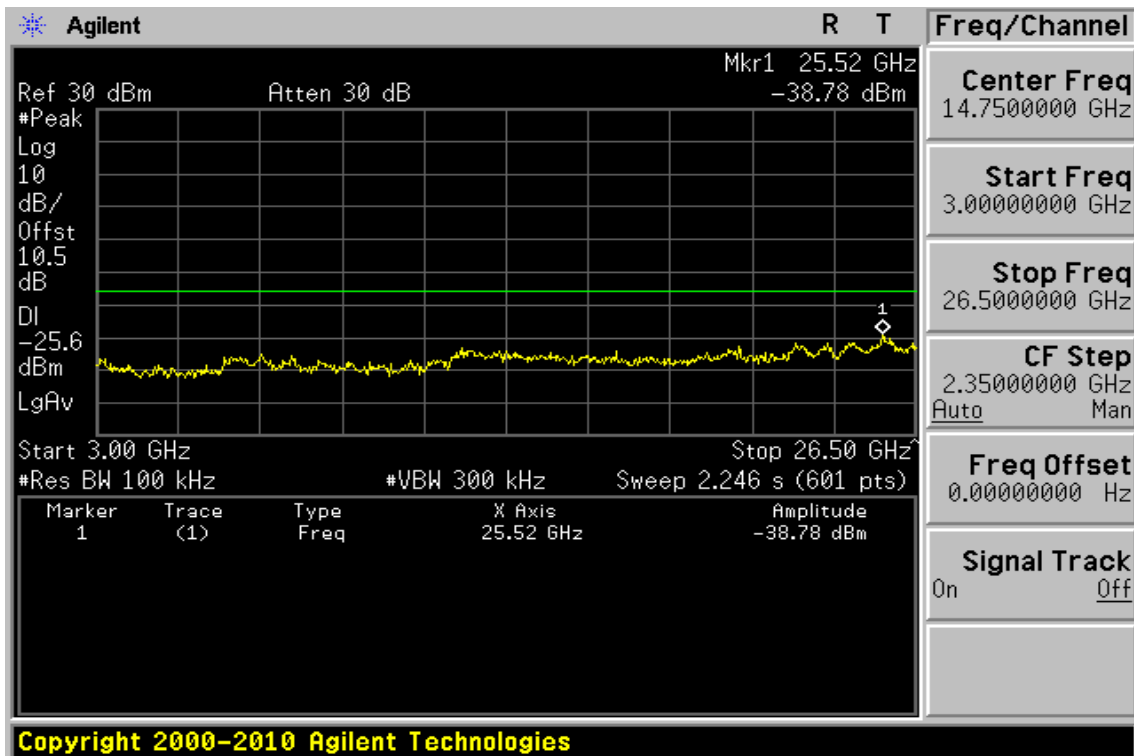
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Conducted Spurious Emission Measurement Result (802.11n_40M)

Ch Low 30MHz – 3GHz



Ch Low 3GHz – 26.5GHz



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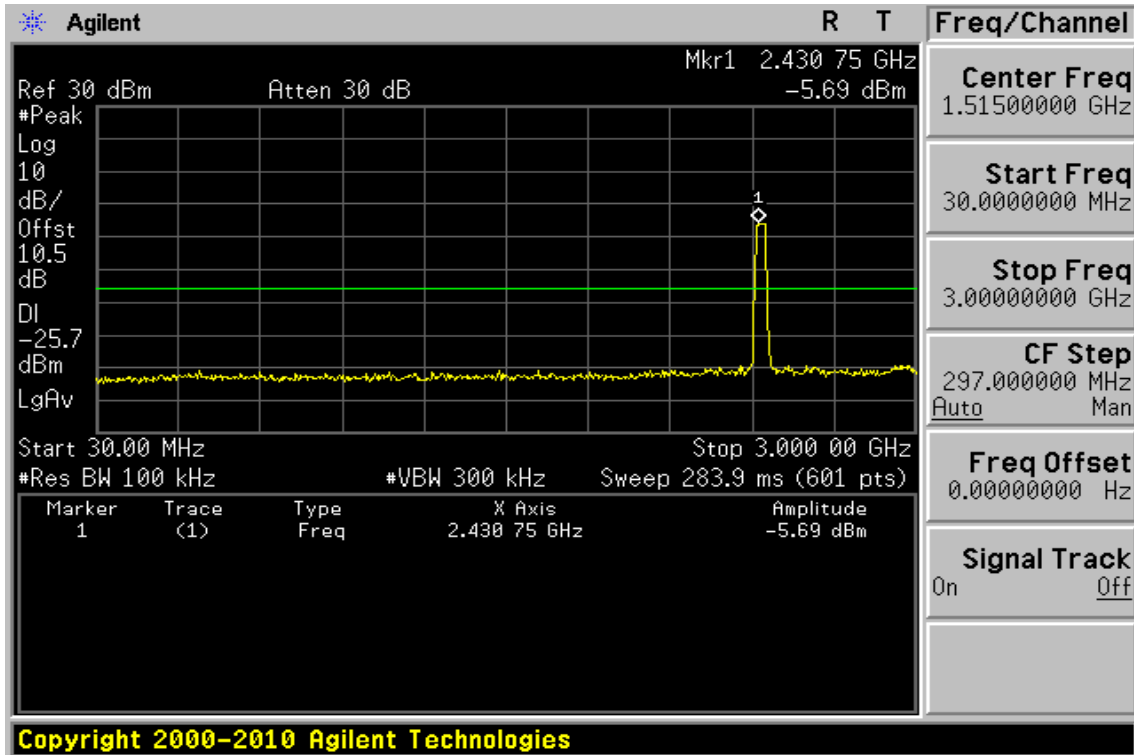
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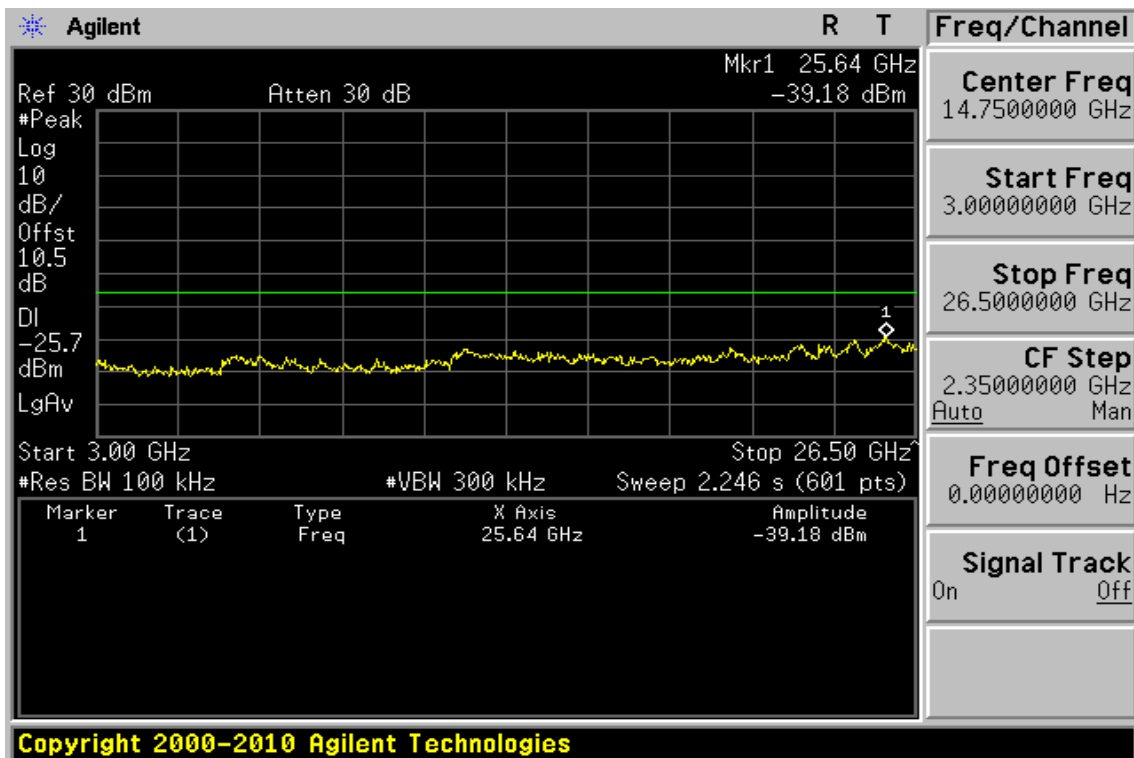
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Ch Mid 30MHz – 3GHz



Ch Mid 3GHz – 26.5GHz



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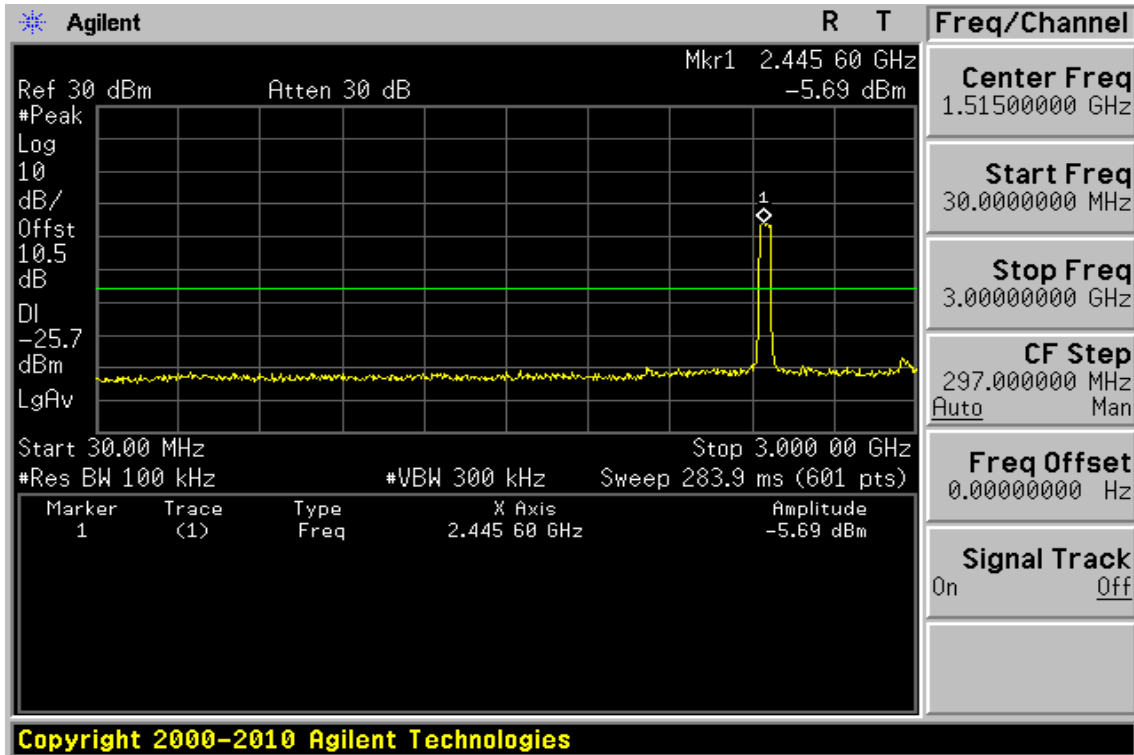
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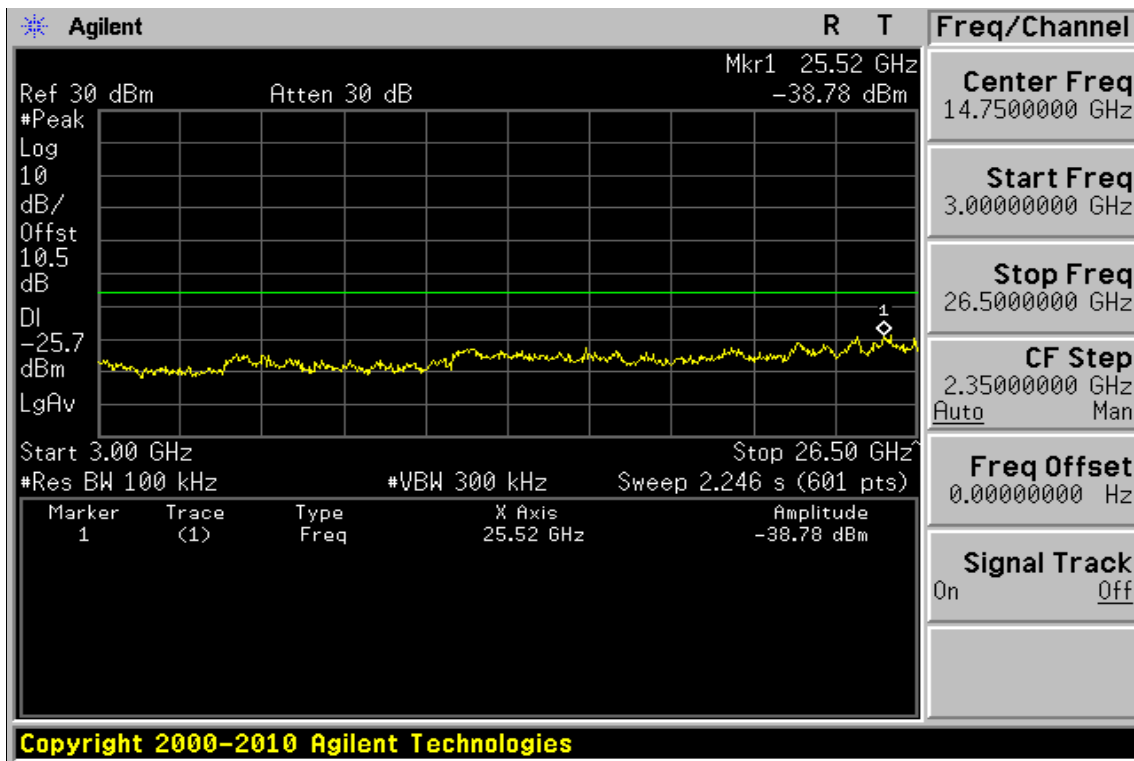
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Ch High 30MHz – 3GHz



Ch High 3GHz – 26.5GHz



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Radiated Spurious Emission Measurement Result (802.11b)

Operation Band	:802.11 b	Test Date	:2013-04-16
Fundamental Frequency	:2412 MHz	Temp./Humi.	:23.6deg_C/57RH
Operation Mode	:TX LOW	Engineer	:Allen
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:VERTICAL

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.

“---” : denotes Noise Floor.

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
70.74	S	Peak	46.74	-16.55	30.19	40.00	-9.81
132.82	S	Peak	43.30	-13.67	29.63	43.50	-13.87
335.55	S	Peak	36.58	-11.86	24.72	46.00	-21.28
495.60	S	Peak	35.86	-9.63	26.23	46.00	-19.77
720.64	S	Peak	32.57	-5.43	27.14	46.00	-18.86
911.73	S	Peak	28.08	-2.58	25.50	46.00	-20.50
4824.00	H	Average	25.83	7.07	32.90	54.00	-21.10
4824.00	H	Peak	36.81	7.07	43.88	74.00	-30.12
7236.00	H	---					
9648.00	H	---					
12060.00	H	---					
14472.00	H	---					
16884.00	H	---					
19296.00	H	---					
21708.00	H	---					
24120.00	H	---					

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Operation Band	:802.11 b	Test Date	:2013-04-16
Fundamental Frequency	:2412 MHz	Temp./Humi.	:23.6deg_C/57RH
Operation Mode	:TX LOW	Engineer	:Allen
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:HORIZONTAL

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.

“---” : denotes Noise Floor.

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
70.74	S	Peak	50.90	-16.55	34.35	40.00	-5.65
166.77	S	Peak	45.91	-12.87	33.04	43.50	-10.46
281.23	S	Peak	44.65	-13.02	31.63	46.00	-14.37
402.48	S	Peak	41.86	-11.00	30.86	46.00	-15.14
722.58	S	Peak	41.37	-5.39	35.98	46.00	-10.02
960.23	S	Peak	29.71	-2.06	27.65	54.00	-26.35
4824.00	H	Average	25.93	7.08	33.01	54.00	-20.99
4824.00	H	Peak	37.50	7.08	44.58	74.00	-29.42
7236.00	H	---					
9648.00	H	---					
12060.00	H	---					
14472.00	H	---					
16884.00	H	---					
19296.00	H	---					
21708.00	H	---					
24120.00	H	---					

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Operation Band :802.11 b Test Date :2013-04-16
 Fundamental Frequency :2437 MHz Temp./Humi. :23.6deg_C/57RH
 Operation Mode :TX MID Engineer :Allen
 EUT Pol. :E1 Plan Measurement Antenna Pol. :VERTICAL

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.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
70.74	S	Peak	46.80	-16.55	30.25	40.00	-9.75
140.58	S	Peak	41.73	-13.04	28.69	43.50	-14.81
290.93	S	Peak	38.39	-12.78	25.61	46.00	-20.39
495.60	S	Peak	36.25	-9.63	26.62	46.00	-19.38
725.49	S	Peak	32.32	-5.35	26.97	46.00	-19.03
799.21	S	Peak	32.41	-4.21	28.20	46.00	-17.80
4874.00	H	Average	24.67	7.14	31.81	54.00	-22.19
4874.00	H	Peak	36.37	7.14	43.51	74.00	-30.49
7311.00	H	---					
9748.00	H	---					
12185.00	H	---					
14622.00	H	---					
17059.00	H	---					
19496.00	H	---					
21933.00	H	---					
24370.00	H	---					

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Operation Band	:802.11 b	Test Date	:2013-04-16
Fundamental Frequency	:2437 MHz	Temp./Humi.	:23.6deg_C/57RH
Operation Mode	:TX MID	Engineer	:Allen
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:HORIZONTAL

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.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
71.71	S	Peak	45.44	-16.69	28.75	40.00	-11.25
166.77	S	Peak	45.93	-12.87	33.06	43.50	-10.44
296.75	S	Peak	43.32	-12.64	30.68	46.00	-15.32
405.39	S	Peak	41.65	-10.95	30.70	46.00	-15.30
719.67	S	Peak	42.50	-5.44	37.06	46.00	-8.94
928.22	S	Peak	31.62	-2.30	29.32	46.00	-16.68
4874.00	H	Average	25.66	7.09	32.75	54.00	-21.25
4874.00	H	Peak	36.51	7.09	43.60	74.00	-30.40
7311.00	H	---					
9748.00	H	---					
12185.00	H	---					
14622.00	H	---					
17059.00	H	---					
19496.00	H	---					
21933.00	H	---					
24370.00	H	---					

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Operation Band	:802.11 b	Test Date	:2013-04-16
Fundamental Frequency	:2462 MHz	Temp./Humi.	:23.6deg_C/57RH
Operation Mode	:TX HIGH	Engineer	:Allen
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:VERTICAL

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.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
70.74	S	Peak	47.46	-16.55	30.91	40.00	-9.09
290.93	S	Peak	38.81	-12.78	26.03	46.00	-19.97
495.60	S	Peak	36.02	-9.63	26.39	46.00	-19.61
666.32	S	Peak	36.51	-6.27	30.24	46.00	-15.76
799.21	S	Peak	31.62	-4.21	27.41	46.00	-18.59
931.13	S	Peak	32.43	-2.28	30.15	46.00	-15.85
4924.00	H	Average	24.59	7.19	31.78	54.00	-22.22
4924.00	H	Peak	38.78	7.19	45.97	74.00	-28.03
7386.00	H	---					
9848.00	H	---					
12310.00	H	---					
14772.00	H	---					
17234.00	H	---					
19696.00	H	---					
22158.00	H	---					
24620.00	H	---					

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Operation Band	:802.11 b	Test Date	:2013-04-16
Fundamental Frequency	:2462 MHz	Temp./Humi.	:23.6deg_C/57RH
Operation Mode	:TX HIGH	Engineer	:Allen
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:HORIZONTAL

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.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
71.71	S	Peak	45.90	-16.69	29.21	40.00	-10.79
166.77	S	Peak	46.49	-12.87	33.62	43.50	-9.88
291.90	S	Peak	43.87	-12.76	31.11	46.00	-14.89
397.63	S	Peak	41.70	-11.09	30.61	46.00	-15.39
719.67	S	Peak	41.35	-5.44	35.91	46.00	-10.09
796.30	S	Peak	36.99	-4.24	32.75	46.00	-13.25
4924.00	H	Average	25.36	7.08	32.44	54.00	-21.56
4924.00	H	Peak	38.44	7.08	45.52	74.00	-28.48
7386.00	H	---					
9848.00	H	---					
12310.00	H	---					
14772.00	H	---					
17234.00	H	---					
19696.00	H	---					
22158.00	H	---					
24620.00	H	---					

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Radiated Spurious Emission Measurement Result (802.11g)

Operation Band	:802.11 g	Test Date	:2013-04-16
Fundamental Frequency	:2412 MHz	Temp./Humi.	:23.6deg_C/57RH
Operation Mode	:TX LOW	Engineer	:Allen
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:VERTICAL

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.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
70.74	S	Peak	46.64	-16.55	30.09	40.00	-9.91
142.52	S	Peak	39.32	-12.89	26.43	43.50	-17.07
288.02	S	Peak	38.46	-12.86	25.60	46.00	-20.40
669.23	S	Peak	35.17	-6.21	28.96	46.00	-17.04
798.24	S	Peak	31.61	-4.22	27.39	46.00	-18.61
930.16	S	Peak	32.32	-2.28	30.04	46.00	-15.96
4824.00	H	Average	24.66	7.07	31.73	54.00	-22.27
4824.00	H	Peak	37.74	7.07	44.81	74.00	-29.19
7236.00	H	---					
9648.00	H	---					
12060.00	H	---					
14472.00	H	---					
16884.00	H	---					
19296.00	H	---					
21708.00	H	---					
24120.00	H	---					

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Operation Band	:802.11 g	Test Date	:2013-04-16
Fundamental Frequency	:2412 MHz	Temp./Humi.	:23.6deg_C/57RH
Operation Mode	:TX LOW	Engineer	:Allen
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:HORIZONTAL

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.

“---” : denotes Noise Floor.

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
71.71	S	Peak	44.75	-16.69	28.06	40.00	-11.94
166.77	S	Peak	45.53	-12.87	32.66	43.50	-10.84
266.68	S	Peak	44.55	-13.48	31.07	46.00	-14.93
409.27	S	Peak	41.86	-10.87	30.99	46.00	-15.01
721.61	S	Peak	41.29	-5.40	35.89	46.00	-10.11
796.30	S	Peak	33.41	-4.24	29.17	46.00	-16.83
4824.00	H	Average	25.32	7.08	32.40	54.00	-21.60
4824.00	H	Peak	37.67	7.08	44.75	74.00	-29.25
7236.00	H	---					
9648.00	H	---					
12060.00	H	---					
14472.00	H	---					
16884.00	H	---					
19296.00	H	---					
21708.00	H	---					
24120.00	H	---					

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Operation Band :802.11 g Test Date :2013-04-16
 Fundamental Frequency :2437 MHz Temp./Humi. :23.6deg_C/57RH
 Operation Mode :TX MID Engineer :Allen
 EUT Pol. :E1 Plan Measurement Antenna Pol. :VERTICAL

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.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
70.74	S	Peak	46.32	-16.55	29.77	40.00	-10.23
128.94	S	Peak	42.54	-13.97	28.57	43.50	-14.93
295.78	S	Peak	37.76	-12.66	25.10	46.00	-20.90
495.60	S	Peak	36.10	-9.63	26.47	46.00	-19.53
720.64	S	Peak	33.02	-5.43	27.59	46.00	-18.41
946.65	S	Peak	28.86	-2.12	26.74	46.00	-19.26
4874.00	H	Average	24.57	7.14	31.71	54.00	-22.29
4874.00	H	Peak	36.53	7.14	43.67	74.00	-30.33
7311.00	H	---					
9748.00	H	---					
12185.00	H	---					
14622.00	H	---					
17059.00	H	---					
19496.00	H	---					
21933.00	H	---					
24370.00	H	---					

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Operation Band	:802.11 g	Test Date	:2013-04-16
Fundamental Frequency	:2437 MHz	Temp./Humi.	:23.6deg_C/57RH
Operation Mode	:TX MID	Engineer	:Allen
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:HORIZONTAL

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.

“---” : denotes Noise Floor.

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
70.74	S	Peak	44.25	-16.55	27.70	40.00	-12.30
165.80	S	Peak	45.41	-12.77	32.64	43.50	-10.86
335.55	S	Peak	41.61	-11.86	29.75	46.00	-16.25
402.48	S	Peak	42.04	-11.00	31.04	46.00	-14.96
719.67	S	Peak	41.44	-5.44	36.00	46.00	-10.00
799.21	S	Peak	35.46	-4.21	31.25	46.00	-14.75
4874.00	H	Average	25.62	7.09	32.71	54.00	-21.29
4874.00	H	Peak	37.17	7.09	44.26	74.00	-29.74
7311.00	H	---					
9748.00	H	---					
12185.00	H	---					
14622.00	H	---					
17059.00	H	---					
19496.00	H	---					
21933.00	H	---					
24370.00	H	---					

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Operation Band	:802.11 g	Test Date	:2013-04-16
Fundamental Frequency	:2462 MHz	Temp./Humi.	:23.6deg_C/57RH
Operation Mode	:TX HIGH	Engineer	:Allen
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:VERTICAL

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.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
70.74	S	Peak	43.37	-16.55	26.82	40.00	-13.18
132.82	S	Peak	43.63	-13.67	29.96	43.50	-13.54
292.87	S	Peak	38.77	-12.74	26.03	46.00	-19.97
499.48	S	Peak	36.04	-9.60	26.44	46.00	-19.56
719.67	S	Peak	33.38	-5.44	27.94	46.00	-18.06
849.65	S	Peak	30.48	-3.69	26.79	46.00	-19.21
4924.00	H	Average	24.79	7.19	31.98	54.00	-22.02
4924.00	H	Peak	36.91	7.19	44.10	74.00	-29.90
7386.00	H	---					
9848.00	H	---					
12310.00	H	---					
14772.00	H	---					
17234.00	H	---					
19696.00	H	---					
22158.00	H	---					
24620.00	H	---					

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Operation Band	:802.11 g	Test Date	:2013-04-16
Fundamental Frequency	:2462 MHz	Temp./Humi.	:23.6deg_C/57RH
Operation Mode	:TX HIGH	Engineer	:Allen
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:HORIZONTAL

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.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
71.71	S	Peak	44.68	-16.69	27.99	40.00	-12.01
166.77	S	Peak	46.05	-12.87	33.18	43.50	-10.32
288.99	S	Peak	45.33	-12.83	32.50	46.00	-13.50
335.55	S	Peak	41.66	-11.86	29.80	46.00	-16.20
416.06	S	Peak	41.54	-10.71	30.83	46.00	-15.17
724.52	S	Peak	41.47	-5.37	36.10	46.00	-9.90
4924.00	H	Average	25.69	7.08	32.77	54.00	-21.23
4924.00	H	Peak	36.46	7.08	43.54	74.00	-30.46
7386.00	H	---					
9848.00	H	---					
12310.00	H	---					
14772.00	H	---					
17234.00	H	---					
19696.00	H	---					
22158.00	H	---					
24620.00	H	---					

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Radiated Spurious Emission Measurement Result (802.11n_20M)

Operation Band	:802.11 n20M	Test Date	:2013-04-16
Fundamental Frequency	:2412 MHz	Temp./Humi.	:23.6deg_C/57RH
Operation Mode	:TX LOW	Engineer	:Allen
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:VERTICAL

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.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
71.71	S	Peak	42.49	-16.69	25.80	40.00	-14.20
127.97	S	Peak	42.40	-14.04	28.36	43.50	-15.14
282.20	S	Peak	38.63	-12.99	25.64	46.00	-20.36
499.48	S	Peak	36.59	-9.60	26.99	46.00	-19.01
722.58	S	Peak	32.41	-5.39	27.02	46.00	-18.98
800.18	S	Peak	31.08	-4.19	26.89	46.00	-19.11
4824.00	H	Average	24.96	7.07	32.03	54.00	-21.97
4824.00	H	Peak	37.36	7.07	44.43	74.00	-29.57
7236.00	H	---					
9648.00	H	---					
12060.00	H	---					
14472.00	H	---					
16884.00	H	---					
19296.00	H	---					
21708.00	H	---					
24120.00	H	---					

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Operation Band	:802.11 n20M	Test Date	:2013-04-16
Fundamental Frequency	:2412 MHz	Temp./Humi.	:23.6deg_C/57RH
Operation Mode	:TX LOW	Engineer	:Allen
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:HORIZONTAL

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.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
71.71	S	Peak	44.77	-16.69	28.08	40.00	-11.92
165.80	S	Peak	45.96	-12.77	33.19	43.50	-10.31
291.90	S	Peak	43.82	-12.76	31.06	46.00	-14.94
400.54	S	Peak	42.10	-11.04	31.06	46.00	-14.94
666.32	S	Peak	34.76	-6.27	28.49	46.00	-17.51
721.61	S	Peak	41.16	-5.40	35.76	46.00	-10.24
4824.00	H	Average	25.36	7.08	32.44	54.00	-21.56
4824.00	H	Peak	36.89	7.08	43.97	74.00	-30.03
7236.00	H	---					
9648.00	H	---					
12060.00	H	---					
14472.00	H	---					
16884.00	H	---					
19296.00	H	---					
21708.00	H	---					
24120.00	H	---					

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Operation Band :802.11 n20M Test Date :2013-04-16
 Fundamental Frequency :2437 MHz Temp./Humi. :23.6deg_C/57RH
 Operation Mode :TX MID Engineer :Allen
 EUT Pol. :E1 Plan Measurement Antenna Pol. :VERTICAL

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.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
70.74	S	Peak	46.87	-16.55	30.32	40.00	-9.68
131.85	S	Peak	41.81	-13.75	28.06	43.50	-15.44
286.08	S	Peak	38.96	-12.89	26.07	46.00	-19.93
495.60	S	Peak	35.60	-9.63	25.97	46.00	-20.03
724.52	S	Peak	32.82	-5.37	27.45	46.00	-18.55
937.92	S	Peak	34.25	-2.21	32.04	46.00	-13.96
4874.00	H	Average	24.77	7.14	31.91	54.00	-22.09
4874.00	H	Peak	36.75	7.14	43.89	74.00	-30.11
7311.00	H	---					
9748.00	H	---					
12185.00	H	---					
14622.00	H	---					
17059.00	H	---					
19496.00	H	---					
21933.00	H	---					
24370.00	H	---					

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Operation Band	:802.11 n20M	Test Date	:2013-04-16
Fundamental Frequency	:2437 MHz	Temp./Humi.	:23.6deg_C/57RH
Operation Mode	:TX MID	Engineer	:Allen
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:HORIZONTAL

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.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
70.74	S	Peak	44.92	-16.55	28.37	40.00	-11.63
166.77	S	Peak	45.70	-12.87	32.83	43.50	-10.67
280.26	S	Peak	45.07	-13.04	32.03	46.00	-13.97
407.33	S	Peak	41.66	-10.90	30.76	46.00	-15.24
723.55	S	Peak	42.03	-5.38	36.65	46.00	-9.35
796.30	S	Peak	33.29	-4.24	29.05	46.00	-16.95
4874.00	H	Average	25.05	7.09	32.14	54.00	-21.86
4874.00	H	Peak	37.25	7.09	44.34	74.00	-29.66
7311.00	H	---					
9748.00	H	---					
12185.00	H	---					
14622.00	H	---					
17059.00	H	---					
19496.00	H	---					
21933.00	H	---					
24370.00	H	---					

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Operation Band	:802.11 n20M	Test Date	:2013-04-16
Fundamental Frequency	:2462 MHz	Temp./Humi.	:23.6deg_C/57RH
Operation Mode	:TX HIGH	Engineer	:Allen
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:VERTICAL

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.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
70.74	S	Peak	47.27	-16.55	30.72	40.00	-9.28
142.52	S	Peak	40.16	-12.89	27.27	43.50	-16.23
283.17	S	Peak	37.85	-12.97	24.88	46.00	-21.12
495.60	S	Peak	36.09	-9.63	26.46	46.00	-19.54
721.61	S	Peak	32.49	-5.40	27.09	46.00	-18.91
948.59	S	Peak	32.82	-2.11	30.71	46.00	-15.29
4924.00	H	Average	24.87	7.19	32.06	54.00	-21.94
4924.00	H	Peak	37.44	7.19	44.63	74.00	-29.37
7386.00	H	---					
9848.00	H	---					
12310.00	H	---					
14772.00	H	---					
17234.00	H	---					
19696.00	H	---					
22158.00	H	---					
24620.00	H	---					

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Operation Band	:802.11 n20M	Test Date	:2013-04-16
Fundamental Frequency	:2462 MHz	Temp./Humi.	:23.6deg_C/57RH
Operation Mode	:TX HIGH	Engineer	:Allen
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:HORIZONTAL

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.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
71.71	S	Peak	44.57	-16.69	27.88	40.00	-12.12
166.77	S	Peak	45.73	-12.87	32.86	43.50	-10.64
273.47	S	Peak	44.28	-13.25	31.03	46.00	-14.97
404.42	S	Peak	42.20	-10.96	31.24	46.00	-14.76
659.53	S	Peak	35.35	-6.39	28.96	46.00	-17.04
718.70	S	Peak	40.97	-5.45	35.52	46.00	-10.48
4924.00	H	Average	25.12	7.08	32.20	54.00	-21.80
4924.00	H	Peak	37.11	7.08	44.19	74.00	-29.81
7386.00	H	---					
9848.00	H	---					
12310.00	H	---					
14772.00	H	---					
17234.00	H	---					
19696.00	H	---					
22158.00	H	---					
24620.00	H	---					

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Radiated Spurious Emission Measurement Result (802.11n_40M)

Operation Band	:802.11 n40M	Test Date	:2013-04-16
Fundamental Frequency	:2422 MHz	Temp./Humi.	:23.6deg_C/57RH
Operation Mode	:TX LOW	Engineer	:Allen
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:VERTICAL

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.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
70.74	S	Peak	46.29	-16.55	29.74	40.00	-10.26
126.03	S	Peak	43.16	-14.16	29.00	43.50	-14.50
287.05	S	Peak	38.29	-12.87	25.42	46.00	-20.58
499.48	S	Peak	35.69	-9.60	26.09	46.00	-19.91
719.67	S	Peak	32.70	-5.44	27.26	46.00	-18.74
798.24	S	Peak	30.44	-4.22	26.22	46.00	-19.78
4844.00	H	Average	24.68	7.10	31.78	54.00	-22.22
4844.00	H	Peak	36.82	7.10	43.92	74.00	-30.08
7266.00	H	---					
9688.00	H	---					
12110.00	H	---					
14532.00	H	---					
16954.00	H	---					
19376.00	H	---					
21798.00	H	---					
24220.00	H	---					

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Operation Band	:802.11 n40M	Test Date	:2013-04-16
Fundamental Frequency	:2422 MHz	Temp./Humi.	:23.6deg_C/57RH
Operation Mode	:TX LOW	Engineer	:Allen
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:HORIZONTAL

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.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
71.71	S	Peak	45.34	-16.69	28.65	40.00	-11.35
165.80	S	Peak	44.89	-12.77	32.12	43.50	-11.38
290.93	S	Peak	44.87	-12.78	32.09	46.00	-13.91
335.55	S	Peak	41.62	-11.86	29.76	46.00	-16.24
407.33	S	Peak	42.15	-10.90	31.25	46.00	-14.75
721.61	S	Peak	40.99	-5.40	35.59	46.00	-10.41
4844.00	H	Average	25.03	7.08	32.11	54.00	-21.89
4844.00	H	Peak	36.11	7.08	43.19	74.00	-30.81
7266.00	H	---					
9688.00	H	---					
12110.00	H	---					
14532.00	H	---					
16954.00	H	---					
19376.00	H	---					
21798.00	H	---					
24220.00	H	---					

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Operation Band	:802.11 n40M	Test Date	:2013-04-16
Fundamental Frequency	:2437 MHz	Temp./Humi.	:23.6deg_C/57RH
Operation Mode	:TX MID	Engineer	:Allen
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:VERTICAL

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.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
70.74	S	Peak	42.71	-16.55	26.16	40.00	-13.84
142.52	S	Peak	39.47	-12.89	26.58	43.50	-16.92
289.96	S	Peak	38.88	-12.80	26.08	46.00	-19.92
724.52	S	Peak	32.55	-5.37	27.18	46.00	-18.82
797.27	S	Peak	31.47	-4.24	27.23	46.00	-18.77
975.75	S	Peak	35.92	-1.98	33.94	54.00	-20.06
4874.00	H	Average	24.95	7.14	32.09	54.00	-21.91
4874.00	H	Peak	36.79	7.14	43.93	74.00	-30.07
7311.00	H	---					
9748.00	H	---					
12185.00	H	---					
14622.00	H	---					
17059.00	H	---					
19496.00	H	---					
21933.00	H	---					
24370.00	H	---					

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Operation Band :802.11 n40M Test Date :2013-04-16
 Fundamental Frequency :2437 MHz Temp./Humi. :23.6deg_C/57RH
 Operation Mode :TX MID Engineer :Allen
 EUT Pol. :E1 Plan Measurement Antenna Pol. :HORIZONTAL

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.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
71.71	S	Peak	44.97	-16.69	28.28	40.00	-11.72
165.80	S	Peak	45.06	-12.77	32.29	43.50	-11.21
291.90	S	Peak	43.88	-12.76	31.12	46.00	-14.88
335.55	S	Peak	42.14	-11.86	30.28	46.00	-15.72
410.24	S	Peak	42.09	-10.84	31.25	46.00	-14.75
715.79	S	Peak	41.33	-5.50	35.83	46.00	-10.17
4874.00	H	Average	25.62	7.09	32.71	54.00	-21.29
4874.00	H	Peak	36.62	7.09	43.71	74.00	-30.29
7311.00	H	---					
9748.00	H	---					
12185.00	H	---					
14622.00	H	---					
17059.00	H	---					
19496.00	H	---					
21933.00	H	---					
24370.00	H	---					

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Operation Band	:802.11 n40M	Test Date	:2013-04-16
Fundamental Frequency	:2452 MHz	Temp./Humi.	:23.6deg_C/57RH
Operation Mode	:TX HIGH	Engineer	:Allen
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:VERTICAL

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.

“---” : denotes Noise Floor.

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
71.71	S	Peak	42.37	-16.69	25.68	40.00	-14.32
138.64	S	Peak	43.06	-13.20	29.86	43.50	-13.64
289.96	S	Peak	38.16	-12.80	25.36	46.00	-20.64
499.48	S	Peak	36.04	-9.60	26.44	46.00	-19.56
719.67	S	Peak	33.01	-5.44	27.57	46.00	-18.43
927.25	S	Peak	30.09	-2.30	27.79	46.00	-18.21
4904.00	H	Average	24.03	7.17	31.20	54.00	-22.80
4904.00	H	Peak	36.10	7.17	43.27	74.00	-30.73
7356.00	H	---					
9808.00	H	---					
12260.00	H	---					
14712.00	H	---					
17164.00	H	---					
19616.00	H	---					
22068.00	H	---					
24520.00	H	---					

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Operation Band	:802.11 n40M	Test Date	:2013-04-16
Fundamental Frequency	:2452 MHz	Temp./Humi.	:23.6deg_C/57RH
Operation Mode	:TX HIGH	Engineer	:Allen
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:HORIZONTAL

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.

“---” : denotes Noise Floor.

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
71.71	S	Peak	45.26	-16.69	28.57	40.00	-11.43
166.77	S	Peak	45.24	-12.87	32.37	43.50	-11.13
288.99	S	Peak	44.18	-12.83	31.35	46.00	-14.65
400.54	S	Peak	42.86	-11.04	31.82	46.00	-14.18
665.35	S	Peak	33.90	-6.28	27.62	46.00	-18.38
719.67	S	Peak	40.52	-5.44	35.08	46.00	-10.92
4904.00	H	Average	25.30	7.09	32.39	54.00	-21.61
4904.00	H	Peak	35.77	7.09	42.86	74.00	-31.14
7356.00	H	---					
9808.00	H	---					
12260.00	H	---					
14712.00	H	---					
17164.00	H	---					
19616.00	H	---					
22068.00	H	---					
24520.00	H	---					

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11 PEAK POWER SPECTRAL DENSITY

11.1 Standard Applicable:

According to §15.247(e) For digitally modulated systems, 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. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

11.2 Measurement Equipment Used:

Refer to section 7.2 for details.

11.3 Test Set-up:

Refer to section 8.3 for details.

11.4 Measurement Procedure: (following the measurement procedure 9.1 option1 of KDB558074):

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

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11.5 Measurement Result:

802.11b

Frequency MHz	RF Power Density Reading (dBm)	Maximum Limit (dBm)
2412	-11.15	8
2437	-12.03	8
2462	-12.20	8

802.11g

Frequency MHz	RF Power Density Reading (dBm)	Maximum Limit (dBm)
2412	-13.33	8
2437	-13.31	8
2462	-13.54	8

802.11n_20M

Frequency MHz	RF Power Density Reading (dBm)	Maximum Limit (dBm)
2412	-15.73	8
2437	-14.91	8
2462	-15.39	8

802.11_40M

Frequency MHz	RF Power Density Reading (dBm)	Maximum Limit (dBm)
2422	-17.36	8
2437	-16.99	8
2452	-16.92	8

**Offset 10.5dB*

Note: Refer to next page for plots.

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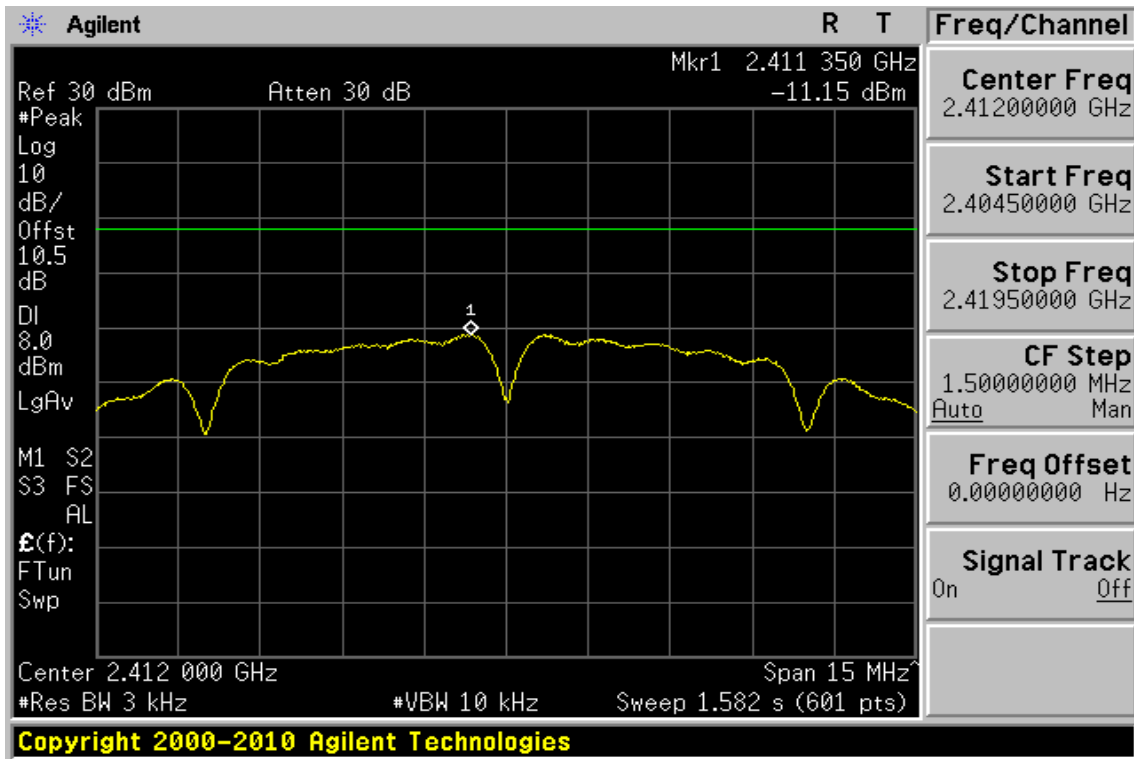
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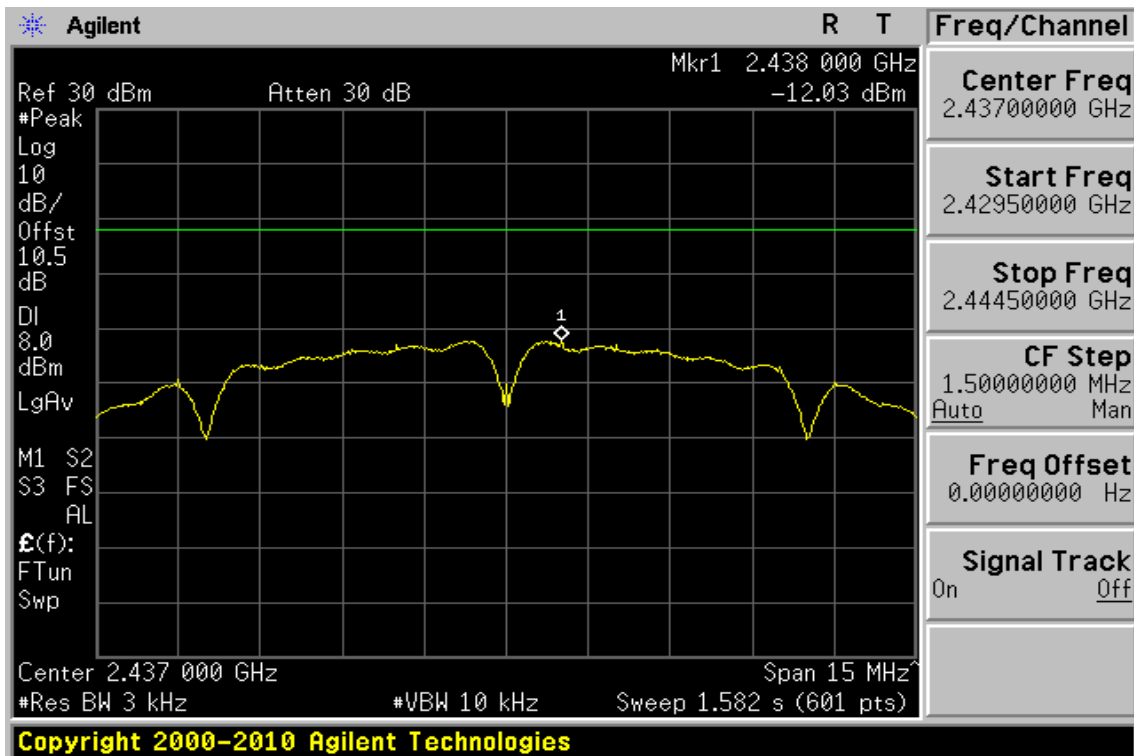
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802.11b

Power Spectral Density Test Plot (CH-Low)



Power Spectral Density Test Plot (CH-Mid)



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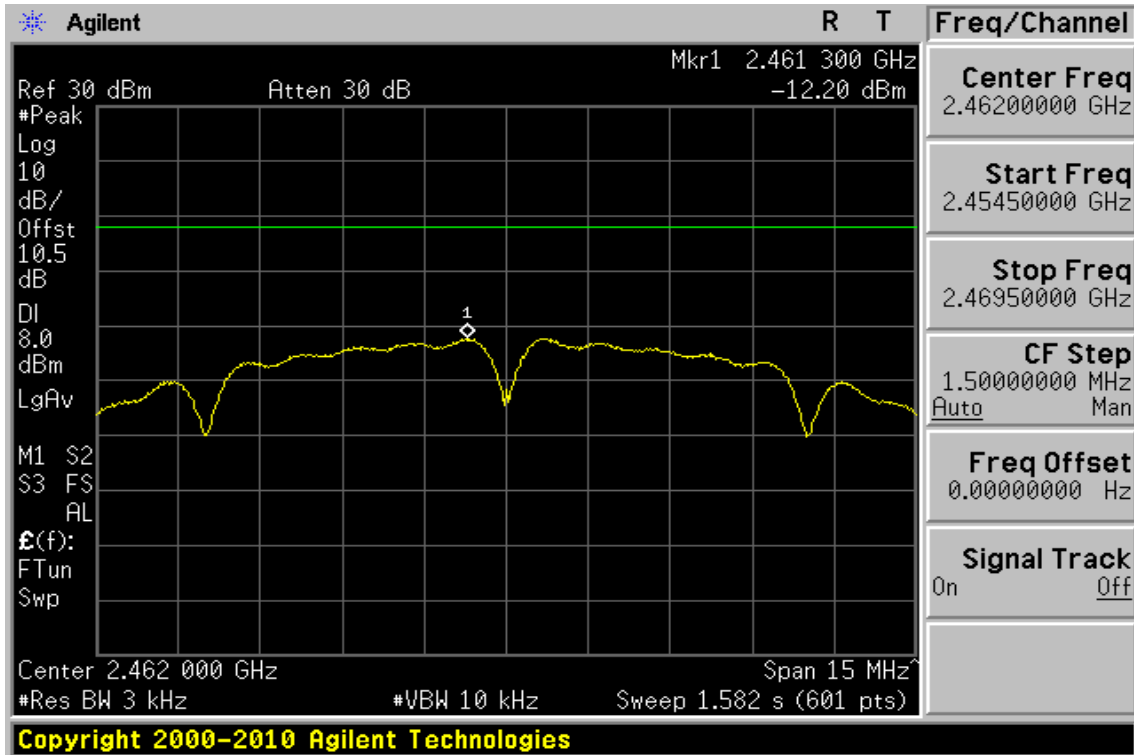
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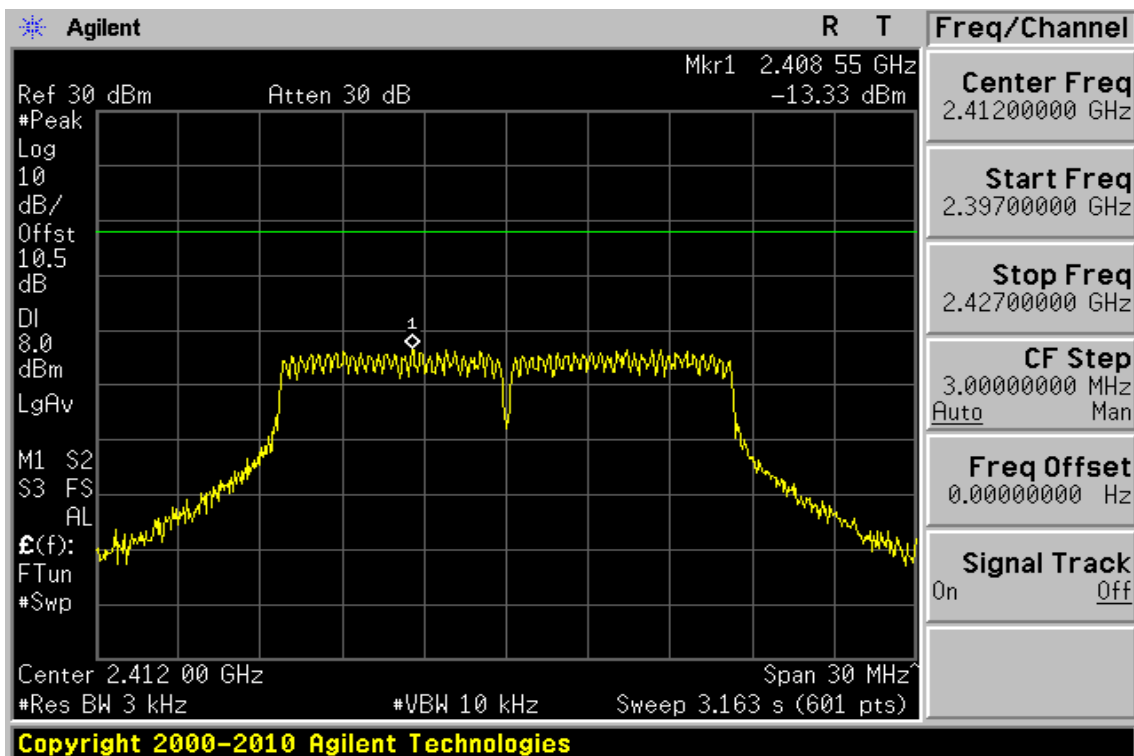
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Power Spectral Density Test Plot (CH-High)



802.11g

Power Spectral Density Test Plot (CH-Low)



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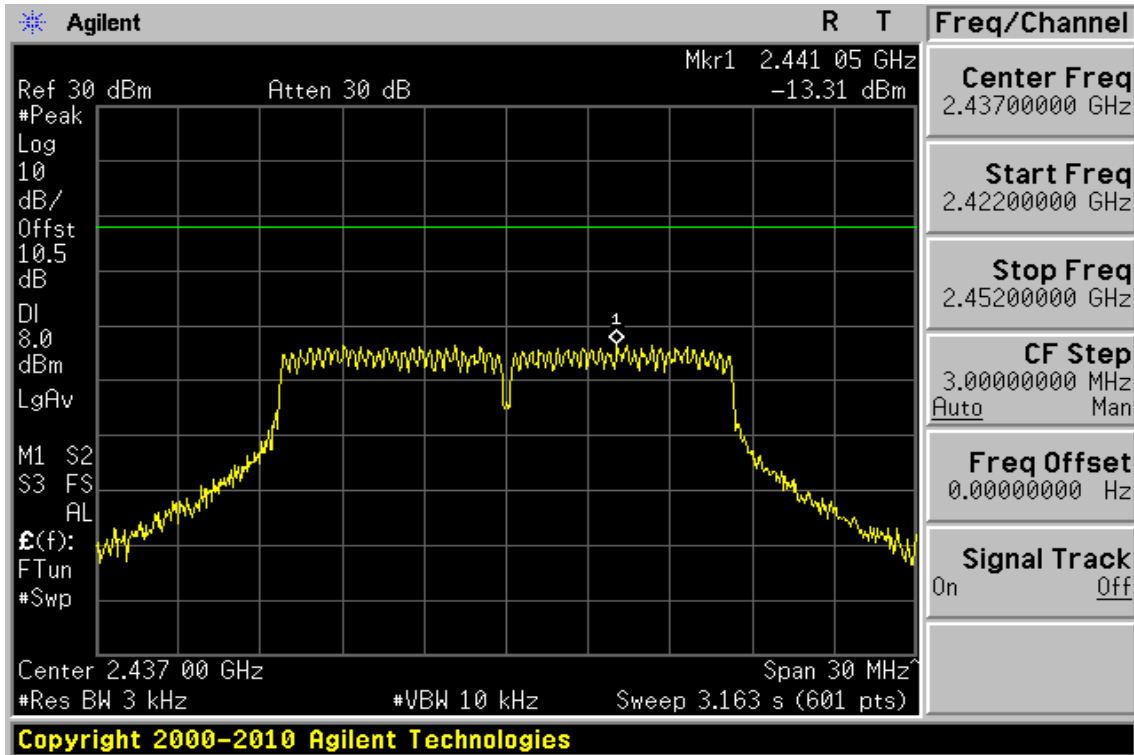
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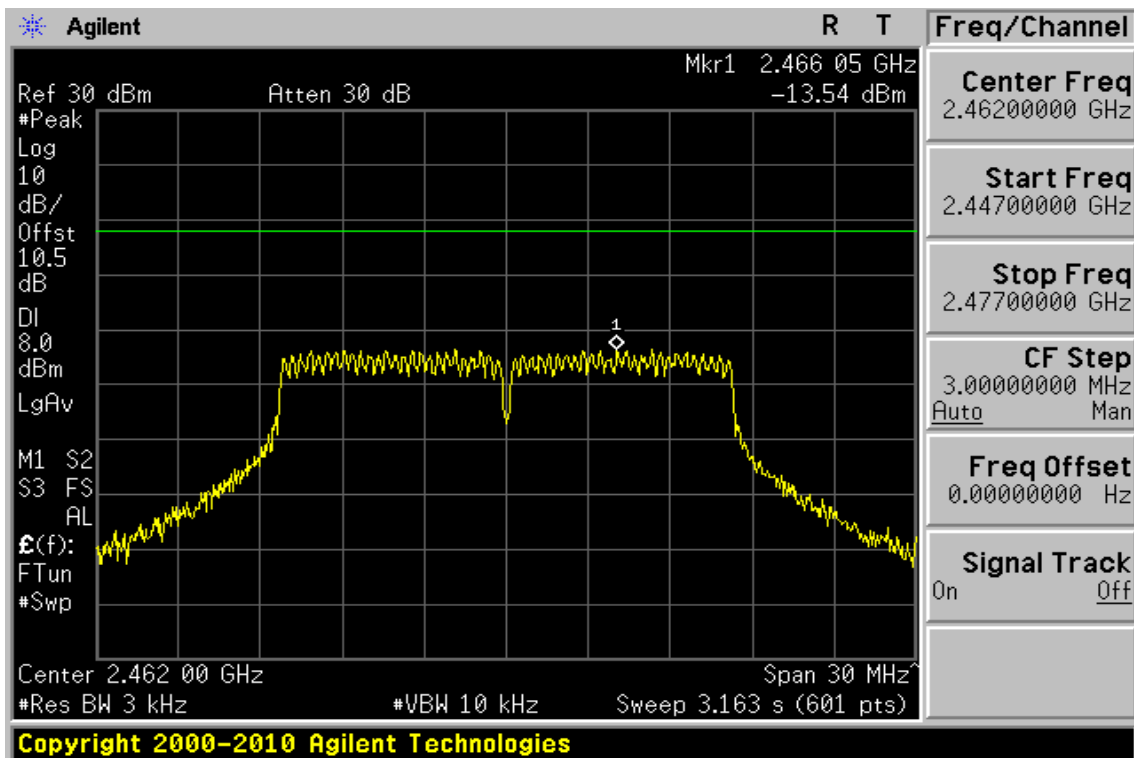
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Power Spectral Density Test Plot (CH-Mid)



Power Spectral Density Test Plot (CH-High)



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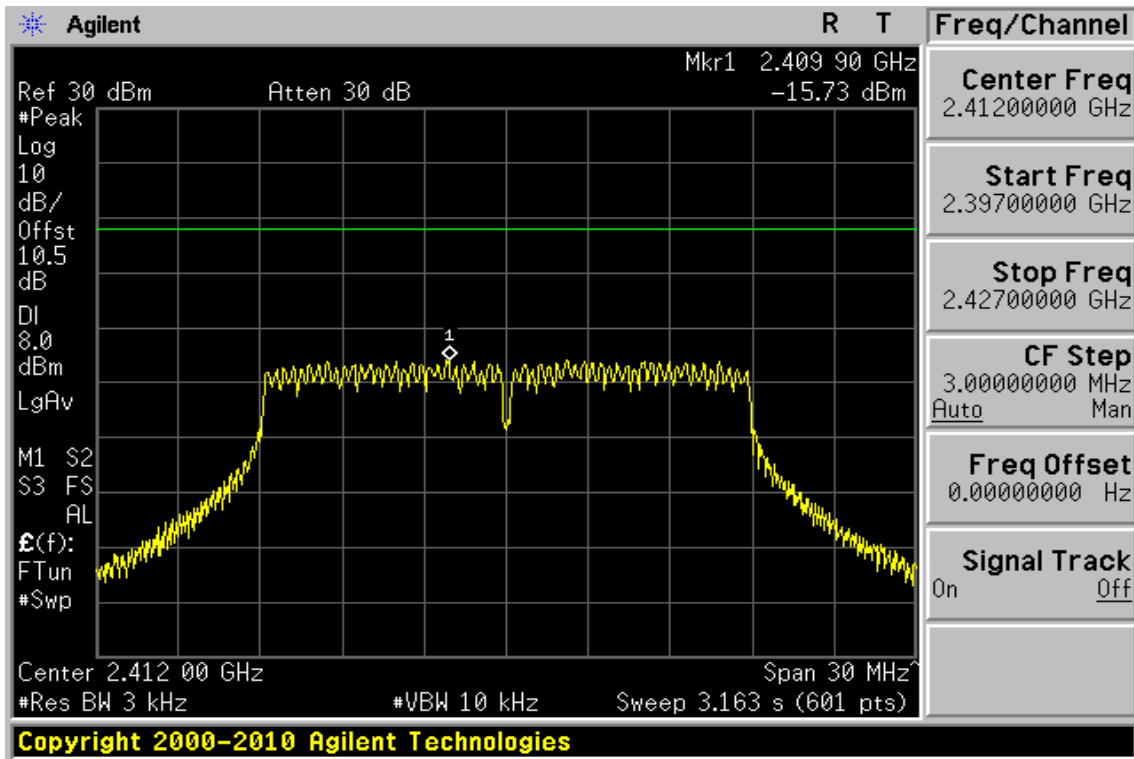
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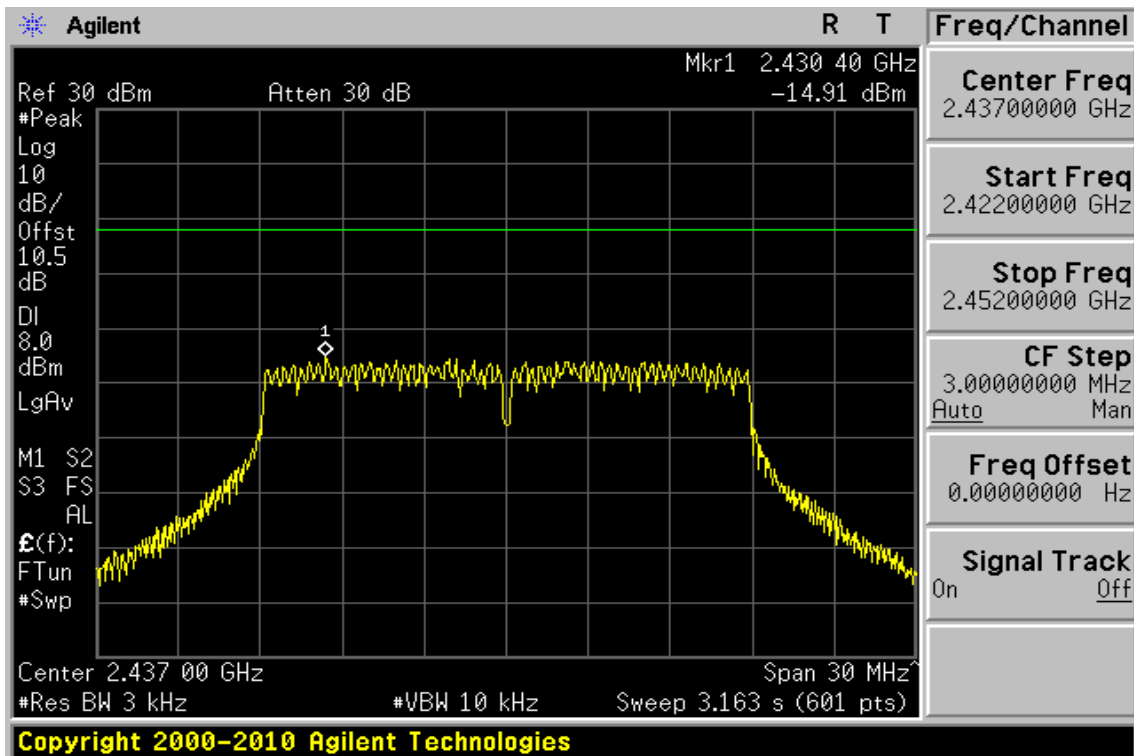
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802.11n_20M

Power Spectral Density Test Plot (CH-Low)



Power Spectral Density Test Plot (CH-Mid)



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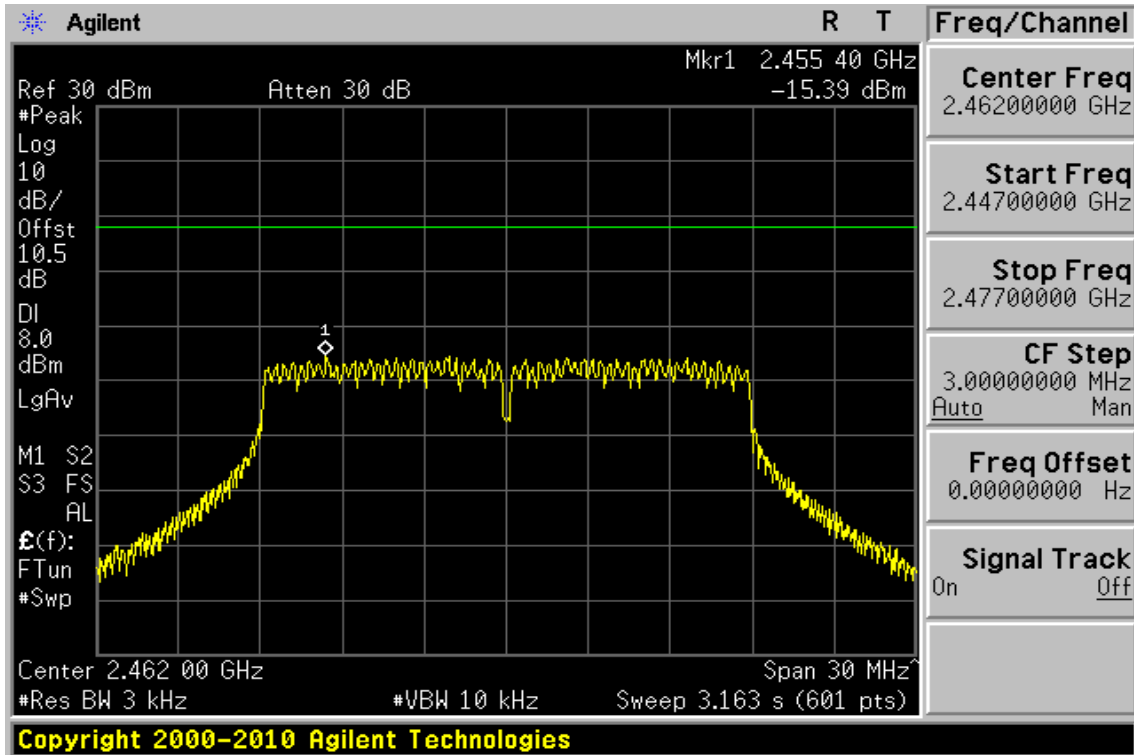
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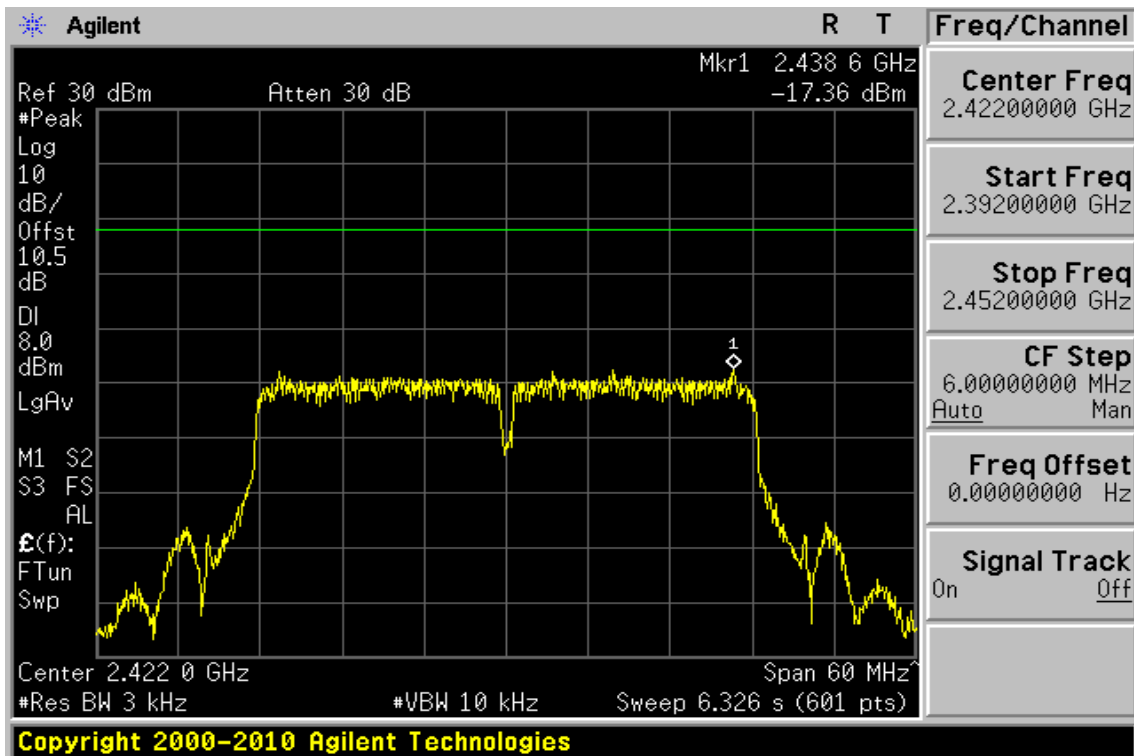
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Power Spectral Density Test Plot (CH-High)



802.11n_40M

Power Spectral Density Test Plot (CH-Low)



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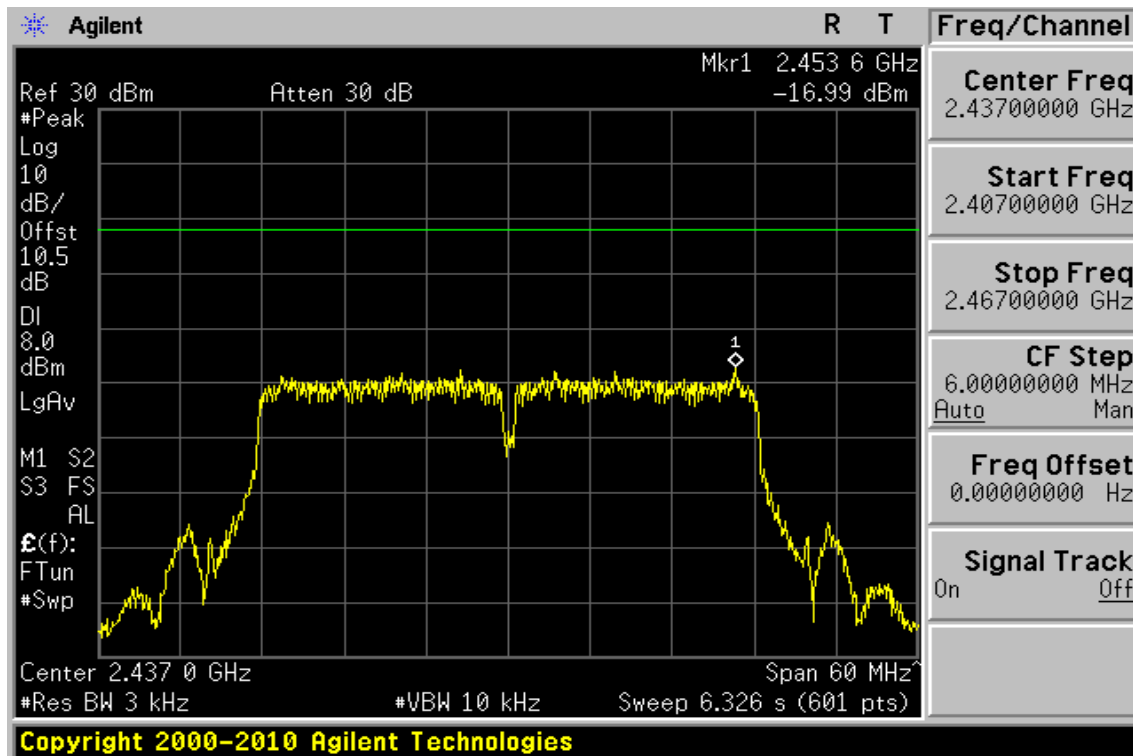
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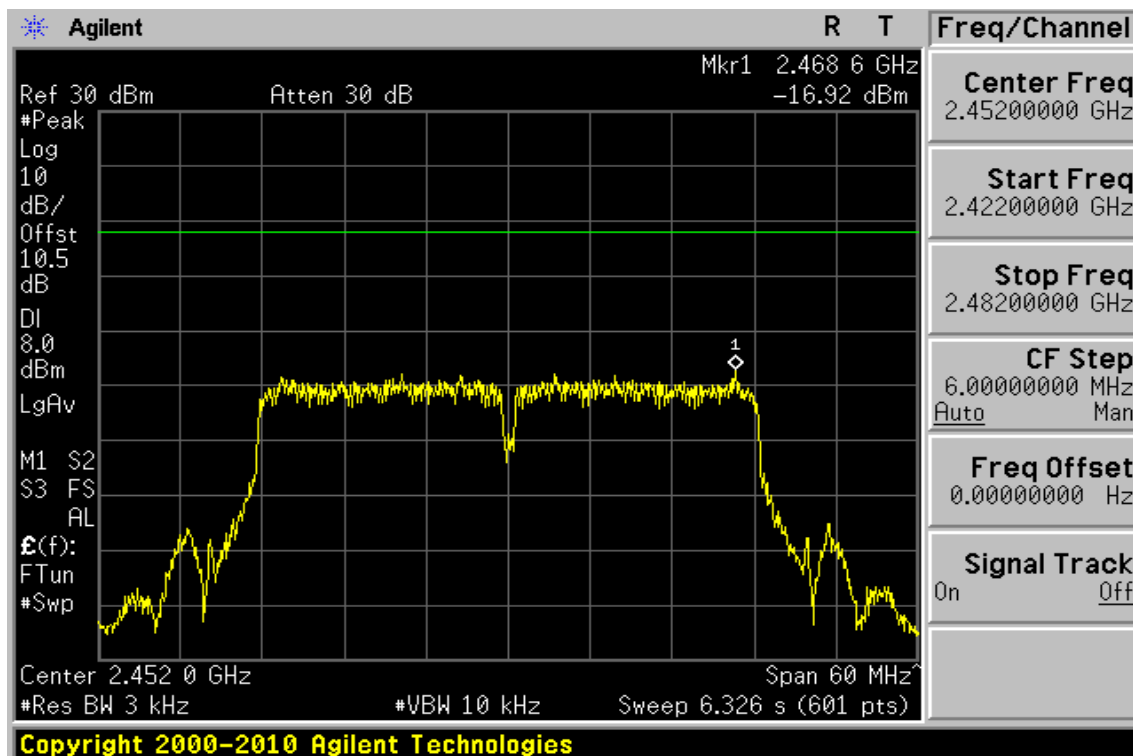
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Power Spectral Density Test Plot (CH-Mid)



Power Spectral Density Test Plot (CH-High)



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12 ANTENNA REQUIREMENT

12.1 Standard Applicable:

According to §15.203, Antenna requirement.

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

12.2 Antenna Connected Construction:

The directional gains of antenna used for transmitting is 0.5 dBi, and the antenna connector is designed with unique type RF connector and no consideration of replacement. Please see EUT photo and antenna spec. for details.

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