RF TEST REPORT

Test item	:	IP network camera
Model No.	:	2GIG-CAM-HD100
Order No.	:	DEMC1211-02511, DEMC1211-02512
Date of receipt	:	2012-11-13
Test duration	:	2012-11-28 ~ 2012-12-11
Date of issue	:	2012-12-21
Use of report	:	FCC & IC Original Grant

Applicant : 2GIG Technologies, Inc.
2961 W. Maple Loop Dr., Lehi, UT 84043, USA

Test laboratory : Digital EMC Co., Ltd.
683-3, Yubang-Dong, Cheoin-Gu, Yongin-Si, Kyunggi-Do, 449-080, Korea

Test specification	:	FCC Part 15 Subpart C 247 RSS-210 Issue 8
Test environment	:	See appended test report
Test result	:	☒ Pass ☐ Fail

Tested by:	Witnessed by:	Reviewed by:
Engineer JaeJin Lee	N/A	Technical Director Harvey Sung

Test Report Version

Test Report No.	Date	Description
DRTFCC1212-0891	Dec. 21, 2012	Final version for approval

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1. GENERAL INFORMATION

Applicant	:	2GIG Technologies, Inc.
Address	:	2961 W. Maple Loop Dr. Lehi, UT 84043, USA
FCC ID	:	WDQ-CAMHD100
IC ID	:	7794A-CAMHD100
EUT	:	IP network camera
Model	:	2GIG-CAM-HD100
Additional Model(s)	:	N/A
Data of Test	:	2012-11-28 ~ 2012-12-11
Contact person	:	Greg Hansen

2. EUT DESCRIPTION

Product	IP network camera
Model Name	2GIG-CAM-HD100
Power Supply	DC 12V
Frequency Range	802.11b/g/n(20MHz): 2412 ~ 2462 MHz 802.11n(40MHz): 2422~2452 MHz
Max. RF Output Power	802.11b: 19.23 dBm 802.11g: 23.32 dBm 802.11n(HT20): 21.67 dBm 802.11n(HT40): 21.79 dBm
Modulation Type	802.11b: DSSS/CCK 802.11g/n: OFDM
Antenna Specification	Antenna Type: Internal PIFA antenna Gain: 0.77 dBi(PK)

3. SUMMARY OF TESTS

FCC Part Section(s)	RSS Section(s)	Parameter	Limit	Test Condition	Status Note 1
I. Transmitter Mode (TX)					
15.247(a)	RSS-210 [A8.2]	6 dB Bandwidth	> 500 kHz	Conducted	**C**
15.247(b)	RSS-210 [A8.4]	Transmitter Output Power	< 1Watt		**C**
15.247(c)	RSS-210 [A8.5]	Out of Band Emissions / Band Edge	20dBc in any 100kHz BW		**NT Note 2**
15.247(d)	RSS-210 [A8.2]	Transmitter Power Spectral Density	< 8dBm / 3kHz		**NT Note 2**
-	RSS Gen Issue 3	Occupied Bandwidth (99%)	RSS-Gen(4.6.1)		**C**
15.205 15.209	RSS-210 [A8.5]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	< FCC 15.209 limits	Radiated	**C Note.3**
15.207	RSS-Gen [7.2.4]	AC Conducted Emissions	< FCC 15.207 limits	AC Line Conducted	**C**
15.203	RSS-Gen [7.1.2]	Antenna Requirements	FCC 15.203	-	**C**

Note 1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable

Note 2: This device uses the granted module.(FCC ID: YZP-TWFMKB304D, IC ID: 7414C-TWFMB304D)
Therefore these test items was not performed.

Note 3: This test item was performed in each axis and the worst case data was reported.

4. TEST METHODOLOGY

The measurement procedure described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2009) and KDB558074

4.1 EUT CONFIGURATION

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

4.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

4.3 GENERAL TEST PROCEDURES

Conducted Emissions

According to the requirements in Section 6.2 of ANSI C63.10, the EUT is placed on the turntable, which is 0.8 m above ground plane and the conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and Average detector.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m 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 highest emission, the relative positions of the EUT were rotated through three orthogonal axes according to the requirements in Section 6.3 of ANSI C63.10.

4.4 DESCRIPTION OF TEST MODES

The EUT has been tested with all modes of operating conditions to determine the worst case emission characteristics. A test program is used to control the EUT for staying in continuous transmitting mode.

5. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.

6. FACILITIES AND ACCREDITATIONS

6.1 FACILITIES

The open area test site(OATS) or semi anechoic chamber and conducted measurement facility used to collect the radiated and conducted test data are located at the 683-3, Yubang-Dong, Yongin-Si, Gyunggi-Do, 449-080, South Korea. The site is constructed in conformance with the requirements.

- Semi anechoic chamber registration Number : 678747

6.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and peak, quasi-peak detectors are used to perform radiated measurements. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.
All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

7. ANTENNA REQUIREMENTS

According to FCC 47 CFR §15.203 & RSS-Gen [7.1.2]
“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 antennas of this E.U.T are permanently attached.
* Therefore this E.U.T Complies with the requirement of §15.203

8. TEST RESULT

8.1 6dB Bandwidth Measurement

Test Requirements and limit, §15.247(d) & RSS-210 [A8.2]

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequencies.

The minimum permissible 6dB bandwidth is 500 kHz.

▣ TEST CONFIGURATION

Refer to the APPENDIX I.

▣ TEST PROCEDURE

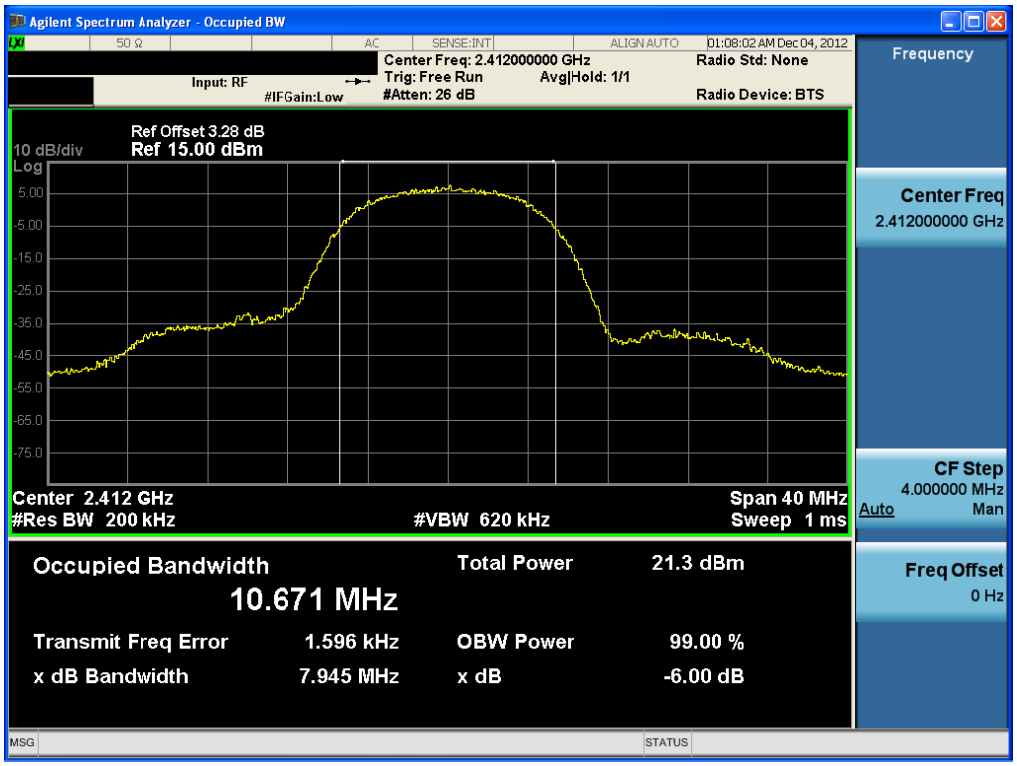
The transmitter output is connected to the Spectrum Analyzer and used following test procedure of KDB558074.

1. Set resolution bandwidth (RBW) = 1-5% of DTS BW.
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
   (RBW:200KHz/VBW:620KHz for EBW < 20 MHz , RBW:390KHz/VBW:1.2MHz for 20 MHz < EBW < 40 MHz)
3. Detector = **Peak**.
4. Trace mode = **max hold**.
5. Sweep = **auto couple**.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. Compare the resultant bandwidth with the RBW setting of the analyzer.

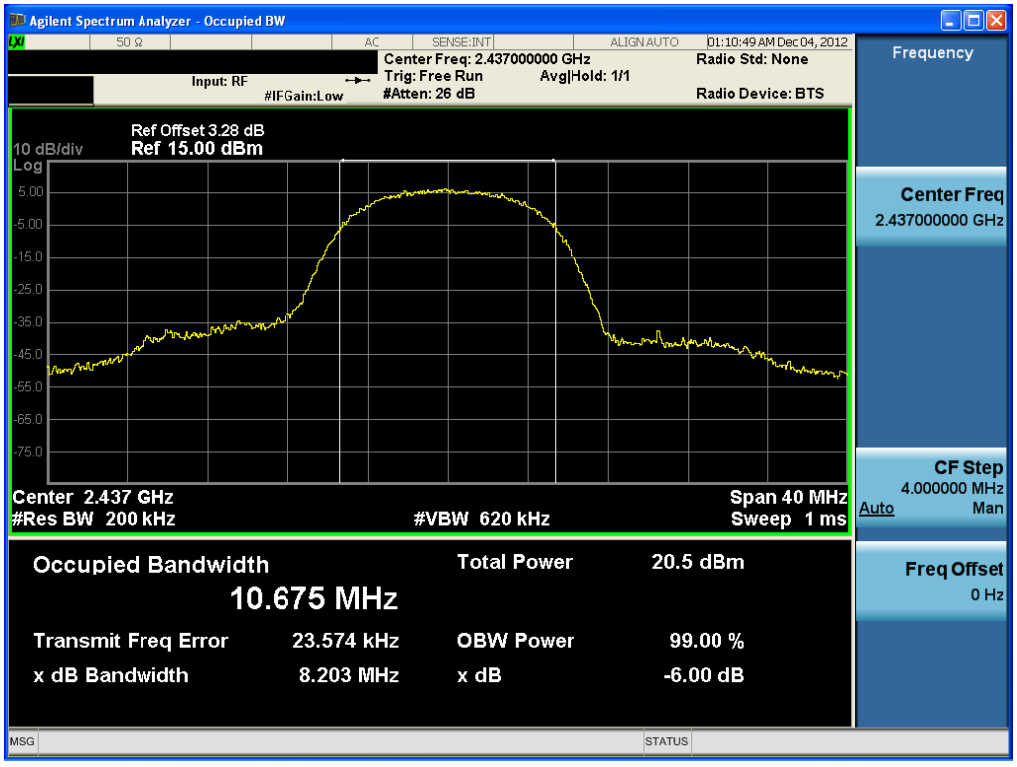
▣ TEST RESULTS: Comply

Test Mode	Data Rate	Frequency [MHz]	Test Results [MHz]
802.11b	11Mbps	2412	7.945
		2437	8.203
		2462	8.153
802.11g	54Mbps	2412	15.790
		2437	15.520
		2462	15.730
802.11n (20MHz)	MCS7	2412	17.300
		2437	17.470
		2462	17.380
802.11n (40MHz)	MCS7	5745	36.560
		5785	36.500
		5825	36.580

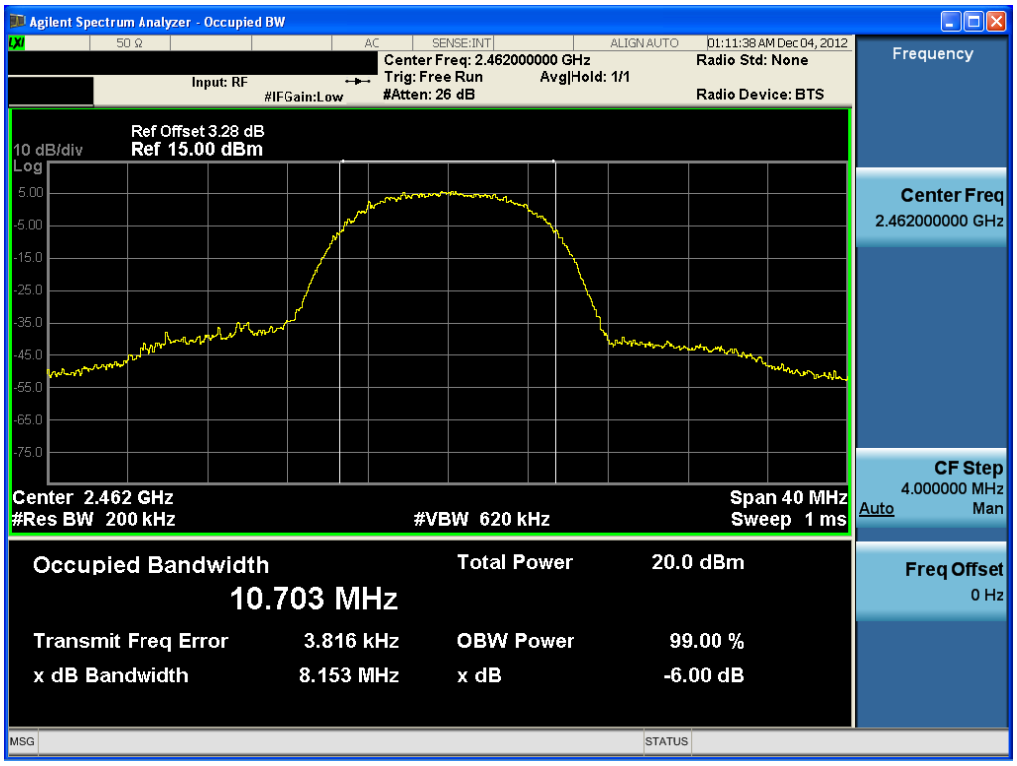
6dB Bandwidth 802.11b & 11Mbps & 2412MHz



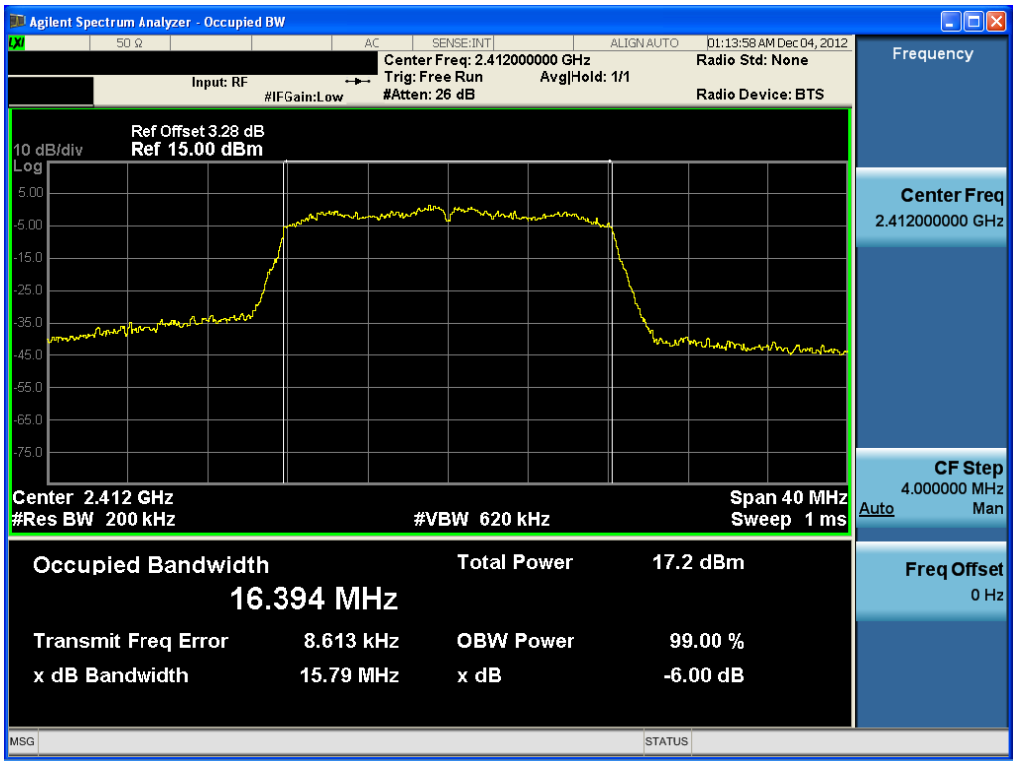
6dB Bandwidth 802.11b & 11Mbps & 2437MHz



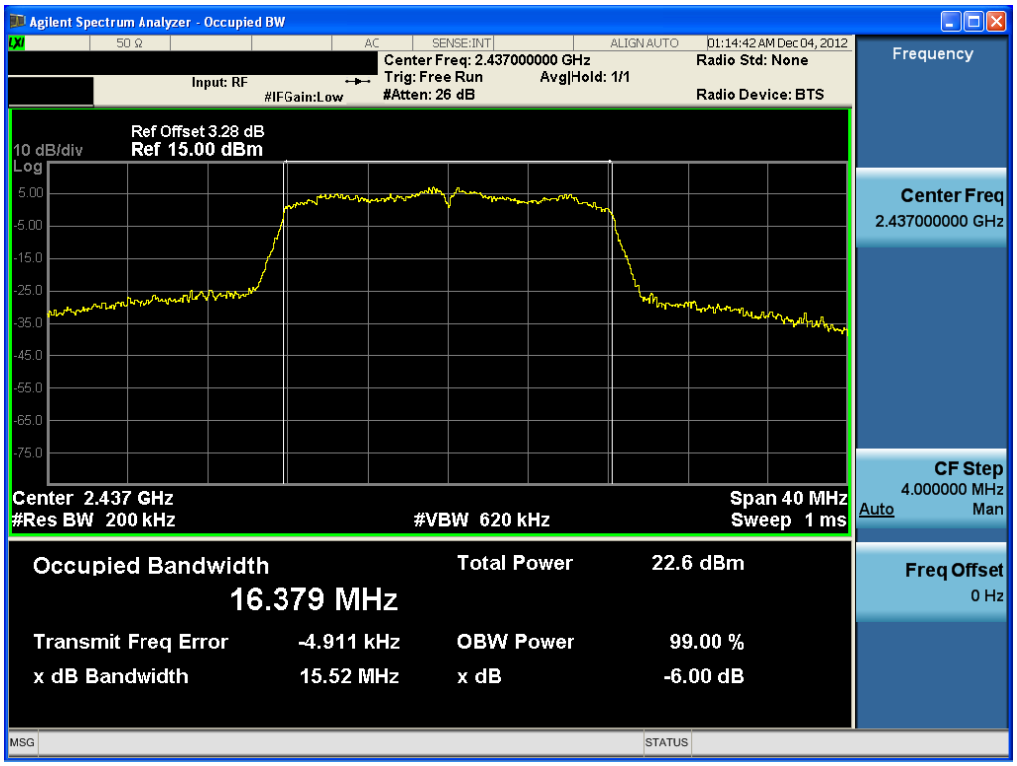
6dB Bandwidth 802.11b & 11Mbps & 2462MHz



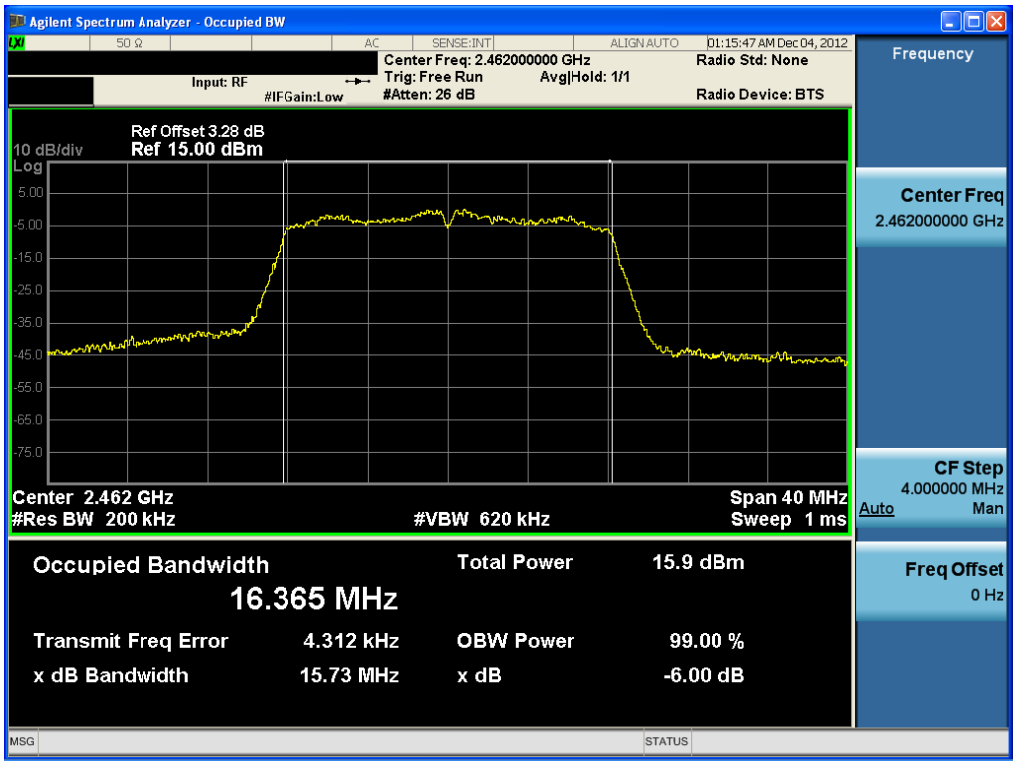
6dB Bandwidth 802.11g & 54Mbps & 2412MHz



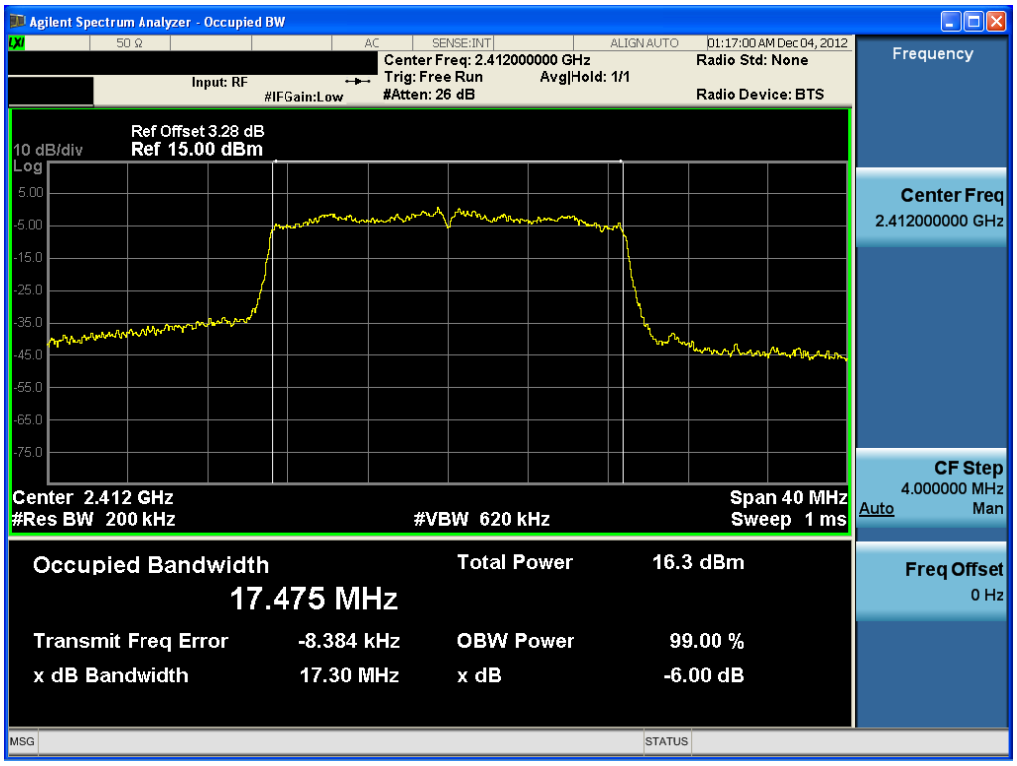
6dB Bandwidth 802.11g & 54Mbps & 2437MHz



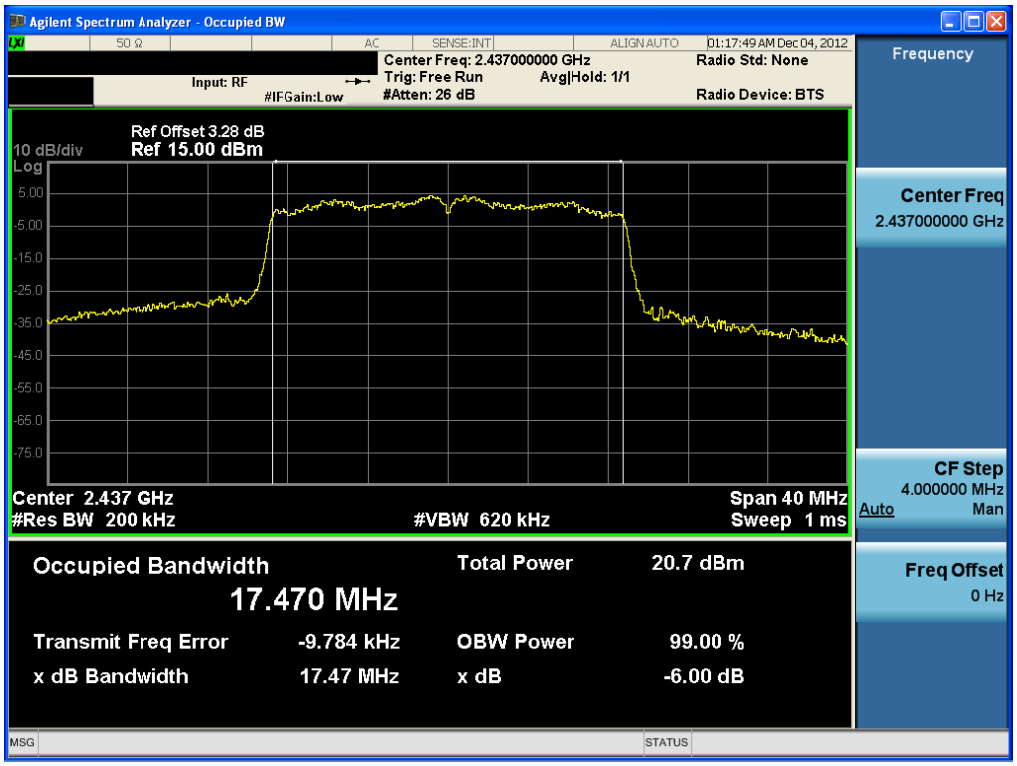
6dB Bandwidth 802.11g & 54Mbps & 2462MHz



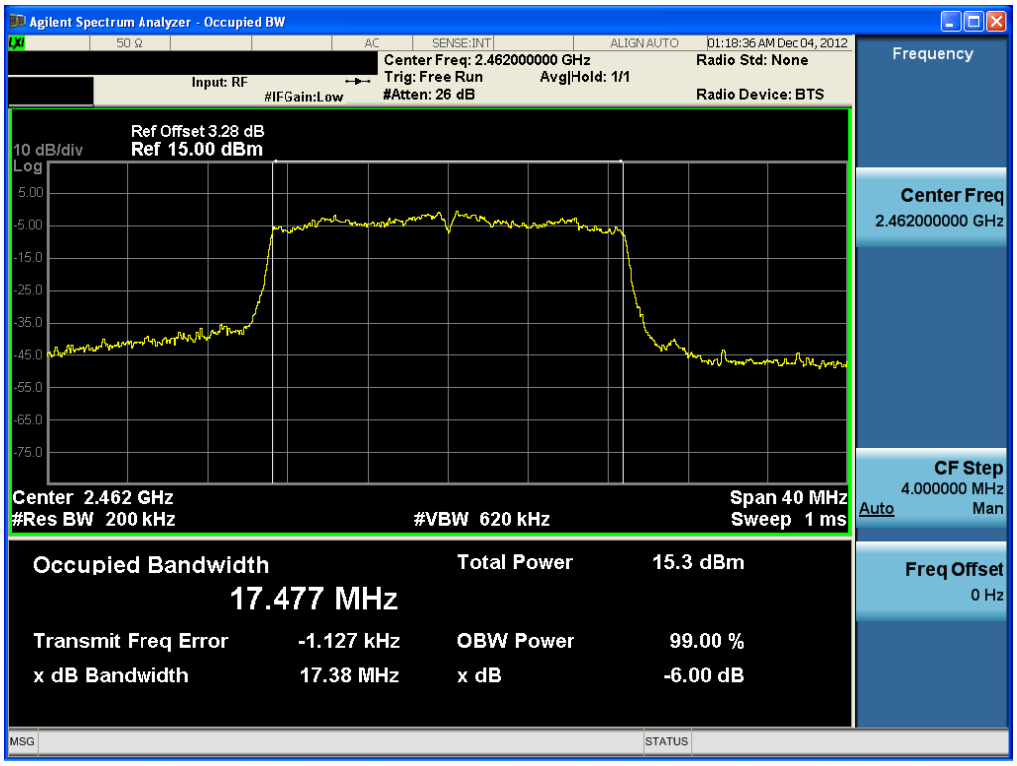
6dB Bandwidth 802.11n(HT20) & MCS 7 & 2412MHz



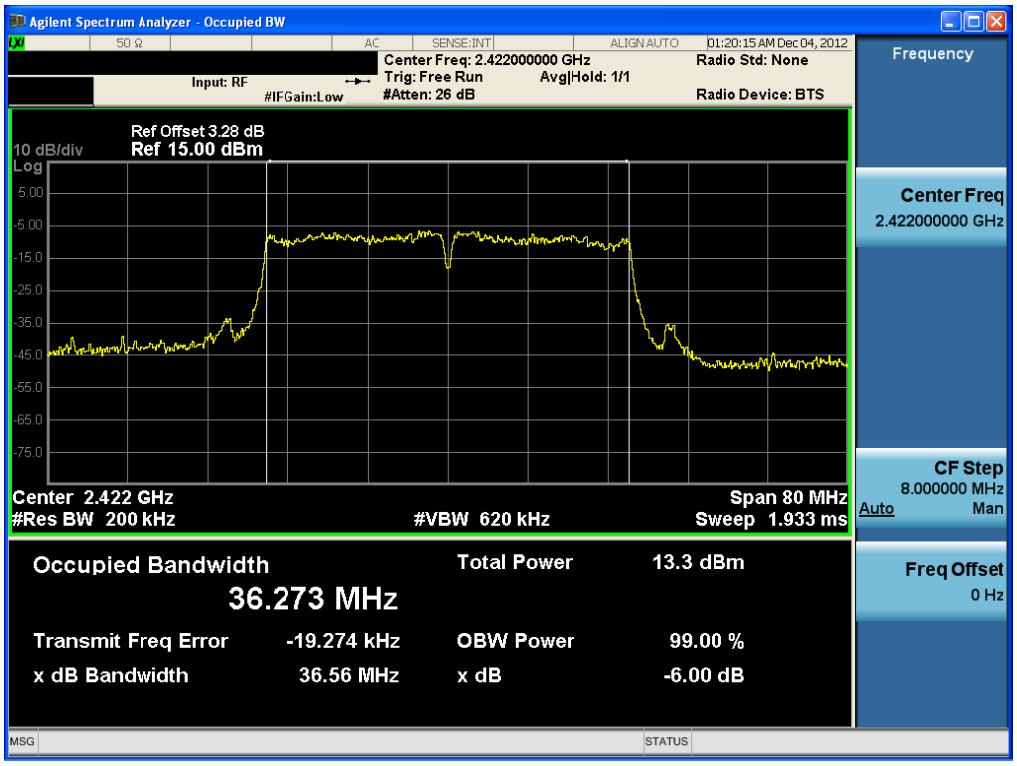
6dB Bandwidth 802.11n(HT20) & MCS 7 & 2437MHz



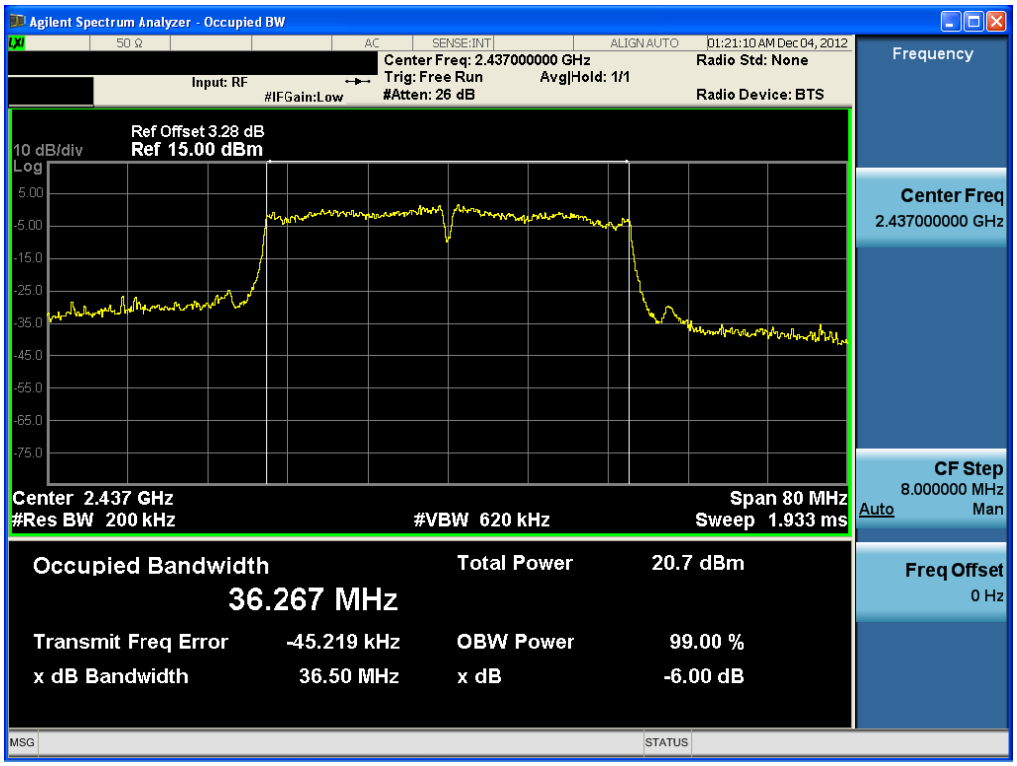
6dB Bandwidth 802.11n(HT20) & MCS 7 & 2462MHz



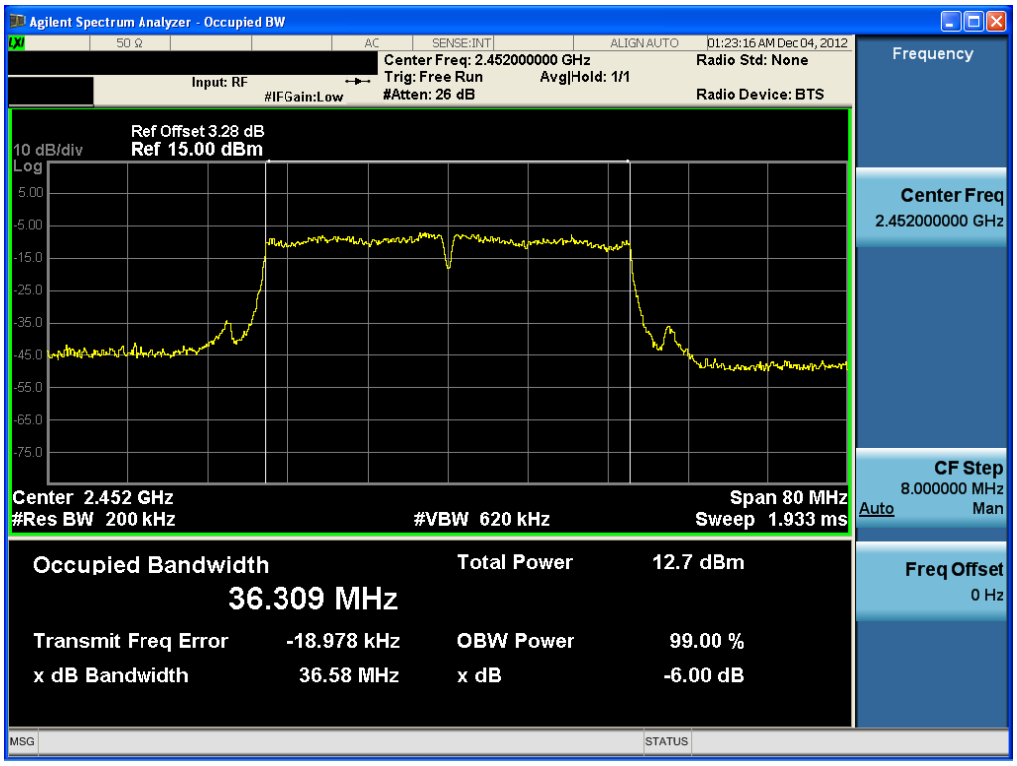
6dB Bandwidth 802.11n(HT40) & MCS 7 & 2422MHz



6dB Bandwidth 802.11n(HT40) & MCS 7 & 2437MHz



6dB Bandwidth 802.11n(HT40) & MCS 7 & 2452MHz



8.2 Maximum Peak Conducted Output Power

Test Requirements and limit, §15.247(d) & RSS-210 [A8.4]

A transmitter antenna terminal of EUT is connected to the input of a spectrum analyzer.

Measurement is made while the EUT is operating in transmission mode at the appropriate frequencies.

The maximum permissible conducted output power is 1 Watt.

▣ TEST CONFIGURATION

Refer to the APPENDIX I.

▣ TEST PROCEDURE:

Maximum Peak Conducted Output Power is measured using Measurement Procedure PK2 of KDB558074.

1. Set the RBW = maximum available (at least 1 MHz).
2. Set the VBW = 3 x RBW or maximum available setting (must be ≥ RBW)
3. Set the span to fully encompass the DTS bandwidth.
4. Detector = **peak.**
5. Sweep time = **auto couple.**
6. Trace mode = **max hold.**
7. Allow trace to fully stabilize.
8. Use the spectrum analyzer's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges (for some analyzers, this may require a manual override to ensure use of peak detector). If the spectrum analyzer does not have a band power function, sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the DTS channel bandwith.

▣ TEST RESULTS: Comply

Test Mode	Data Rate	Frequency [MHz]	Test Results[dBm]	
			Module (FCC ID: YZP-TWFMKB304D)	EUT (FCC ID: WDQ-CAMHD100)
802.11b	11Mbps	2412	***20.93***	***19.23***
		2437	20.82	18.58
		2462	20.85	18.15
802.11g	54Mbps	2412	19.57	18.03
		2437	***24.74***	***23.32***
		2462	19.50	16.57
802.11n(HT20)	MCS 7	2412	18.29	17.47
		2437	***22.96***	***21.67***
		2462	18.15	16.38
802.11n(HT40)	MCS 7	2422	15.61	14.59
		2437	***23.08***	***21.79***
		2452	15.86	14.02

Output Power 802.11b & 11Mbps & 2412MHz

Output Power 802.11b & 11Mbps & 2437MHz

Output Power 802.11b & 11Mbps & 2462MHz

Output Power 802.11g & 54Mbps & 2412MHz

Output Power 802.11g & 54Mbps & 2437MHz

Output Power 802.11g & 54Mbps & 2462MHz

Output Power 802.11n(HT20) & MCS 7 & 2412MHz

Output Power 802.11n(HT20) & MCS 7 & 2437MHz

Output Power 802.11n(HT20) & MCS 7 & 2462MHz

Output Power 802.11n(HT40) & MCS 7 & 2422MHz

Output Power 802.11n(HT40) & MCS 7 & 2437MHz

Output Power 802.11n(HT40) & MCS 7 & 2452MHz

8.3 Maximum Power Spectral Density.

Test requirements and limit, §15.247(e) & RSS-210 [A8.2]

The peak power density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

Minimum Standard –specifies a conducted power spectral density (PSD) limit of 8 dBm in any 3 kHz band segment within the fundamental EBW during any time interval of continuous transmission.

▣ TEST CONFIGURATION

Refer to the APPENDIX I.

▣ TEST PROCEDURE:

The Measurement Procedure **Option 1 of KDB558074** is used.
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 ≥ **3 x 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.

▣ TEST RESULTS: Not Tested

Note: This device uses already certified module.(FCC ID: YZP-TWFMKB304D)
Therefore this test item was not performed.

8.4 Out of Band Emissions at the Band Edge/ Conducted Spurious Emissions

Test requirements and limit, §15.247(d)

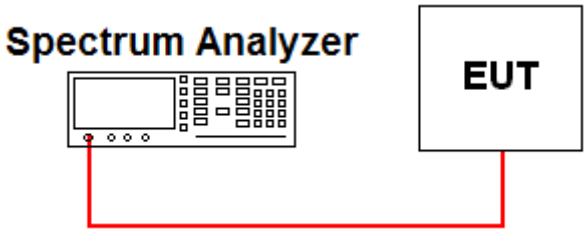
§15.247(d) specifies that in any 100 kHz bandwidth outside of the authorized frequency band, the power shall be attenuated according to the following conditions:

If **the peak output power procedure** is used to measure the fundamental emission power to demonstrate compliance to **15.247(b)(3)** requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated **by at least 20 dB** relative to the maximum measured in-band peak PSD level.

If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to **15.247(b)(3)** requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured inband average PSD level.

In either case, attenuation to levels below the general emission limits specified in **§15.209(a)** is not required.

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer.

- Measurement Procedure 1 – Reference Level

Establish the reference level by using the peak PSD procedure of KDB558074 to measure the PSD level in any 100 kHz bandwidth (i.e., set RBW = 100 kHz and VBW ≥ 300 kHz) within the DTS channel bandwidth (the channel found to contain the maximum PSD level can be used to establish the reference level).

- Measurement Procedure 2 - Unwanted Emissions

1. Set start frequency to DTS channel edge frequency.
2. Set stop frequency so as to encompass the spectrum to be examined.
3. Set RBW = **100 kHz**.
4. Set VBW ≥ **300 kHz**.
5. Detector = **peak**.
6. Trace Mode = **max hold**.
7. Sweep = **auto couple**.
8. **Allow the trace to stabilize** (this may take some time, depending on the extent of the span).
9. Use peak marker function to determine maximum amplitude of all unwanted emissions within any 100 kHz bandwidth.

▣ TEST RESULTS: Not Tested

Note: This device uses already certified module.(FCC ID: YZP-TWFMKB304D)

Therefore this test item was not performed.

8.5 Radiated Spurious Emissions

Test Requirements and limit, §15.247(d), §15.205, §15.209 & RSS-210 [A8.5], RSS-Gen [7.2.2]

In any 100kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a) and (b), then the 15.209(a) limit in the table below has to be followed

▪ **FCC Part 15.209(a) and (b)**

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

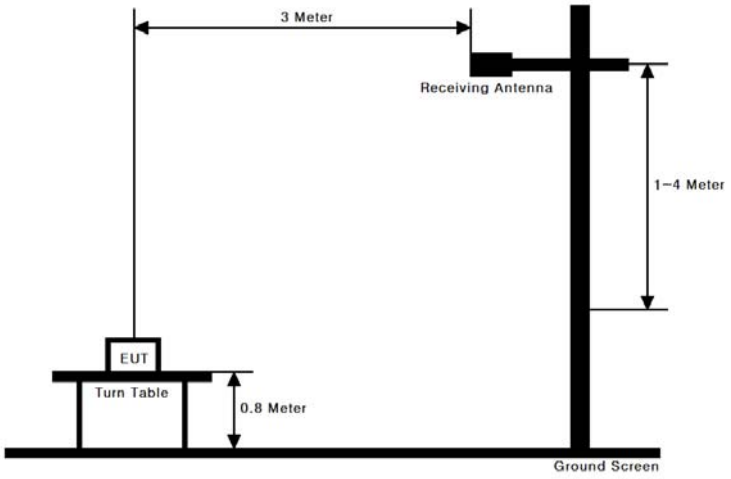
** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part,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

▪ **FCC Part 15.205 (a):** Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.41425 ~ 8.41475	108 ~ 121.94	1300 ~ 1427	3600 ~ 4400	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1435 ~ 1626.5	4.5 ~ 5.15	15.35 ~ 16.2
2.1735 ~ 2.1905	12.51975 ~	149.9 ~ 150.05	1645.5 ~ 1646.5	5.35 ~ 5.46	17.7 ~ 21.4
4.125 ~ 4.128	12.52025	156.52475 ~	1660 ~ 1710	7.25 ~ 7.75	22.01 ~ 23.12
4.17725 ~ 4.17775	12.57675 ~	156.52525	1718.8 ~ 1722.2	8.025 ~ 8.5	23.6 ~ 24.0
4.20725 ~ 4.20775	12.57725	156.7 ~ 156.9	2200 ~ 2300	9.0 ~ 9.2	31.2 ~ 31.8
6.215 ~ 6.218	13.36 ~ 13.41	162.0125 ~ 167.17	2310 ~ 2390	9.3 ~ 9.5	36.43 ~ 36.5
6.26775 ~ 6.26825	16.42 ~ 16.423	167.72 ~ 173.2	2483.5 ~ 2500	10.6 ~ 12.7	Above 38.6
6.31175 ~ 6.31225	16.69475 ~	240 ~ 285	2655 ~ 2900	13.25 ~ 13.4	
8.291 ~ 8.294	16.69525	322 ~ 335.4	3260 ~ 3267		
8.362 ~ 8.366	16.80425 ~	399.90 ~ 410	3332 ~ 3339		
8.37625 ~ 8.38675	16.80475	608 ~ 614	3345.8 ~ 3358		
	25.5 ~ 25.67	960 ~ 1240			
	37.5 ~ 38.25				
	73 ~ 74.6				
	74.8 ~ 75.2				

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

Test Configuration



TEST PROCEDURE

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

Note : Measurement Instrument Setting for Radiated Emission Measurements.

1. **Frequency Range Below 1 GHz**
   RBW = 100 or 120 KHz, VBW = 3 x RBW , Detector = Peak or Quasi Peak

2. **Frequency Range > 1 GHz**
   Peak Measurement
   RBW = 1 MHz , VBW = 3 MHz, Detector = Peak
   Average Measurement
   VBW = 10 Hz, When duty cycle is no less than 98 percent.
   VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

Band	Duty Cycle (%)	T_{on} (us)	$1/T_{on}$ (KHz)	Determined VBW Setting
802.11b	92.84	1.206	0.829	**1KHz**
802.11g	71.47	0.248	4.032	**5KHz**
802.11n(HT20)	68.25	0.215	4.651	**5KHz**
802.11n(HT40)	54.21	0.116	8.621	**9KHz**

Note: For average measurement with duty cycle < 98%, the reduced VBW measurement method of 4.2.3.2.3 in ANSI C63.10 is used.

30MHz ~ 25GHz Data(*802.11b & 11Mbps*)

▪ Lowest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
264.73	H	Z	QP	47.70	-8.50	39.20	46.00	6.80
2389.68	H	X	PK	62.53	-2.33	60.20	74.00	13.80
2390.00	H	X	AV	52.96	-2.33	50.63	54.00	3.37
3215.85	H	X	PK	50.04	1.12	51.16	74.00	22.84
3216.05	H	X	AV	44.10	1.12	45.22	54.00	8.78
4823.93	V	X	PK	50.34	6.21	56.55	74.00	17.45
4824.06	V	X	AV	46.89	6.21	53.10	54.00	0.90

▪ Middle Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
264.24	H	Z	QP	48.22	-8.50	39.72	46.00	6.28
3249.39	H	X	PK	50.21	1.28	51.49	74.00	22.51
3249.35	H	X	AV	44.79	1.28	46.07	54.00	7.93
4873.96	V	X	PK	50.66	6.60	57.26	74.00	16.74
4874.00	V	X	AV	46.52	6.60	53.12	54.00	0.88

▪ Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
264.48	H	Z	QP	47.65	-8.50	39.15	46.00	6.85
2483.52	H	X	PK	58.44	-2.24	56.20	74.00	17.80
2483.54	H	X	AV	47.20	-2.24	44.96	54.00	9.04
3282.79	H	X	PK	51.28	1.44	52.72	74.00	21.28
3282.73	H	X	AV	45.73	1.44	47.17	54.00	6.83
4924.36	V	X	PK	50.24	6.72	56.96	74.00	17.04
4924.05	V	X	AV	45.45	6.72	52.17	54.00	1.83

Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

30MHz ~ 25GHz Data(*802.11g & 54Mbps*)

▪ Lowest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
264.40	H	Z	QP	48.61	-8.50	40.11	46.00	5.89
2389.76	H	X	PK	73.89	-2.33	71.56	74.00	2.44
2389.84	H	X	AV	55.57	-2.33	53.24	54.00	0.76
3216.08	H	X	PK	49.84	1.12	50.96	74.00	23.04
3216.09	H	X	AV	43.78	1.12	44.90	54.00	9.10

▪ Middle Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
265.12	H	Z	QP	48.37	-8.50	39.87	46.00	6.13
3249.41	H	X	PK	49.56	1.28	50.84	74.00	23.16
3249.40	H	X	AV	44.21	1.28	45.49	54.00	8.51

▪ Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
265.36	H	Z	QP	48.06	-8.50	39.56	46.00	6.44
2483.71	H	X	PK	64.01	-2.24	61.77	74.00	12.23
2483.74	H	X	AV	50.95	-2.24	48.71	54.00	5.29
3282.77	H	X	PK	48.99	1.44	50.43	74.00	23.57
3282.75	H	X	AV	43.86	1.44	45.30	54.00	8.70

Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

30MHz ~ 25GHz Data(*802.11n HT20 & MCS 7*)

▪ Lowest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
264.89	H	Z	QP	47.90	-8.50	39.40	46.00	6.60
2389.44	H	X	PK	73.27	-2.33	70.94	74.00	3.06
2390.00	H	X	AV	54.93	-2.33	52.60	54.00	1.40
3216.18	H	X	PK	49.46	1.12	50.58	74.00	23.42
3216.07	H	X	AV	43.37	1.12	44.49	54.00	9.51

▪ Middle Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
264.70	H	Z	QP	47.75	-8.50	39.25	46.00	6.75
3249.35	H	X	PK	49.65	1.28	50.93	74.00	23.07
3249.36	H	X	AV	43.98	1.28	45.26	54.00	8.74

▪ Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
265.27	H	Z	QP	48.05	-8.50	39.55	46.00	6.45
2483.66	H	X	PK	65.10	-2.24	62.86	74.00	11.14
2483.51	H	X	AV	49.58	-2.24	47.34	54.00	6.66
3282.69	H	X	PK	50.18	1.44	51.62	74.00	22.38
3282.73	H	X	AV	44.10	1.44	45.54	54.00	8.46

Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

30MHz ~ 25GHz Data(*802.11n HT40 & MCS 7*)

▪ Lowest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
264.73	H	Z	QP	47.24	-8.50	38.74	46.00	7.26
2389.52	H	X	PK	73.08	-2.33	70.75	74.00	3.25
2389.84	H	X	AV	54.49	-2.33	52.16	54.00	1.84
3229.36	H	X	PK	49.92	1.12	51.04	74.00	22.96
3229.39	H	X	AV	42.29	1.12	43.41	54.00	10.59

▪ Middle Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
264.85	H	Z	QP	46.95	-8.50	38.45	46.00	7.55
3249.32	H	X	PK	48.32	1.28	49.60	74.00	24.40
3249.39	H	X	AV	42.28	1.28	43.56	54.00	10.44

▪ Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
265.04	H	Z	QP	47.42	-8.50	38.92	46.00	7.08
2484.87	H	X	PK	65.93	-2.24	63.69	74.00	10.31
2483.50	H	X	AV	51.89	-2.24	49.65	54.00	4.35
3249.63	H	X	PK	49.09	1.44	50.53	74.00	23.47
3249.41	H	X	AV	42.75	1.44	44.19	54.00	9.81

Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

8.6 POWERLINE CONDUCTED EMISSIONS

Test Requirements and limit, §15.247(d) & RSS-Gen [7.2.4]

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

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

* Decreases with the logarithm of the frequency

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

Test Configuration

See test photographs for the actual connections between EUT and support equipment.

TEST PROCEDURE

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.

▣ RESULT PLOTS

AC Line Conducted Emissions (Graph)

Test Mode: 802.11n(HT20) & MCS 7 & 2437MHz

Digital EMC

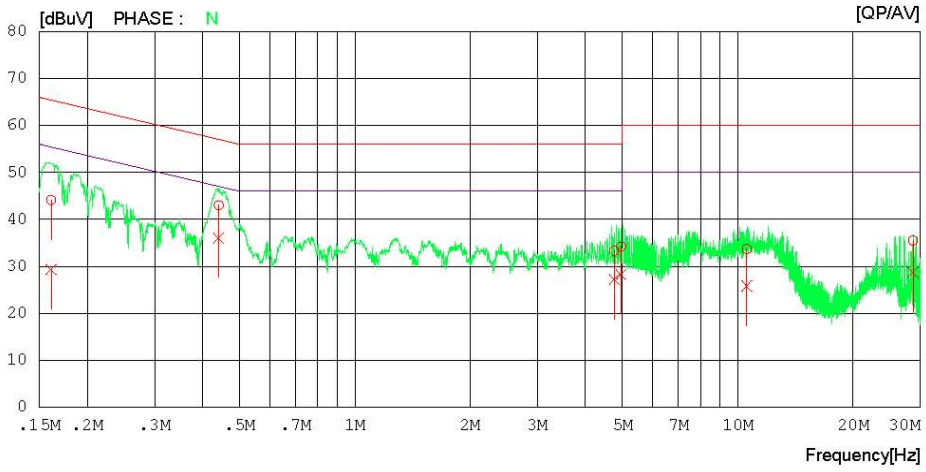
Results of Conducted Emission

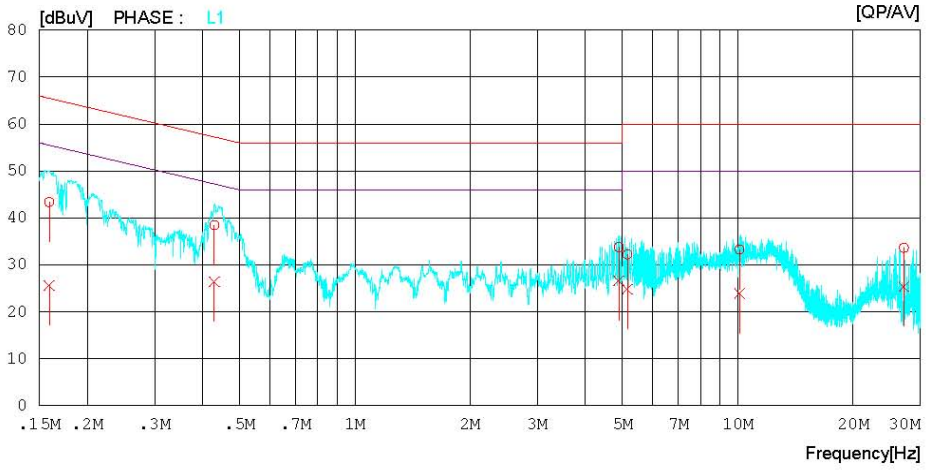
Digital EMC
Date : 2012-12-07

Model No.	:	HD100	Referrence No.	:	
Type	:		Power Supply	:	120 V 60 Hz
Serial No.	:	Identical prototype	Temp/Humi.	:	24 'C 40 % R.H.
Test Condition	:	WLAN	Operator	:	J.J.LEE

Memo : 802.11n(HT20)

LIMIT : CISPR22_B QP
CISPR22_B AV





AC Line Conducted Emissions (List)

Test Mode: 802.11n(HT20) & MCS 7 & 2437MHz

Results of Conducted Emission

Digital EMC
Date : 2012-12-07

Model No.	:	HD100	Referrence No.	:	
Type	:		Power Supply	:	120 V 60 Hz
Serial No.	:	Identical prototype	Temp/Humi.	:	24 'C 40 % R.H.
Test Condition	:	WLAN	Operator	:	J.J.LEE

Memo : 802.11n(HT20)

LIMIT : CISPR22_B QP
CISPR22_B AV

NO	FREQ	READING QP	READING AV	C.FACTOR	RESULT QP	RESULT AV	LIMIT QP	LIMIT AV	MARGIN QP	MARGIN AV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.16098	43.9	29.1	0.2	44.1	29.3	65.4	55.4	21.3	26.1	N
2	0.44111	42.8	35.9	0.2	43.0	36.1	57.0	47.0	14.0	10.9	N
3	4.75900	32.9	26.8	0.4	33.3	27.2	56.0	46.0	22.7	18.8	N
4	4.95800	33.8	27.9	0.4	34.2	28.3	56.0	46.0	21.8	17.7	N
5	10.56650	33.0	25.1	0.7	33.7	25.8	60.0	50.0	26.3	24.2	N
6	28.68600	34.5	27.7	1.0	35.5	28.7	60.0	50.0	24.5	21.3	N
7	0.15916	43.2	25.4	0.2	43.4	25.6	65.5	55.5	22.1	29.9	L1
8	0.42960	38.3	26.2	0.2	38.5	26.4	57.3	47.3	18.8	20.9	L1
9	4.89150	33.4	26.3	0.4	33.8	26.7	56.0	46.0	22.2	19.3	L1
10	5.15350	31.8	24.4	0.4	32.2	24.8	60.0	50.0	27.8	25.2	L1
11	10.10950	32.6	23.2	0.7	33.3	23.9	60.0	50.0	26.7	26.1	L1
12	27.15800	32.6	24.4	1.0	33.6	25.4	60.0	50.0	26.4	24.6	L1

8.7 Occupied Bandwidth (99%)

Test Requirements, RSS-Gen [4.6.1]

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

▣ TEST CONFIGURATION

Refer to the APPENDIX I.

▣ TEST PROCEDURE

The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%.
The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted.
Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual.

- Measurement Data: Comply

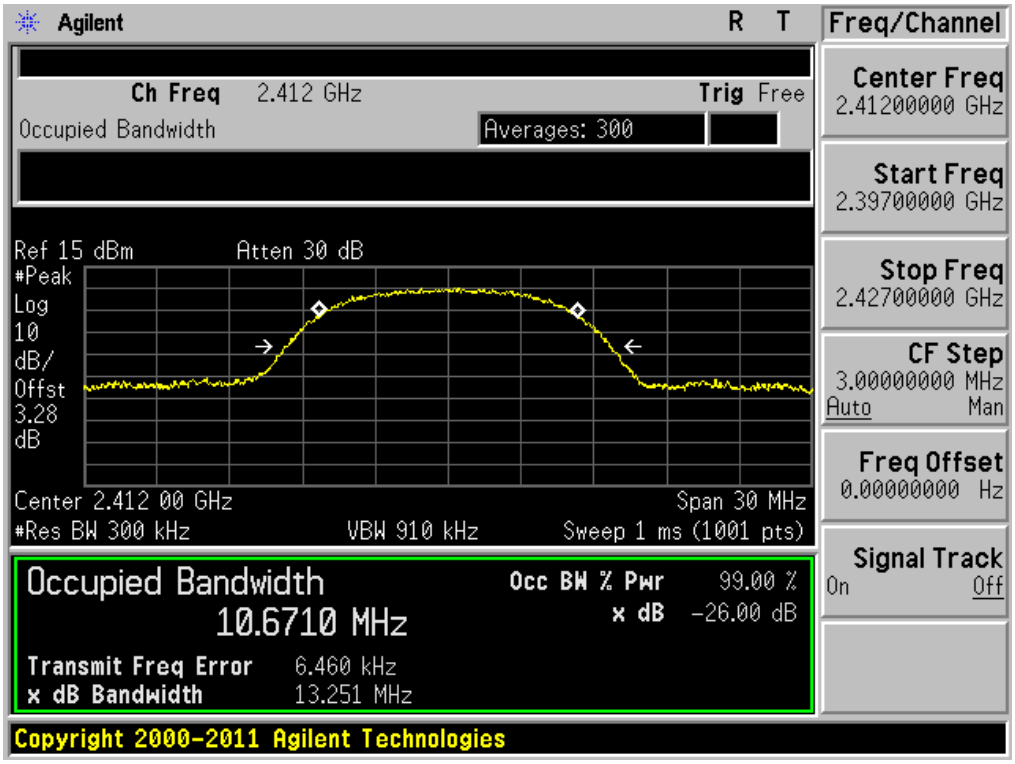
Test Mode	Tested Channel	Test Results (MHz)
802.11b	**Lowest**	10.6710
	Middle	**10.6903**
	Highest	10.6334
802.11g	**Lowest**	16.3437
	Middle	16.4080
	Highest	**16.4097**
802.11n (20MHz)	**Lowest**	17.5057
	Middle	**17.5127**
	Highest	17.4466
802.11n (40MHz)	**Lowest**	36.3239
	Middle	36.2635
	Highest	**36.3385**

Note 1: See next pages for actual measured spectrum plots.

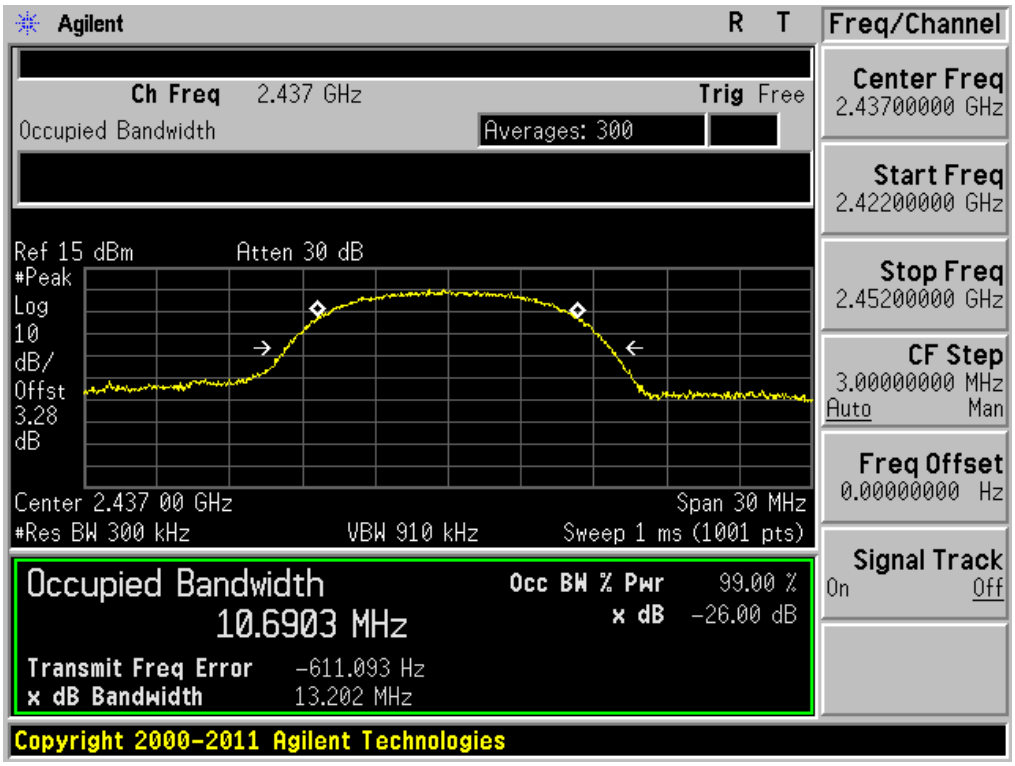
- Minimum Standard:

N/A

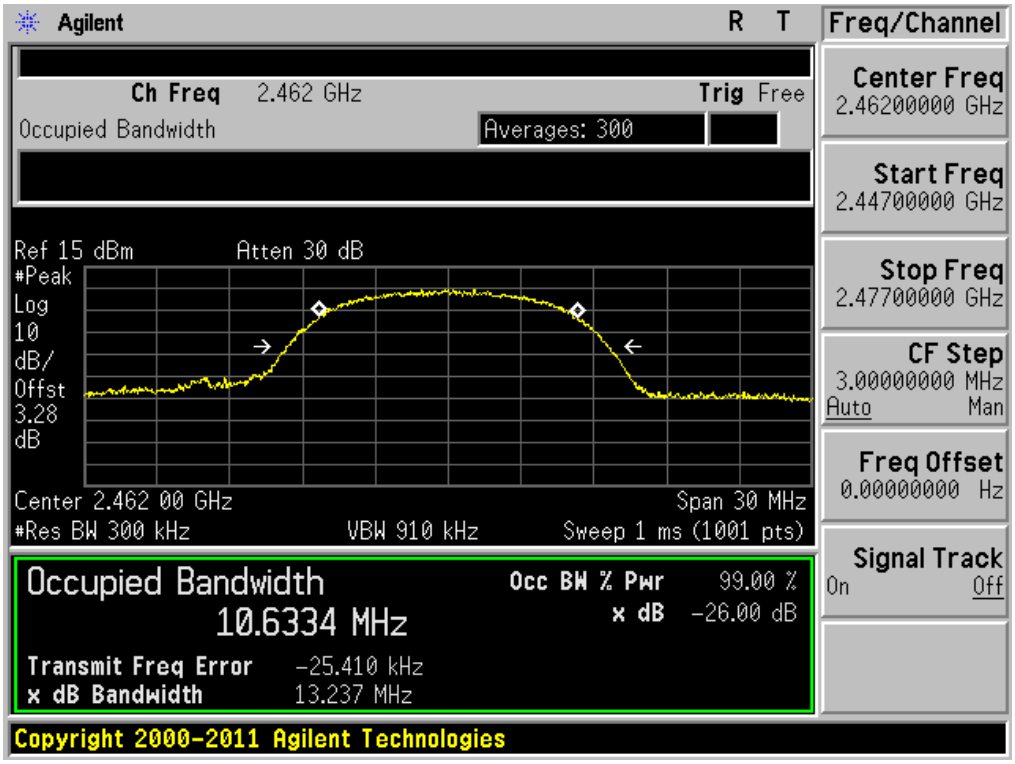
Occupied Bandwidth (99%) 802.11b & 11Mbps & 2412MHz



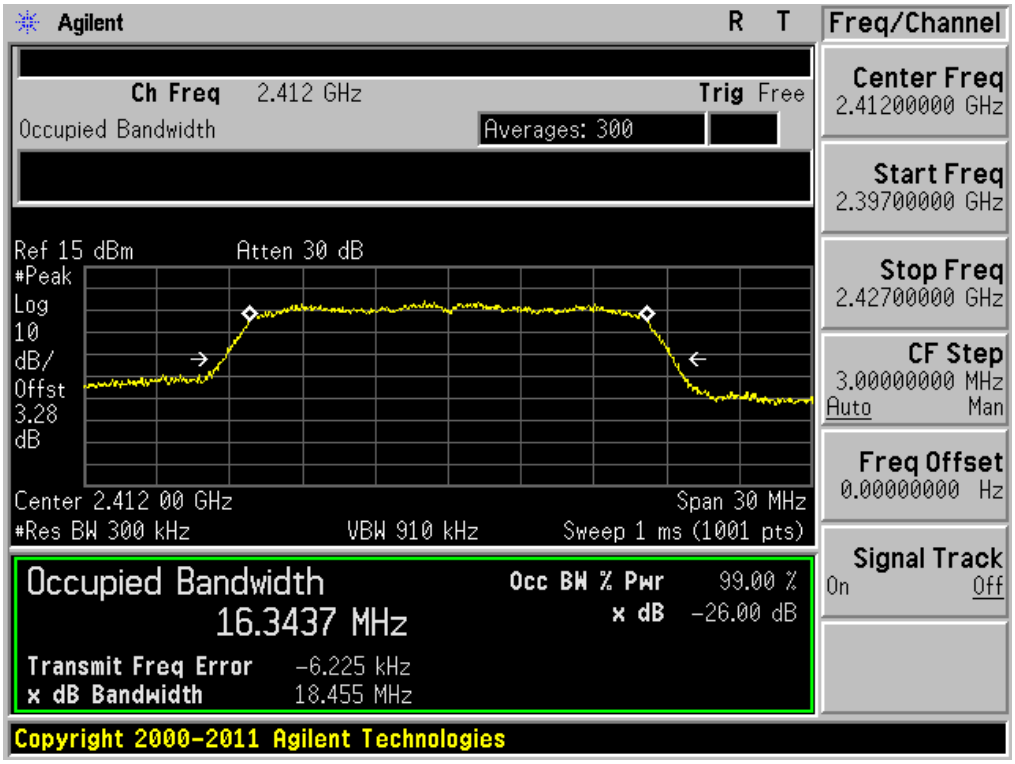
Occupied Bandwidth (99%) 802.11b & 11Mbps & 2437MHz



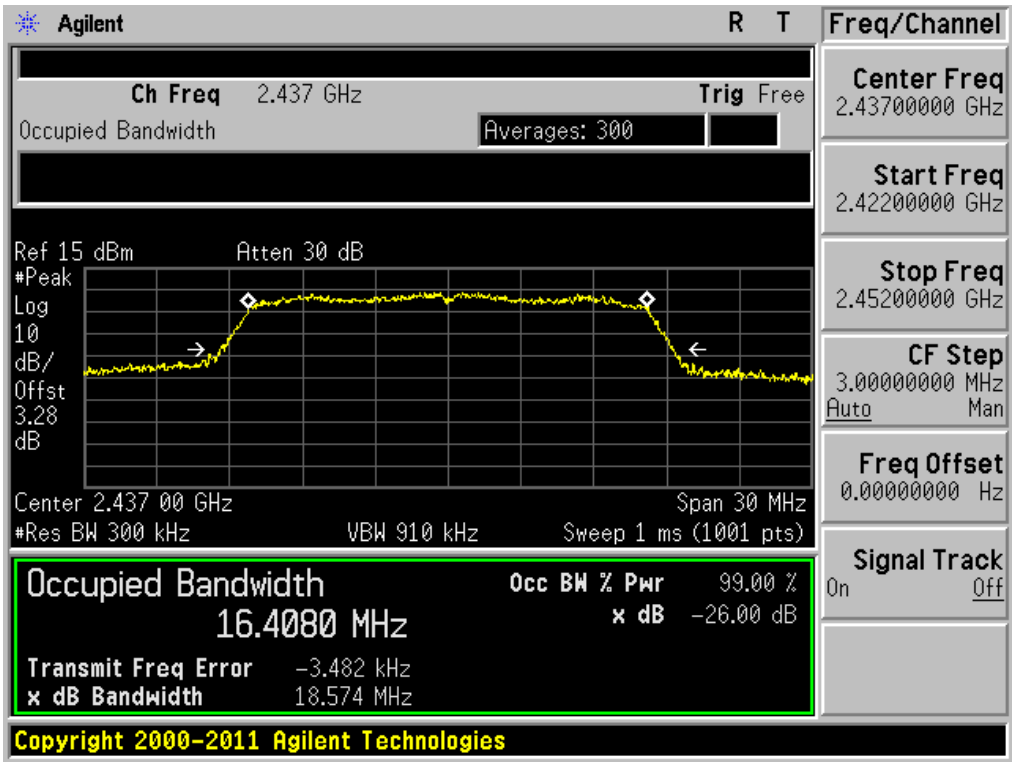
Occupied Bandwidth (99%) 802.11b & 11Mbps & 2462MHz



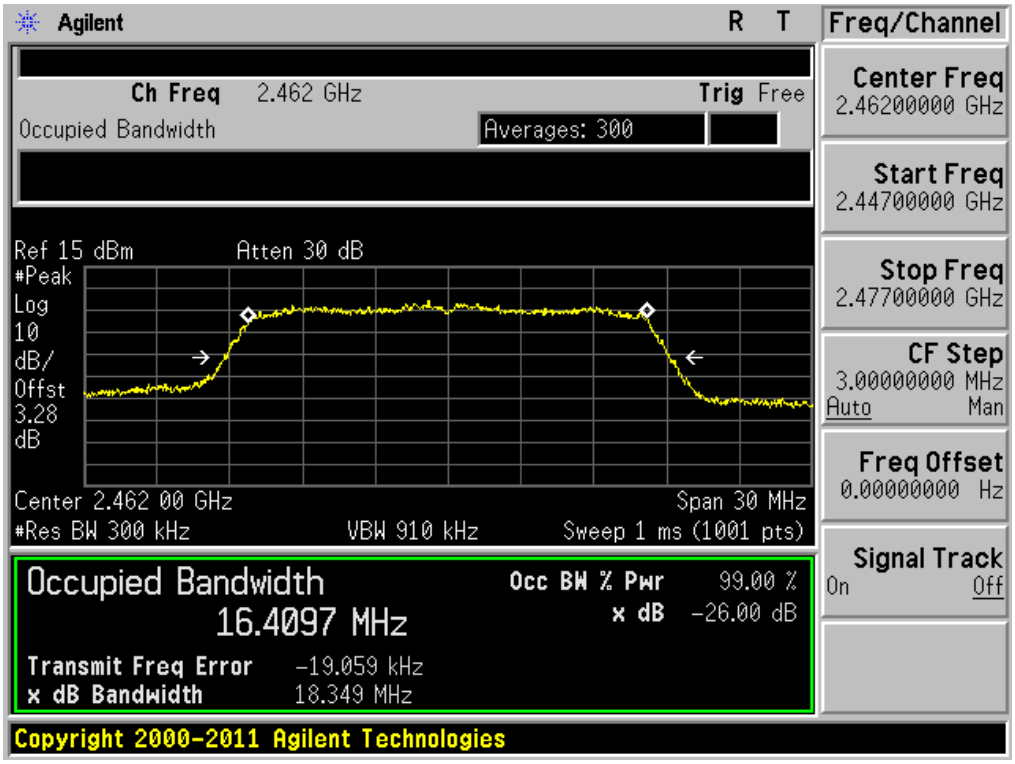
Occupied Bandwidth (99%) 802.11g & 54Mbps & 2412MHz



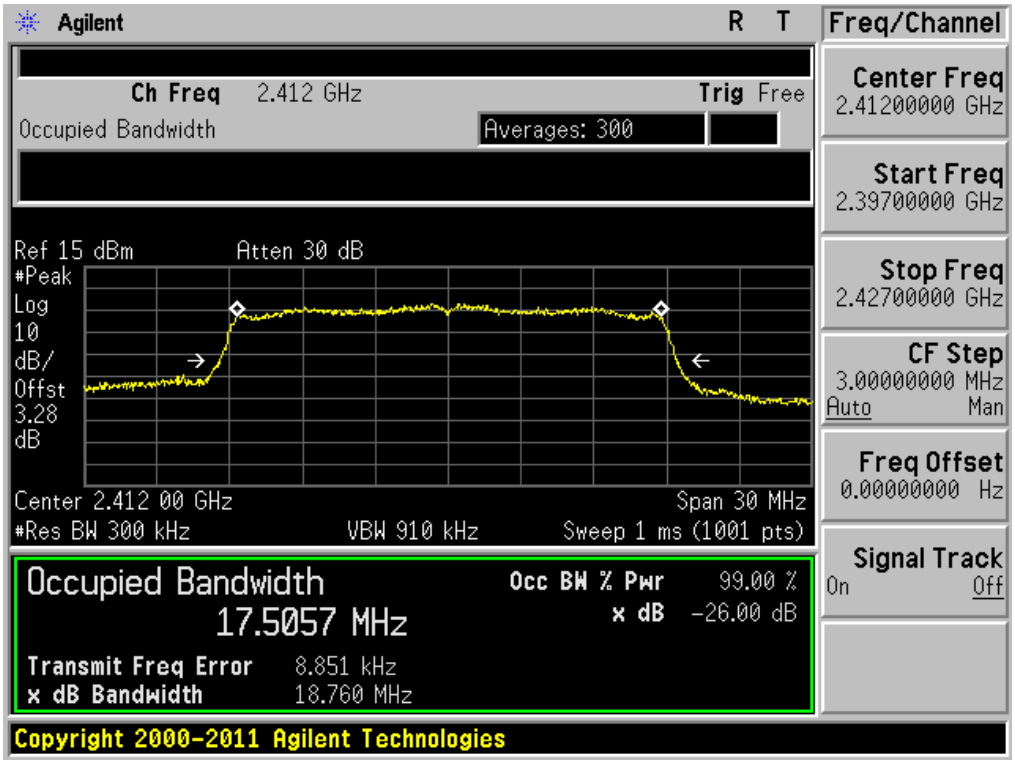
Occupied Bandwidth (99%) 802.11g & 54Mbps & 2437MHz



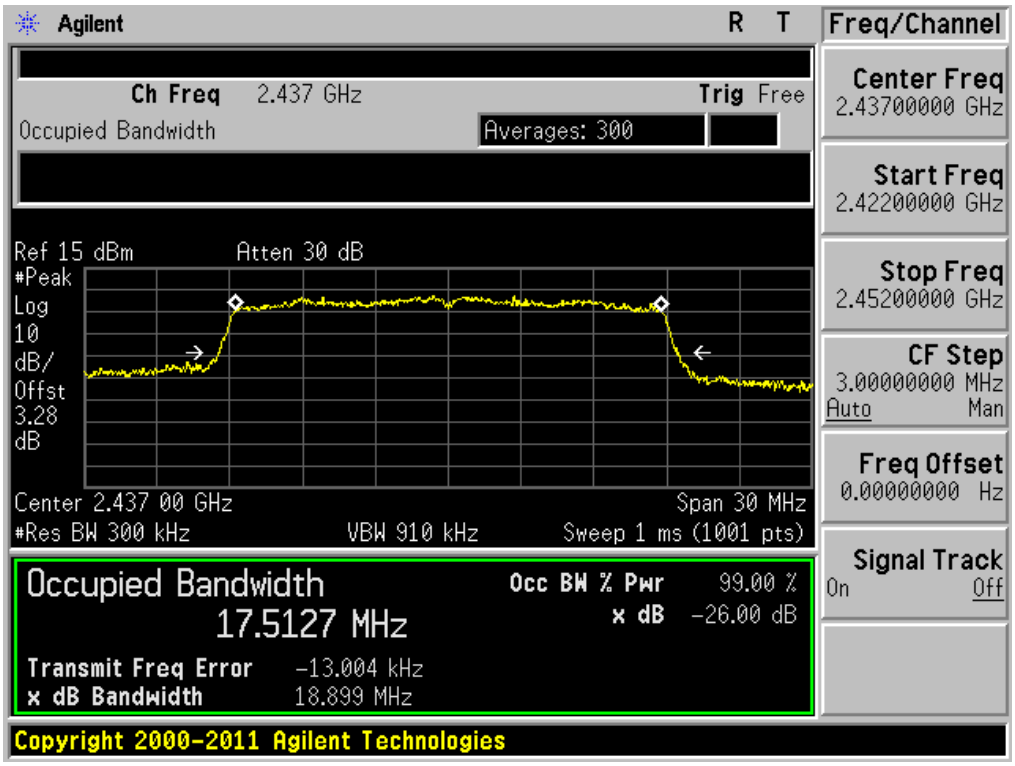
Occupied Bandwidth (99%) 802.11g & 54Mbps & 2462MHz



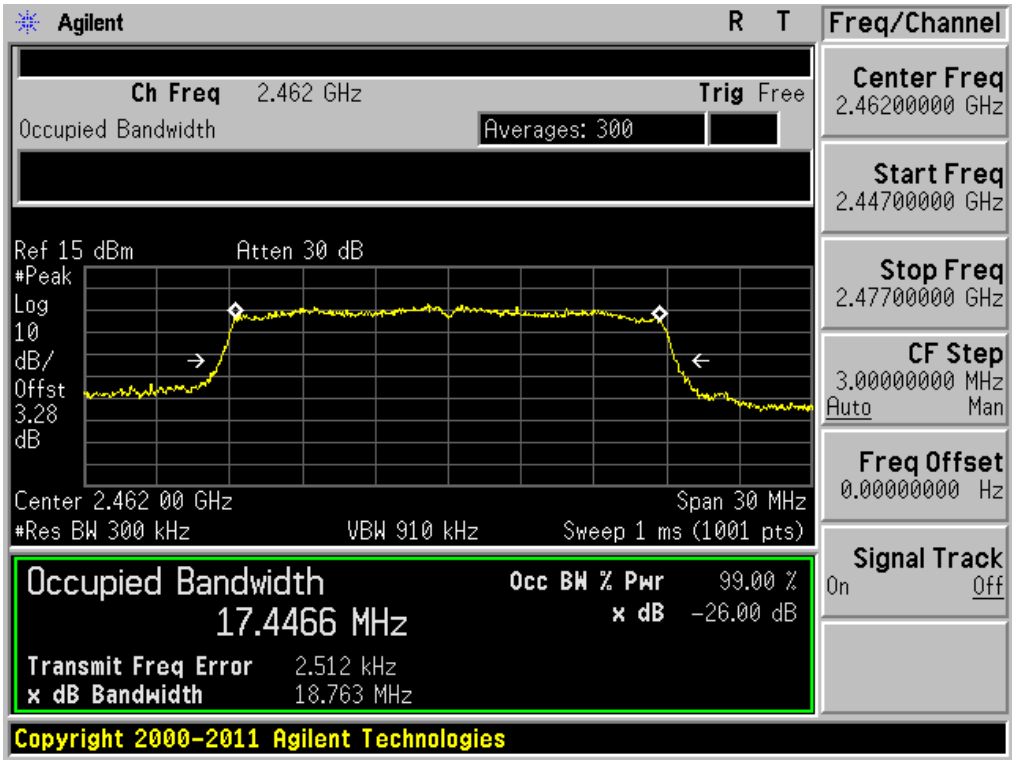
Occupied Bandwidth (99%) 802.11n(HT20) & MCS 7 & 2412MHz



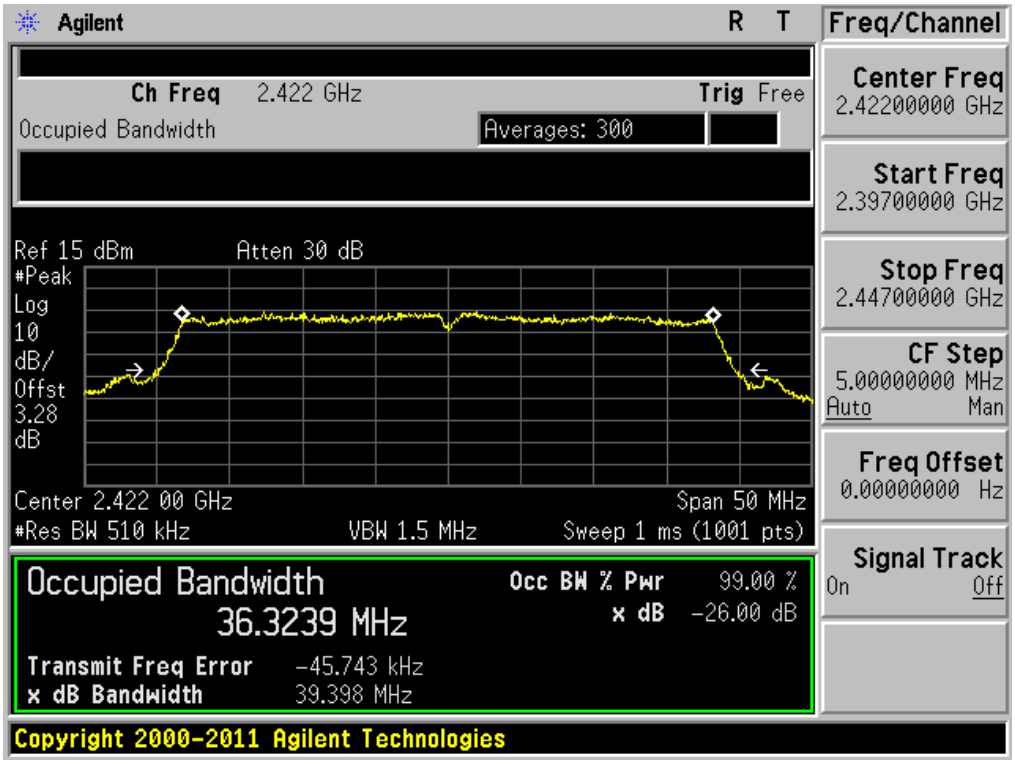
Occupied Bandwidth (99%) 802.11n(HT20) & MCS 7 & 2437MHz



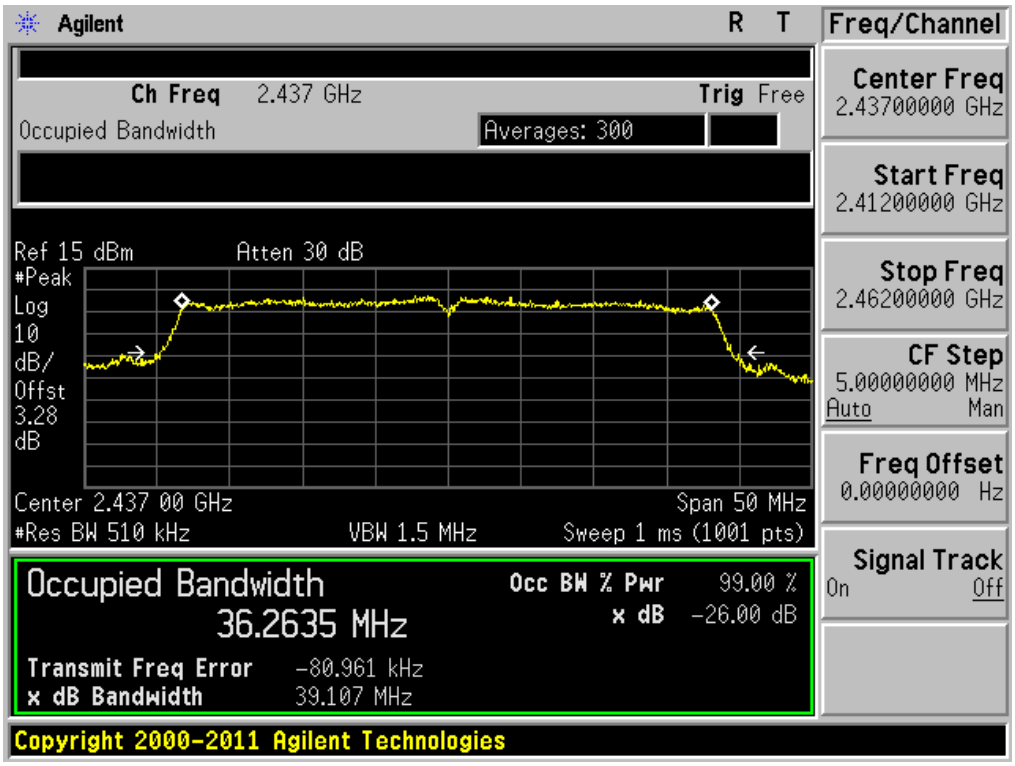
Occupied Bandwidth (99%) 802.11n(HT20) & MCS 7 & 2462MHz



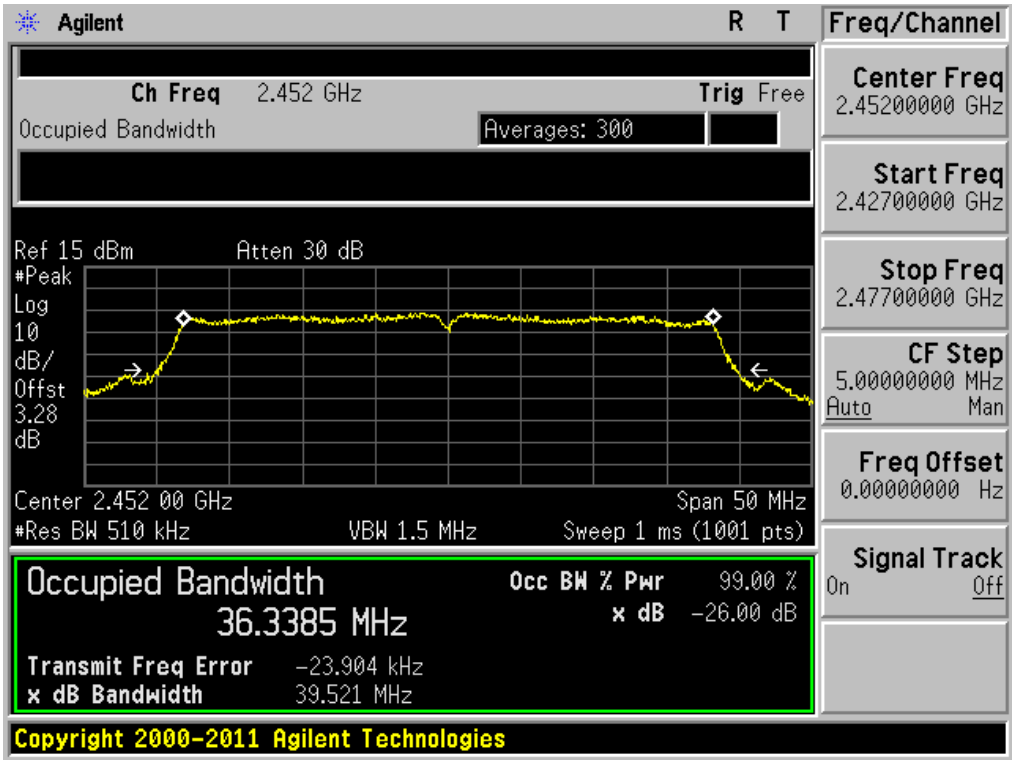
Occupied Bandwidth (99%) 802.11n(HT40) & MCS 7 & 2422MHz



Occupied Bandwidth (99%) 802.11n(HT40) & MCS 7 & 2437MHz



Occupied Bandwidth (99%) 802.11n(HT40) & MCS 7 & 2452MHz



9. LIST OF TEST EQUIPMENT

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent	E4440A	12/09/18	13/09/18	MY45304199
Spectrum Analyzer	Agilent	N9020A	12/01/09	13/01/09	MY49100833
Digital Multimeter	H.P	34401A	12/03/05	13/03/05	3146A13475
Signal Generator	Rohde Schwarz	SMR20	12/03/05	13/03/05	101251
Vector Signal Generator	Rohde Schwarz	SMJ100A	12/01/09	13/01/09	100148
Thermo hygrometer	BODYCOM	BJ5478	12/01/13	13/01/13	090205-2
DC Power Supply	HP	6622A	12/03/05	13/03/05	3448A03760
High-pass filter	Wainwright	WHNX3.0	12/09/17	13/09/17	9
BILOG ANTENNA	SCHAFFNER	CBL 6112D	10/12/21	12/12/21	22609
HORN ANT	ETS	3115	12/02/20	14/02/20	6419
HORN ANT	A.H.Systems	SAS-574	11/03/25	13/03/25	154
Attenuator (3dB)	WEINSCHEL	56-3	12/09/17	13/09/17	Y2342
Amplifier (22dB)	H.P	8447E	12/01/09	13/01/09	2945A02865
Amplifier (30dB)	Agilent	8449B	12/03/05	13/03/05	3008A01590
EMI TEST RECEIVER	R&S	ESU	12/03/05	13/03/05	100014
EMI TEST RECEIVER	R&S	ESCI	12/03/06	13/03/06	100364
CVCF	NF Electronic	4420	12/03/06	13/03/06	304935/337980
LISN	R&S	ESH2-Z5	12/09/18	13/09/18	828739/006
RFI/Field intensity Meter	KYORITSU	KNM-2402	12/07/02	13/07/02	4N-170-3