

FCC Part 15C Measurement and Test Report

For

BlueCats Incorporated

301-A Chicon St, Austin, Texas, United States, 78702

FCC ID: 2AHXCBC510

FCC Rule(s): FCC Part 15C

Product Description: BC510 Edge Relay 1

Tested Model: BC510

Report No.: HCT18CR055E-1

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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen SEM Test Technology Co., Ltd.

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information	
Applicant:	BlueCats Incorporated
Address of applicant:	301-A Chicon St, Austin, Texas, United States, 78702
Manufacturer:	BlueCats Incorporated
Address of manufacturer:	301-A Chicon St, Austin, Texas, United States, 78702

General Description of EUT	
Product Name:	BC510 Edge Relay 1
Trade Name:	/
Model No.:	BC510
Rated Voltage:	Input: DC 5V/1A from micro USB connection or from a POE through the WAN port
Power Adapter Model:	/
Note: The test data is gathered from a production sample provided by the manufacturer.	

Technical Characteristics of EUT	
Frequency Range:	IEEE 802.11b/ g / nHT20: 2412MHz~2462MHz IEEE802.11nHT40: 2422MHz~2452MHz,
RF Output Power:	16.43dBm (Conducted)
Data Rate:	802.11b: 1-11Mbps; 802.11g: 6-54Mbps; 802.11n HT20:MCS0: 6.5Mbps-MCS23:195Mbps; 802.11n HT40: MCS0:13.5Mbps-MCS23:405Mbps
Modulation:	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK,BPSK)
Quantity of Channels:	11 for 802.11b/g/n(HT20); 7 for 802.11n(HT40)
Type of Antenna:	PCB Antenna
Antenna Gain:	2.57dBi

1.2 Test Standards

The following report is prepared on behalf of the **BlueCats Incorporated** in accordance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commission rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commission rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices.

1.4 Test Facility

FCC – Registration No.: 125990

Shenzhen SEM Test Technology Co., Ltd. Laboratory has been recognized to perform compliance testing on equipment subject to the Commissions Declaration of Conformity (DOC). The Designation Number is CN5010, and Test Firm Registration Number is 125990.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Shenzhen SEM. Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	802.11b	2412MHz, 2437MHz, 2462MHz
TM2	802.11g	2412MHz, 2437MHz, 2462MHz
TM3	802.11n-HT20	2412MHz, 2437MHz, 2462MHz
TM4	802.11n-HT40	2422MHz, 2437MHz, 2452MHz
Note: All test modes (different data rate and different modulation) are performed, but only the worst case is recorded in this report.		

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Core
Adapter Cable	1.45	PSAC05R-050L6	Without Core

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
RJ45 Cable	0.2	Unshielded	Without Ferrite

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
Network switch	LINKSYS	LGS108P	13U10C95702137
Notebook	Dell	Inspiron 15	/
RJ45 Adapter	Cabel Matters® Inc	202013	WISWEYB4

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
RF Output Power	Conducted	$\pm 0.42\text{dB}$
Occupied Bandwidth	Conducted	$\pm 1.5\%$
Power Spectral Density	Conducted	$\pm 1.8\text{dB}$
Conducted Spurious Emission	Conducted	$\pm 2.17\text{dB}$
Conducted Emissions	Conducted	$\pm 2.88\text{dB}$
Transmitter Spurious Emissions	Radiated	$\pm 5.1\text{dB}$

1.7 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2017-06-12	2018-06-11
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2017-06-12	2018-06-11
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2017-06-12	2018-06-11
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2017-06-12	2018-06-11
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2017-06-12	2018-06-11
SEMT-1011	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2017-06-08	2018-06-07
SEMT-1042	Horn Antenna	ETS	3117	00086197	2017-06-08	2018-06-07
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170582	2017-06-08	2018-06-07
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2017-06-08	2018-06-07
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2017-06-12	2018-06-11
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2017-06-12	2018-06-11
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2017-06-12	2018-06-11

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§ 2.1093	RF Exposure	Compliant
§ 15.203; § 15.247(b)(4)(i)	Antenna Requirement	Compliant
§ 15.205	Restricted Band of Operation	Compliant
§ 15.207(a)	Conducted Emission	Compliant
§ 15.247(e)	Power Spectral Density	Compliant
§ 15.247(a)(2)	6 dB Bandwidth	Compliant
§ 15.247(b)(3)	RF Output Power	Compliant
§ 15.209(a)	Radiated Emission	Compliant
§ 15.247(d)	Band Edge (Out of Band Emissions)	Compliant

N/A: not applicable

3. RF Exposure

3.1 Standard Applicable

According to § 1.1307 and § 2.1091, the mobile transmitter must comply the RF exposure requirements.

3.2 Test Result

This product complied with the requirement of the RF Exposure, please see the MPE Report.

4. Antenna Requirement

4.1 Standard Applicable

According to FCC Part 15.203, 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.

4.2 Evaluation Information

This product has PCB Antenna, fulfill the requirement of this section.

5. Power Spectral Density

5.1 Standard Applicable

According to 15.247(a)(1)(iii), 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.

5.2 Test Procedure

According to the KDB 558074 D01 V04, such specifications require that the same method as used to determine the conducted output power shall also be used to determine the power spectral density. The test method of power spectral density as below:

- a) Set instrument center frequency to DTS channel center frequency.
- b) Set span to at least 1.5 times the OBW.
- c) Set RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- d) Set VBW $\geq 3 \times \text{RBW}$.
- e) Detector = power averaging (RMS) or sample detector (when RMS not available).
- f) Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span/RBW}$.
- g) Sweep time = auto couple.
- h) Employ trace averaging (RMS) mode over a minimum of 100 traces.
- i) Use the peak marker function to determine the maximum amplitude level.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span in order to meet the minimum measurement point requirement as the RBW is reduced).

5.3 Environmental Conditions

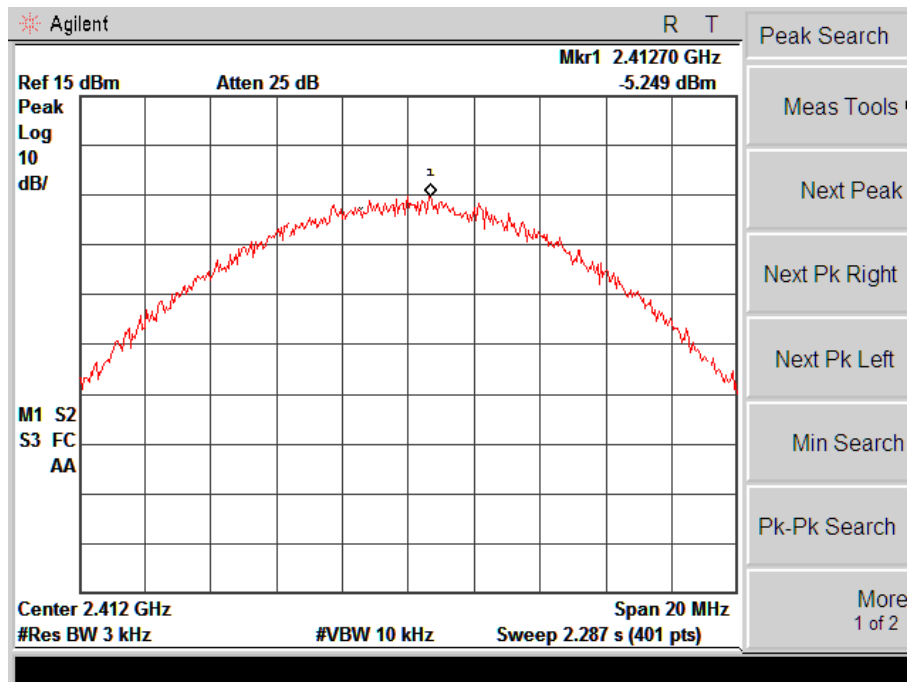
Temperature:	26° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

5.4 Summary of Test Results/Plots

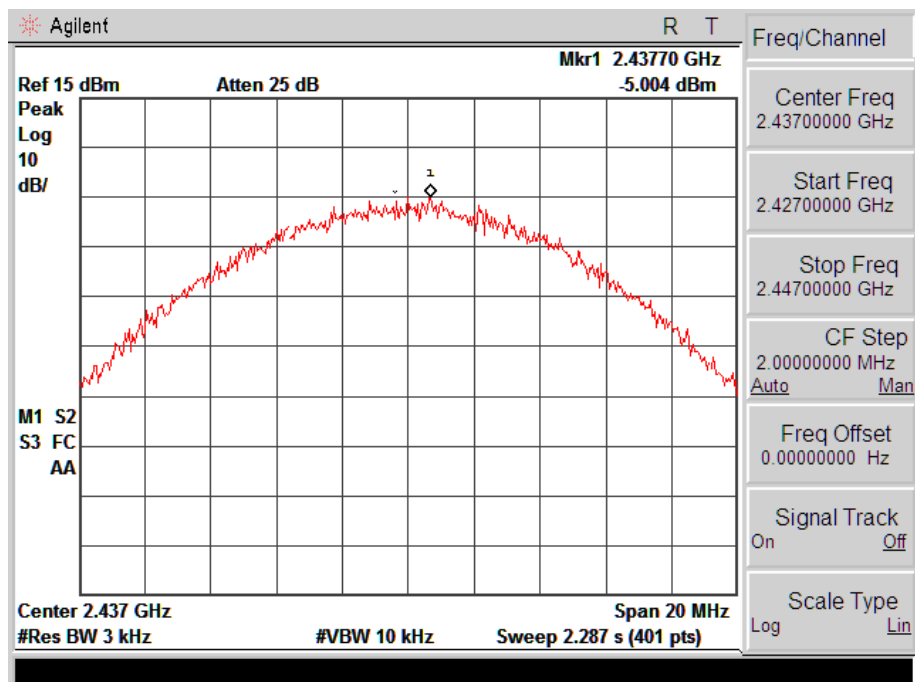
Test Mode	Test Channel MHz	Power Spectral Density dBm/3kHz	Limit dBm/3kHz
802.11b-11Mbps	2412	-5.249	8
	2437	-5.004	8
	2462	-4.797	8
802.11g-54Mbps	2412	-13.960	8
	2437	-13.160	8
	2462	-13.690	8
802.11n HT20-MCS0:6.5Mbps	2412	-10.310	8
	2437	-10.700	8
	2462	-8.617	8
802.11n HT40-MCS0:13.5Mbps	2422	15.790	8
	2437	-14.610	8
	2452	-13.590	8

Please refer to the following test plots:

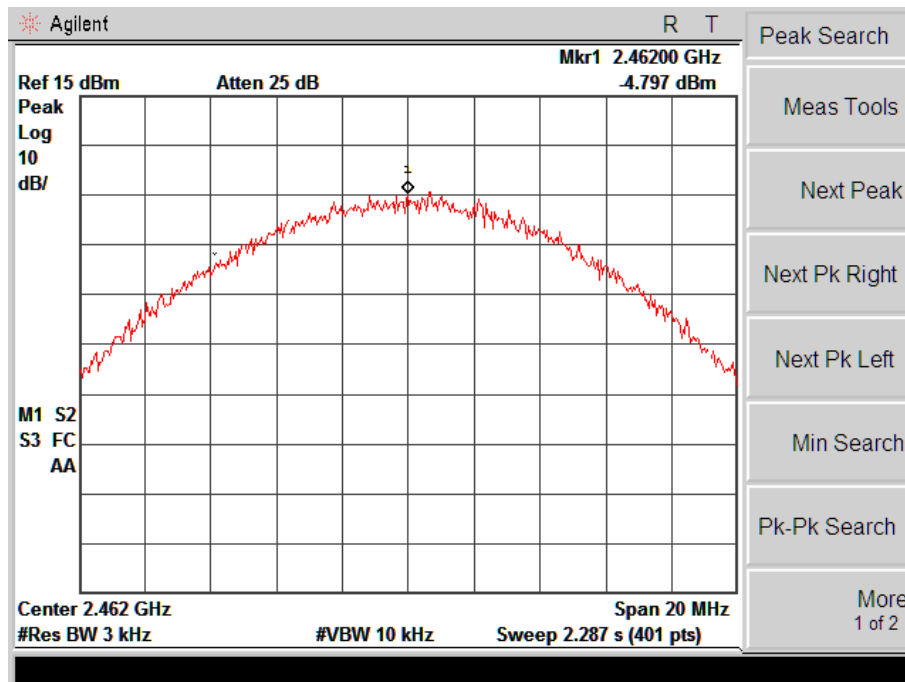
802.11b-Low Channel



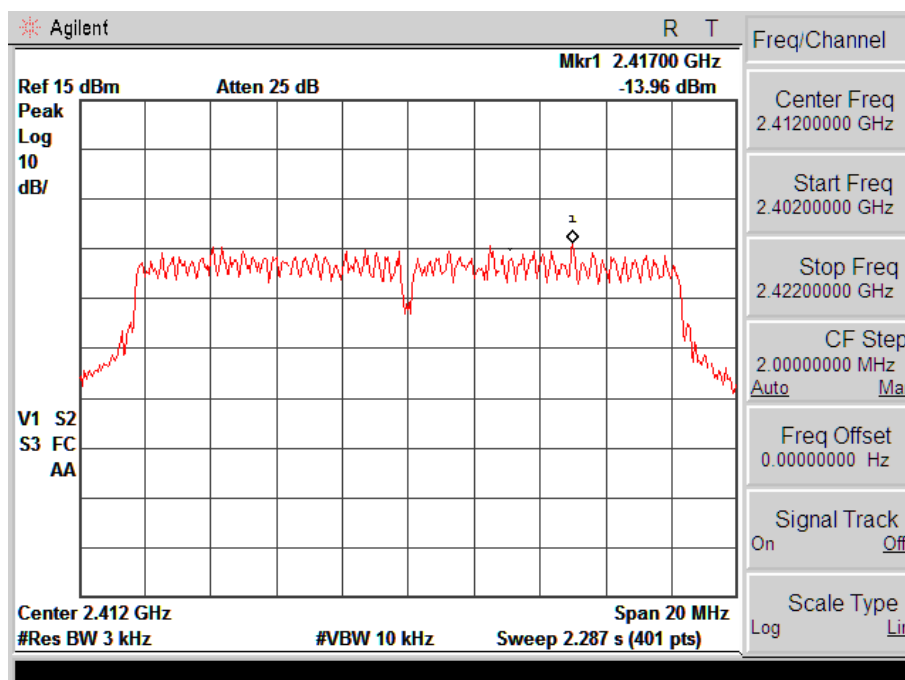
802.11b-Middle Channel



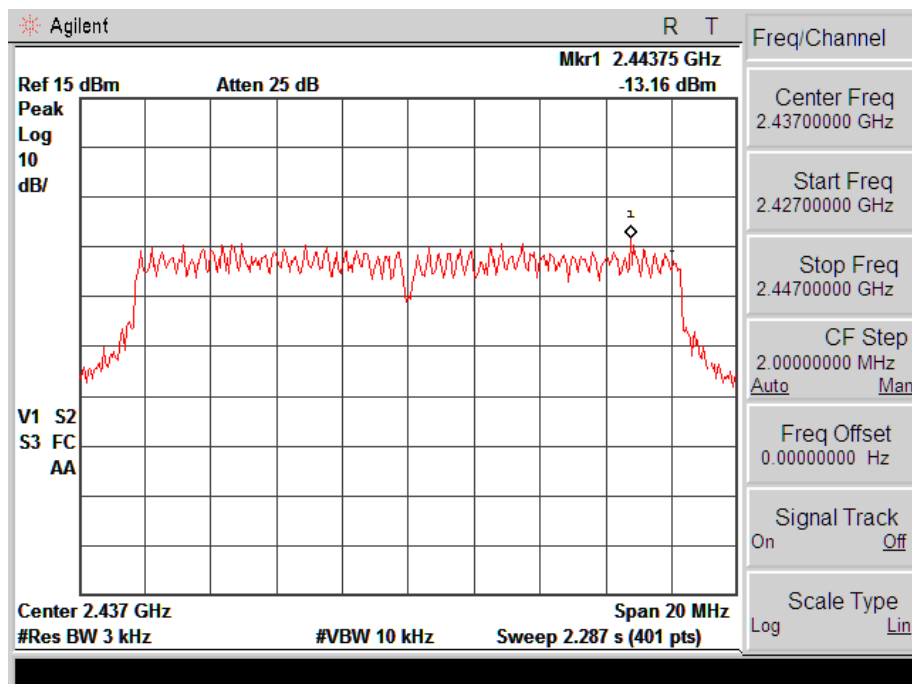
802.11b-High Channel



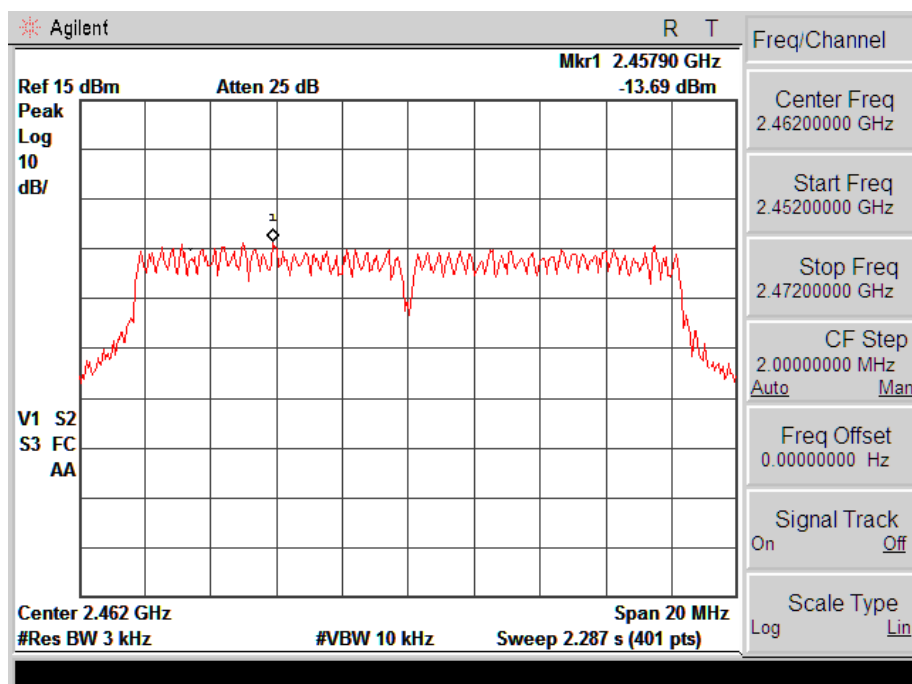
802.11g-Low Channel



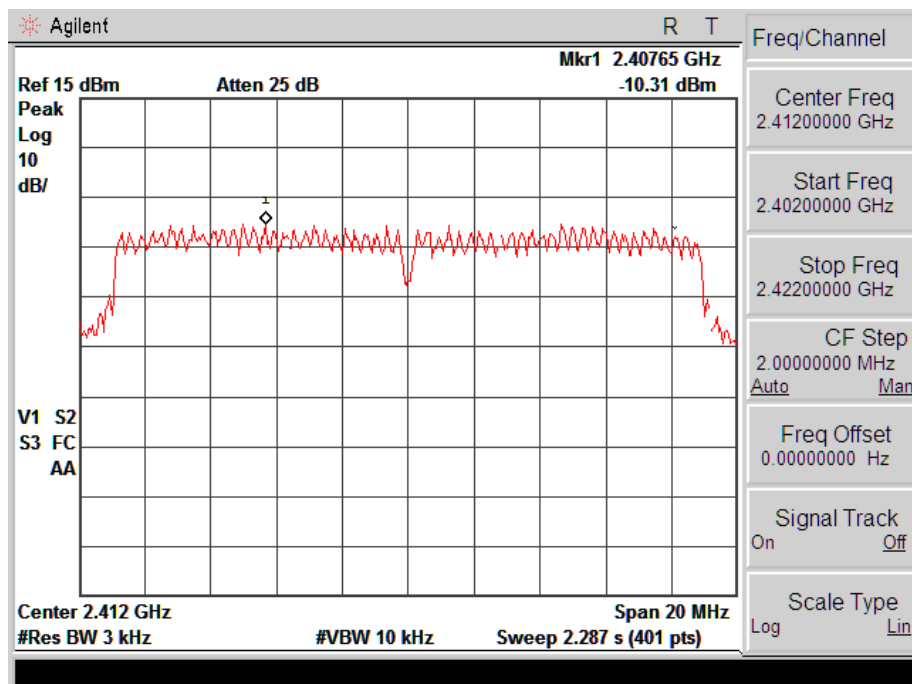
802.11g-Middle Channel



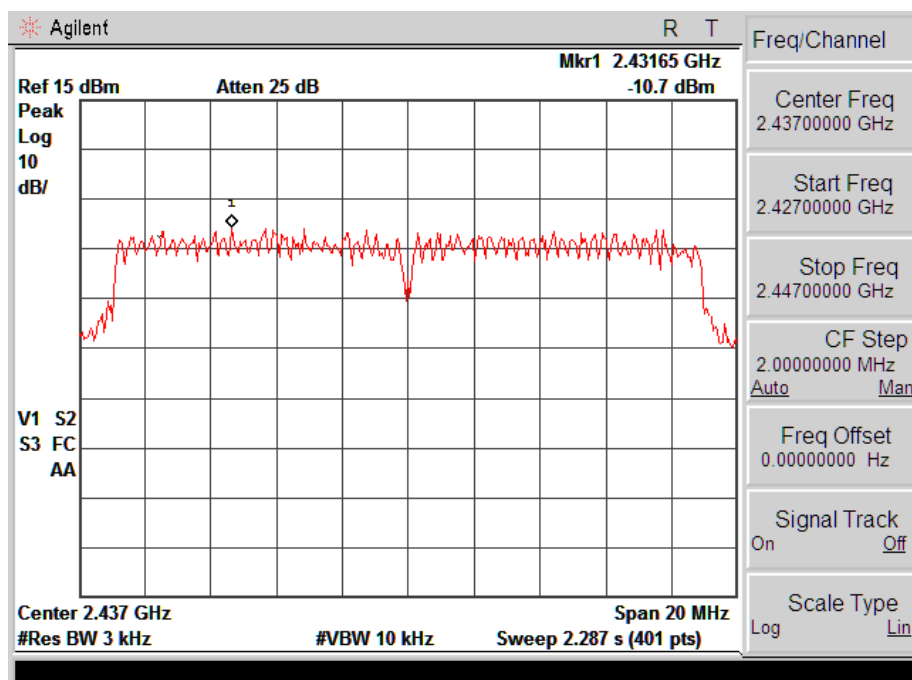
802.11g-High Channel



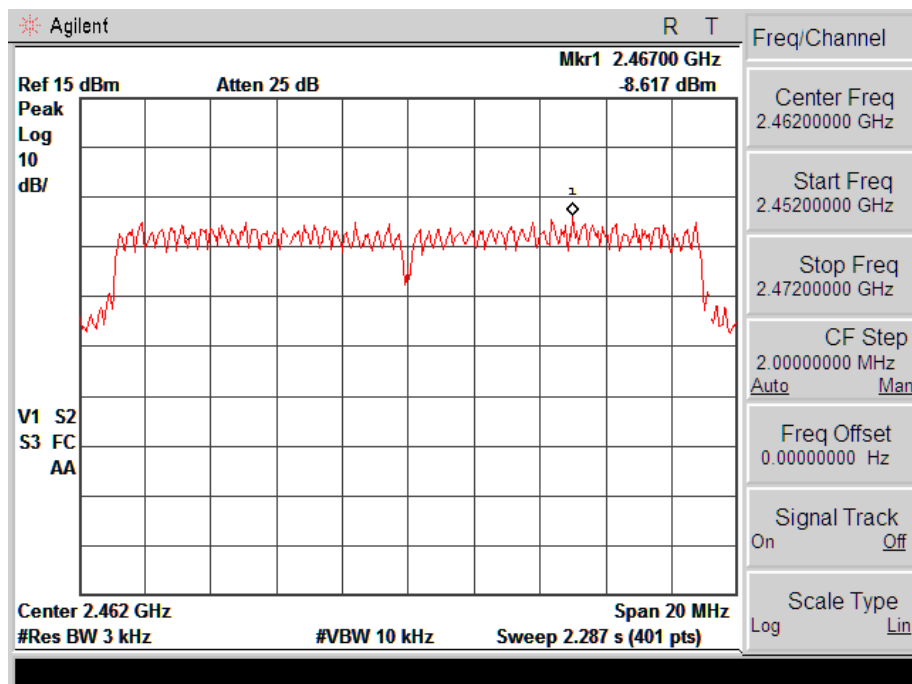
802.11n-HT20-Low Channel



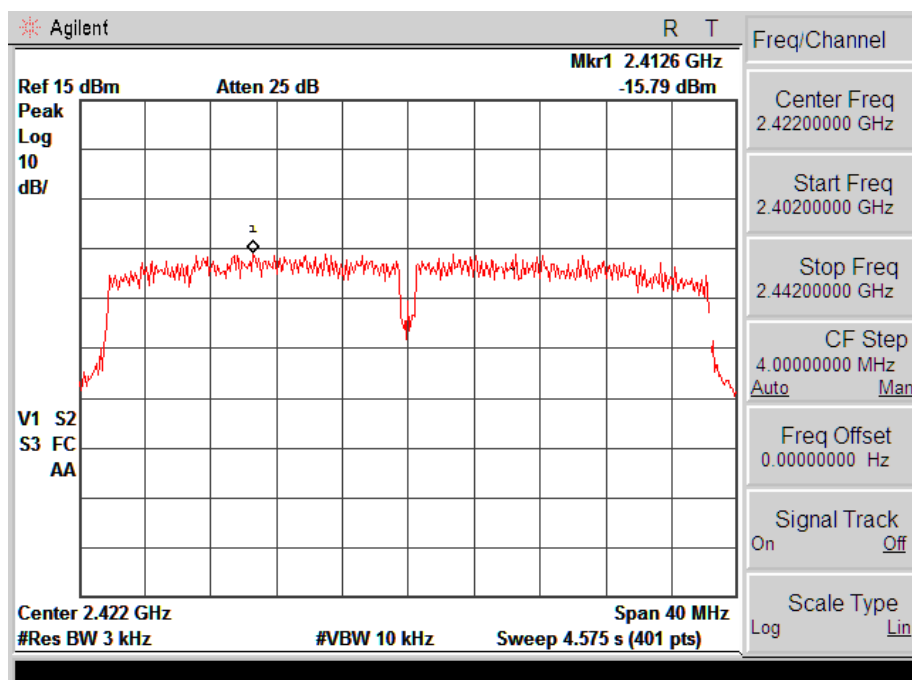
802.11n-HT20-Middle Channel



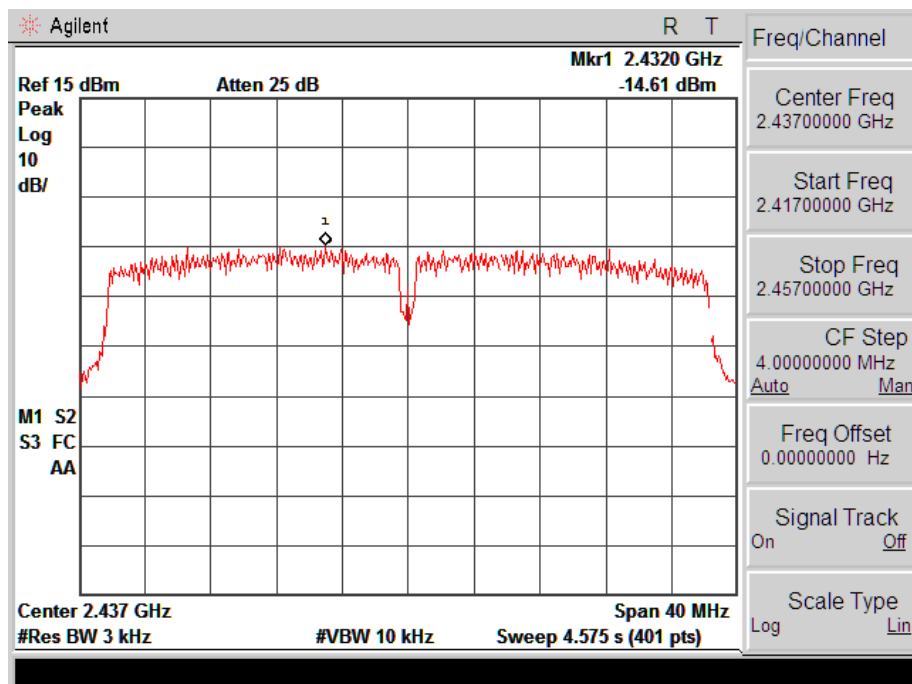
802.11n-HT20-High Channel



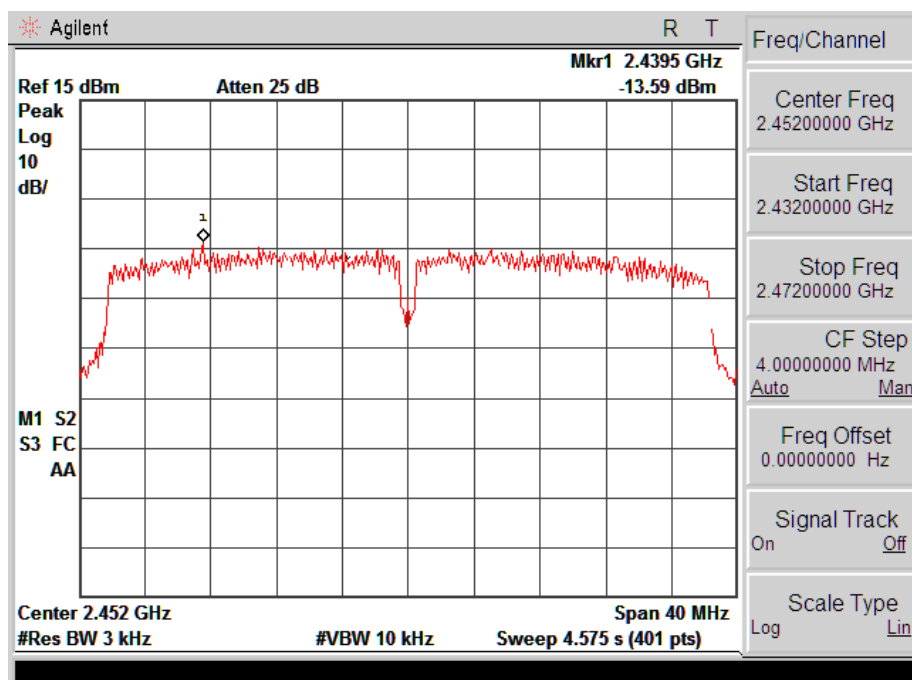
802.11n-HT40-Low Channel



802.11n-HT40-Middle Channel



802.11n-HT40-High Channel



6. 6dB Bandwidth

6.1 Standard Applicable

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

6.2 Test Procedure

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

6.3 Environmental Conditions

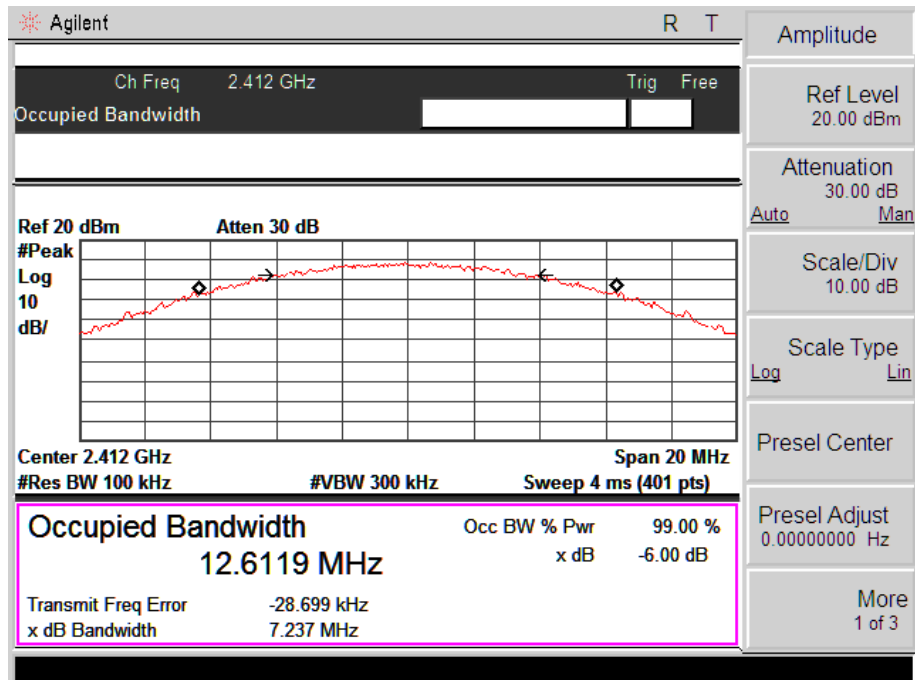
Temperature:	25° C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

6.4 Summary of Test Results/Plots

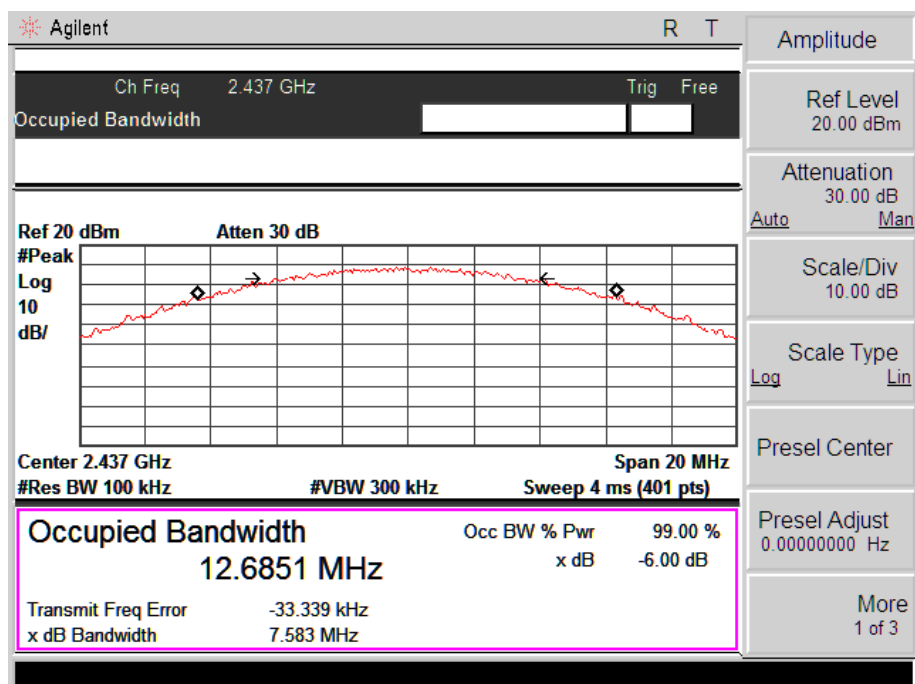
Test Mode	Test Channel MHz	6 dB Bandwidth MHz	99% Bandwidth MHz	Limit kHz
802.11b-11Mbps	2412	7.237	12.6119	≥ 500
	2437	7.583	12.6851	≥ 500
	2462	7.481	12.7423	≥ 500
802.11g-54Mbps	2412	16.458	16.4125	≥ 500
	2437	16.476	16.4044	≥ 500
	2462	16.465	16.4111	≥ 500
802.11n HT20-MCS0:6.5Mbps	2412	17.307	17.5900	≥ 500
	2437	17.336	17.5978	≥ 500
	2462	17.273	17.6078	≥ 500
802.11n HT40-MCS0:13.5Mbps	2422	35.132	35.7428	≥ 500
	2437	35.028	35.7296	≥ 500
	2452	35.158	37.7484	≥ 500

Please refer to the following test plots:

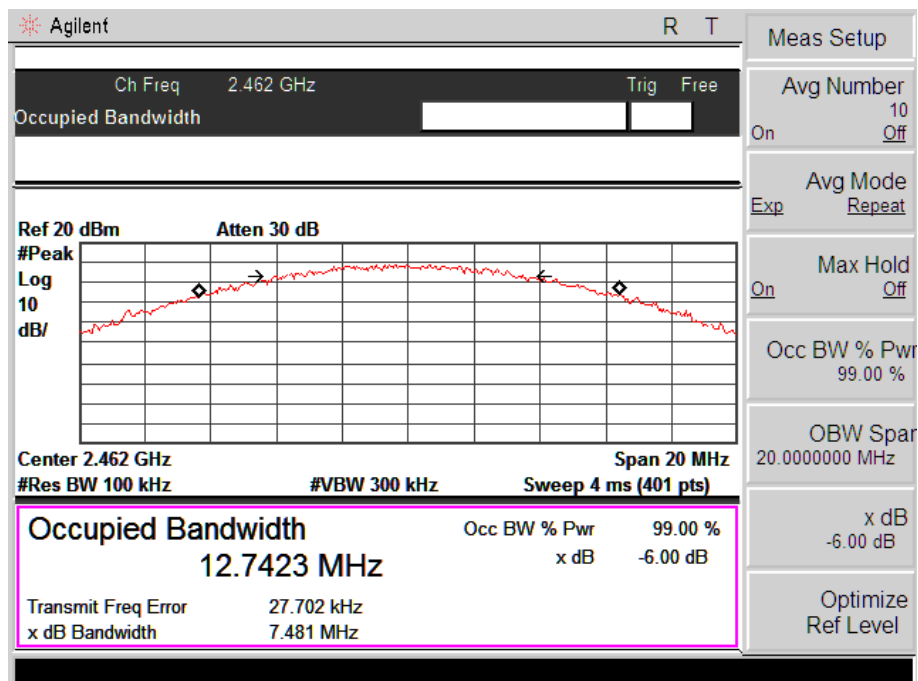
802.11b-Low Channel



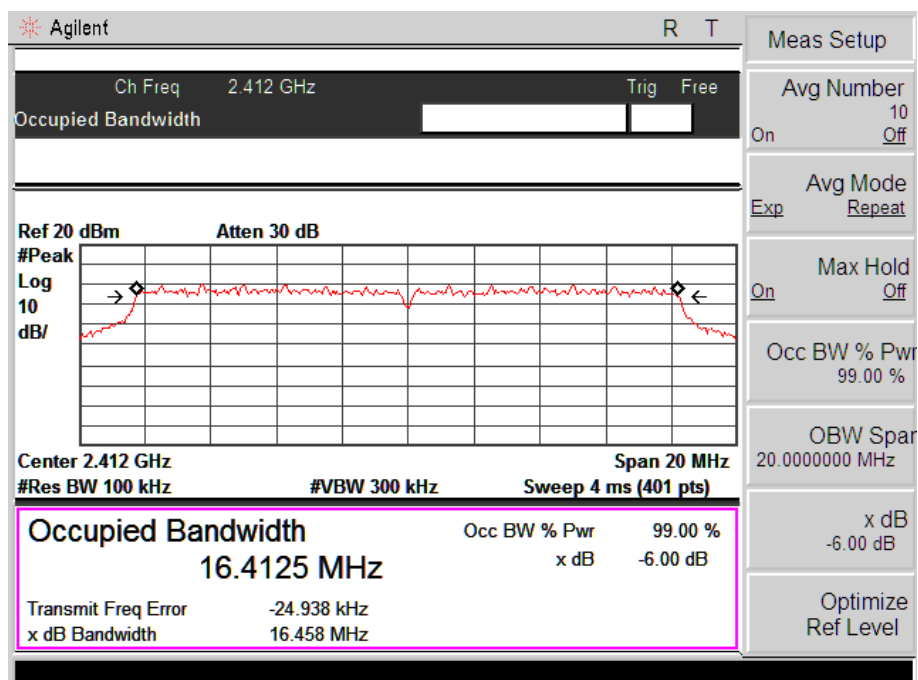
802.11b-Middle Channel



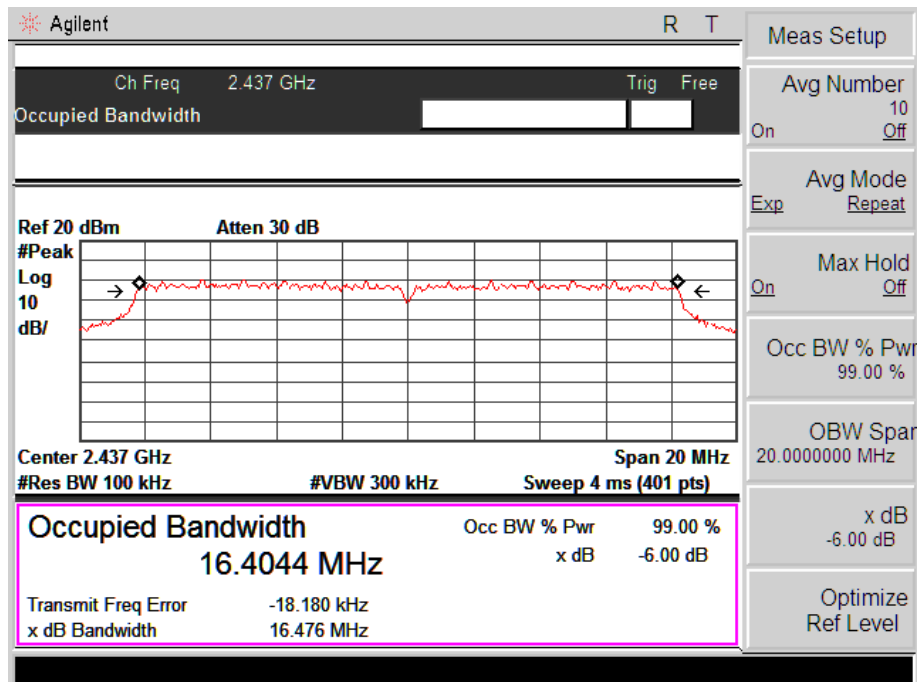
802.11b-High Channel



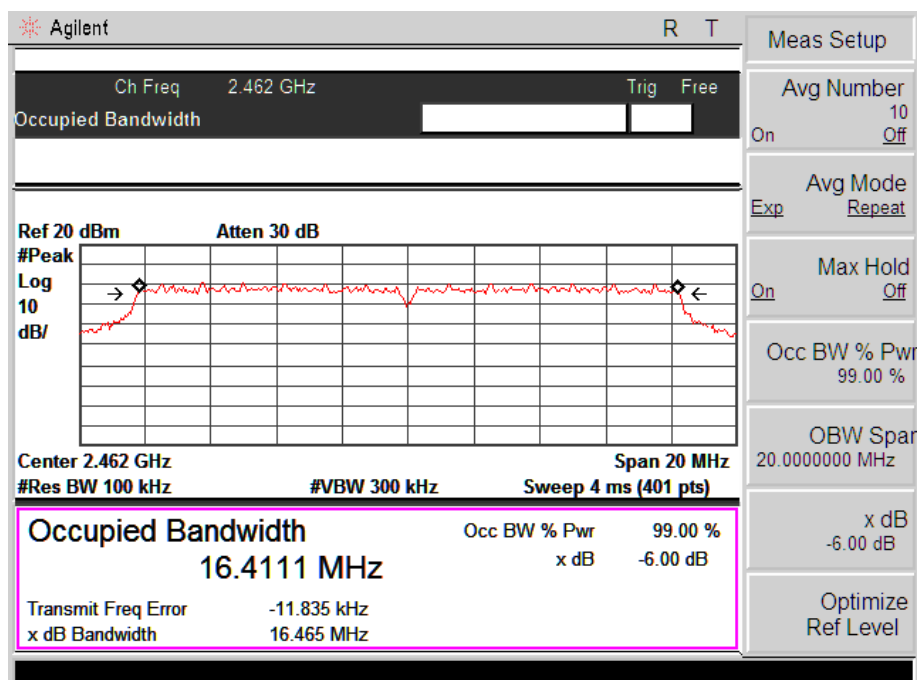
802.11 g-Low Channel



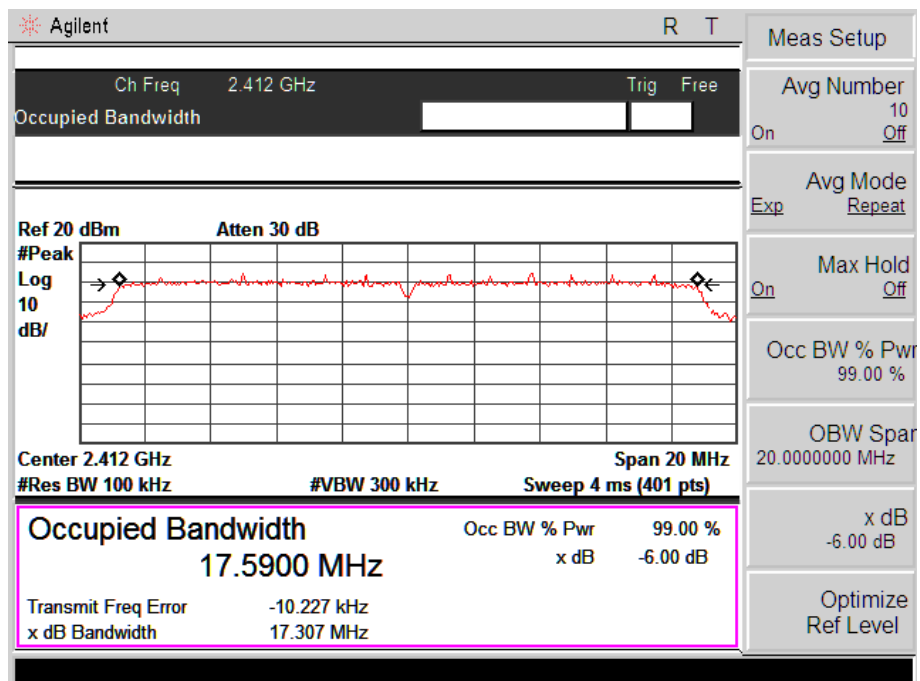
802.11g-Middle Channel



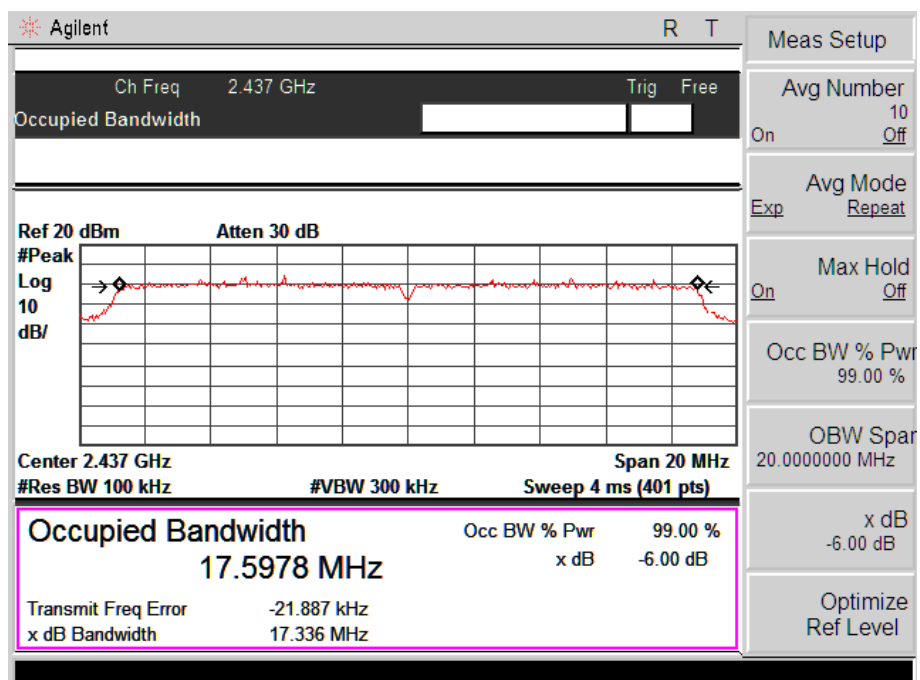
802.11g-High Channel



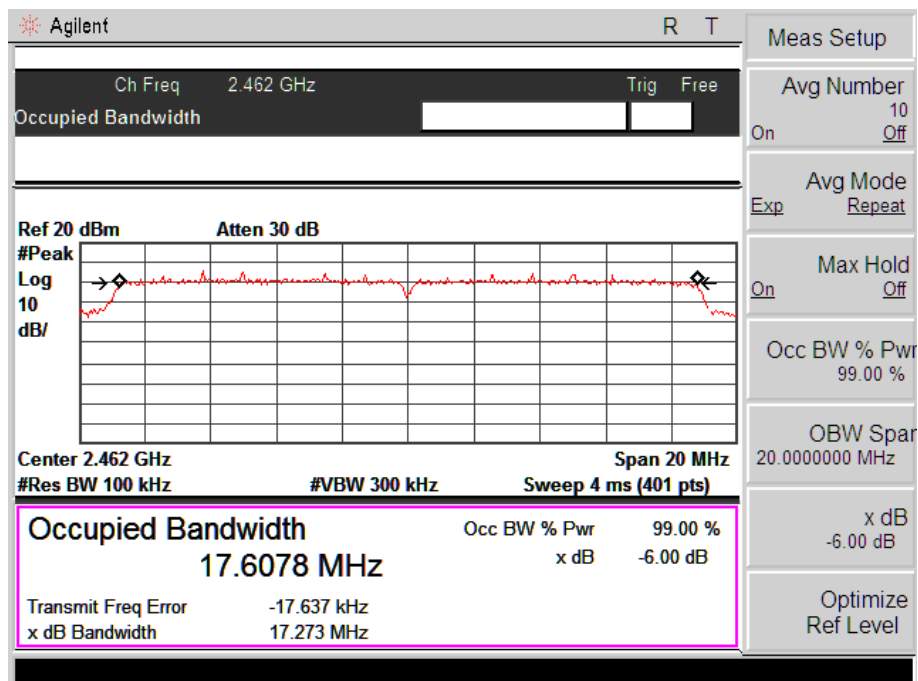
802.11n-HT20-Low Channel



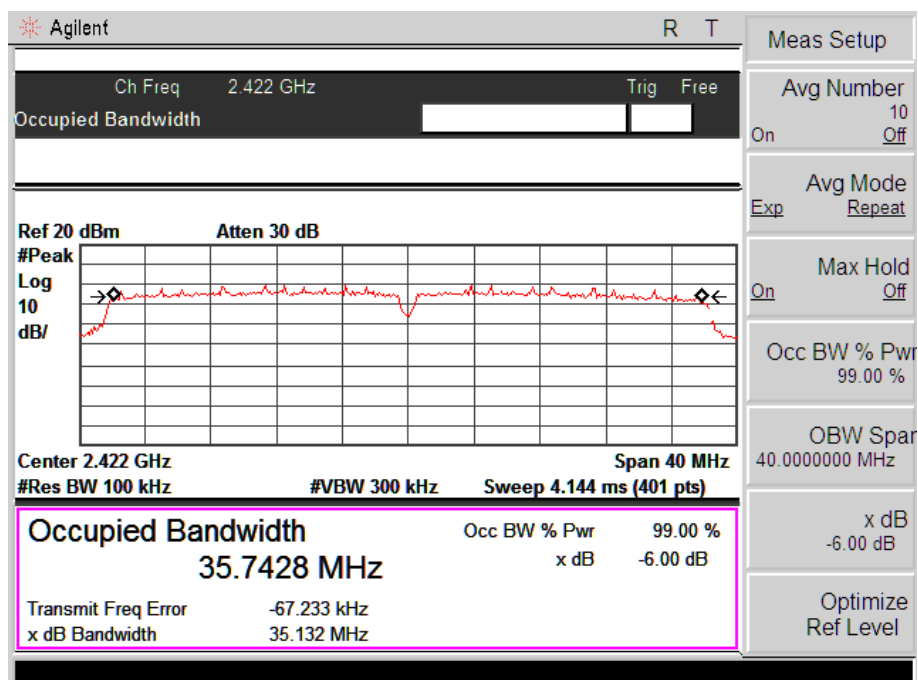
802.11n-HT20-Middle Channel



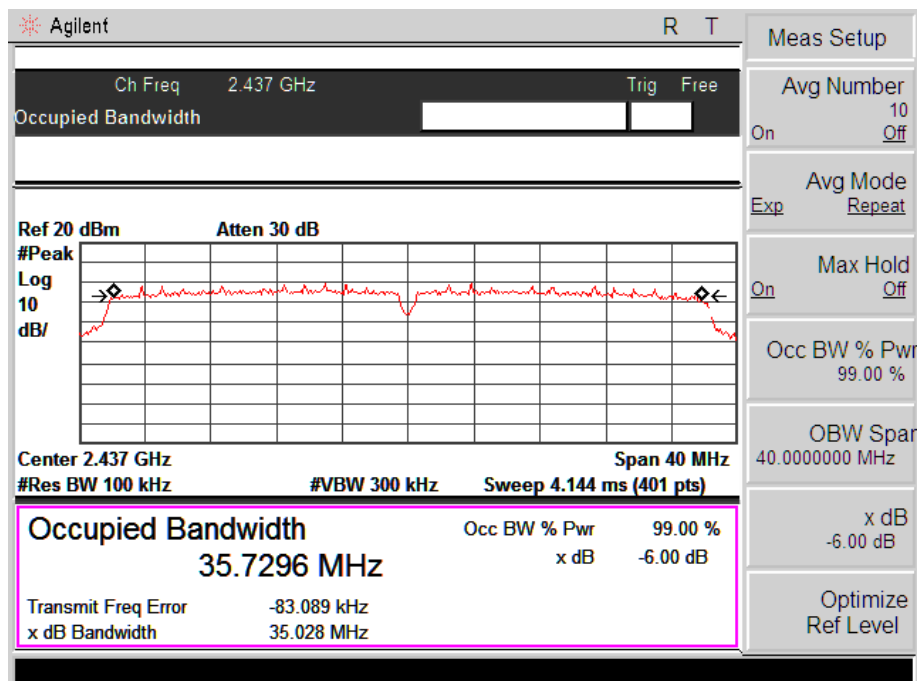
802.11n-HT20-High Channel



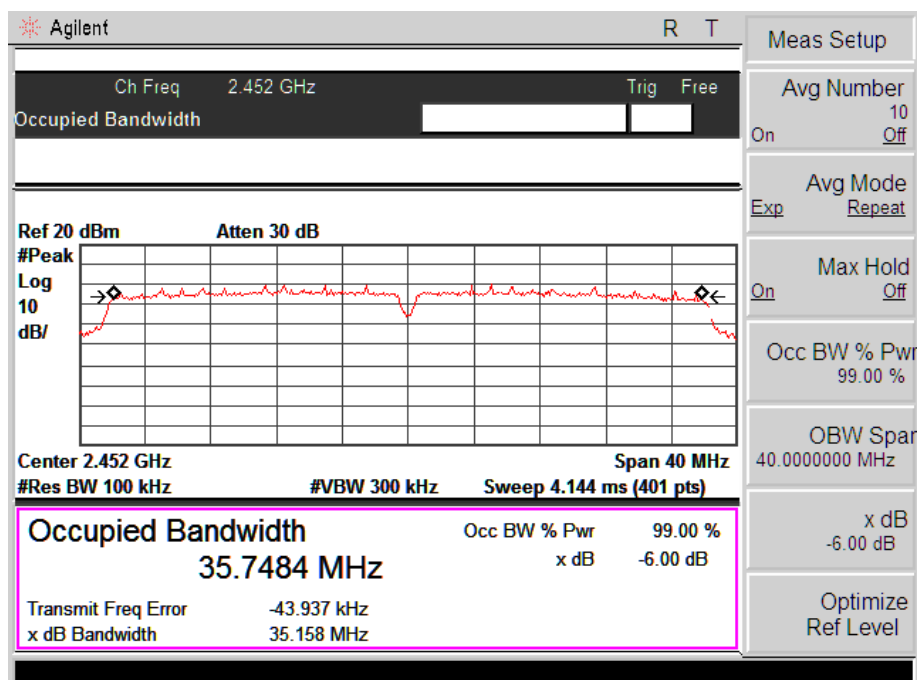
802.11n-HT40-Low Channel



802.11n-HT40-Middle Channel



802.11n-HT40-High Channel



7. RF Output Power

7.1 Standard Applicable

According to 15.247(b)(3). For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz bands: 1 Watt.

7.2 Test Procedure

According to KDB-558074 D01 V04, (channel integration method) When this option is exercised, the measured power is to be referenced to the OBW rather than the DTS bandwidth

- a) Set span to at least 1.5 times the OBW.
- b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
- c) Set VBW $\geq 3 \times$ RBW.
- d) Number of points in sweep $\geq 2 \times \text{span} / \text{RBW}$. (This gives bin-to-bin spacing $\leq \text{RBW}/2$, so that narrowband signals are not lost between frequency bins.)
- e) Sweep time = auto.
- f) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
- g) If transmit duty cycle $< 98\%$, use a sweep trigger with the level set to enable triggering only on full power pulses. The transmitter shall operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle $\geq 98\%$, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to “free run”.
- h) Trace average at least 100 traces in power averaging (i.e., RMS) mode.
- i) Compute power by integrating the spectrum across the OBW of the signal using the instrument’s band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

7.3 Environmental Conditions

Temperature:	26° C
Relative Humidity:	57%
ATM Pressure:	1011 mbar

7.4 Summary of Test Results/Plots

Test Mode	Frequency MHz	Power dBm	Output Power mW	Limit mW
802.11b-11Mbps	2412	15.90	38.90	1000
	2437	16.19	41.60	1000
	2462	16.43	44.00	1000
802.11g-54Mbps	2412	9.37	8.60	1000
	2437	10.17	10.40	1000
	2462	10.80	12.00	1000
802.11n HT20-MCS0:6.5Mbps	2412	12.82	19.10	1000
	2437	12.44	17.50	1000
	2462	13.46	22.20	1000
802.11n HT40-MCS0:13.5Mbps	2422	7.38	5.50	1000
	2437	7.82	6.10	1000
	2452	8.60	7.20	1000

8. Field Strength of Spurious Emissions

8.1 Measurement Uncertainty

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is ± 5.10 dB.

8.2 Standard Applicable

According to §15.247(d), 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. 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).

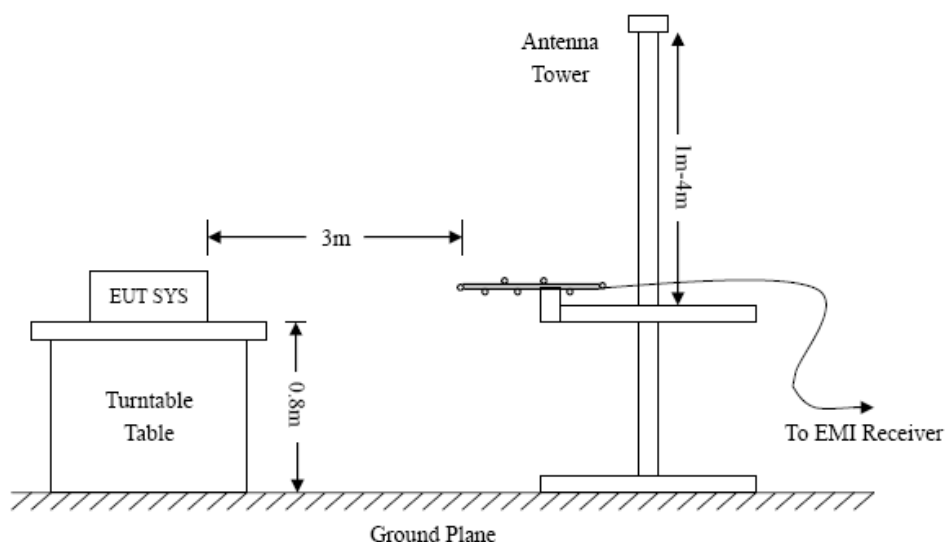
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

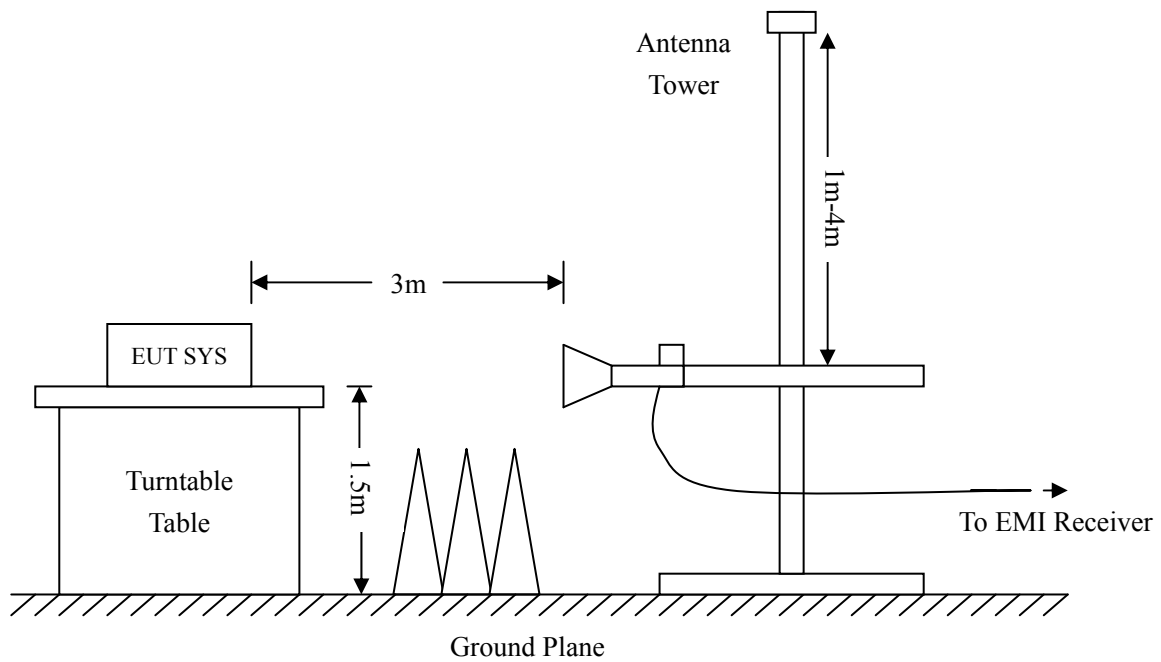
8.3 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.247(a) and FCC Part 15.209 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.





Frequency: 9kHz-30MHz
RBW=10 KHz,
VBW =30 KHz
Sweep time= Auto
Trace = max hold
Detector function = peak

Frequency: 30MHz-1GHz
RBW=120 KHz,
VBW=300 KHz
Sweep time= Auto
Trace = max hold
Detector function = peak, QP

Frequency: Above 1GHz
RBW=1MHz,
VBW=3MHz (Peak), 10Hz (AV)
Sweep time= Auto
Trace = max hold
Detector function = peak, AV

8.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant. Factor} + \text{Cable Loss} - \text{Ampl. Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dB μ V means the emission is 6dB μ V below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15 Limit}$$

8.5 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

8.6 Summary of Test Results/Plots

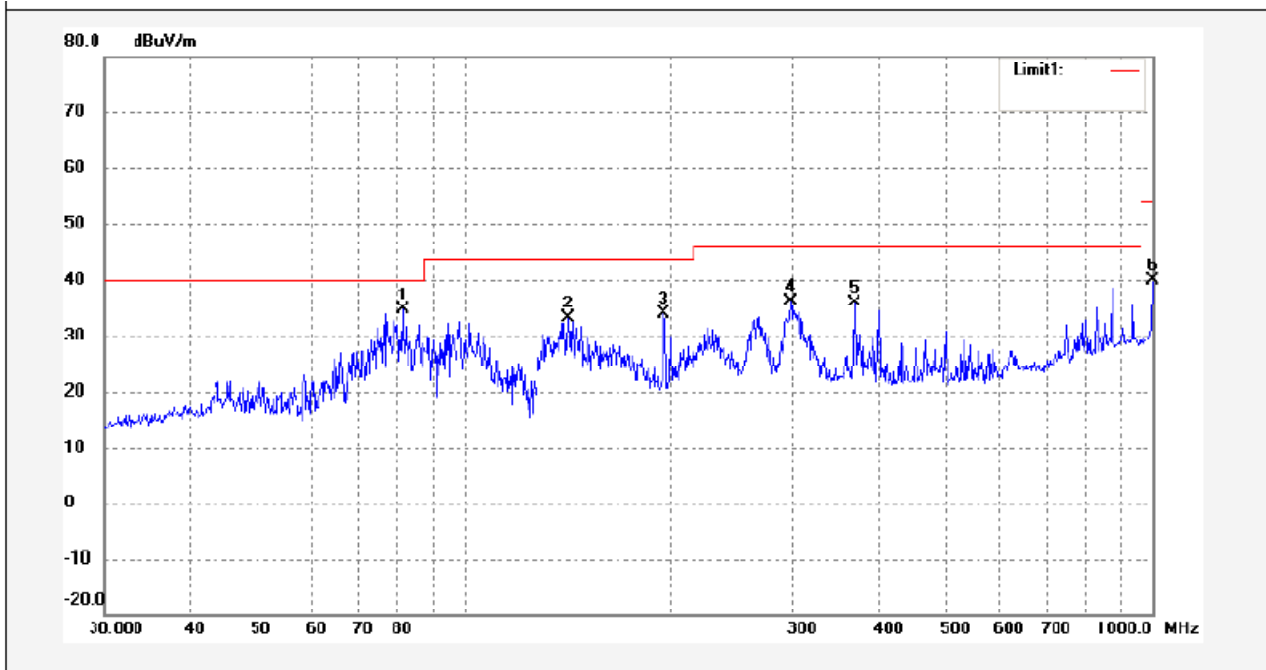
According to the data below, the FCC Part 15.205, 15.209 and 15.247 standards, and had the worst cases:

Note: this EUT was tested in 3 orthogonal positions and the worst case position and the worst mode IEEE 802.11b (channel low, middle, high)) data was reported.

Plot of Radiated Emissions Test Data (30MHz to 1GHz)

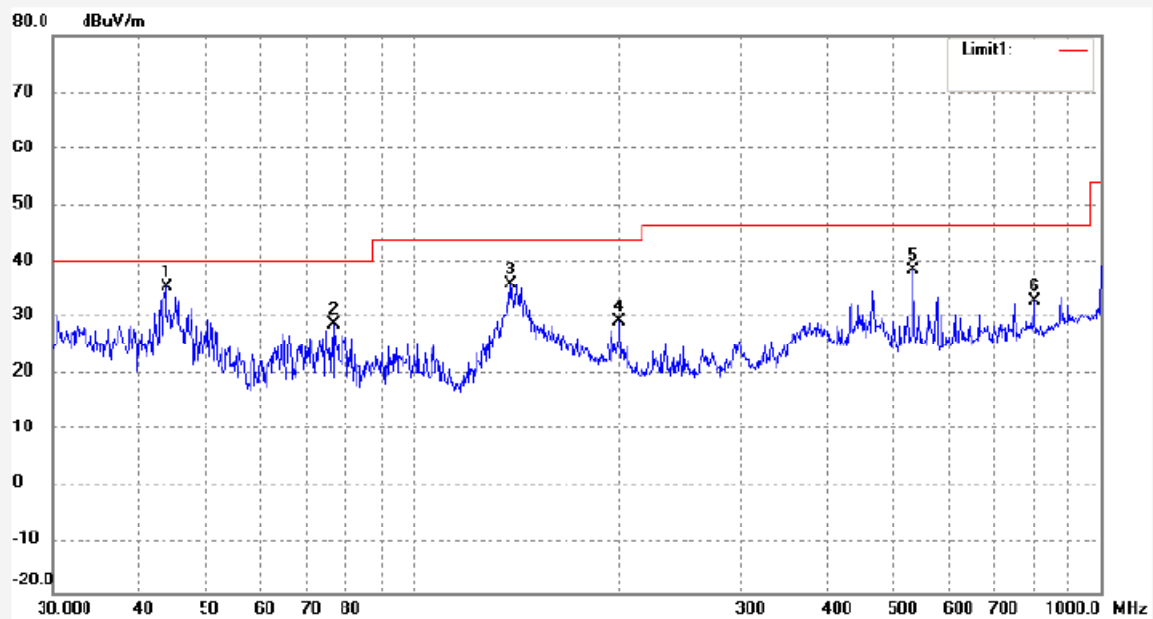
EUT: BC510 Edge Relay 1
 Tested Model: BC510
 Operating Condition: 802.11b Transmitting Low Channel-2412MHz
 Comment: 120V/60Hz; Adapter DC 5V/1A

Test Specification: Horizontal



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/	Margin (dB)	Detector	Remark
1*	81.2117	50.91	-16.19	34.72	40.00	-5.28	peak	
2	141.3298	47.91	-14.82	33.09	43.50	-10.41	peak	
3	195.1365	46.12	-12.24	33.88	43.50	-9.62	peak	
4	298.2681	45.82	9.72	36.10	46.00	9.90	peak	
5	368.1116	43.39	-7.53	35.86	46.00	-10.14	peak	
6	1000.0000	37.17	2.65	39.82	54.00	-14.18	peak	

Test Specification: Vertical

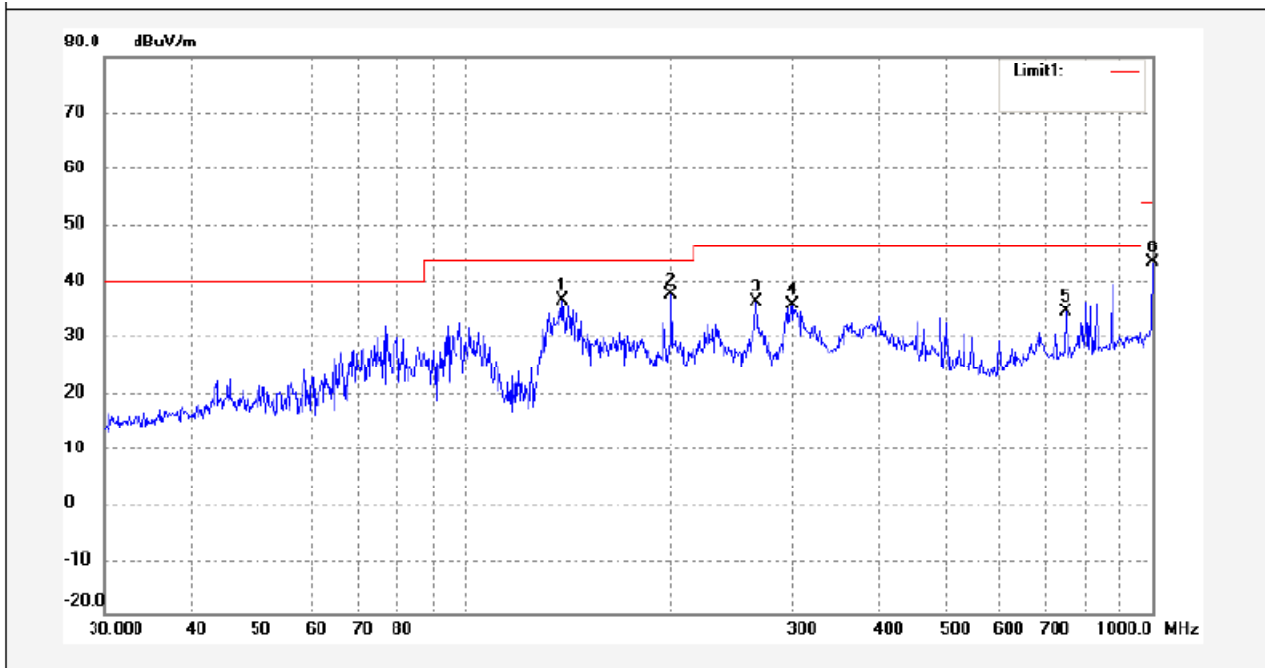


No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/	Margin (dB)	Detector	Remark
1*	43.8119	45.62	-10.44	35.18	40.00	-4.82	peak	
2	77.0505	45.98	-17.59	28.39	40.00	-11.61	peak	
3	138.3873	50.30	-14.72	35.58	43.50	-7.92	peak	
4	199.9856	40.46	-11.60	28.86	43.50	-14.64	peak	
5	533.8321	43.92	-5.82	38.10	46.00	-7.90	peak	
6	798.9797	32.66	-0.07	32.59	46.00	-13.41	peak	

Operating Condition: 802.11b Transmitting Middle Channel-2437MHz

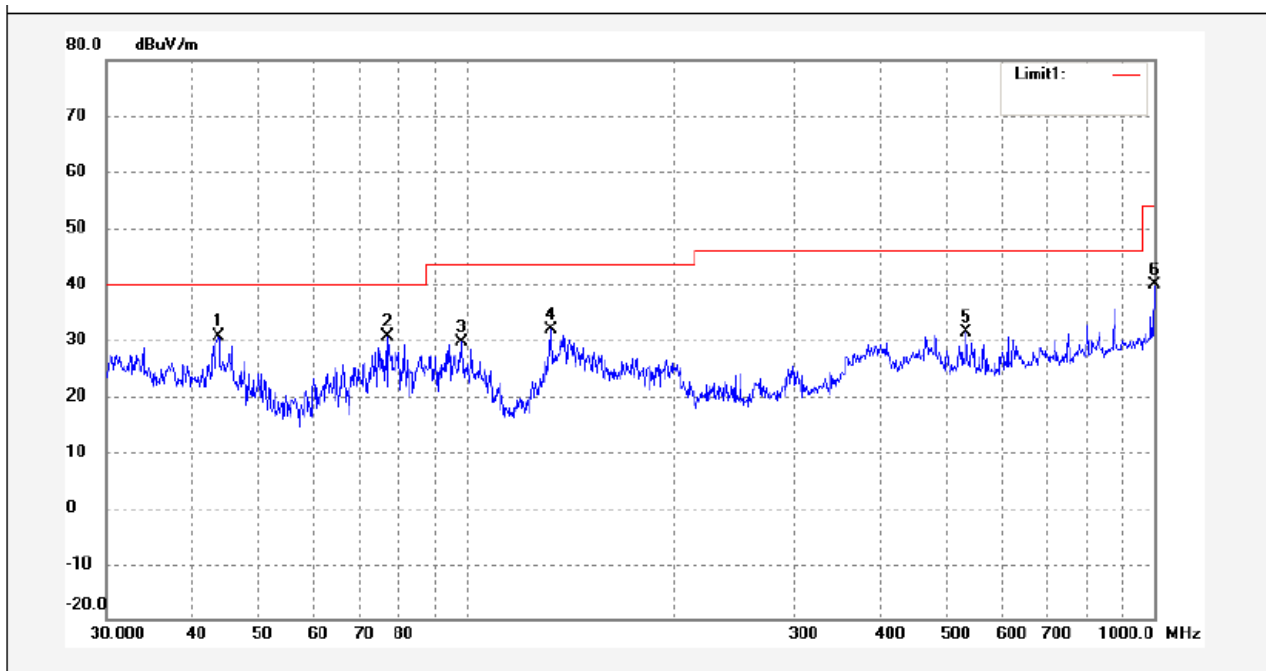
Comment: 120V/60Hz; Adapter DC 5V/1A

Test Specification: Horizontal



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV)	Margin (dB)	Detector	Remark
1	138.3873	51.21	-14.72	36.49	43.50	-7.01	peak	
2*	199.9856	48.89	-11.60	37.29	43.50	-6.21	peak	
3	265.6757	46.10	-9.91	36.19	46.00	-9.81	peak	
4	300.3672	45.46	-9.75	35.71	46.00	-10.29	peak	
5	750.1083	35.66	-1.20	34.46	46.00	-11.54	peak	
6	1000.0000	40.40	2.65	43.05	54.00	-10.95	peak	

Test Specification: Vertical

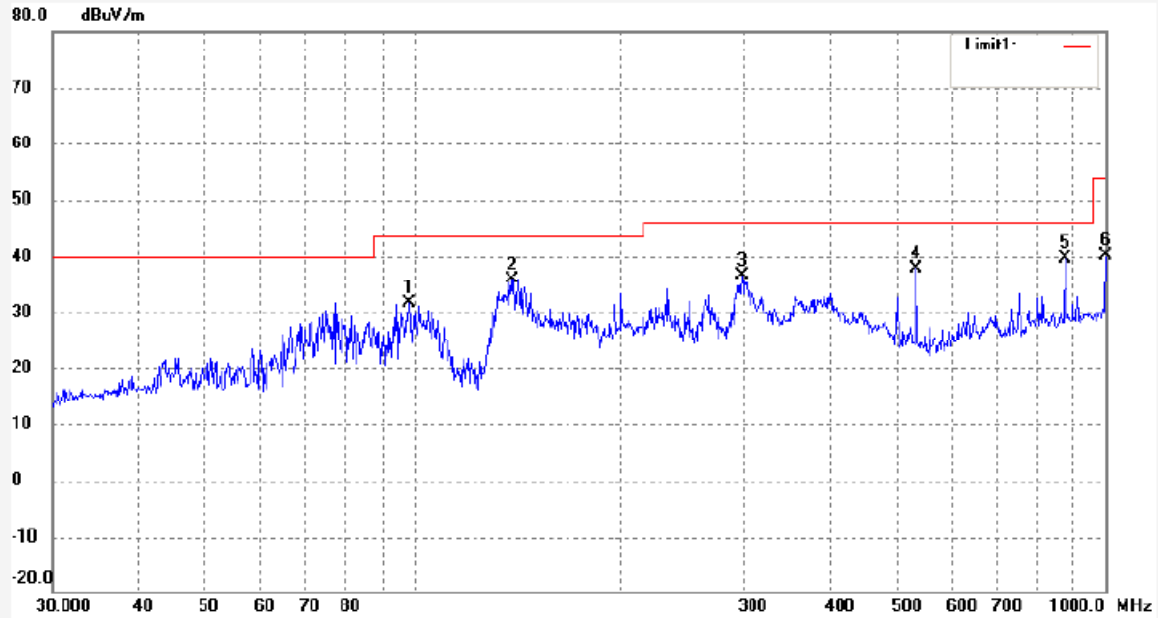


No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV)	Margin (dB)	Detector	Remark
1	43.6584	40.97	-10.44	30.53	40.00	-9.47	peak	
2*	77.0505	48.21	-17.59	30.62	40.00	-9.38	peak	
3	98.4866	41.29	-11.73	29.56	43.50	-13.94	peak	
4	132.6850	46.38	-14.39	31.99	43.50	-11.51	peak	
5	533.8321	37.23	-5.82	31.41	46.00	-14.59	peak	
6	1000.0000	37.11	2.65	39.76	54.00	-14.24	peak	

Operating Condition: 802.11b Transmitting High Channel-2462MHz

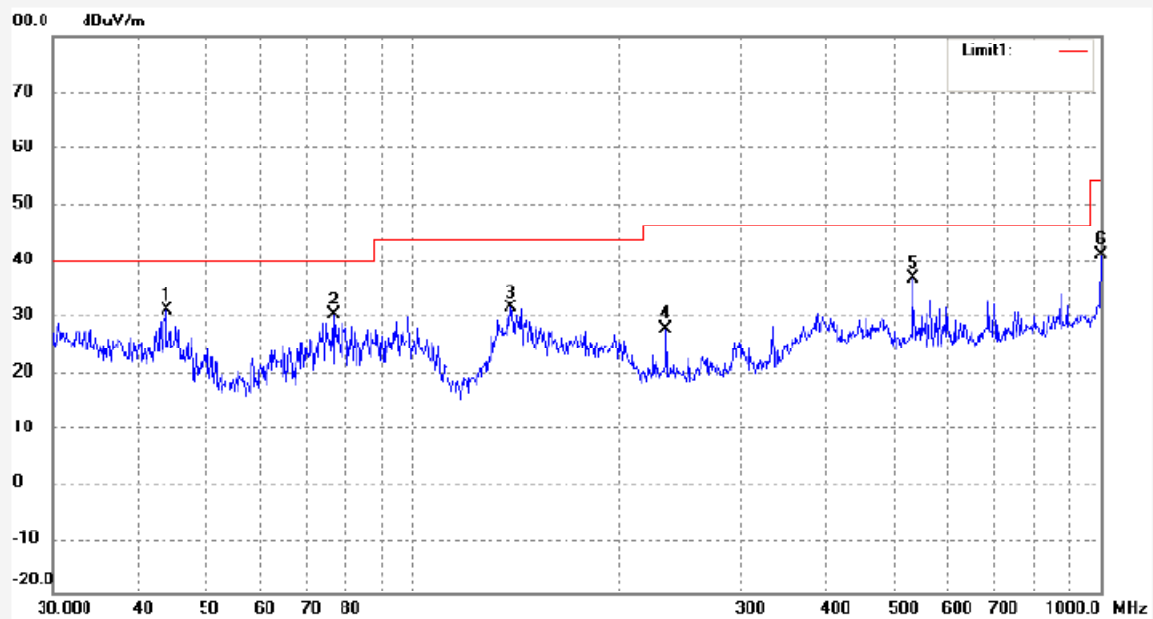
Comment: 120V/60Hz; Adapter DC 5V/1A

Test Specification: Horizontal



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV)	Margin (dB)	Detector	Remark
1	98.4866	43.25	-11.73	31.52	43.50	-11.98	peak	
2	138.3873	50.67	-14.72	35.95	43.50	-7.55	peak	
3	298.2681	46.38	-9.72	36.66	46.00	-9.34	peak	
4	533.8321	43.72	-5.82	37.90	46.00	-8.10	peak	
5*	875.2470	38.21	1.38	39.59	46.00	-6.41	peak	
6	1000.0000	37.54	2.65	40.19	54.00	-13.81	peak	

Test Specification: Vertical



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/	Margin (dB)	Detector	Remark
1*	43.8119	41.22	-10.44	30.78	40.00	-9.22	peak	
2	77.0505	47.80	-17.59	30.21	40.00	-9.79	peak	
3	138.3873	46.18	-14.72	31.46	43.50	-12.04	peak	
4	233.3487	39.16	-11.47	27.69	46.00	-18.31	peak	
5	531.9635	42.53	-5.86	36.67	46.00	-9.33	peak	
6	1000.0000	38.13	2.65	40.78	54.00	-13.22	peak	

Test Mode: 802.11b

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2412MHz							
4824.000	52.44	-3.42	49.02	74	-24.98	H	PK
4824.000	37.39	-3.22	34.17	54	-19.83	H	AV
7236.000	45.05	1.99	47.04	74	-26.96	H	PK
7236.000	33.83	2.14	35.97	54	-18.03	H	AV
4824.000	55.56	-3.51	52.05	74	-21.95	V	PK
4824.000	39.15	-3.11	36.04	54	-17.96	V	AV
7236.000	47.56	1.65	49.21	74	-24.79	V	PK
7236.000	35.89	1.65	37.54	54	-16.46	V	AV
Middle Channel-2437MHz							
4874.000	55.44	-3.29	52.15	74	-21.85	H	PK
4874.000	40.89	-3.09	37.8	54	-16.20	H	AV
7311.000	48.87	2.32	51.19	74	-22.81	H	PK
7311.000	34.3	2.42	36.72	54	-17.28	H	AV
4874.000	54.57	-3.39	51.18	74	-22.82	V	PK
4874.000	41.89	-2.99	38.9	54	-15.10	V	AV
7311.000	48.78	2.02	50.8	74	-23.20	V	PK
7311.000	34.88	2.02	36.9	54	-17.10	V	AV
High Channel-2462MHz							
4924.000	56.27	-2.89	53.38	74	-20.62	H	PK
4924.000	42.41	-2.69	39.72	54	-14.28	H	AV
7386.000	47.23	2.89	50.12	74	-23.88	H	PK
7386.000	35.78	2.99	38.77	54	-15.23	H	AV
4924.000	55.29	-2.99	52.30	74	-21.70	V	PK
4924.000	42.79	-2.59	40.20	54	-13.80	V	AV
7386.000	48.54	2.59	51.13	74	-22.87	V	PK
7386.000	35.73	2.59	38.32	54	-15.68	V	AV

Test Mode: 802.11g

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2412MHz							
4824.000	53.60	-3.16	50.44	74	-23.56	H	PK
4824.000	40.53	-2.96	37.57	54	-16.43	H	AV
7236.000	46.92	2.20	49.12	74	-24.88	H	PK
7236.000	33.00	2.30	35.30	54	-18.70	H	AV
4824.000	53.99	-3.26	50.73	74	-23.27	V	PK
4824.000	41.05	-2.86	38.19	54	-15.81	V	AV
7236.000	47.42	1.90	49.32	74	-24.68	V	PK
7236.000	33.74	1.90	35.64	54	-18.36	V	AV
Middle Channel-2437MHz							
4874.000	53.20	-3.04	50.16	74	-23.84	H	PK
4874.000	41.58	-2.84	38.74	54	-15.26	H	AV
7311.000	45.88	2.57	48.45	74	-25.55	H	PK
7311.000	33.87	2.67	36.54	54	-17.46	H	AV
4874.000	55.07	-3.14	51.93	74	-22.07	V	PK
4874.000	42.26	-2.74	39.52	54	-14.48	V	AV
7311.000	46.60	2.27	48.87	74	-25.13	V	PK
7311.000	33.53	2.27	35.80	54	-18.20	V	AV
High Channel-2462MHz							
4924.000	52.10	-2.89	49.21	74	-24.79	H	PK
4924.000	39.05	-2.69	36.36	54	-17.64	H	AV
7386.000	45.68	2.89	48.57	74	-25.43	H	PK
7386.000	33.33	2.99	36.32	54	-17.68	H	AV
4924.000	54.11	-2.99	51.12	74	-22.88	V	PK
4924.000	41.09	-2.59	38.50	54	-15.5	V	AV
7386.000	46.78	2.59	49.37	74	-24.63	V	PK
7386.000	34.15	2.59	36.74	54	-17.26	V	AV

Test Mode: 802.11n-HT20

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2412MHz							
4824.000	53.70	-3.16	50.54	74	-23.46	H	PK
4824.000	38.84	-2.96	35.88	54	-18.12	H	AV
7236.000	45.76	2.20	47.96	74	-26.04	H	PK
7236.000	33.04	2.30	35.34	54	-18.66	H	AV
4824.000	54.71	-3.26	51.45	74	-22.55	V	PK
4824.000	41.58	-2.86	38.72	54	-15.28	V	AV
7236.000	47.41	1.90	49.31	74	-24.69	V	PK
7236.000	33.97	1.90	35.87	54	-18.13	V	AV
Middle Channel-2437MHz							
4874.000	52.26	-3.04	49.22	74	-24.78	H	PK
4874.000	40.78	-2.84	37.94	54	-16.06	H	AV
7311.000	47.24	2.57	49.81	74	-24.19	H	PK
7311.000	31.70	2.67	34.37	54	-19.63	H	AV
4874.000	52.92	-3.14	49.78	74	-24.22	V	PK
4874.000	41.02	-2.74	38.28	54	-15.72	V	AV
7311.000	46.69	2.27	48.96	74	-25.04	V	PK
7311.000	33.40	2.27	35.67	54	-18.33	V	AV
High Channel-2462MHz							
4924.000	52.00	-2.89	49.11	74	-24.89	H	PK
4924.000	41.53	-2.69	38.84	54	-15.16	H	AV
7386.000	46.81	2.89	49.70	74	-24.30	H	PK
7386.000	34.70	2.99	37.69	54	-16.31	H	AV
4924.000	53.70	-2.99	50.71	74	-23.29	V	PK
4924.000	39.88	-2.59	37.29	54	-16.71	V	AV
7386.000	46.75	2.59	49.34	74	-24.66	V	PK
7386.000	33.56	2.59	36.15	54	-17.85	V	AV

Test Mode: 802.11n-HT40

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2422MHz							
4844.000	51.35	-3.20	48.15	74	-25.85	H	PK
4824.000	36.55	-3.00	33.55	54	-20.45	H	AV
7266.000	44.98	2.16	47.14	74	-26.86	H	PK
7266.000	31.16	2.26	33.42	54	-20.58	H	AV
4844.000	52.22	-3.30	48.92	74	-25.08	V	PK
4824.000	37.82	-2.90	34.92	54	-19.08	V	AV
7266.000	47.01	1.86	48.87	74	-25.13	V	PK
7266.000	32.98	1.86	34.84	54	-19.16	V	AV
Middle Channel-2437MHz							
4874.000	50.63	-3.04	47.59	74	-26.41	H	PK
4874.000	36.18	-2.84	33.34	54	-20.66	H	AV
7311.000	43.38	2.57	45.95	74	-28.05	H	PK
7311.000	30.63	2.67	33.30	54	-20.70	H	AV
4874.000	51.74	-3.14	48.60	74	-25.40	V	PK
4874.000	38.35	-2.74	35.61	54	-18.39	V	AV
7311.000	43.98	2.27	46.25	74	-27.75	V	PK
7311.000	32.2	2.27	34.47	54	-19.53	V	AV
High Channel-2452MHz							
4904.000	50.75	-2.93	47.82	74	-26.18	H	PK
4904.000	37.67	-2.73	34.94	54	-19.06	H	AV
7356.000	44.13	2.72	46.85	74	-27.15	H	PK
7356.000	29.33	2.82	32.15	54	-21.85	H	AV
4904.000	52.84	-3.03	49.81	74	-24.19	V	PK
4904.000	39.23	-2.63	36.60	54	-17.40	V	AV
7356.000	46.38	2.42	48.80	74	-25.20	V	PK
7356.000	33.32	2.42	35.74	54	-18.26	V	AV

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 3th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

The measurements greater than 20dB below the limit from 9kHz to 30MHz.

9. Out of Band Emissions

9.1 Standard Applicable

According to §15.247 (d) 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. 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).

9.2 Test Procedure

According to the KDB 558074D01 v04, the band-edge radiated test method as follows:

Set span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation (2310MHz to 2420MHz for low bandedge, 2460MHz to 2500MHz for the high bandedge)

RBW = 1MHz, VBW = 1MHz for peak value measured

RBW = 1MHz, VBW = 10Hz for average value measured

Sweep = auto; Detector function = peak/average; Trace = max hold

All the trace to stabilize, set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. Those emission must comply with the 15.209 limit for fall in the restricted bands listed in section 15.205. Note that the method of measurement KDB publication number: 913591 may be used for the radiated bandedge measurements.

According to the KDB 558074 D01 V04, the conducted spurious emissions test method as follows:

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 \geq 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.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in section 8.1. Report the three highest emissions relative to the limit.

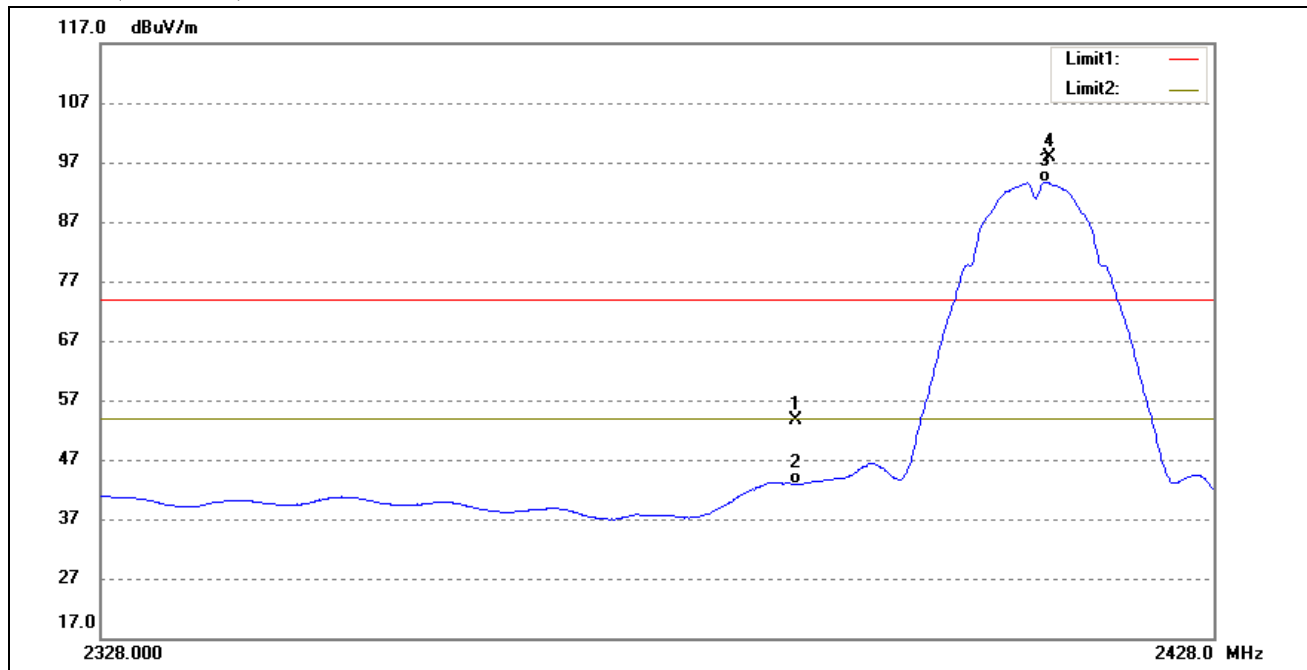
9.3 Environmental Conditions

Temperature:	23°C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

9.4 Summary of Test Results/Plots

802.11b-Lowest Band edge

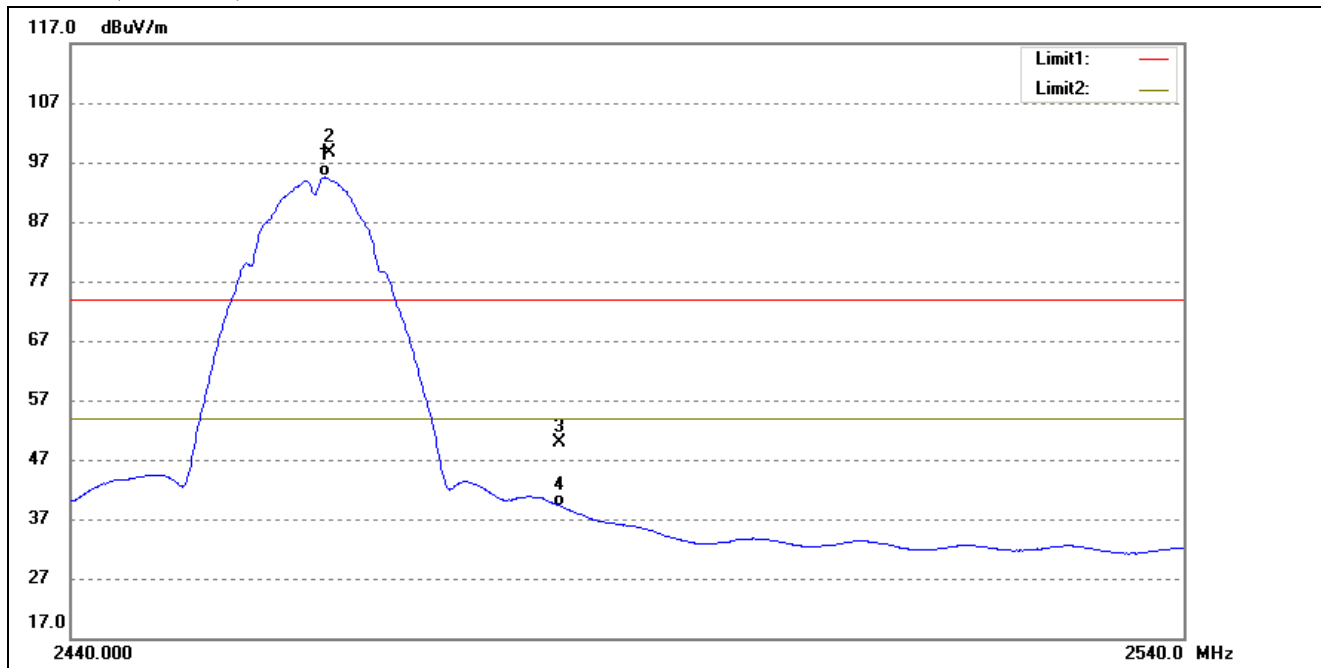
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	2390.000	60.91	-7.26	53.65	74.00	-20.35	100	100	peak
2	2390.000	50.08	-7.26	42.82	54.00	-11.18	169	100	AVG
3	2412.629	101.08	-7.40	93.68	/	/	204	100	AVG
4	2413.100	105.30	-7.40	97.90	/	/	256	100	peak

802.11b-Highest Band edge

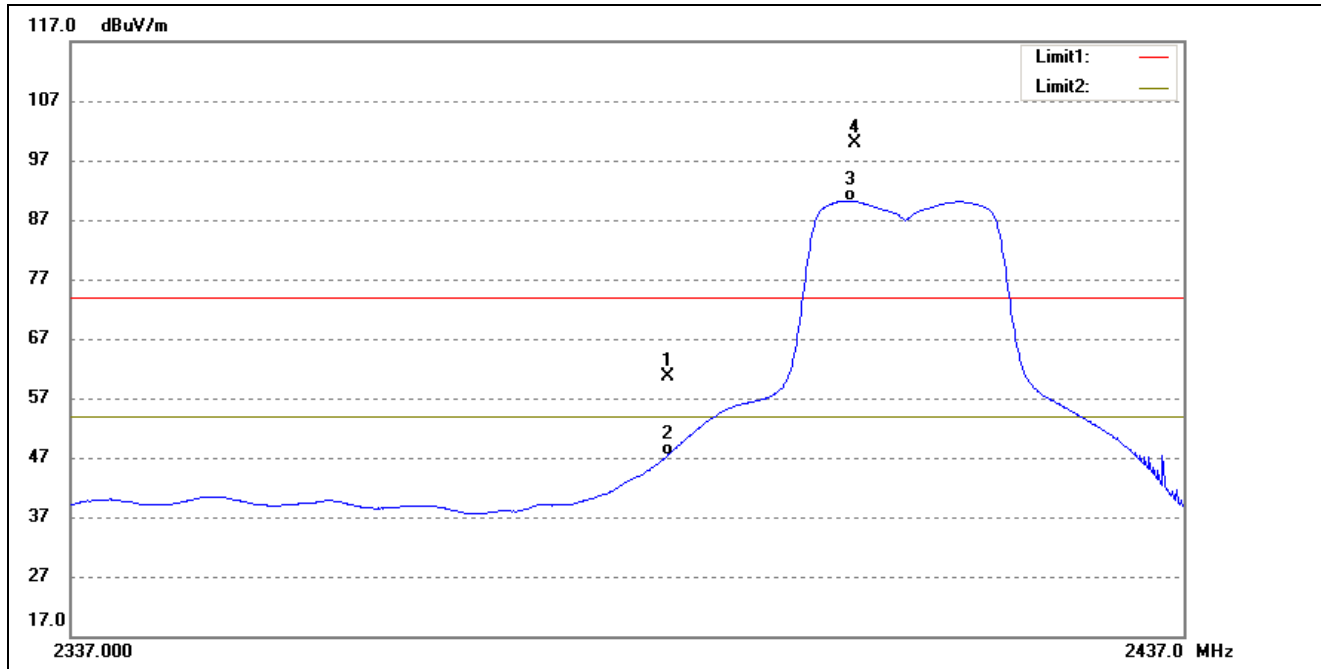
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	2462.448	101.83	-7.31	94.52	/	/	89	100	AVG
2	2463.000	105.95	-7.31	98.64	/	/	152	100	peak
3	2483.500	57.09	-7.28	49.81	74.00	-24.19	198	100	peak
4	2483.500	46.47	-7.28	39.19	54.00	-14.81	287	100	AVG

802.11g-Lowest Band edge

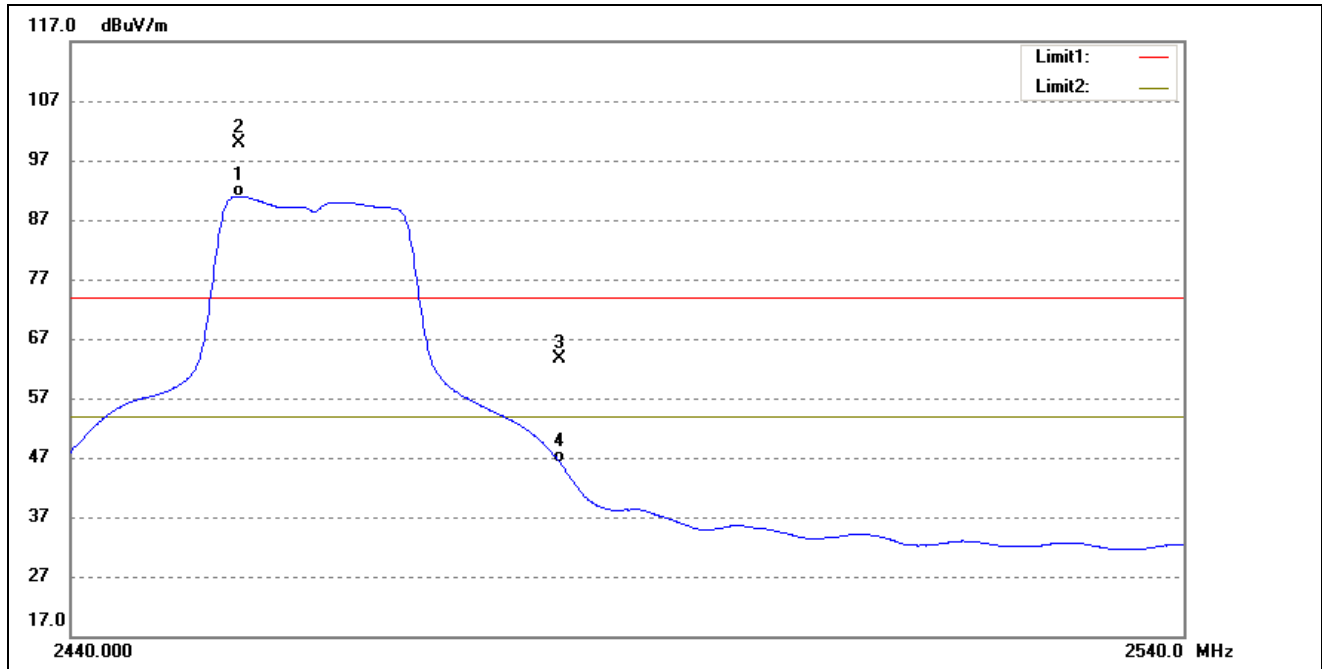
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	2390.000	67.94	-7.26	60.68	74.00	-13.32	76	100	peak
2	2390.000	54.58	-7.26	47.32	54.00	-6.68	156	100	AVG
3	2406.660	97.66	-7.42	90.24	/	/	149	100	AVG
4	2407.000	107.19	-7.42	99.77	/	/	320	100	peak

802.11g-Highest Band edge

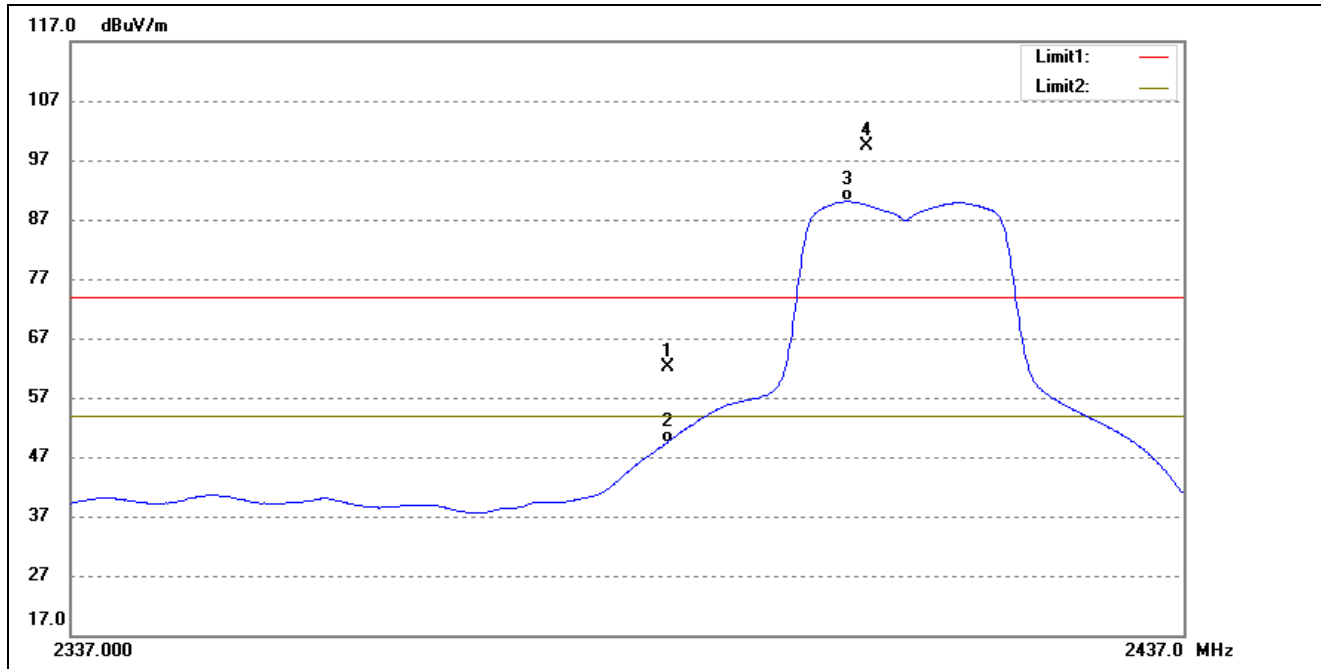
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	2454.844	98.33	-7.33	91.00	/	/	136	100	AVG
2	2454.900	107.24	-7.33	99.91	/	/	159	100	peak
3	2483.500	70.89	-7.28	63.61	74.00	-10.39	265	100	peak
4	2483.500	53.33	-7.28	46.05	54.00	-7.95	287	100	AVG

802.11n-HT20-Lowest Band edge

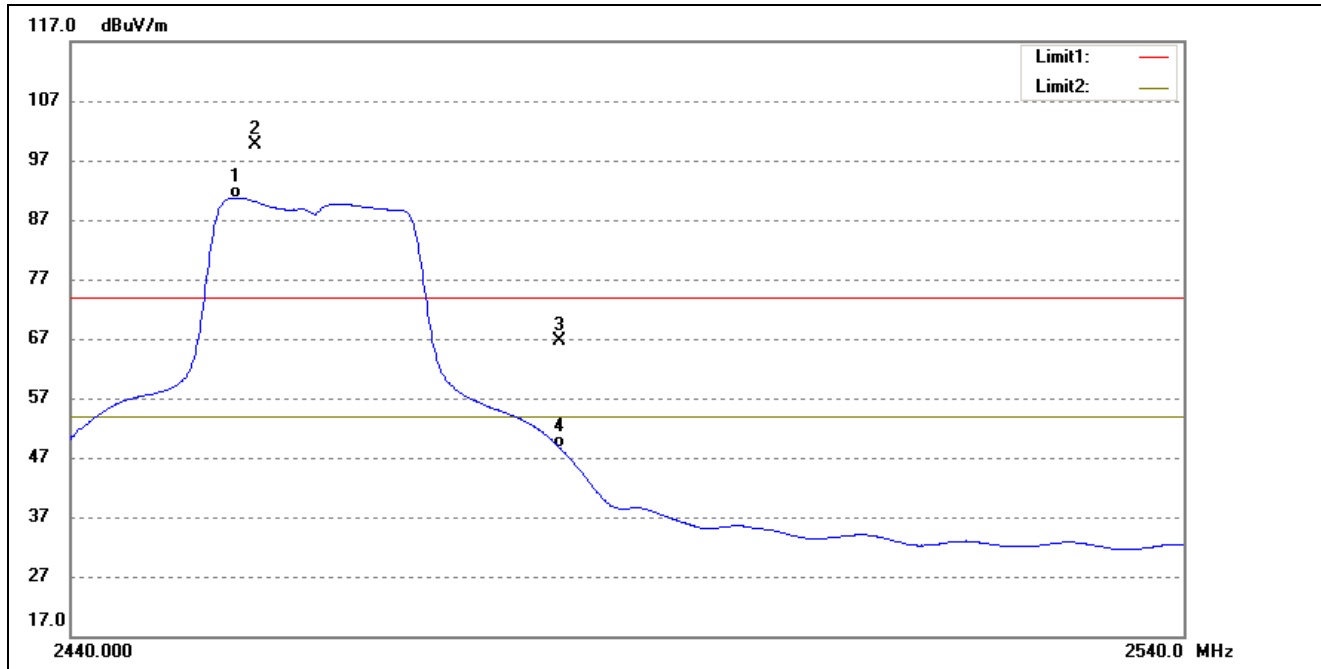
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	2390.000	69.36	-7.26	62.10	74.00	-11.90	123	100	peak
2	2390.000	56.74	-7.26	49.48	54.00	-4.52	345	100	AVG
3	2406.357	97.48	-7.42	90.06	/	/	296	100	AVG
4	2408.100	106.73	-7.42	99.31	/	/	308	100	peak

802.11n-HT20-Highest Band edge

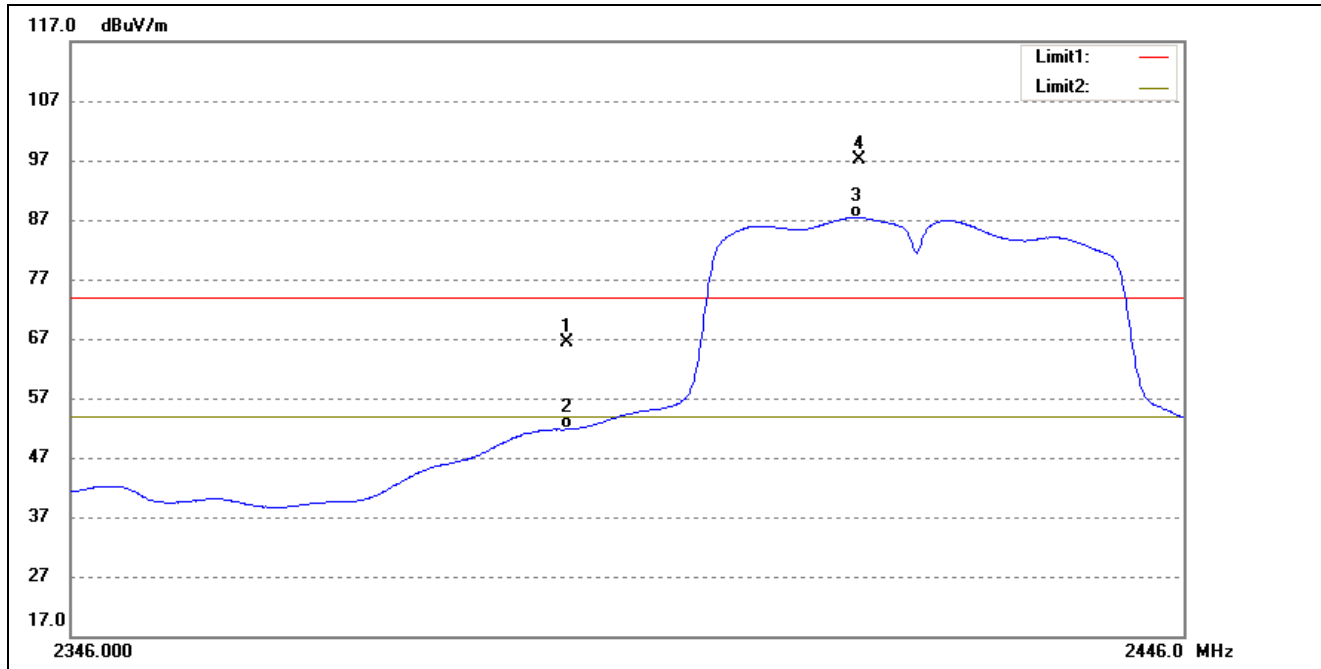
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	2454.647	98.08	-7.33	90.75	/	/	69	100	AVG
2	2456.400	107.02	-7.33	99.69	/	/	147	100	peak
3	2483.500	74.00	-7.28	66.72	74.00	-7.28	269	100	peak
4	2483.500	55.84	-7.28	48.56	54.00	-5.44	327	100	AVG

802.11n-HT40-Lowest Band edge

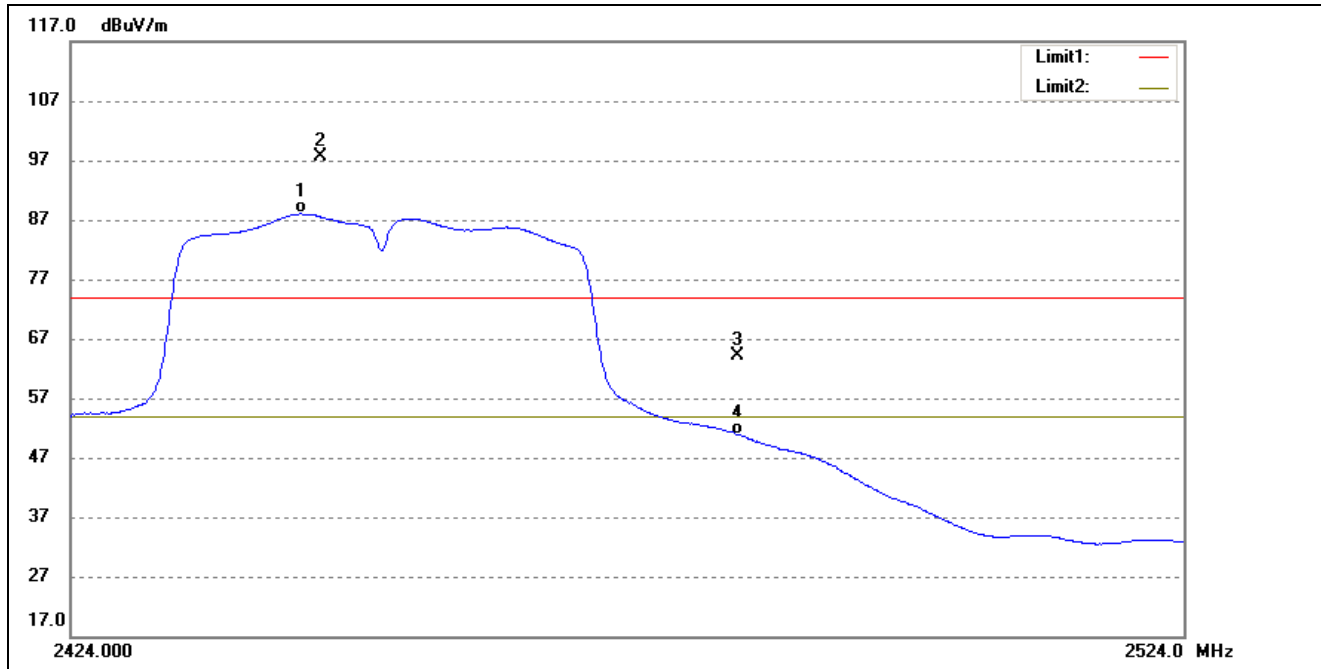
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	2390.000	73.52	-7.26	66.26	74.00	-7.74	49	100	peak
2	2390.000	59.08	-7.26	51.82	54.00	-2.18	135	100	AVG
3	2416.166	94.78	-7.39	87.39	/	/	241	100	AVG
4	2416.400	104.64	-7.39	97.25	/	/	184	100	peak

802.11n-HT40-Highest Band edge

Vertical (Worst case)

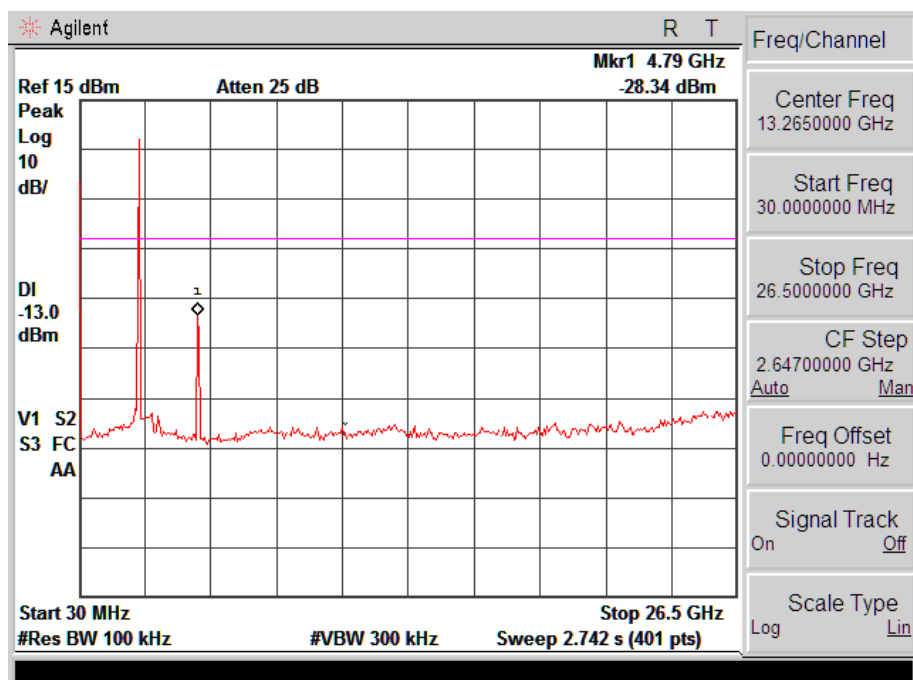
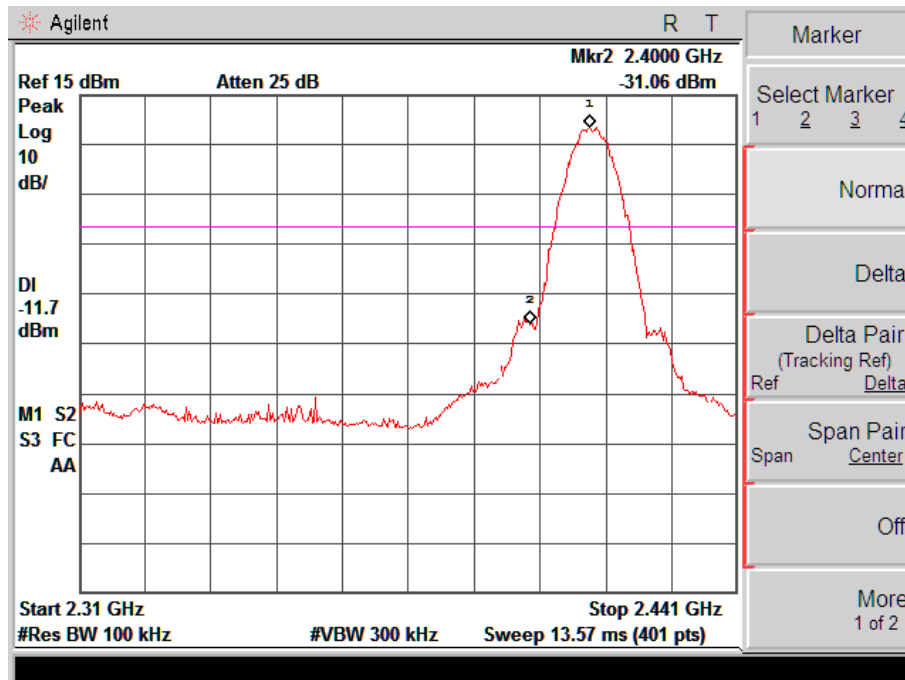


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	2444.369	95.37	-7.35	88.02	/	/	58	100	AVG
2	2446.100	104.90	-7.35	97.55	/	/	135	100	peak
3	2483.500	71.38	-7.28	64.10	74.00	-9.90	246	100	peak
4	2483.500	58.16	-7.28	50.88	54.00	-3.12	315	100	AVG

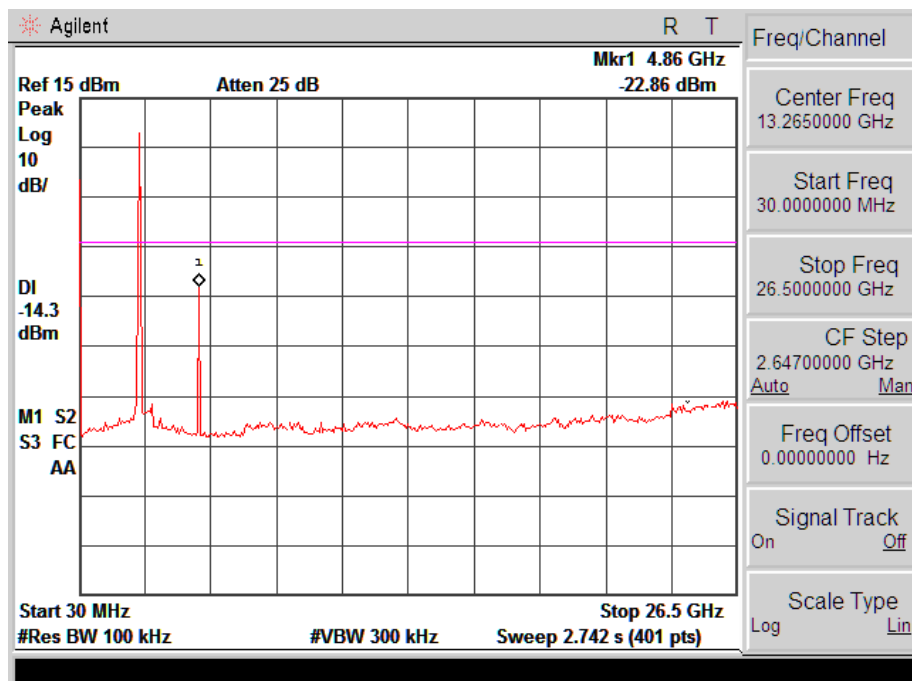
Out-of-Band and Spurious Emission (Conducted)

802.11b-11Mbps

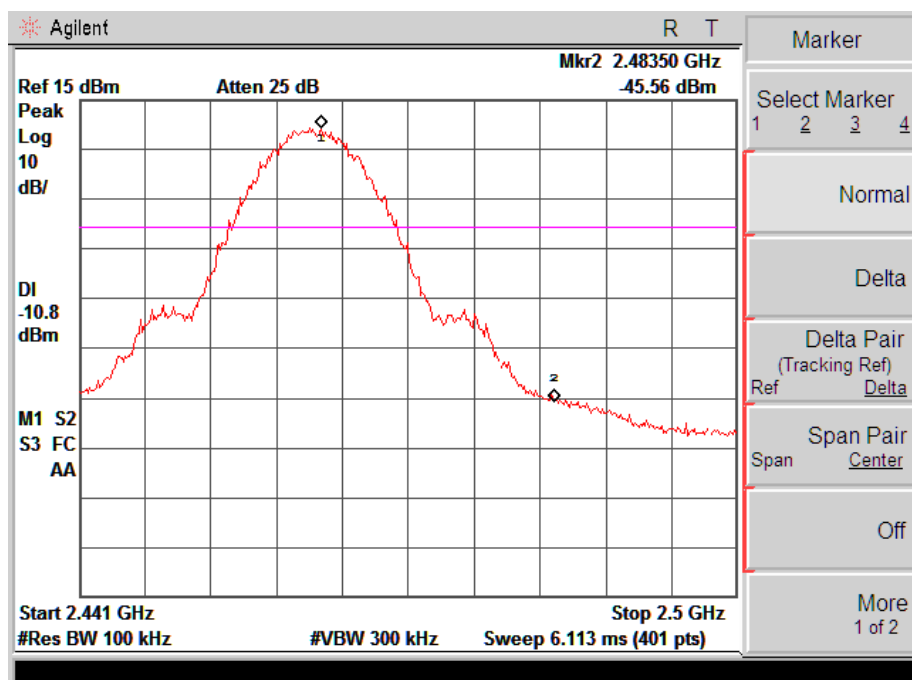
Low Channel

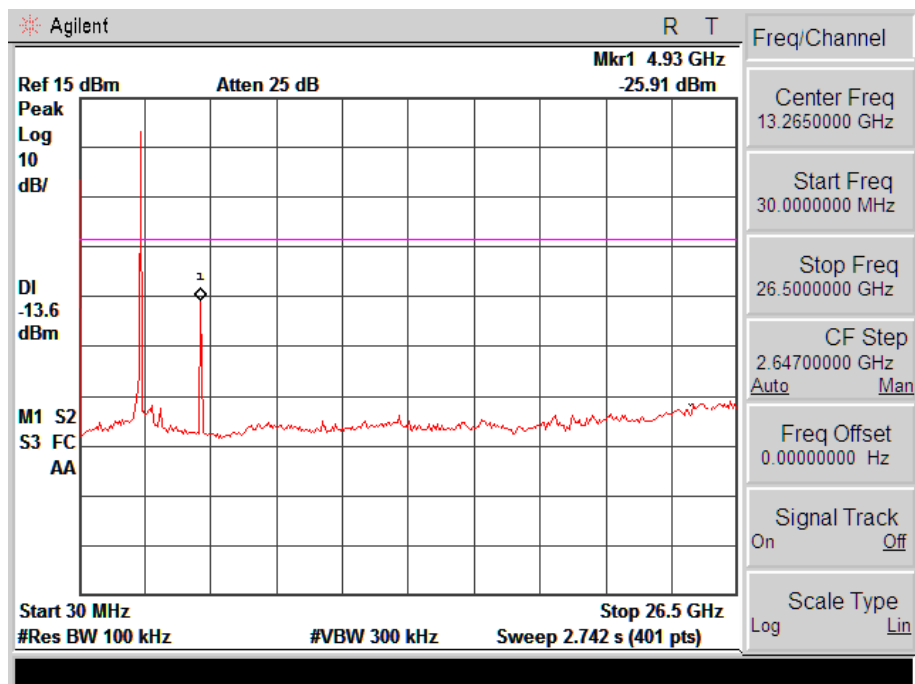


Middle Channel

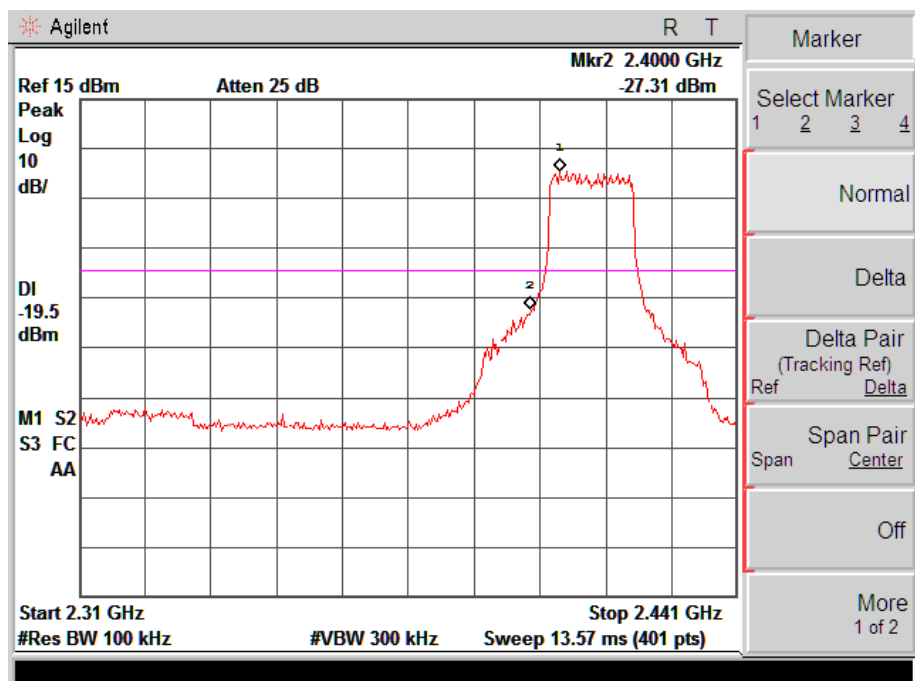


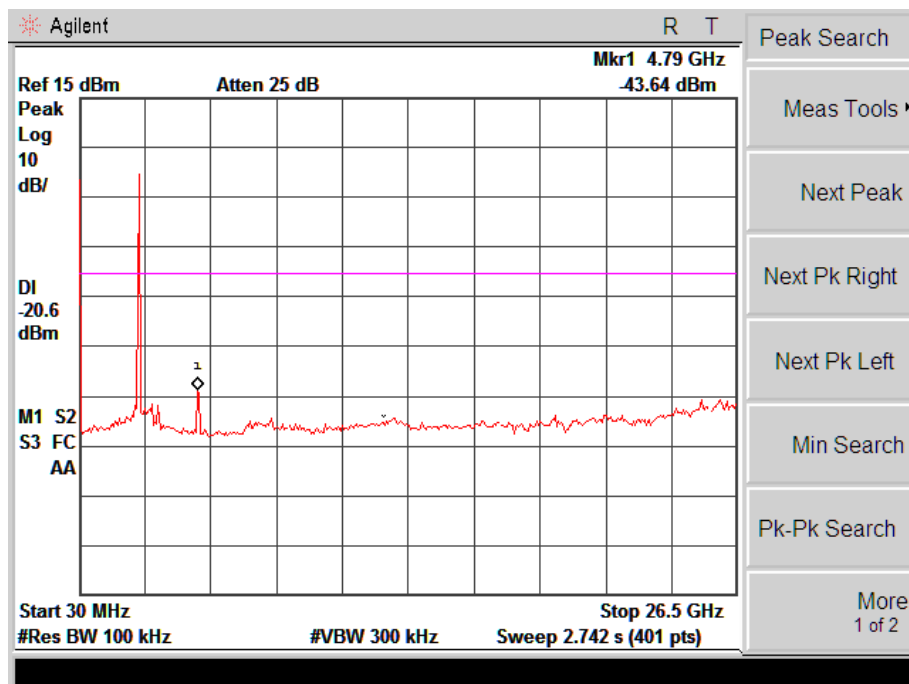
High Channel



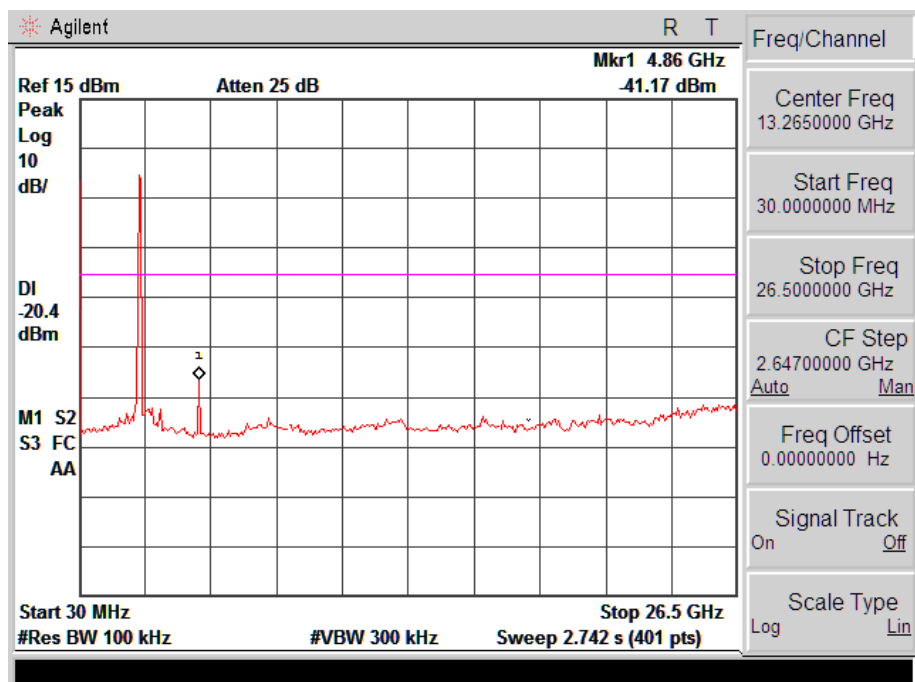


802.11g-54Mbps
Low Channel

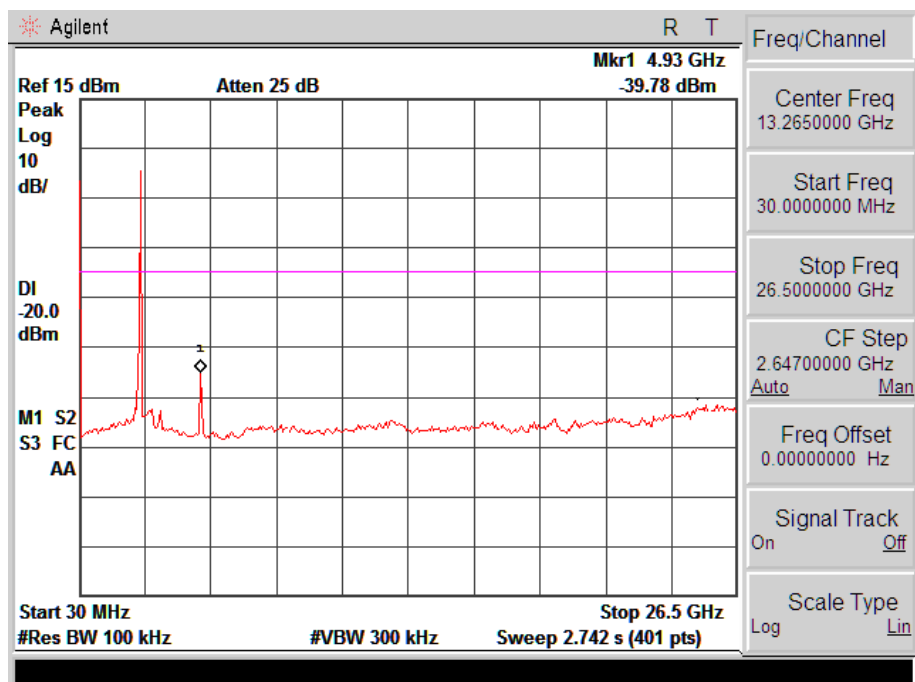
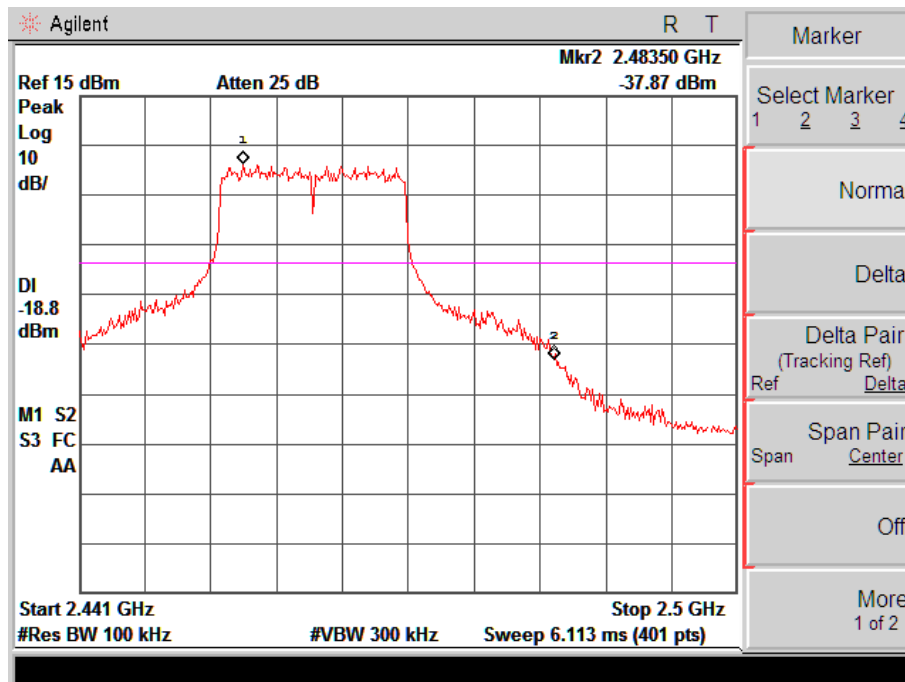




Middle Channel

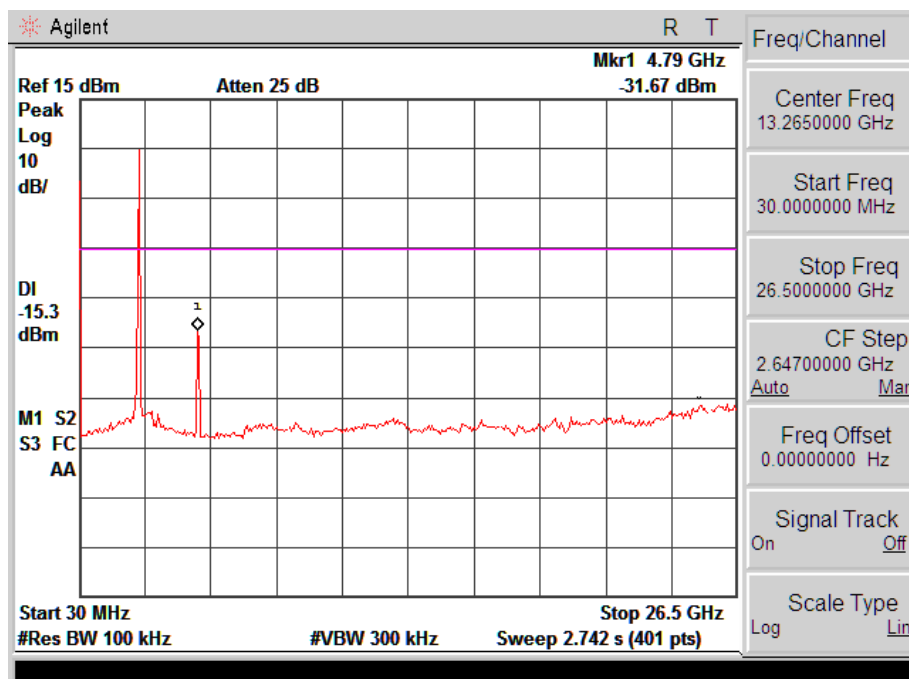
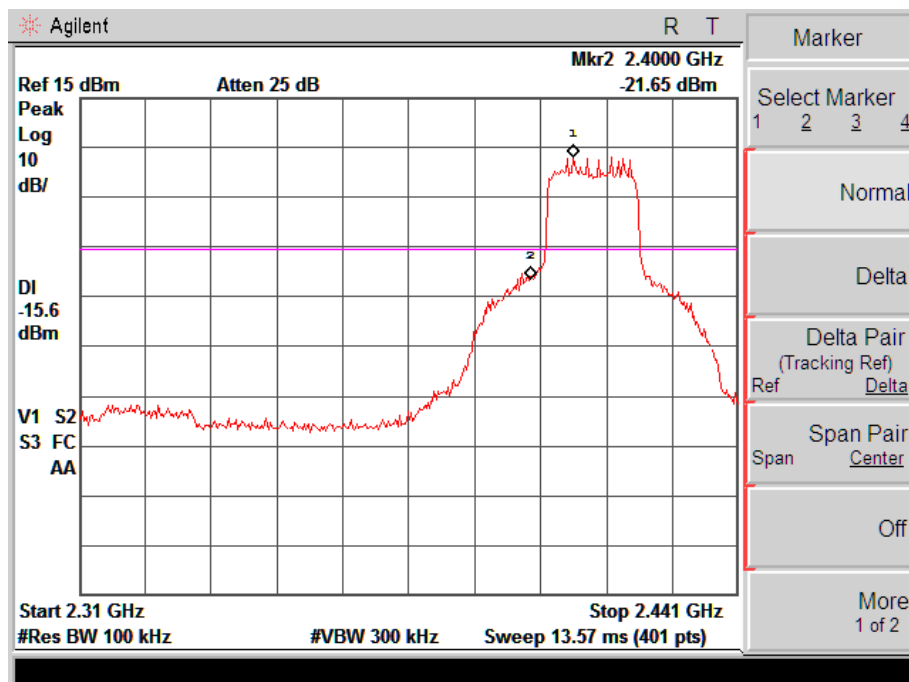


High Channel

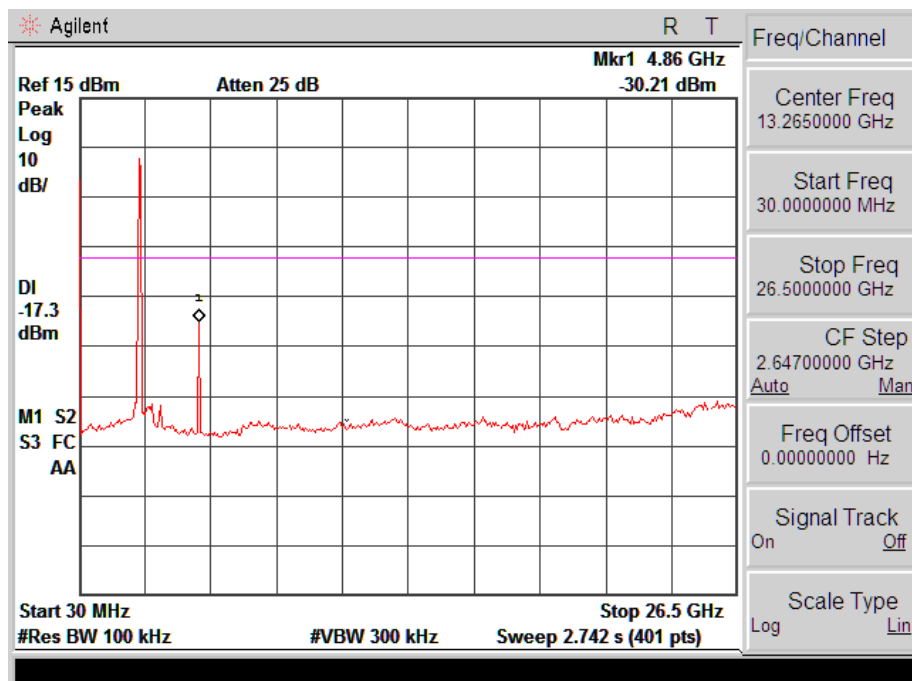


11n-HT20-MCS0:6.5Mbps

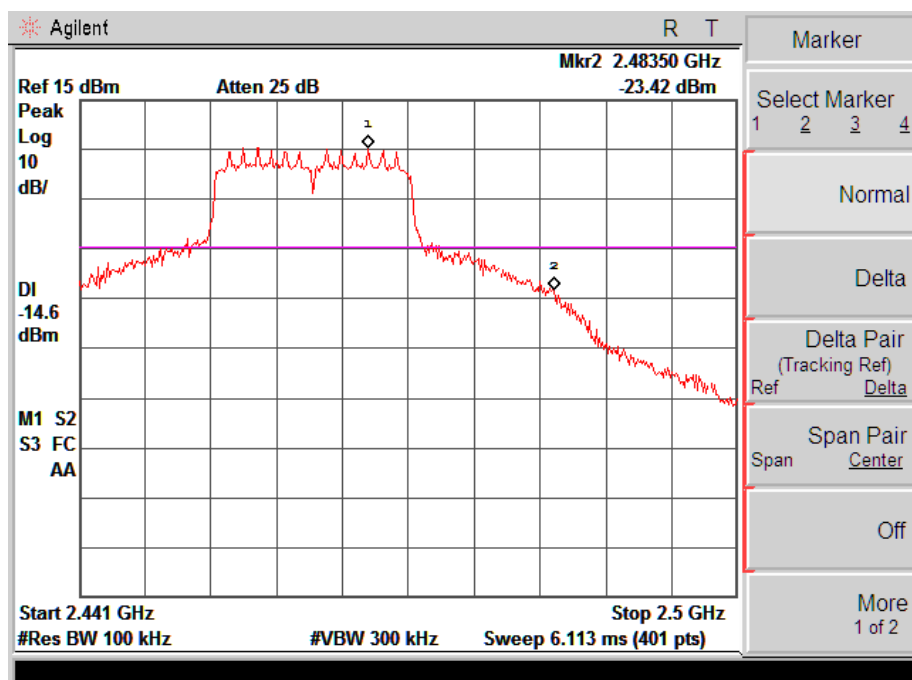
Low Channel

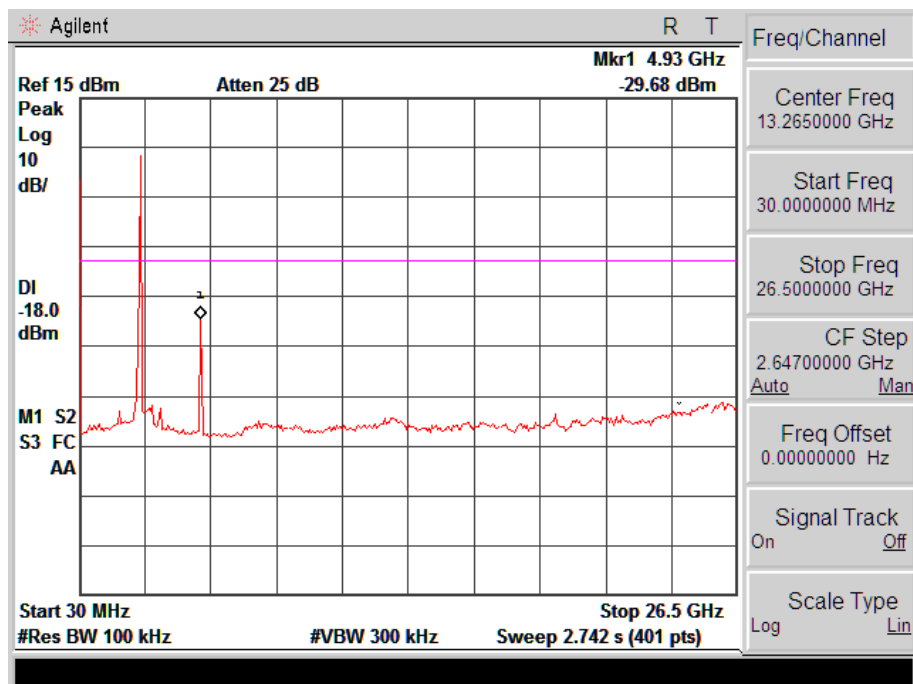


Middle Channel



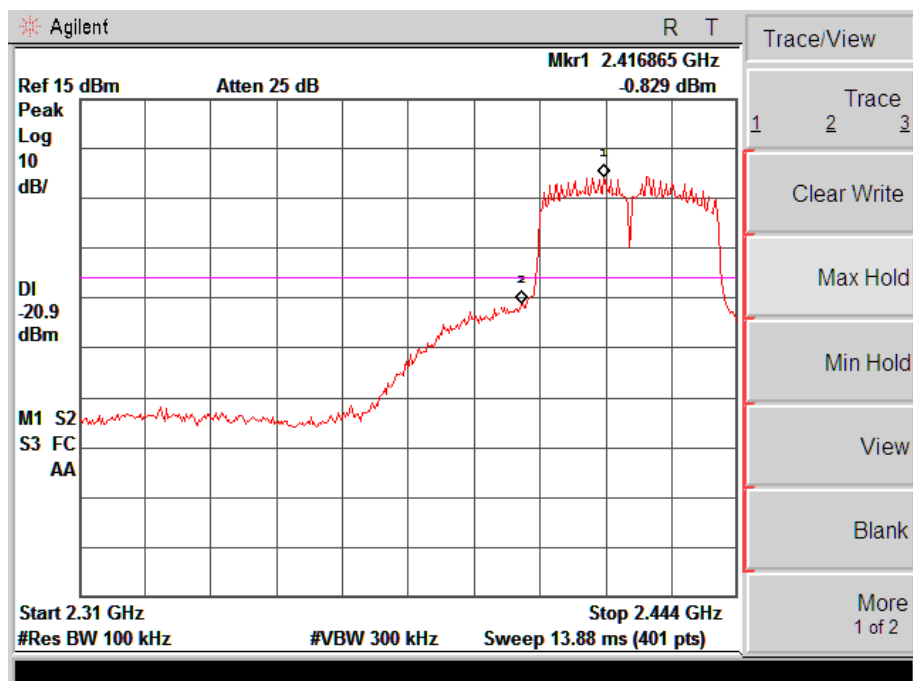
High Channel

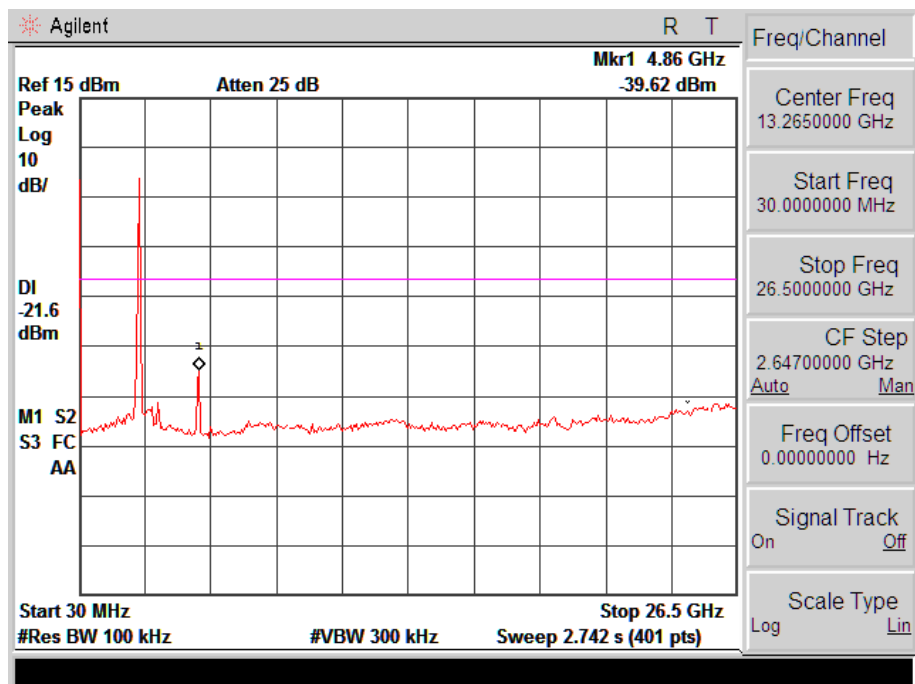




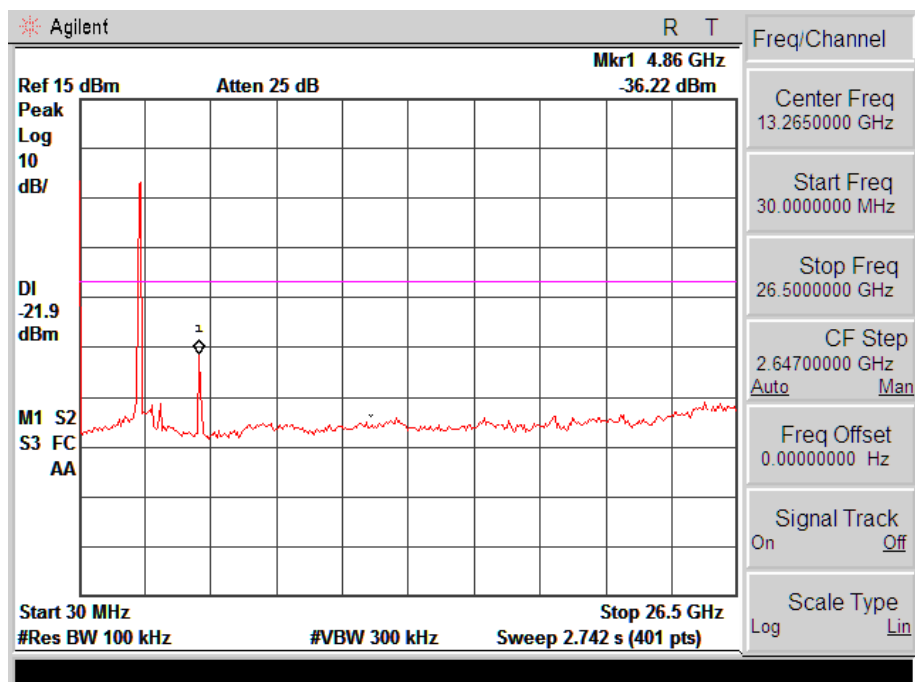
11n-HT40-MCS0:13.5Mbps

Low Channel

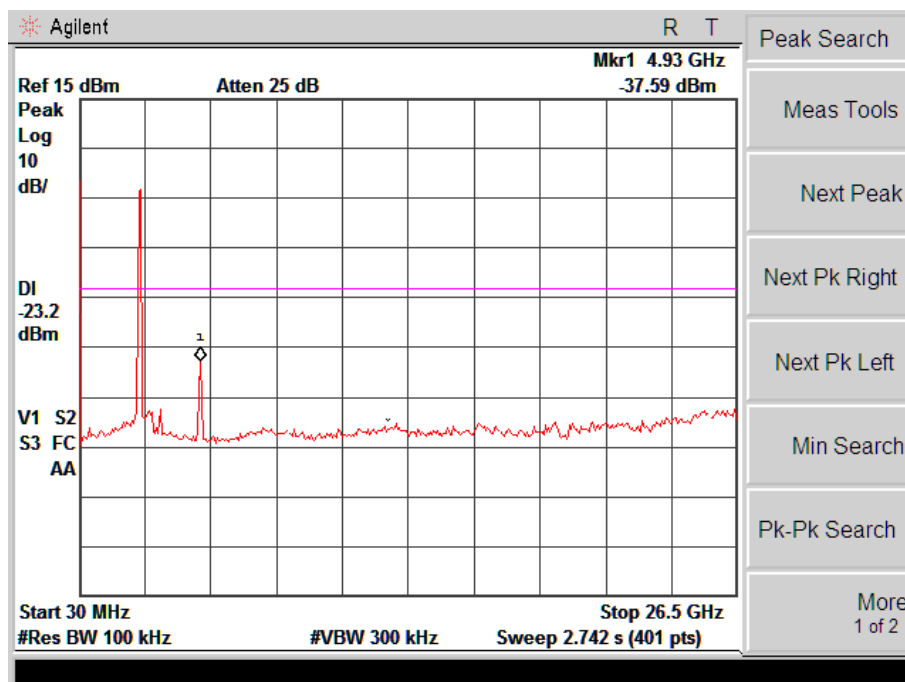
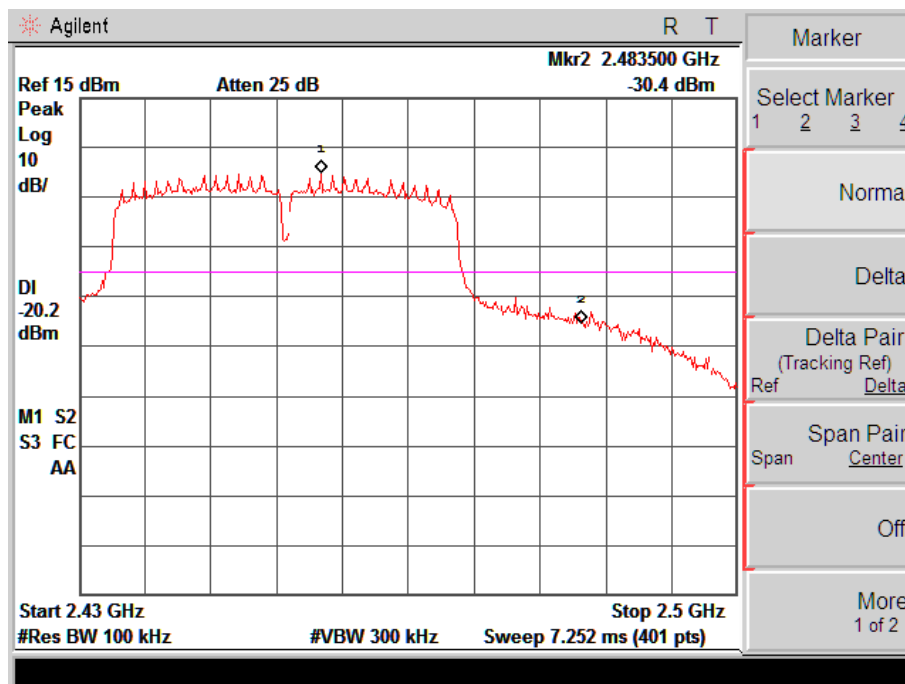




Middle Channel



High Channel



10. Conducted Emissions

10.1 Measurement Uncertainty

Base on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement is ± 2.88 dB.

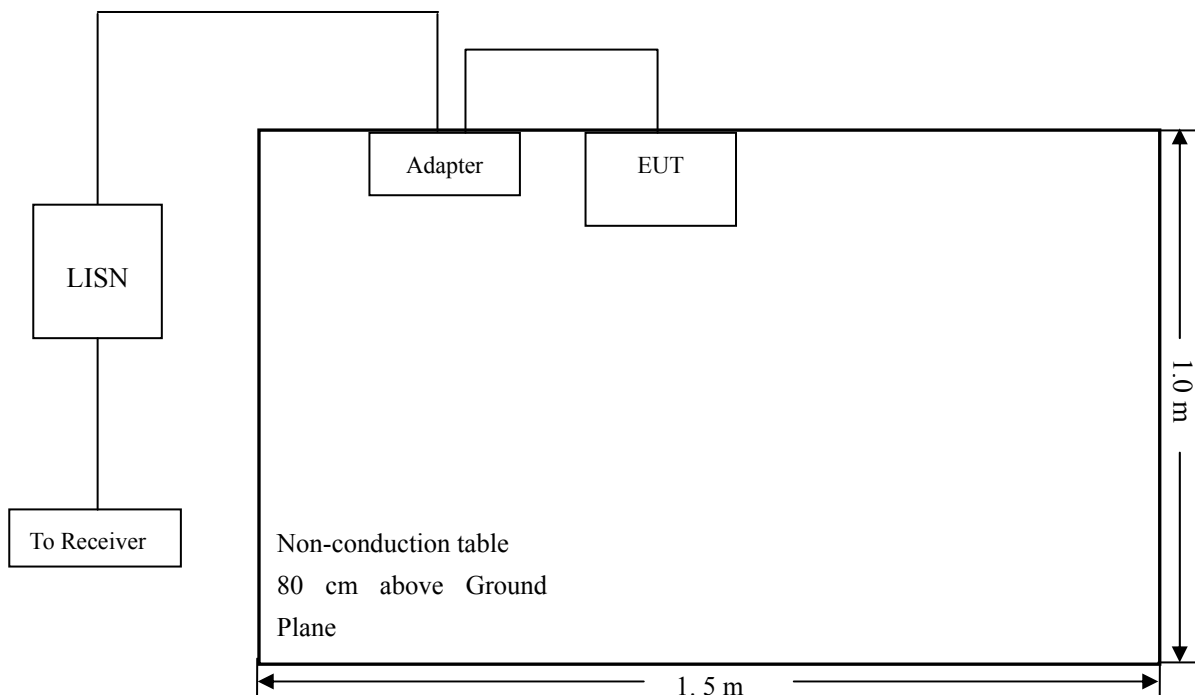
10.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

10.3 Basic Test Setup Block Diagram



10.4 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

10.5 Test Receiver Setup

During the conducted emission test, the test receiver was set with the following configurations:

Start Frequency	150 kHz
Stop Frequency	30 MHz
Sweep Speed	Auto
IF Bandwidth.....	10 kHz
Quasi-Peak Adapter Bandwidth	9 kHz
Quasi-Peak Adapter Mode	Normal

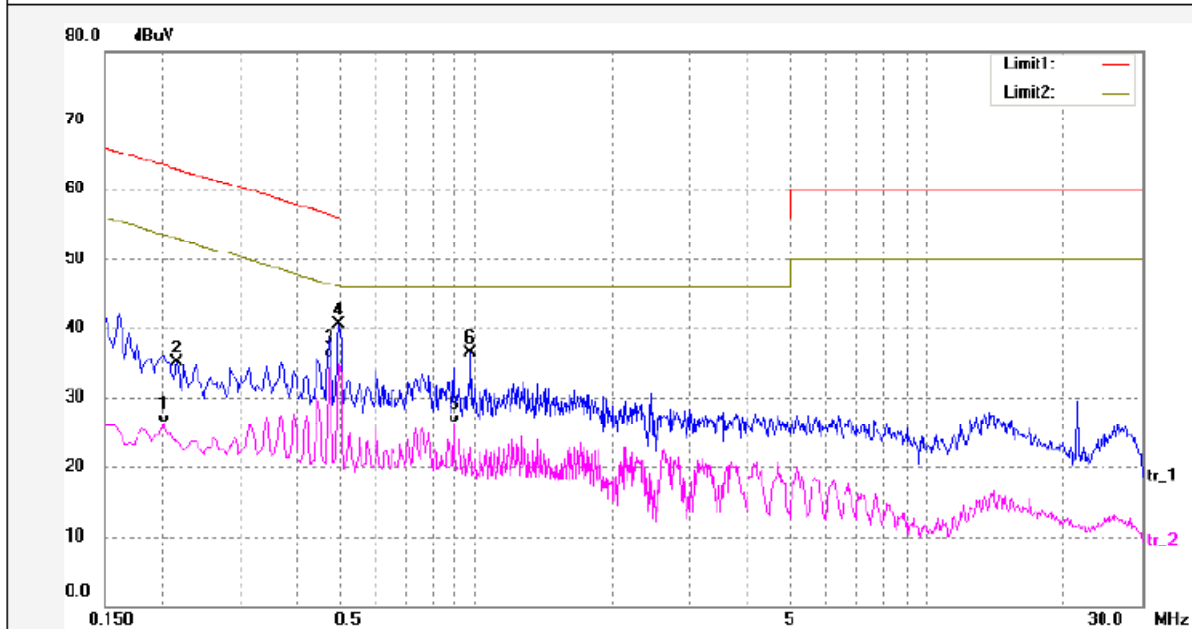
10.6 Summary of Test Results/Plots

According to the data in section 10.7, the EUT complied with the FCC Part 15.207 Conducted margin for this device, with the *worst* margin:

10.7 Conducted Emissions Test Data

Plot of Conducted Emissions Test Data

EUT: BC510 Edge Relay 1
Tested Model: BC510
Operating Condition: Transmitting, Powered by USB
Comment: AC 120V/60Hz
Test Specification: Neutral

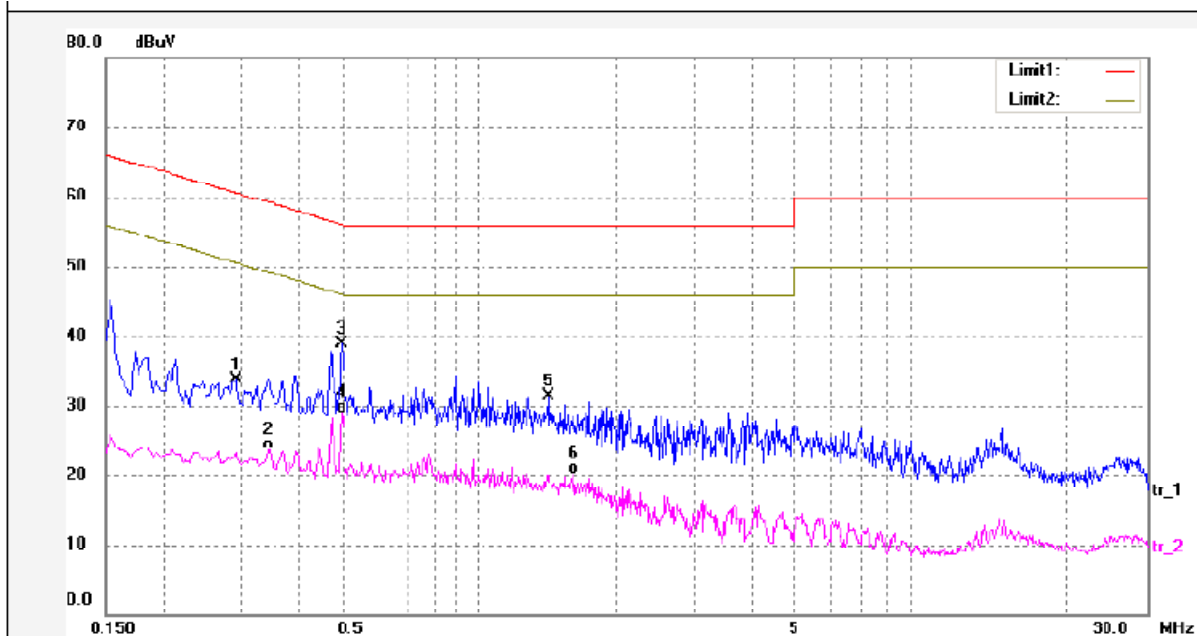


No.	Freq. (MHz)	Reading (dBuV)	F-factor (dB)	Result (dBuV)	Limit dB	Margin (dB)	Detector	Remark
1	0.2020	16.24	9.80	26.04	53.52	-27.48	AVG	
2	0.2180	25.32	9.80	35.12	62.89	-27.77	peak	
3	0.4740	25.89	9.80	35.69	46.44	-10.75	AVG	
4	0.4980	30.66	9.80	40.46	56.03	-15.57	peak	
5	0.8940	16.33	9.77	26.10	46.00	-19.90	AVG	
6	0.9740	26.68	9.76	36.44	56.00	-19.56	peak	

Note:

1. Result Level = Read Level + LISN Factor + Pulse Limiter Factor + Cable loss.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz), Step size: 4 kHz, Scan time: auto.

EUT: BC510 Edge Relay 1
Tested Model: BC510
Operating Condition: Transmitting, Powered by USB
Comment: AC 120V/60Hz
Test Specification: Line

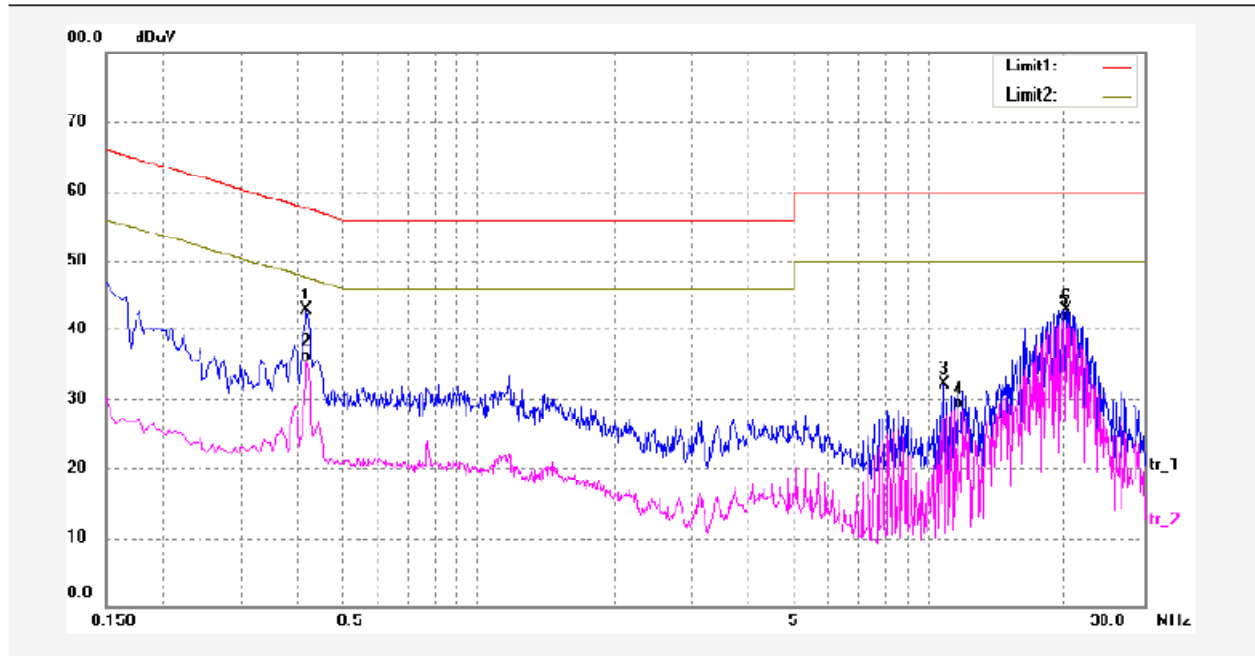


No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dB	Margin (dB)	Detector	Remark
1	0.2900	23.87	9.80	33.67	60.52	-26.85	peak	
2	0.3420	13.78	9.80	23.58	49.15	-25.57	AVG	
3	0.4980	29.03	9.80	38.83	56.03	-17.20	peak	
4	0.4980	19.15	9.80	28.95	46.03	-17.08	AVG	
5	1.4220	21.48	9.75	31.23	56.00	-24.77	peak	
6	1.6260	10.30	9.74	20.04	46.00	-25.96	AVG	

Note:

1. Result Level = Read Level + LISN Factor + Pulse Limiter Factor + Cable loss.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz), Step size: 4 kHz, Scan time: auto.

EUT: BC510 Edge Relay 1
 Tested Model: BC510
 Operating Condition: Transmitting, Powered by POE-RJ45
 Comment: AC 120V/60Hz
 Test Specification: Neutral

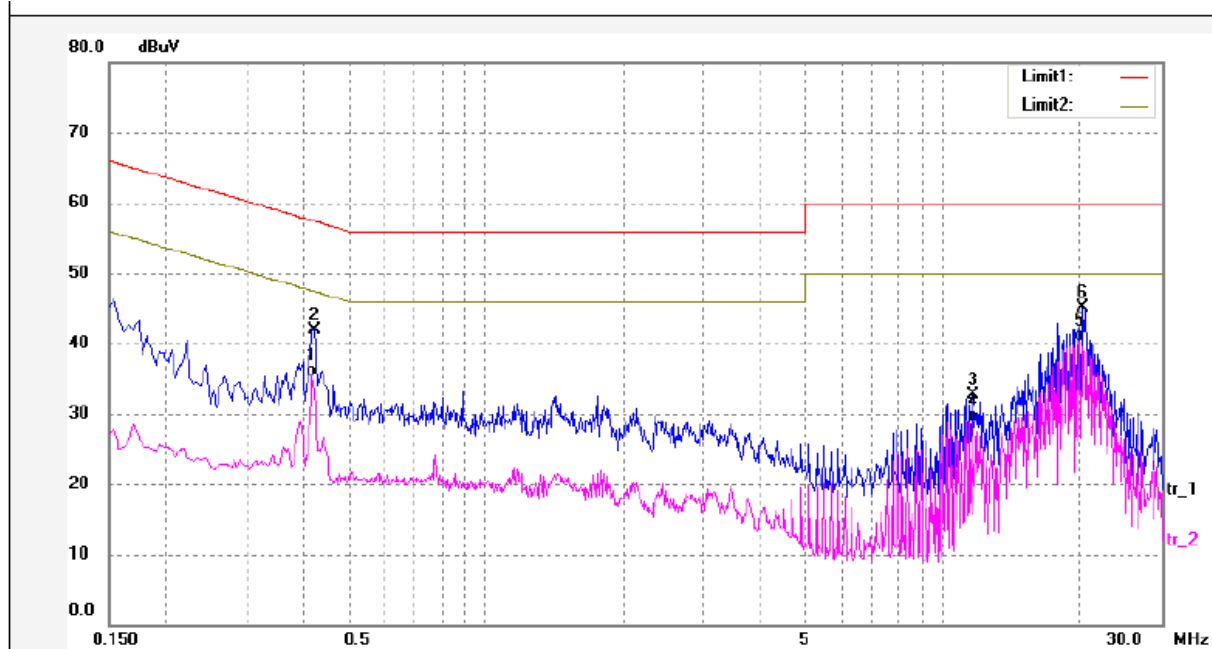


No.	Frcq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dB	Margin (dB)	Detector	Remark
1	0.4180	32.98	9.80	42.78	57.49	-14.71	peak	
2	0.4180	25.44	9.80	35.24	47.49	12.25	AVG	
3	10.7940	22.59	9.53	32.12	60.00	-27.88	peak	
4	11.6100	18.87	9.55	28.42	50.00	-21.58	AVG	
5	19.8540	31.43	9.68	41.11	50.00	-8.89	AVG	
6	20.0940	33.02	9.68	42.70	60.00	-17.30	peak	

Note:

1. Result Level = Read Level + LISN Factor + Pulse Limiter Factor + Cable loss.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz), Step size: 4 kHz, Scan time: auto.

EUT: BC510 Edge Relay 1
Tested Model: BC510
Operating Condition: Transmitting , Powered by POE-RJ45
Comment: AC 120V/60Hz
Test Specification: Line



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dB	Margin (dB)	Detector	Remark
1	0.4180	25.46	9.80	35.26	47.49	-12.23	AVG	
2	0.4220	32.18	9.80	41.98	57.41	-15.43	peak	
3	11.6059	23.08	9.55	32.63	60.00	-27.37	peak	
4	11.6059	19.43	9.55	28.98	50.00	-21.02	AVG	
5	19.8740	30.62	9.68	40.30	50.00	-9.70	AVG	
6	20.2580	35.36	9.68	45.04	60.00	-14.96	peak	

Note:

1. Result Level = Read Level + LISN Factor + Pulse Limiter Factor + Cable loss.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz), Step size: 4 kHz, Scan time: auto.

***** END OF REPORT *****