

FCC Part 15C

Measurement and Test Report

For

Smart Technologies & Investment Ltd.

21/F., Fun Tower, No. 35 Hung To Road, Kwun Tong, Kowloon, Hong Kong

FCC ID: N9KSMARTMA0136

FCC Rule(s):	<u>FCC Part 15C</u>
Product Description:	<u>MaceAlert Smart Panel</u>
Tested Model:	<u>WS136</u>
Report No.:	<u>STR15118148I-1</u>
Tested Date:	<u>2015-11-10 to 2015-11-23</u>
Issued Date:	<u>2015-11-23</u>
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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: Smart Technologies & Investment Ltd.
Address of applicant: 21/F., Fun Tower, No. 35 Hung To Road, Kwun Tong, Kowloon, Hong Kong
Manufacturer: Smart Electronic Industrial (Dong Guan) Co., Ltd.
Address of manufacturer: Qing Long Road, Long Jian Tian-Cun, Huang Jiang-Zhen, Dong Guan, Guang Dong, China

General Description of EUT	
Product Name:	MaceAlert Smart Panel
Trade Name:	/
Model No.:	WS136
Adding Model(s):	/
Rated Voltage:	Adapter DC 9.5V
Power Adapter Model:	HNC095150U I/P: AC 100-240V/0.4A; O/P: DC 9.5V/1.5A
<i>Note: The test data is gathered from a production sample provided by the manufacturer.</i>	

Technical Characteristics of EUT	
Support Standards:	802.11b, 802.11g, 802.11n/HT20
Frequency Range:	2412-2462MHz
RF Output Power:	12.71 dBm (Conducted)
Type of Modulation:	CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM
Data Rate:	1-11Mbps, 6-54Mbps, up to 135Mbps
Quantity of Channels:	11
Channel Separation:	5MHz
Type of Antenna:	Chip Antenna
Antenna Gain:	2.62dBi
Lowest Internal Frequency	16MHz

1.2 Test Standards

The following report is prepared on behalf of the a Smart Technologies & Investment Ltd. 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 Commissions 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 Commissions 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, and ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. The measurement guide KDB 558074 D01 V03r03 for digital transmission systems shall be performed also.

1.4 Test Facility

FCC – Registration No.: 934118

Shenzhen SEM.Test Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 934118.

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.

CNAS Registration No.: L4062

Shenzhen SEM.Test Technology Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road, Bao'an District, Shenzhen, P.R.C (518101).

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

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
DC Cable	1.8	Unshielded	Without Ferrite

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

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
/	/	/	/

1.6 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal Date	Due Date
Spectrum Analyzer	Agilent	E4407B	MY41440400	2015-06-17	2016-06-16
Spectrum Analyzer	Rohde & Schwarz	FSP	836079/035	2015-06-17	2016-06-16
EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2015-06-17	2016-06-16
Amplifier	Agilent	8447F	3113A06717	2015-06-17	2016-06-16
Amplifier	C&D	PAP-1G18	2002	2015-06-17	2016-06-16
Broadband Antenna	Schwarz beck	VULB9163	9163-333	2015-06-17	2016-06-16
Horn Antenna	ETS	3117	00086197	2015-06-17	2016-06-16
Horn Antenna	ETS	3116B	00088203	2015-06-17	2016-06-16
Loop Antenna	Schwarz beck	FMZB 1516	9773	2015-06-17	2016-06-16
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2015-06-17	2016-06-16
L.I.S.N	Schwarz beck	NSLK8126	8126-224	2015-06-17	2016-06-16
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2015-06-17	2016-06-16

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
§ 15.207(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 § 2.1093, the portable transmitter must comply the RF exposure requirements.

3.2 Test Result

This product complied with the requirement of the RF exposure, please see the RF Exposure 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 a chip 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 V03r03, 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

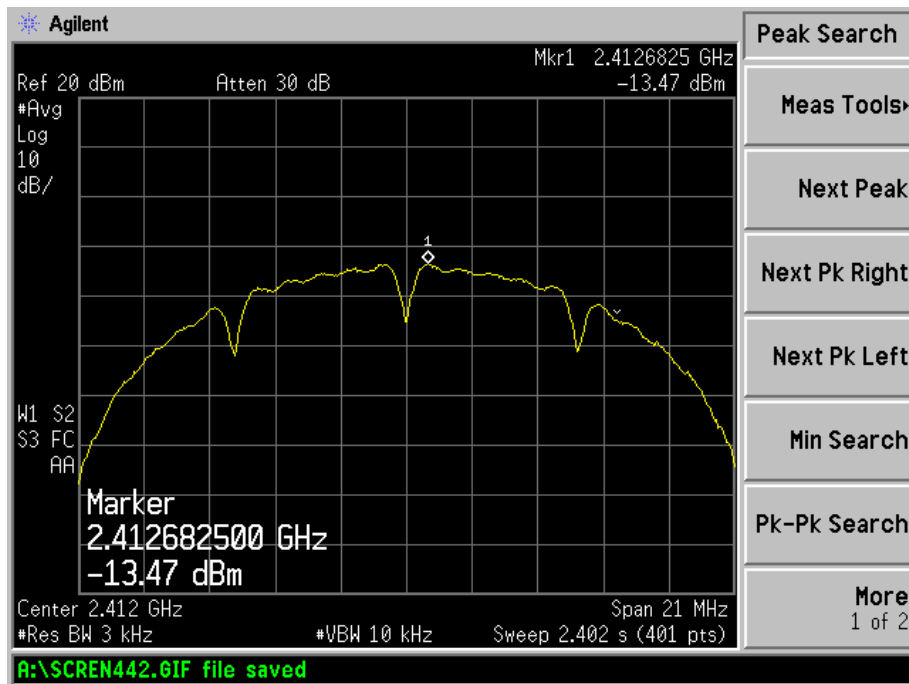
Temperature:	26° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

5.4 Summary of Test Results/Plots

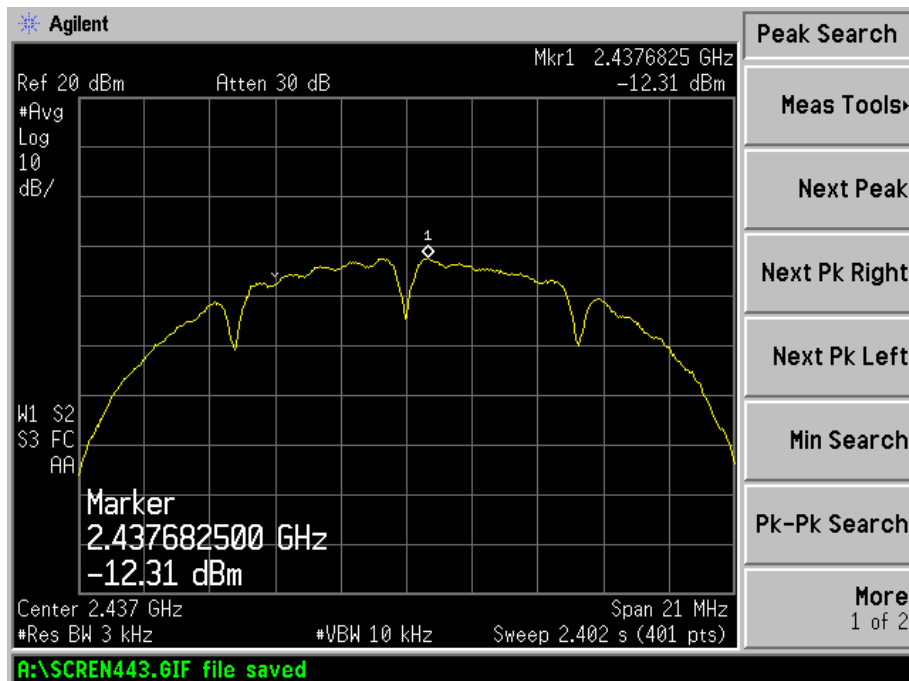
Test Mode	Test Channel MHz	Power Spectral Density dBm/3kHz	Limit dBm/3kHz
802.11b	2412	-13.47	8
	2437	-12.31	8
	2462	-11.49	8
802.11g	2412	-17.48	8
	2437	-15.36	8
	2462	-14.57	8
802.11n HT20	2412	-16.35	8
	2437	-15.27	8
	2462	-14.54	8

Please refer to the following test plots:

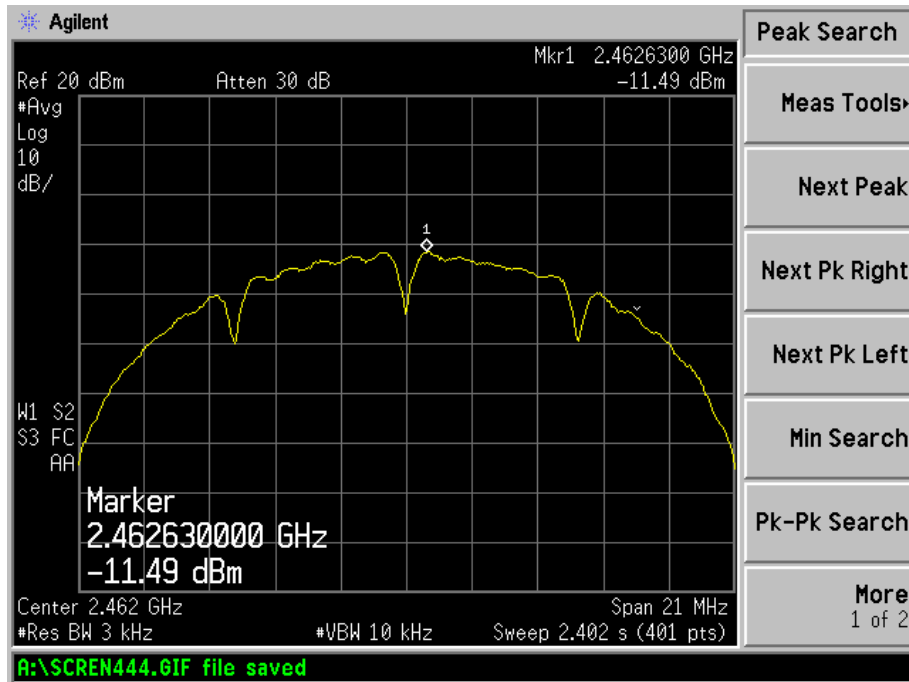
802.11b-Low Channel



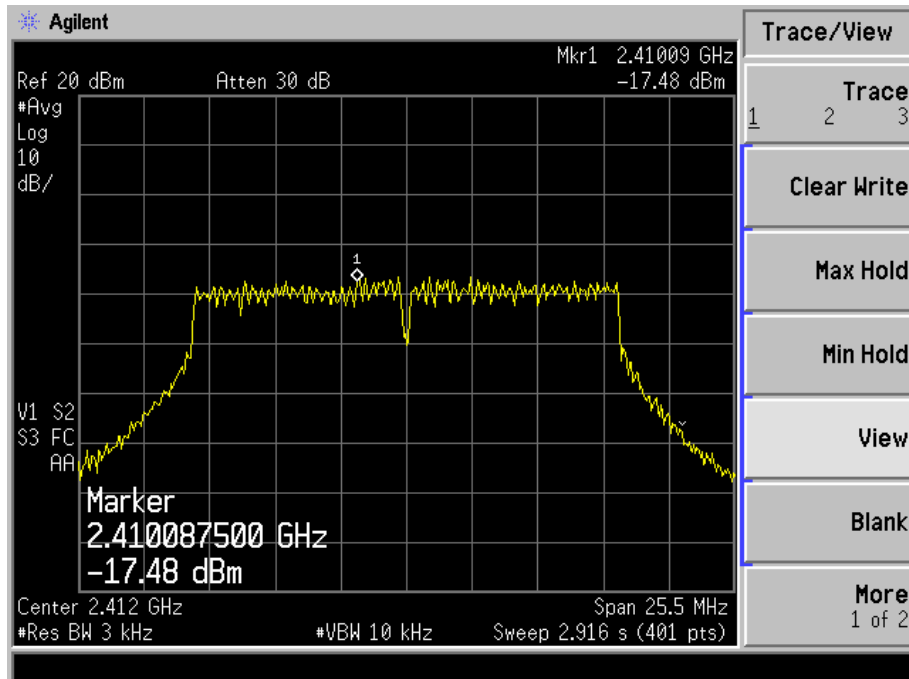
802.11b-Middle Channel



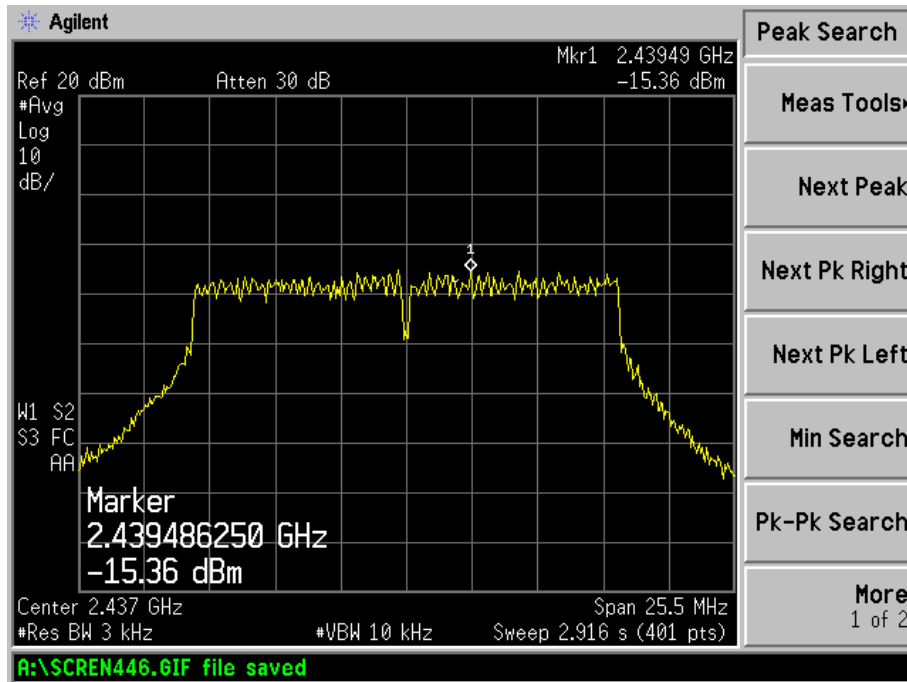
802.11b-High Channel



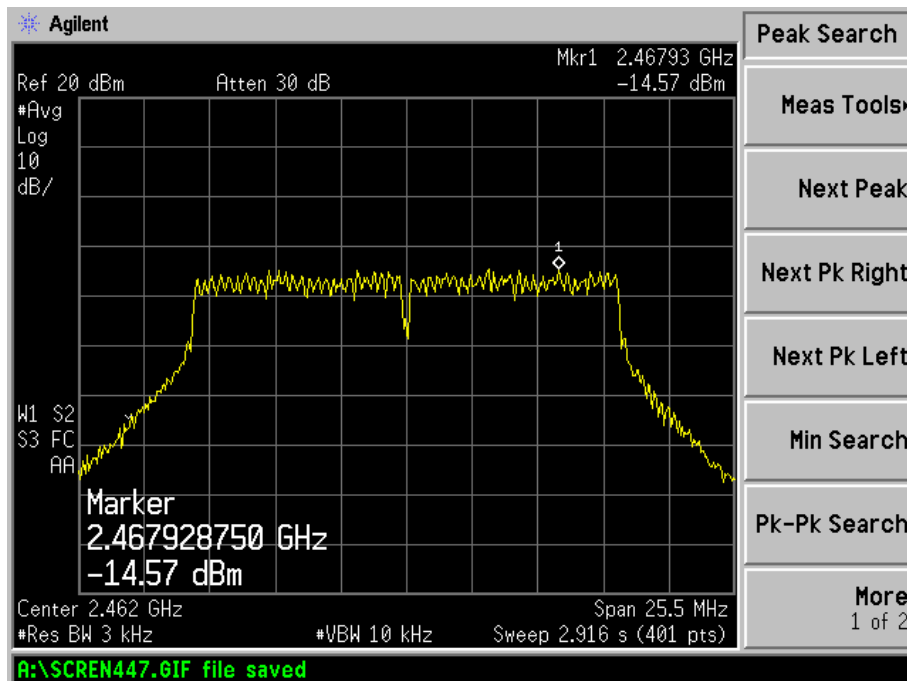
802.11g-Low Channel



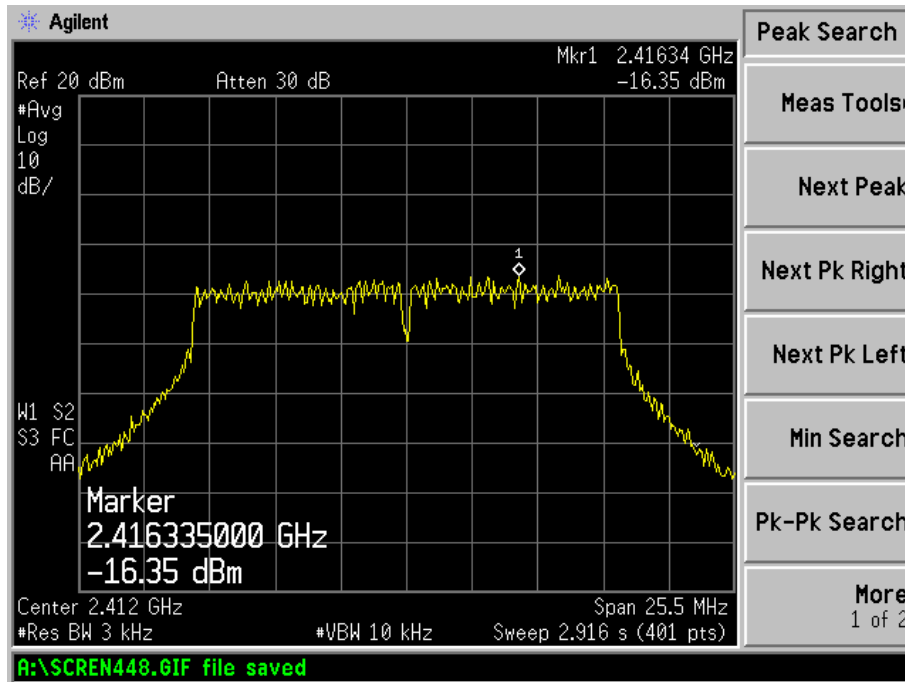
802.11g-Middle Channel



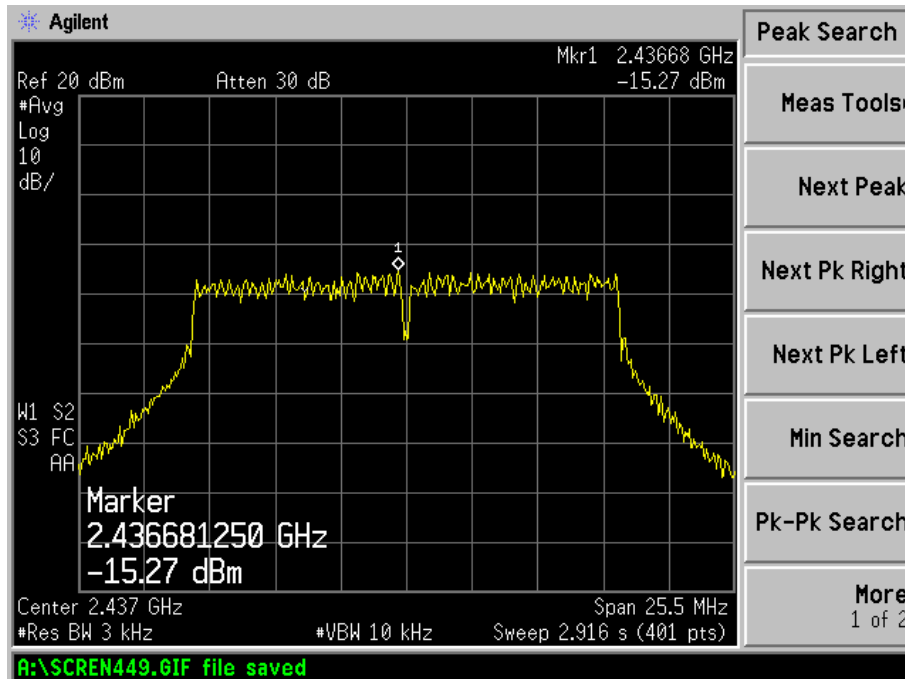
802.11g-High Channel



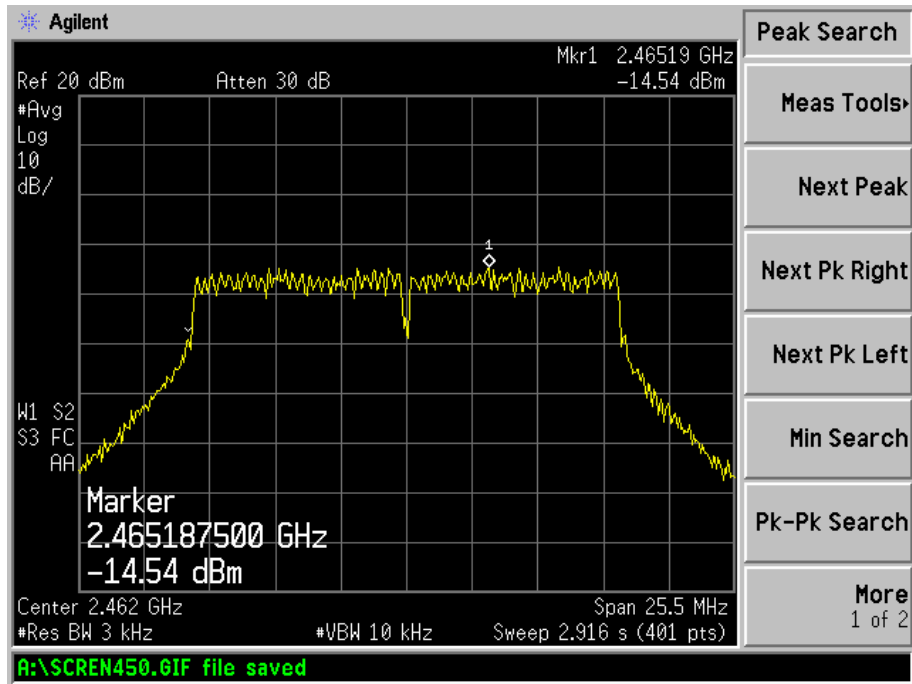
802.11n-HT20-Low Channel



802.11n-HT20-Middle Channel



802.11n-HT20-High Channel



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, and 5725–5850 MHz bands. 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

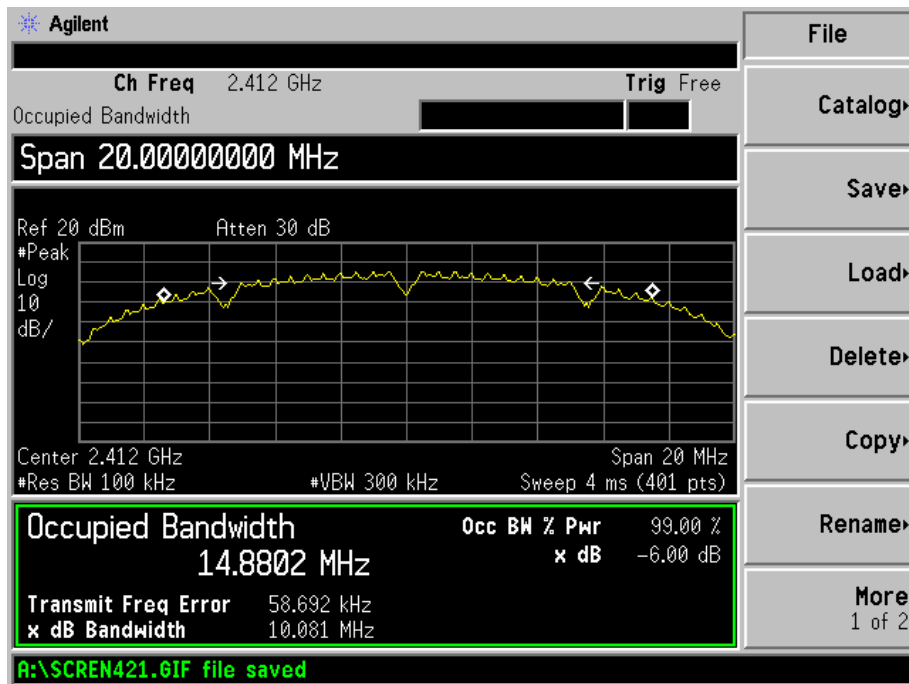
Temperature:	25° C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

6.4 Summary of Test Results/Plots

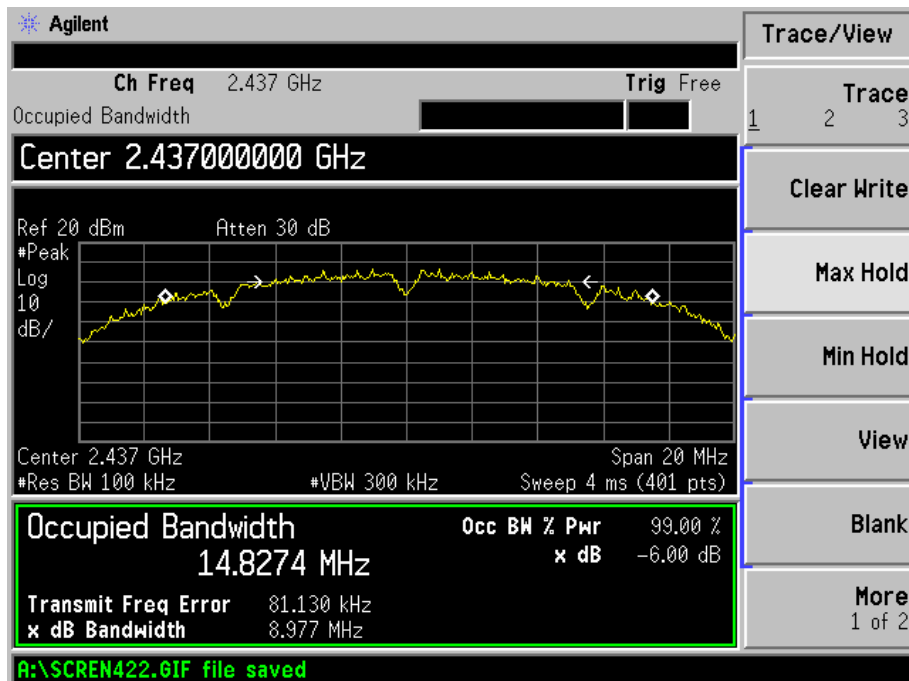
Test Mode	Test Channel MHz	6 dB Bandwidth kHz	99% Bandwidth kHz	Limit kHz
802.11b	2412	10081	14880.2	≥ 500
	2437	8977	14827.4	≥ 500
	2462	10037	14846.3	≥ 500
802.11g	2412	16531	16427.6	≥ 500
	2437	16556	16427.3	≥ 500
	2462	16548	16426.7	≥ 500
802.11n-HT20	2412	16506	16388.2	≥ 500
	2437	16538	16419.1	≥ 500
	2462	16507	16404.5	≥ 500

Please refer to the following test plots:

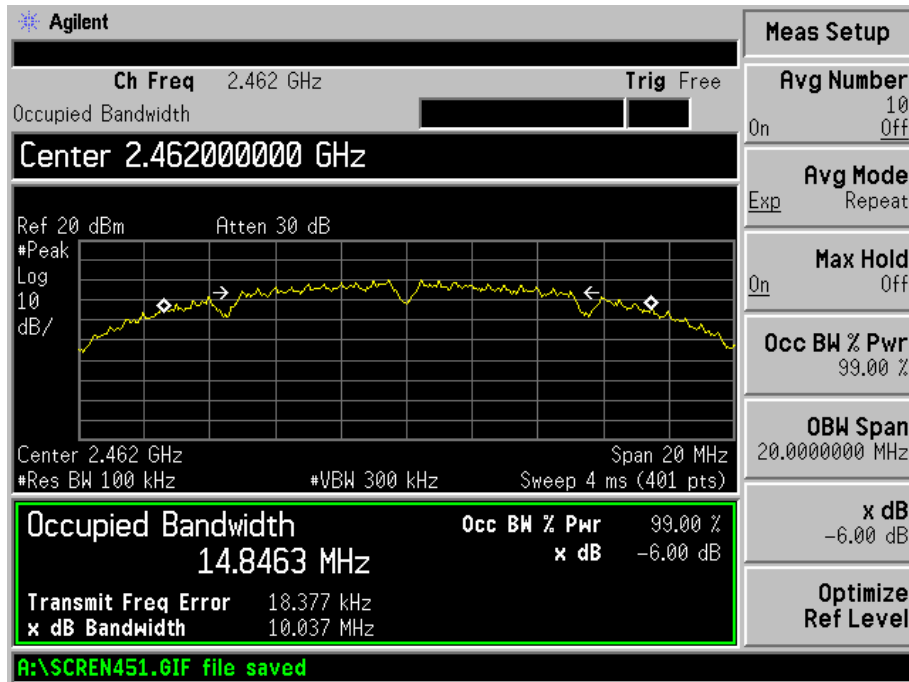
802.11b-Low Channel



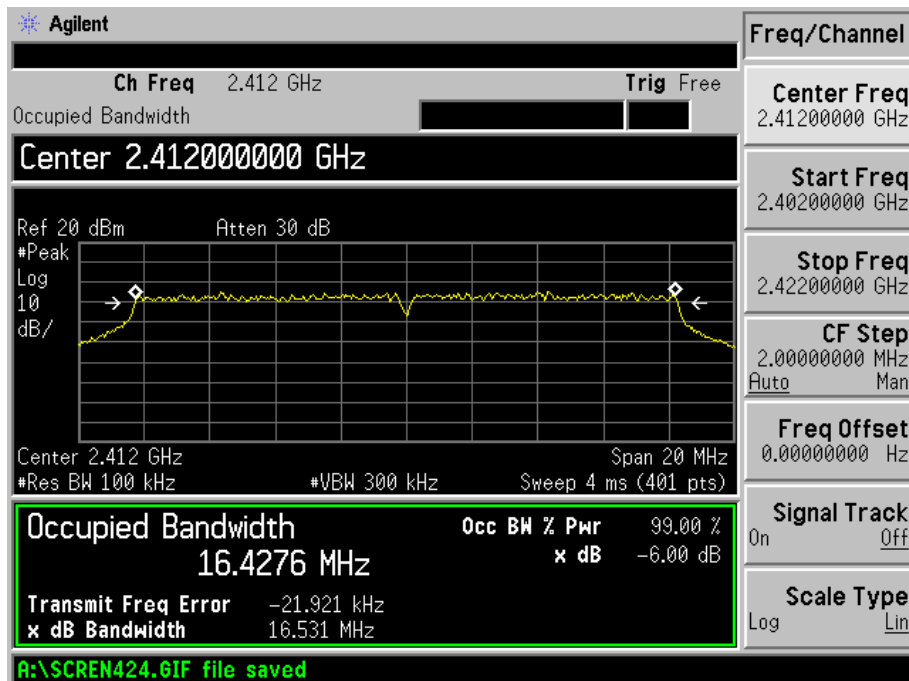
802.11b-Middle Channel



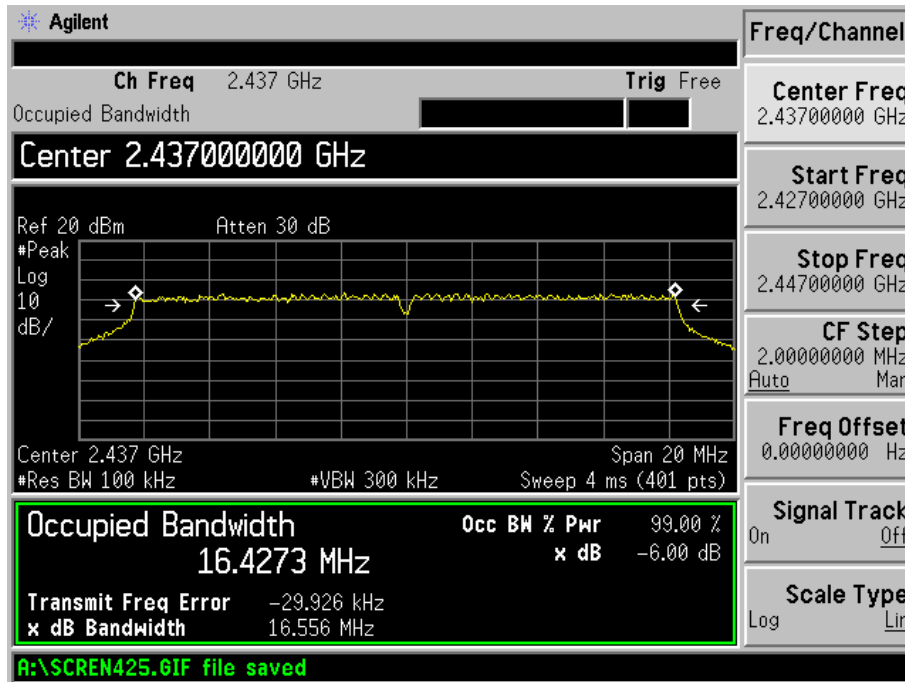
802.11b-High Channel



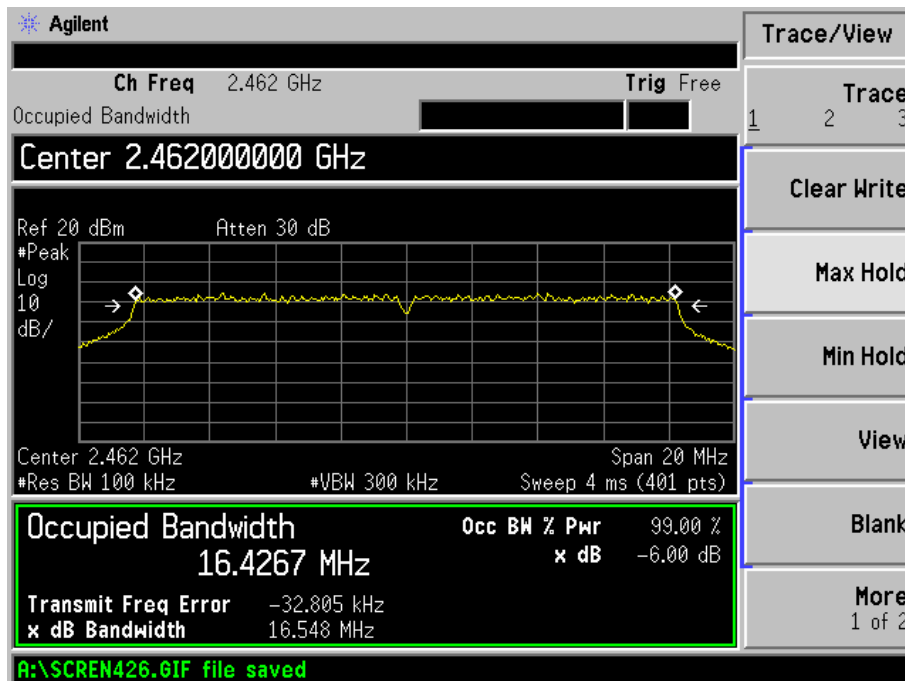
802.11g-Low Channel



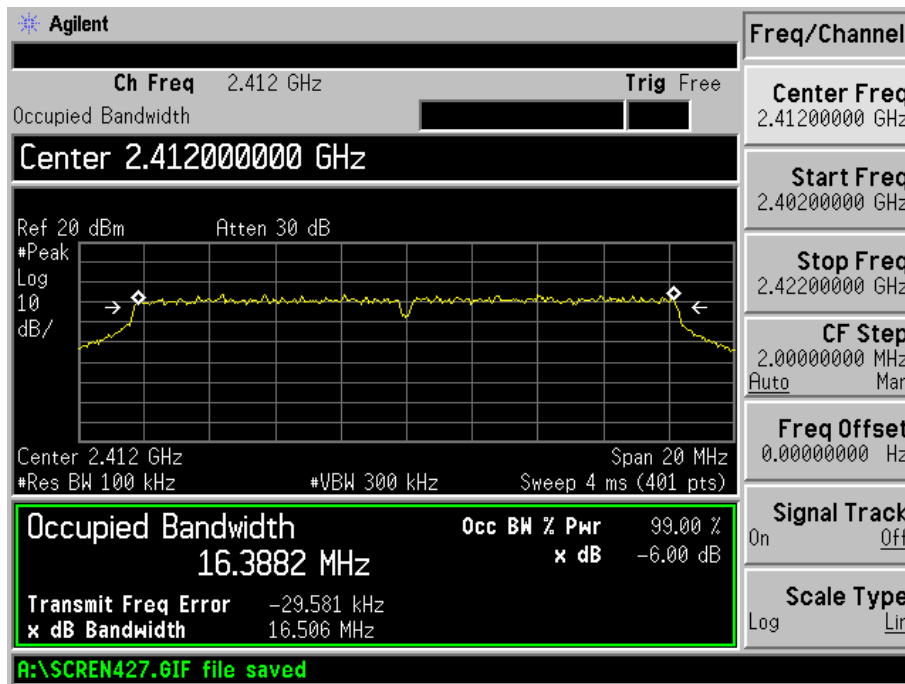
802.11g-Middle Channel



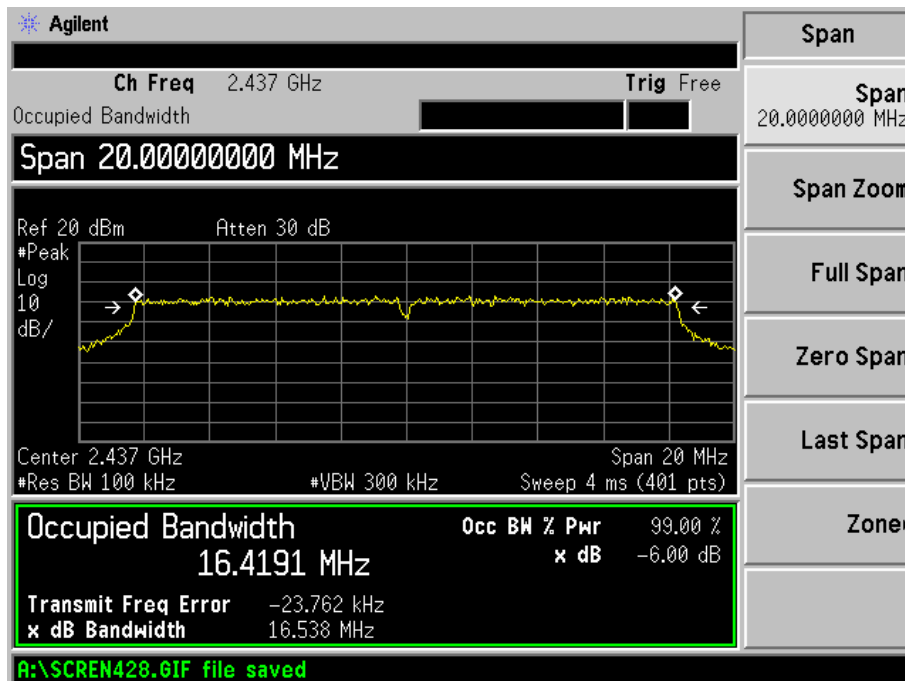
802.11g-High Channel



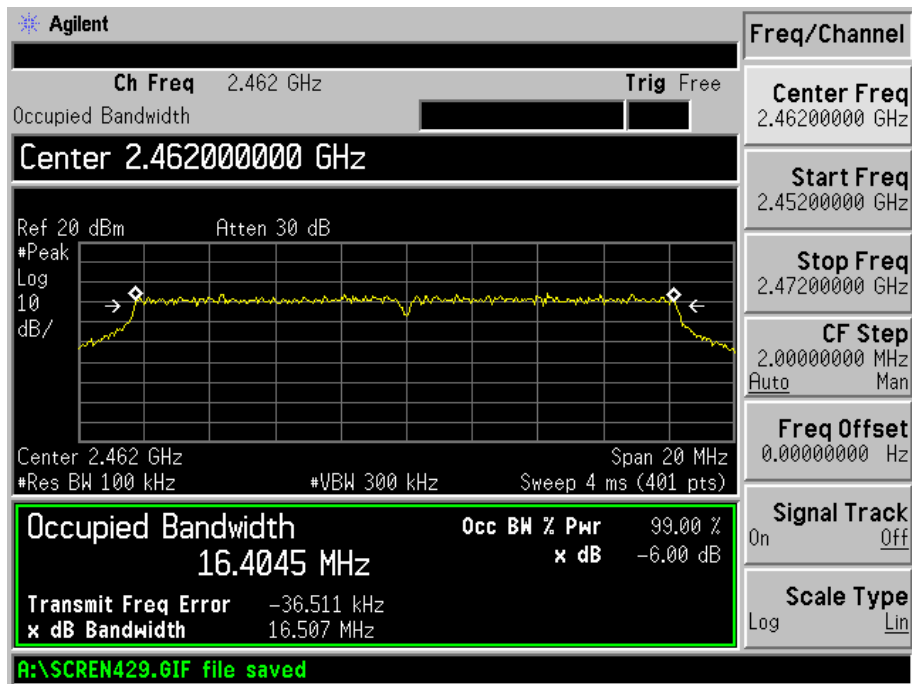
802.11n-HT20-Low Channel



802.11n-HT20-Middle Channel



802.11n-HT20-High Channel



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, and 5725–5850 MHz bands: 1 Watt.

7.2 Test Procedure

According to section 15.247(b)-power output of the KDB-558074 D01 V03r03, 9.2.2.2 (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

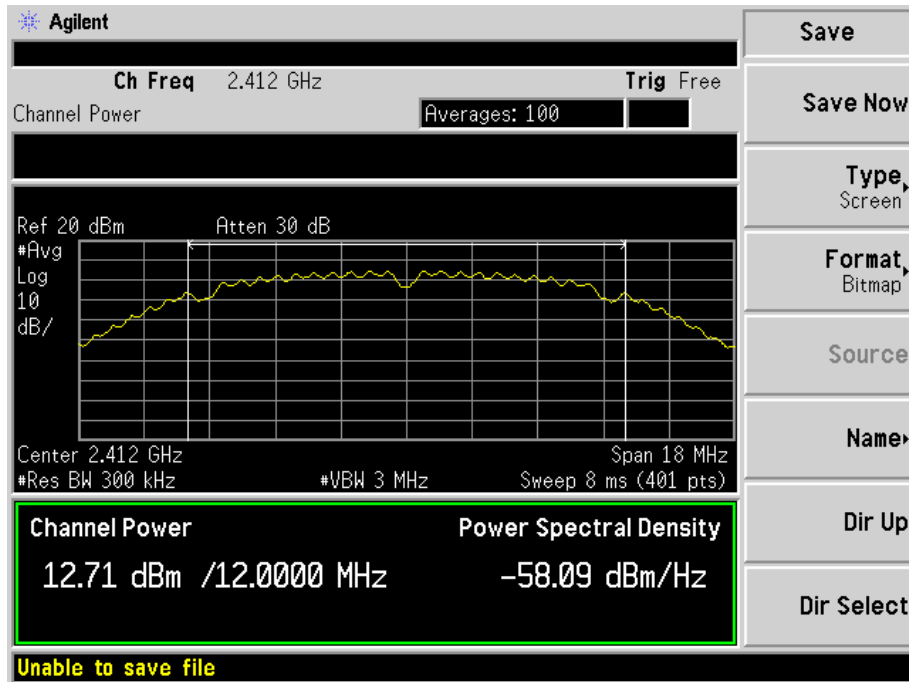
Temperature:	26° C
Relative Humidity:	57%
ATM Pressure:	1011 mbar

7.4 Summary of Test Results/Plots

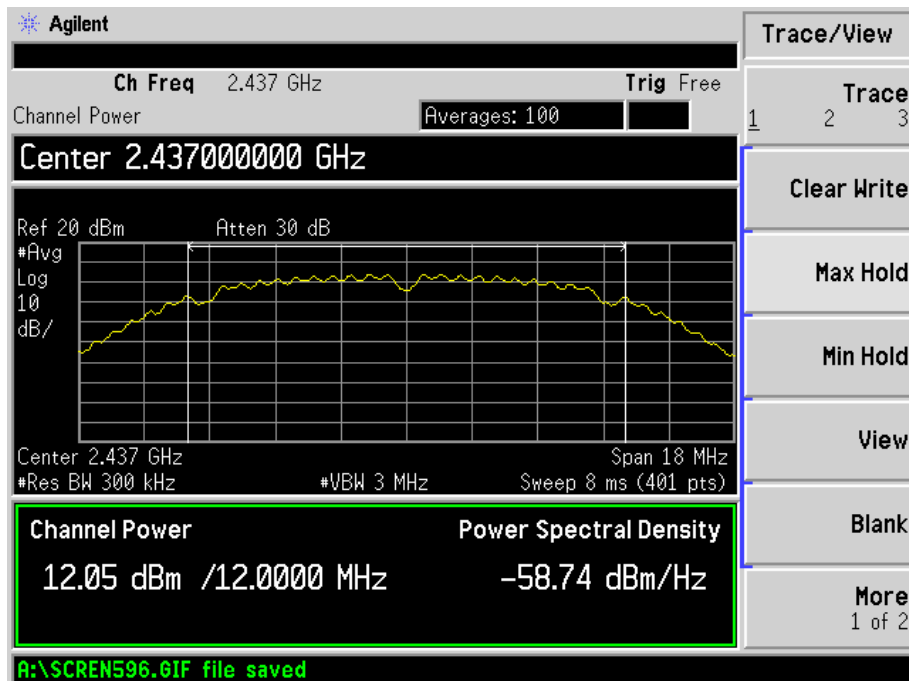
Test Mode	Frequency MHz	Reading dBm	Output Power mW	Limit mW
802.11b_11Mbps	2412	12.71	18.66	1000
	2437	12.05	16.03	1000
	2462	11.78	15.07	1000
802.11g_54Mbps	2412	10.77	11.94	1000
	2437	11.25	13.34	1000
	2462	10.65	11.61	1000
802.11n HT20_MCS7	2412	11.14	13.00	1000
	2437	10.10	10.23	1000
	2462	10.80	12.02	1000

Please refer to the following test plots:

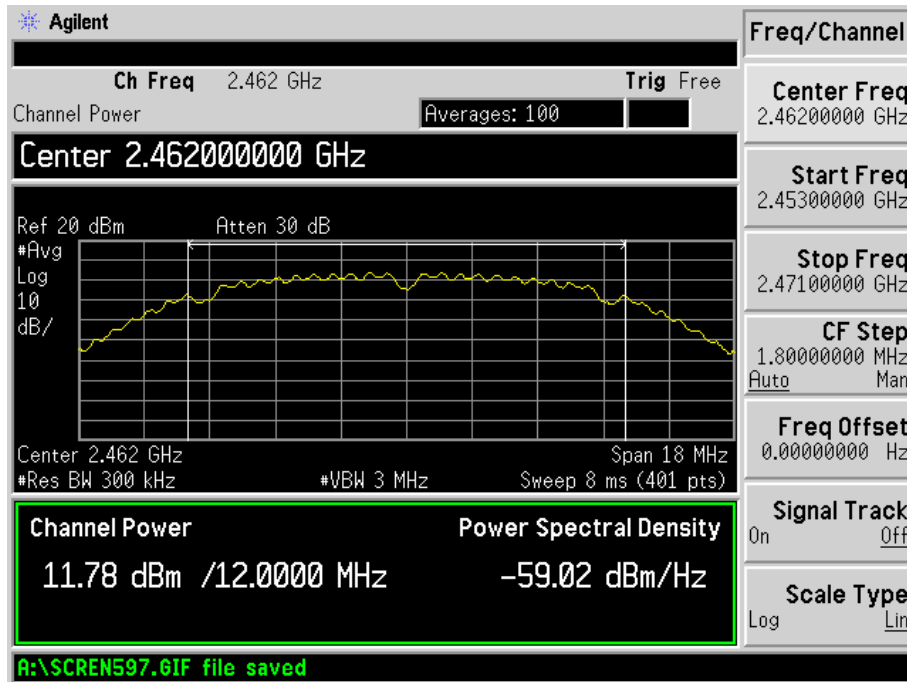
802.11b-11Mbps-Low Channel



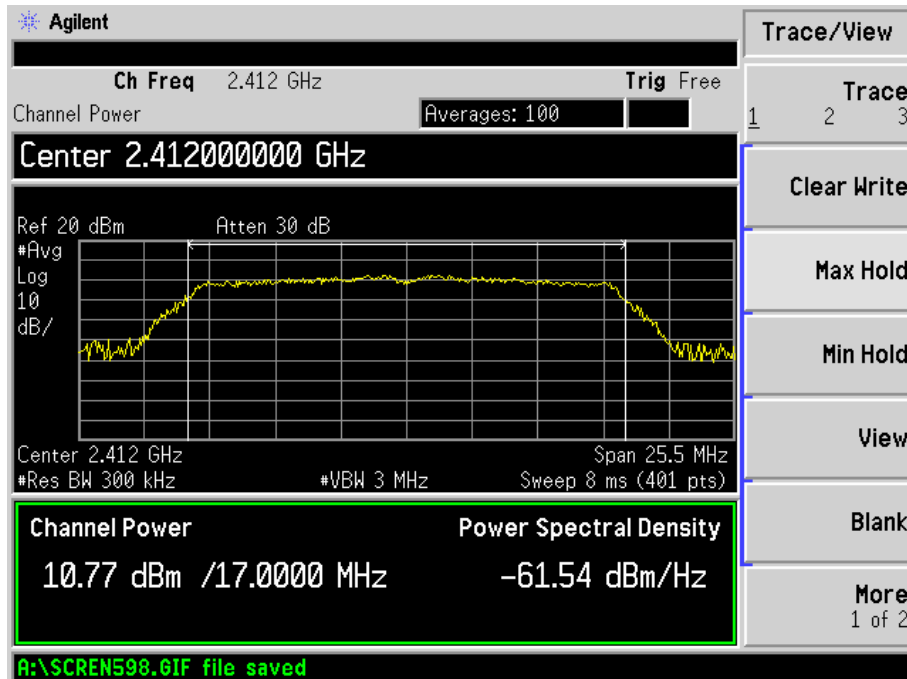
802.11b -11Mbps-Middle Channel



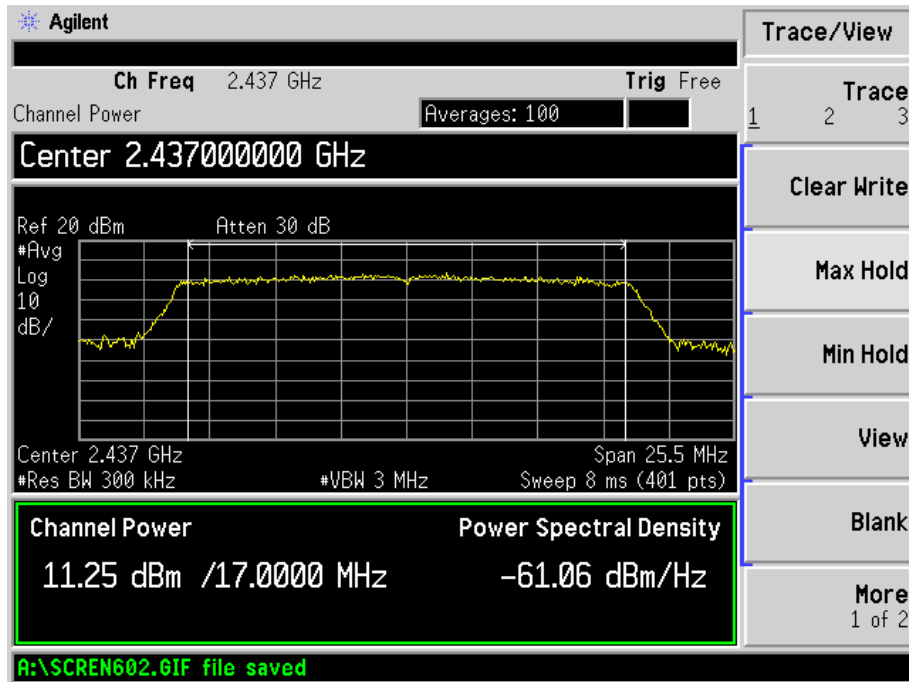
802.11b -11Mbps-High Channel



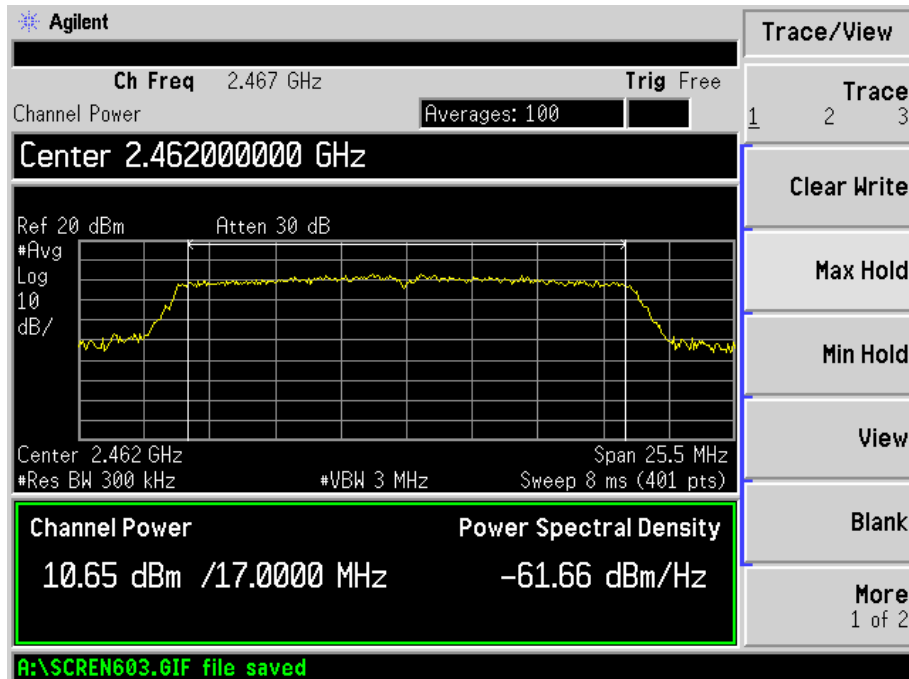
802.11g-54Mbps-Low Channel



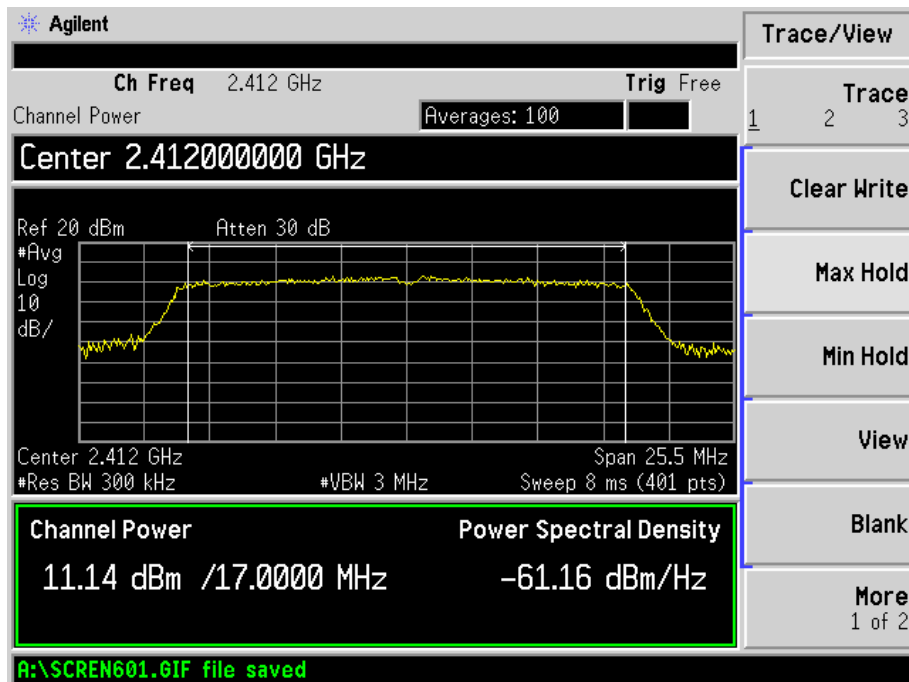
802.11g-54Mbps- Middle Channel



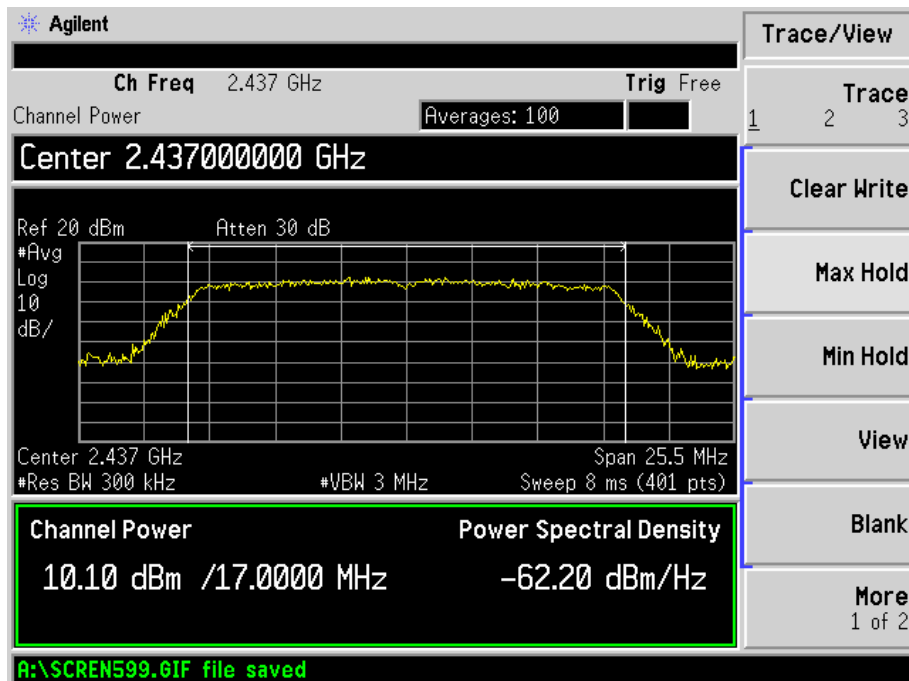
802.11g-54Mbps- High Channel



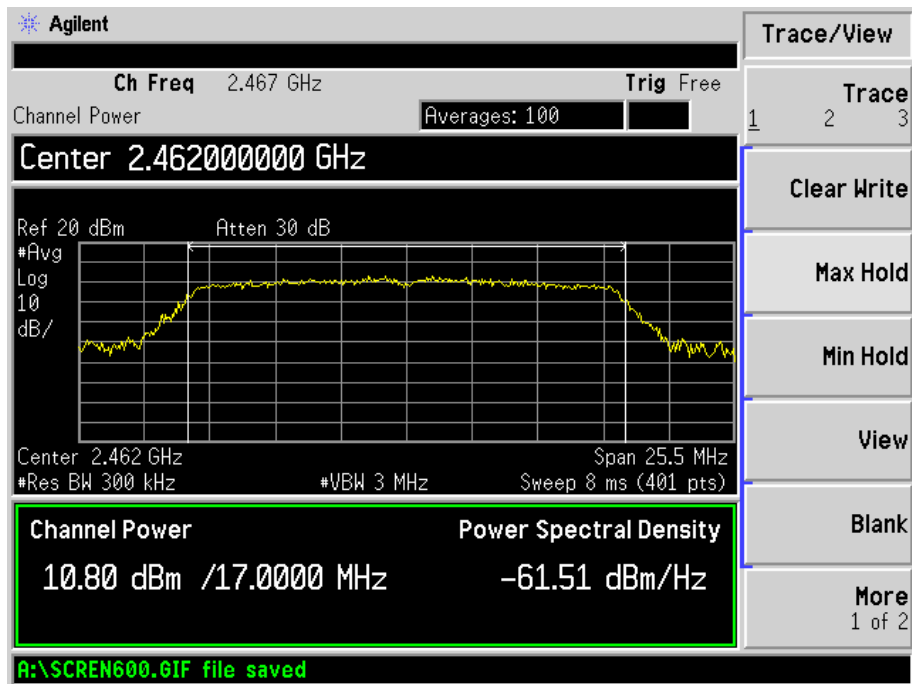
802.11n-HT20-MCS7-Low Channel



802.11n-HT20-MCS7-Middle Channel



802.11n-HT20-MCS7-High Channel



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).

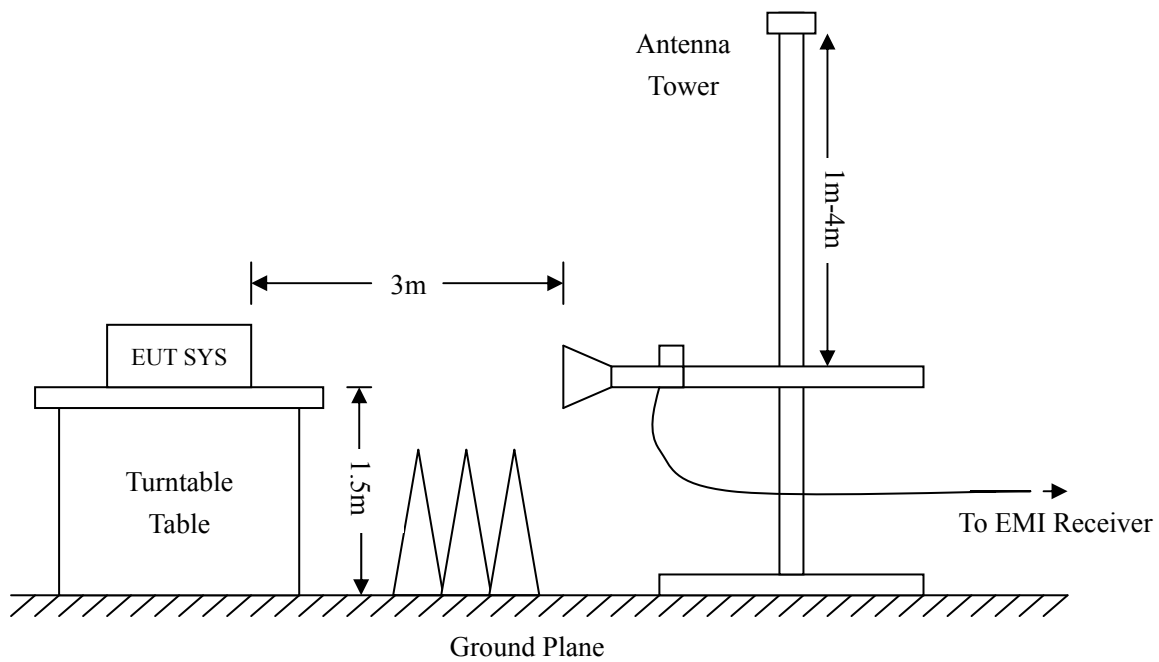
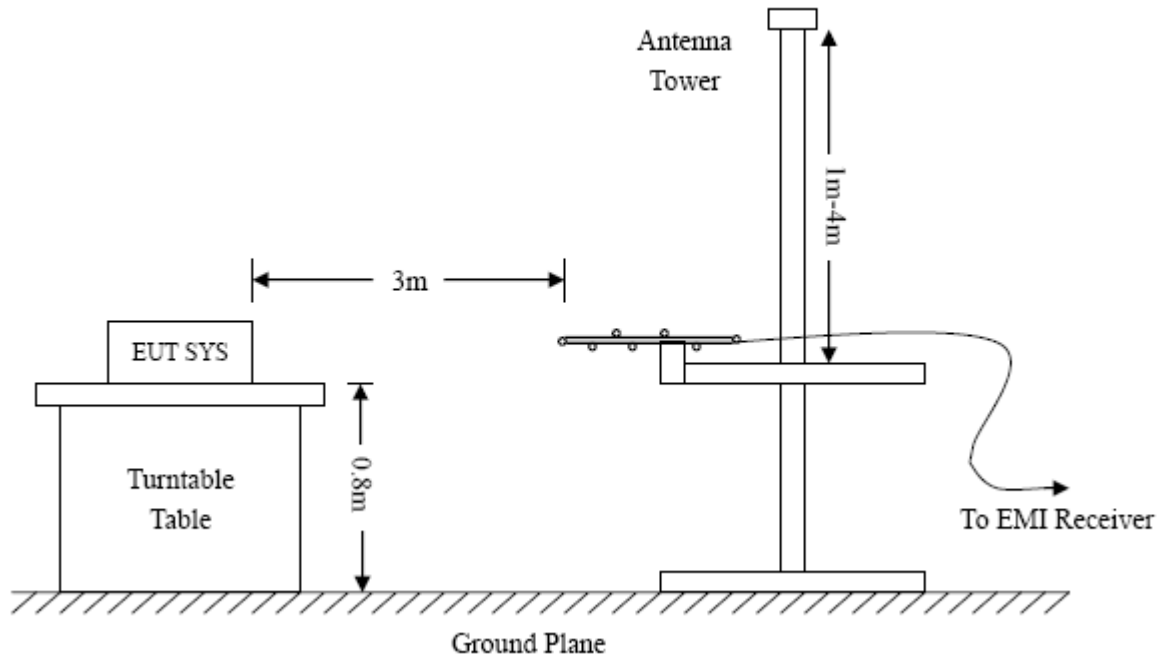
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

8.3 Test Procedure

The setup of EUT is according with per ANSI C63.4-2014 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=10KHz,
 VBW =30KHz
 Sweep time= Auto
 Trace = max hold
 Detector function = peak

Frequency :30MHz-1GHz
 RBW=120KHz,
 VBW=300KHz
 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

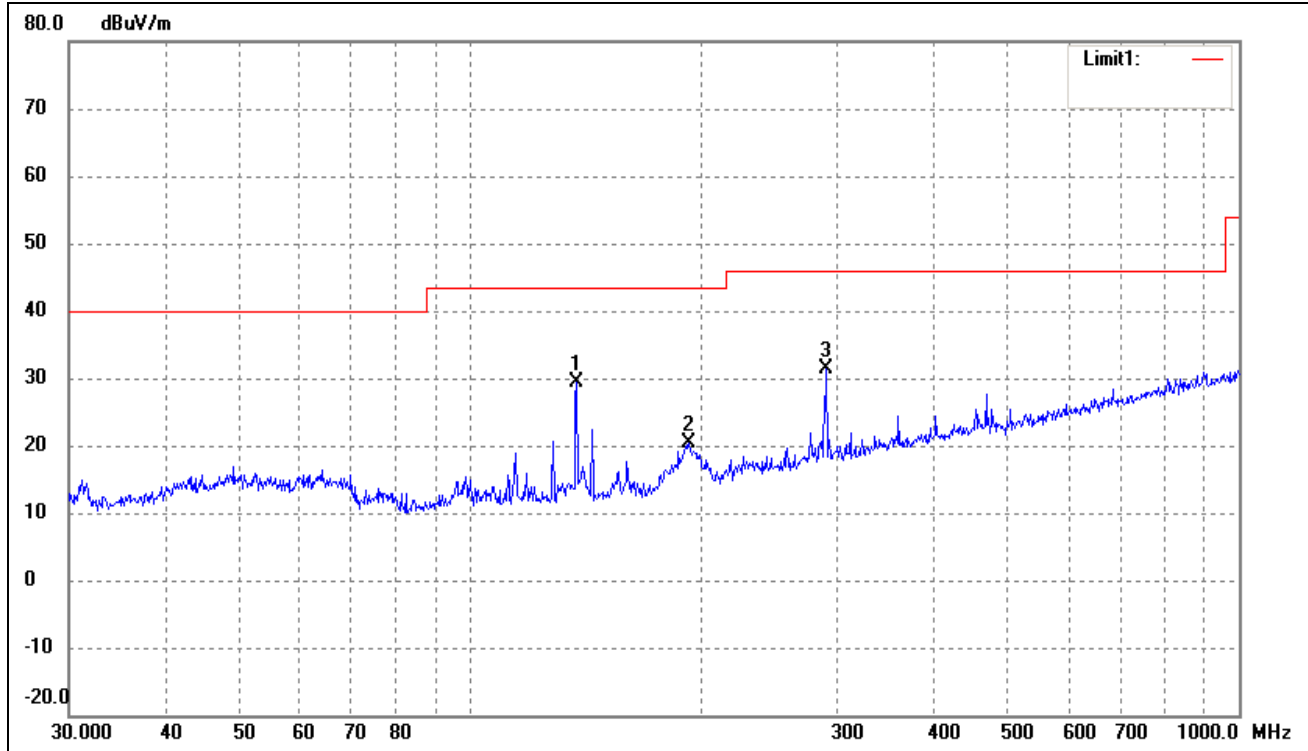
According to the data below, the FCC Part 15.205, 15.209 and 15.247 standards, and had the worst cases:

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

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

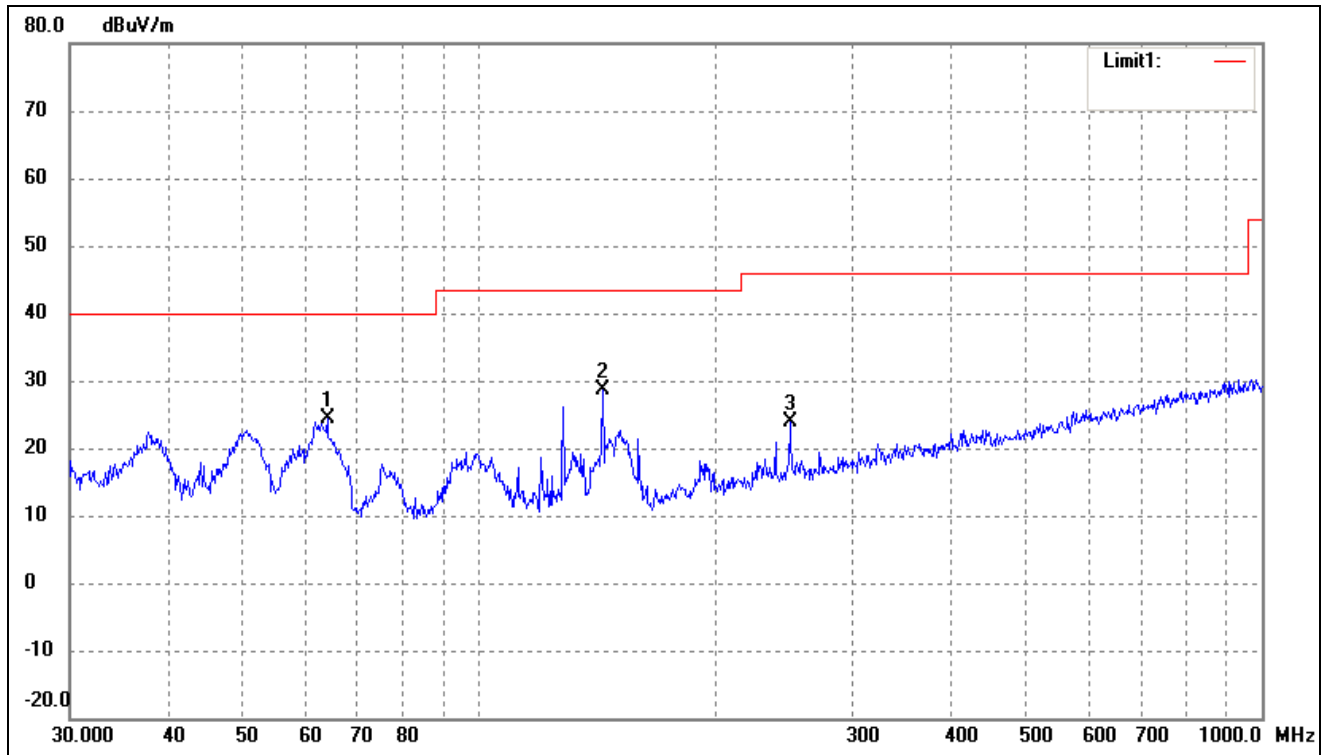
EUT: MaceAlert Smart Panel
 Tested Model: WS136
 Operating Condition: 802.11b Transmitting Low Channel-2412MHz
 Comment: Adapter DC9.5V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	137.4202	40.22	-10.85	29.37	43.50	-14.13	154	100	peak
2	192.4186	28.71	-8.37	20.34	43.50	-23.16	214	100	peak
3	290.0172	36.53	-5.19	31.34	46.00	-14.66	98	100	peak

Test Specification: Vertical

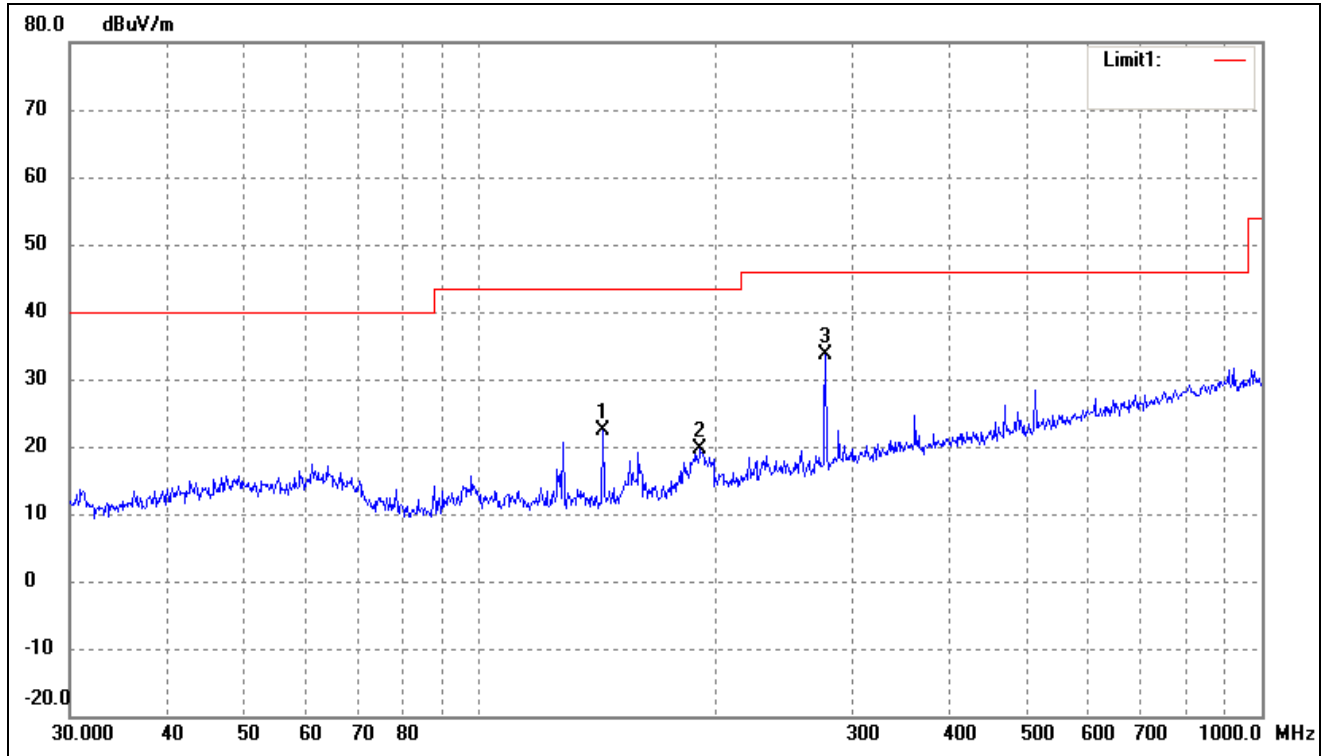


No.	Frequency (MHz)	Reading (dBuV)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	63.9828	35.75	-11.28	24.47	40.00	-15.53	54	100	peak
2	143.8295	39.57	-10.94	28.63	43.50	-14.87	210	100	peak
3	249.4250	30.11	-6.17	23.94	46.00	-22.06	161	100	peak

Operating Condition: 802.11b Transmitting Middle Channel-2437MHz

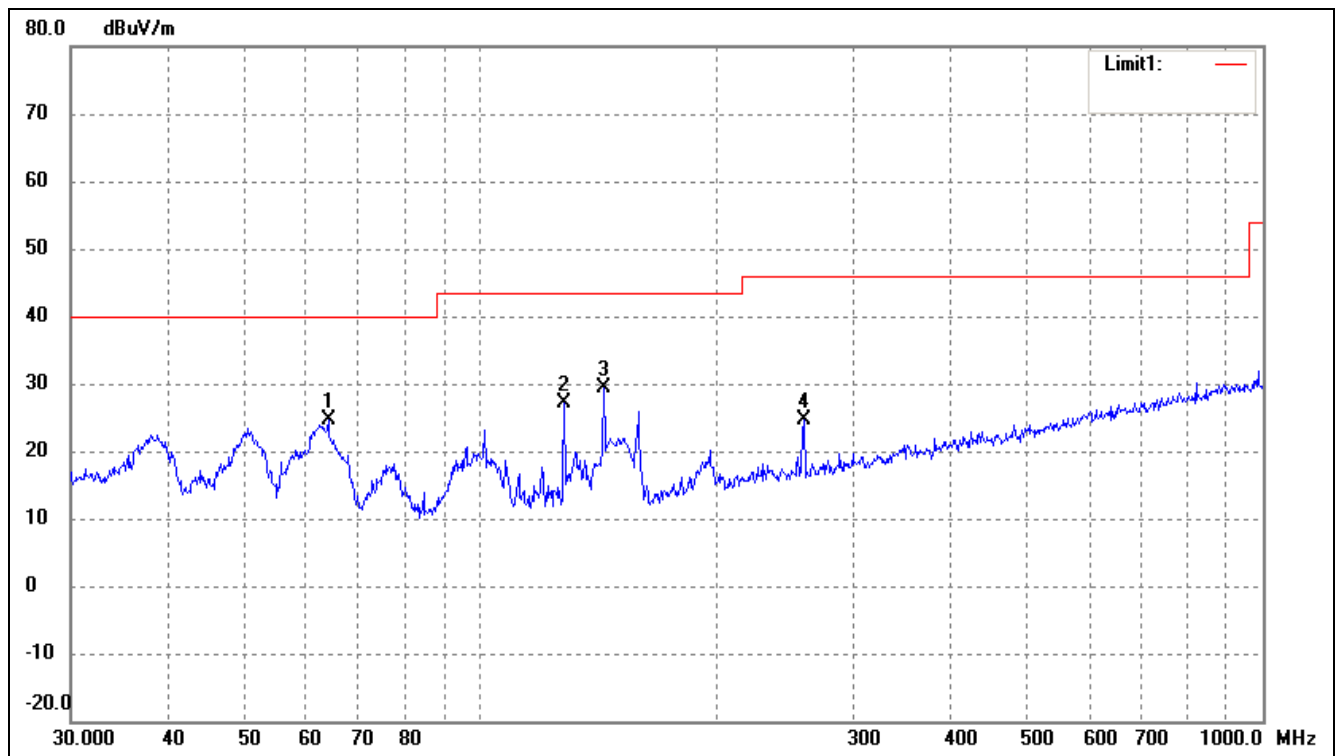
Comment: Adapter DC9.5V

Test Specification: Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV)	dB	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	143.8295	33.35	-10.94	22.41	43.50	-21.09	255	100	peak
2	191.7450	27.96	-8.39	19.57	43.50	-23.93	26	100	peak
3	277.0935	39.40	-5.75	33.65	46.00	-12.35	116	100	peak

Test Specification: Vertical

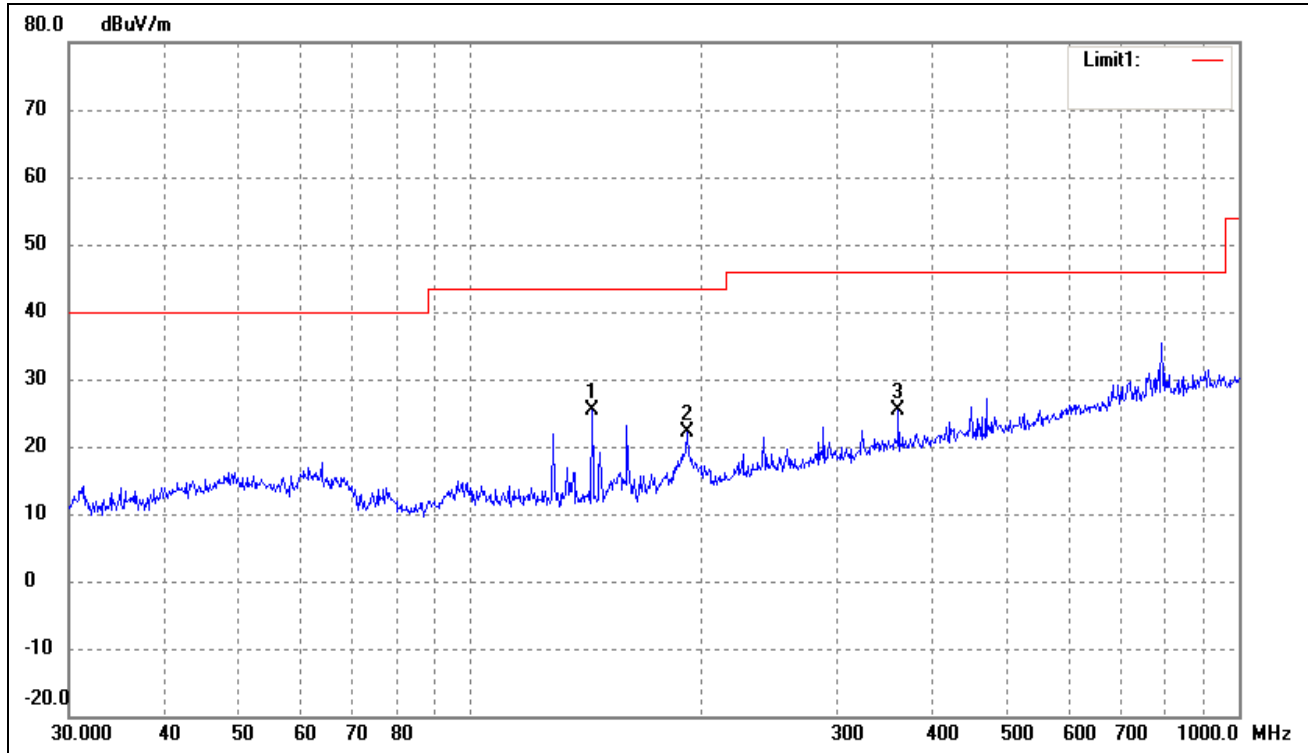


No.	Frequency (MHz)	Reading (dBuV)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	63.9828	35.86	-11.28	24.58	40.00	-15.42	165	100	peak
2	128.1130	37.92	-10.70	27.22	43.50	-16.28	215	100	peak
3	143.8295	40.39	-10.94	29.45	43.50	-14.05	98	100	peak
4	259.2338	30.74	-6.10	24.64	46.00	-21.36	160	100	peak

Operating Condition: 802.11b Transmitting High Channel-2462MHz

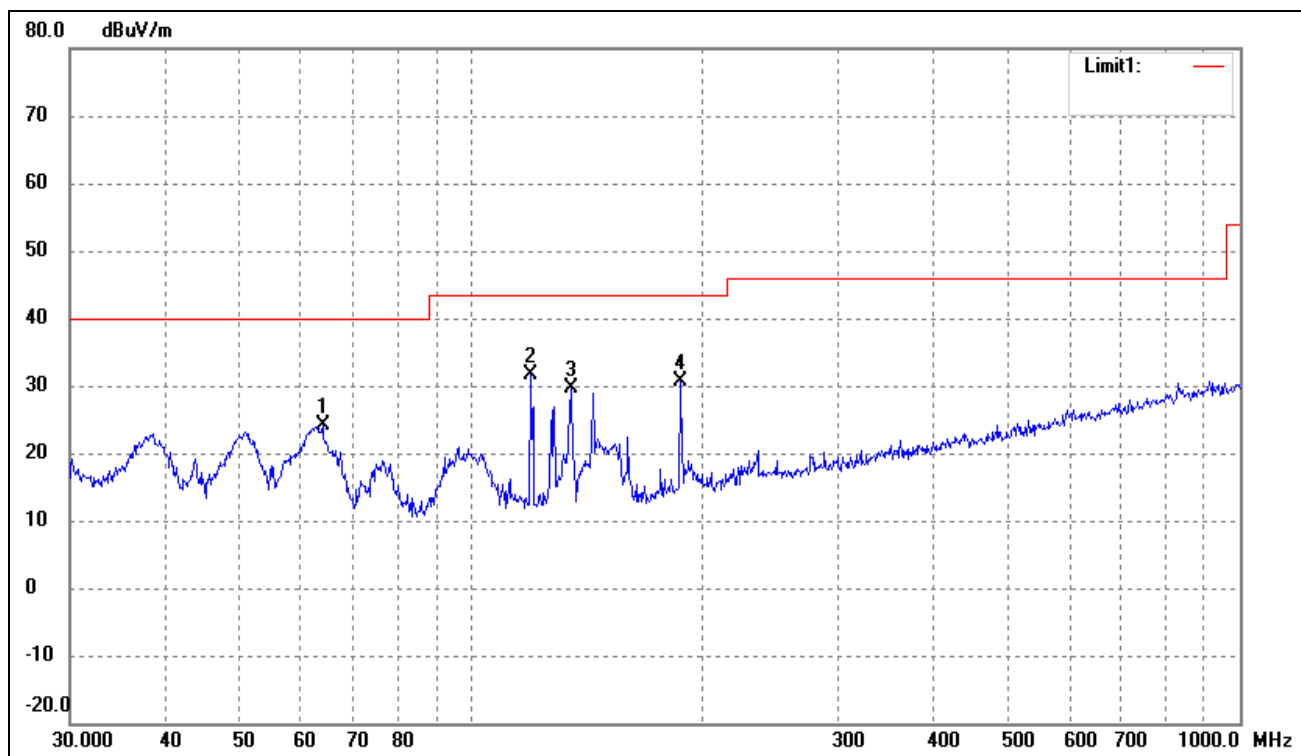
Comment: Adapter DC9.5V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	143.8295	36.33	-10.94	25.39	43.50	-18.11	65	100	peak
2	191.0738	30.43	-8.41	22.02	43.50	-21.48	221	100	peak
3	360.4477	28.61	-3.15	25.46	46.00	-20.54	354	100	peak

Test Specification: Vertical

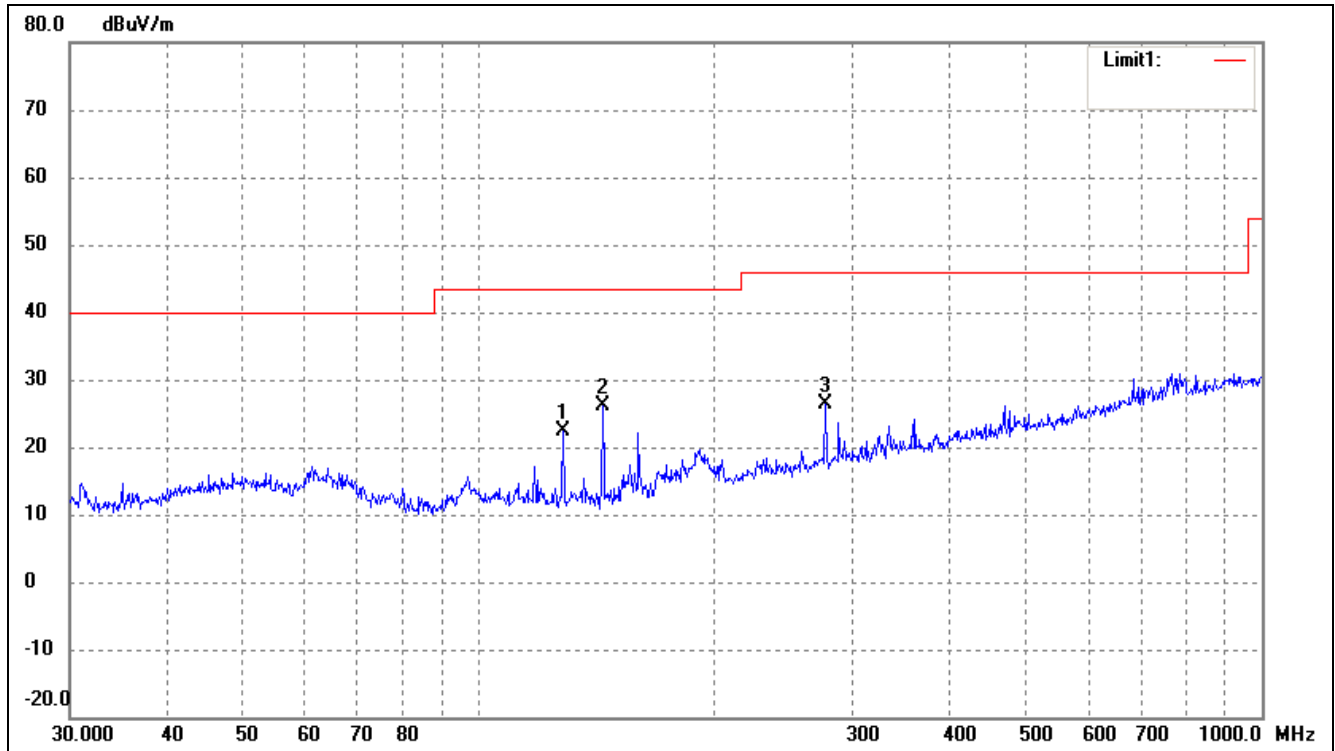


No.	Frequency (MHz)	Reading (dBuV)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	63.9828	35.34	-11.28	24.06	40.00	-15.94	326	100	peak
2	119.4361	42.11	-10.59	31.52	43.50	-11.98	222	100	peak
3	135.0319	40.52	-10.81	29.71	43.50	-13.79	114	100	peak
4	187.0958	39.20	-8.67	30.53	43.50	-12.97	361	100	peak

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

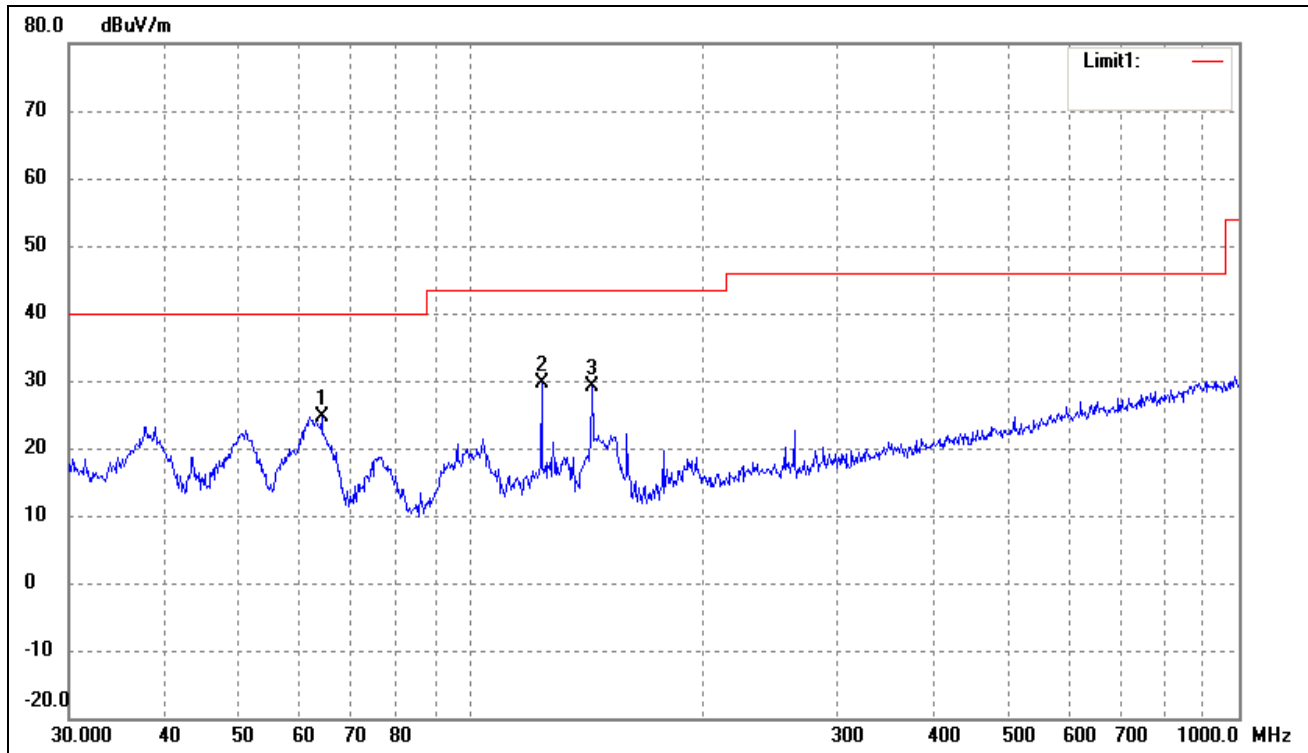
EUT: MaceAlert Smart Panel
 Tested Model: WS136
 Operating Condition: 802.11g Transmitting Low Channel-2412MHz
 Comment: Adapter DC9.5V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	128.1130	32.99	-10.70	22.29	43.50	-21.21	265	100	peak
2	143.8295	36.95	-10.94	26.01	43.50	-17.49	154	100	peak
3	277.0935	32.09	-5.75	26.34	46.00	-19.66	321	100	peak

Test Specification: Vertical

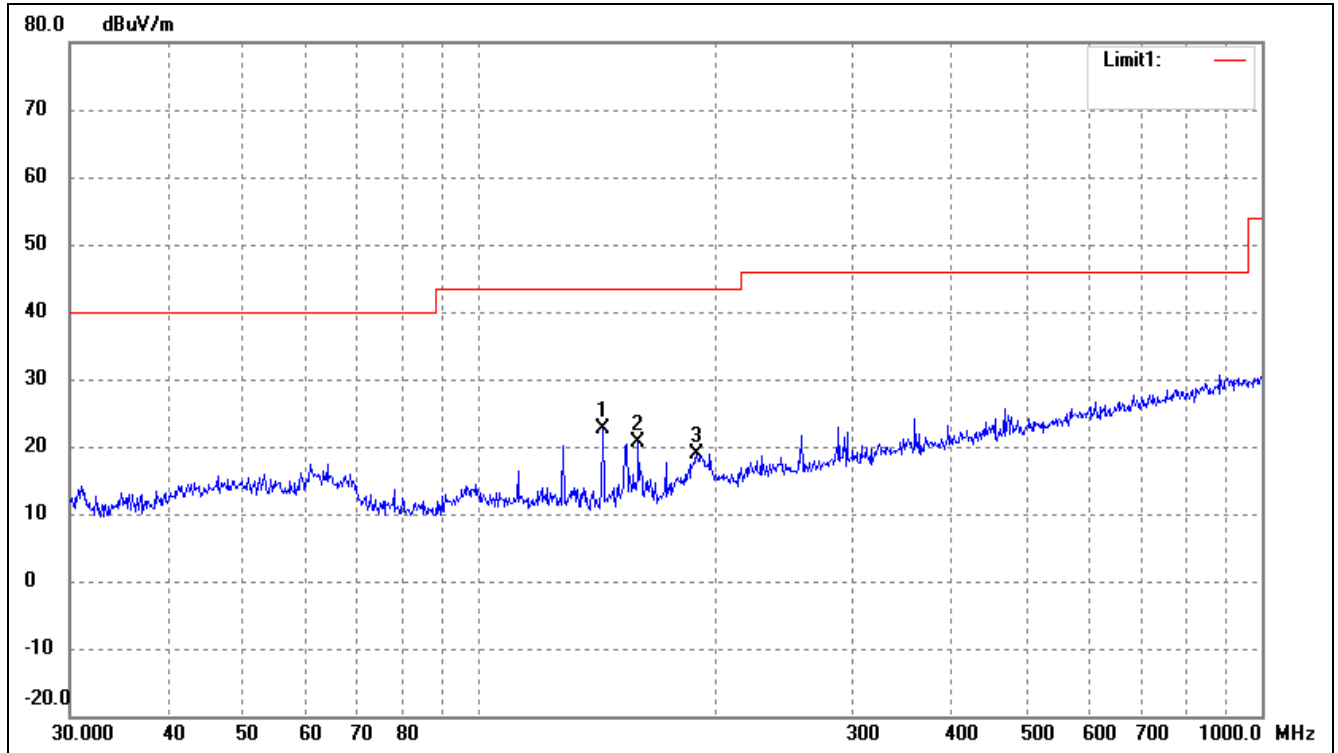


No.	Frequency (MHz)	Reading (dBuV)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	63.9828	36.00	-11.28	24.72	40.00	-15.28	214	100	peak
2	123.6985	40.25	-10.64	29.61	43.50	-13.89	65	100	peak
3	143.8295	40.15	-10.94	29.21	43.50	-14.29	316	100	peak

Operating Condition: 802.11g Transmitting Middle Channel-2437MHz

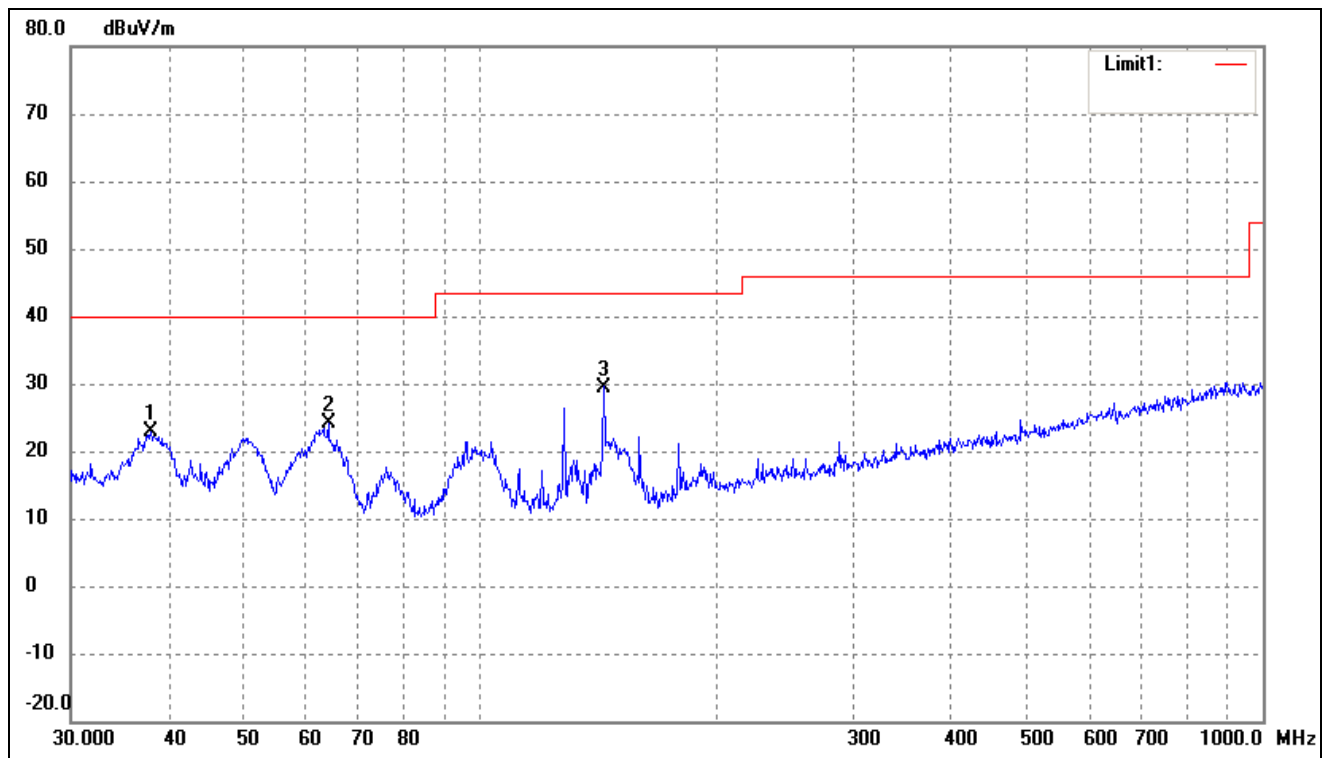
Comment: Adapter DC9.5V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	143.8295	33.49	-10.94	22.55	43.50	-20.95	148	100	peak
2	159.7844	31.23	-10.57	20.66	43.50	-22.84	87	100	peak
3	189.7385	27.24	-8.45	18.79	43.50	-24.71	282	200	peak

Test Specification: Vertical

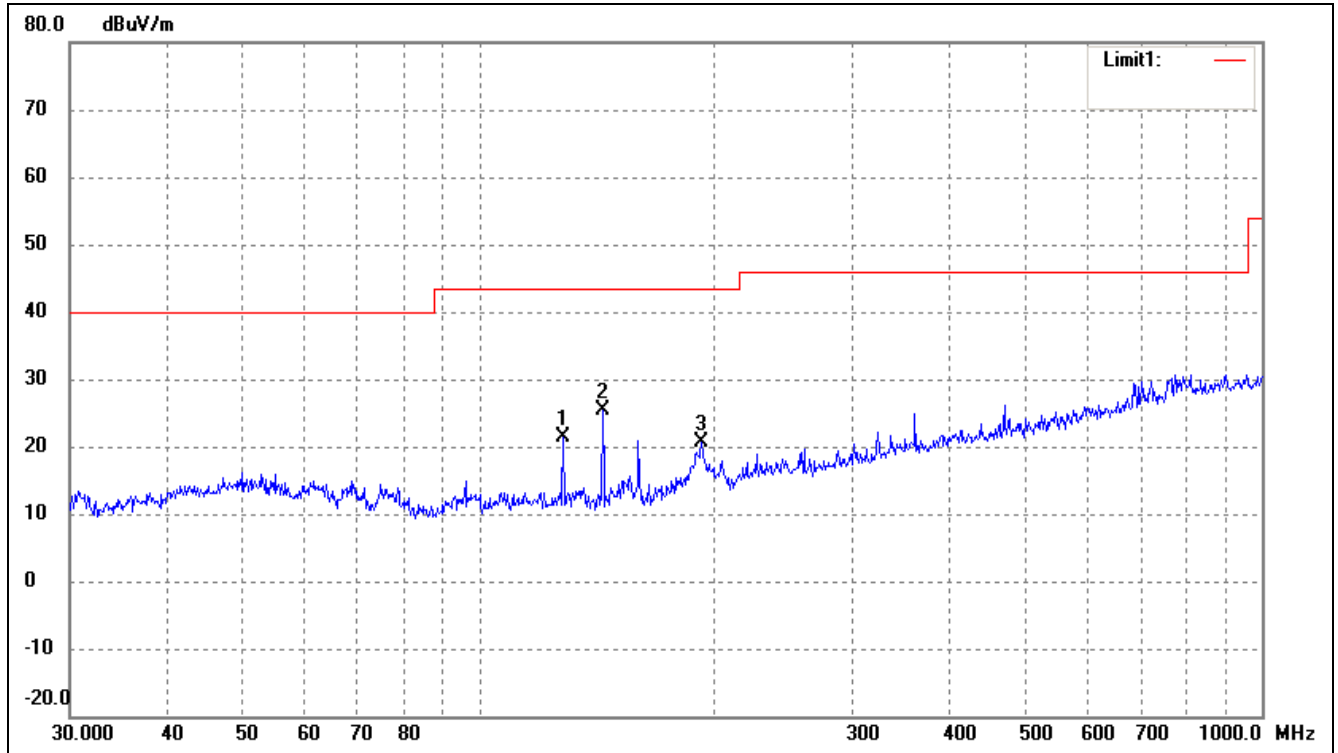


No.	Frequency (MHz)	Reading (dBuV)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	37.9450	33.09	-10.14	22.95	40.00	-17.05	165	100	peak
2	63.9828	35.48	-11.28	24.20	40.00	-15.80	214	100	peak
3	143.8295	40.44	-10.94	29.50	43.50	-14.00	98	100	peak

Operating Condition: 802.11g Transmitting High Channel-2462MHz

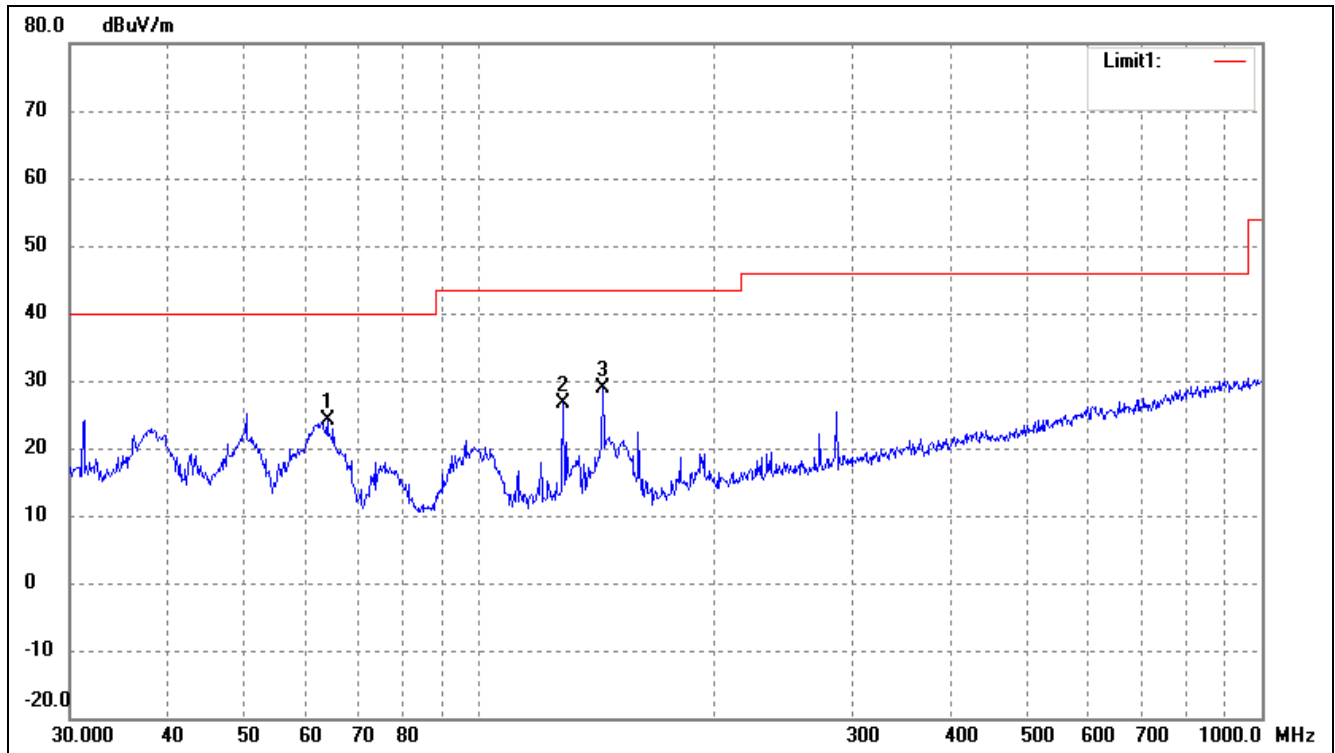
Comment: Adapter DC9.5V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	128.1130	32.07	-10.70	21.37	43.50	-22.13	154	100	peak
2	143.8295	36.33	-10.94	25.39	43.50	-18.11	68	200	peak
3	192.4186	28.88	-8.37	20.51	43.50	-22.99	156	200	peak

Test Specification: Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	63.9828	35.44	-11.28	24.16	40.00	-15.84	166	100	peak
2	128.1130	37.29	-10.70	26.59	43.50	-16.91	121	100	peak
3	143.8295	39.80	-10.94	28.86	43.50	-14.64	54	100	peak

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

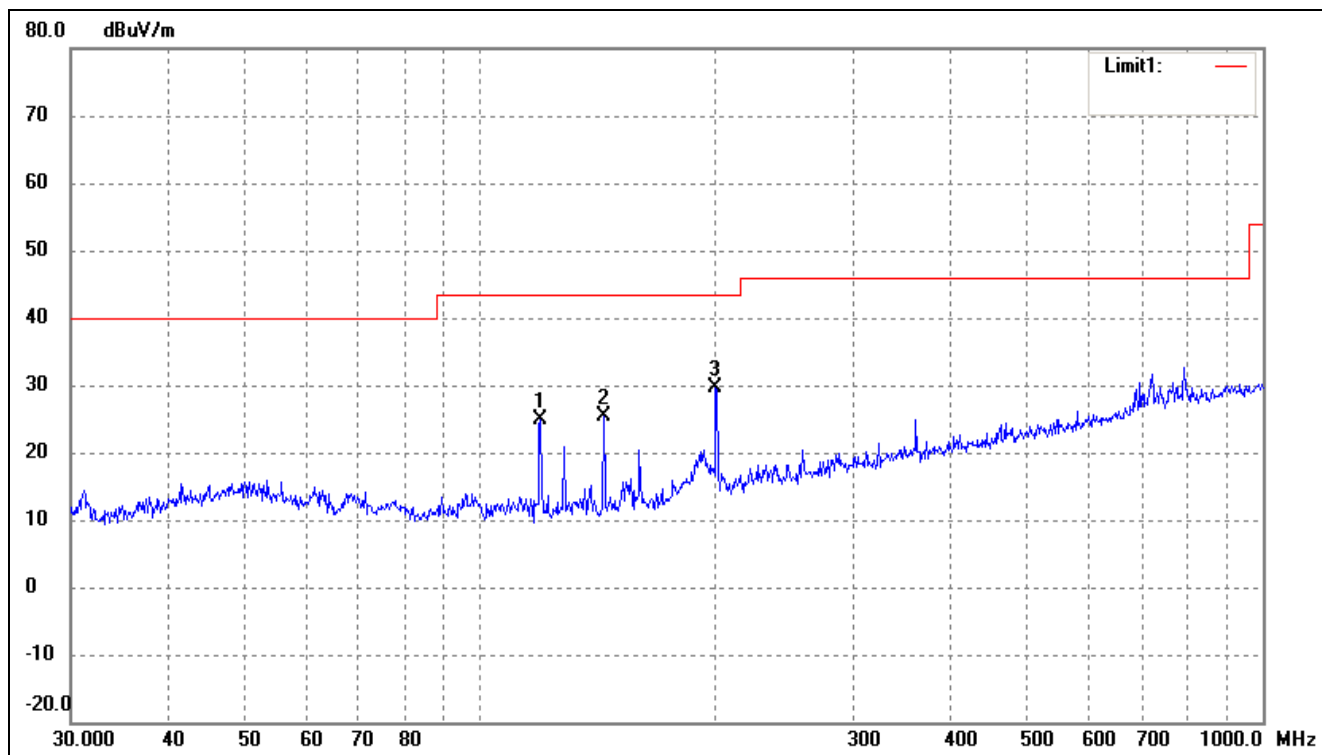
EUT: MaceAlert Smart Panel

Tested Model: WS136

Operating Condition: 802.11n-HT20 Transmitting Low Channel-2412MHz

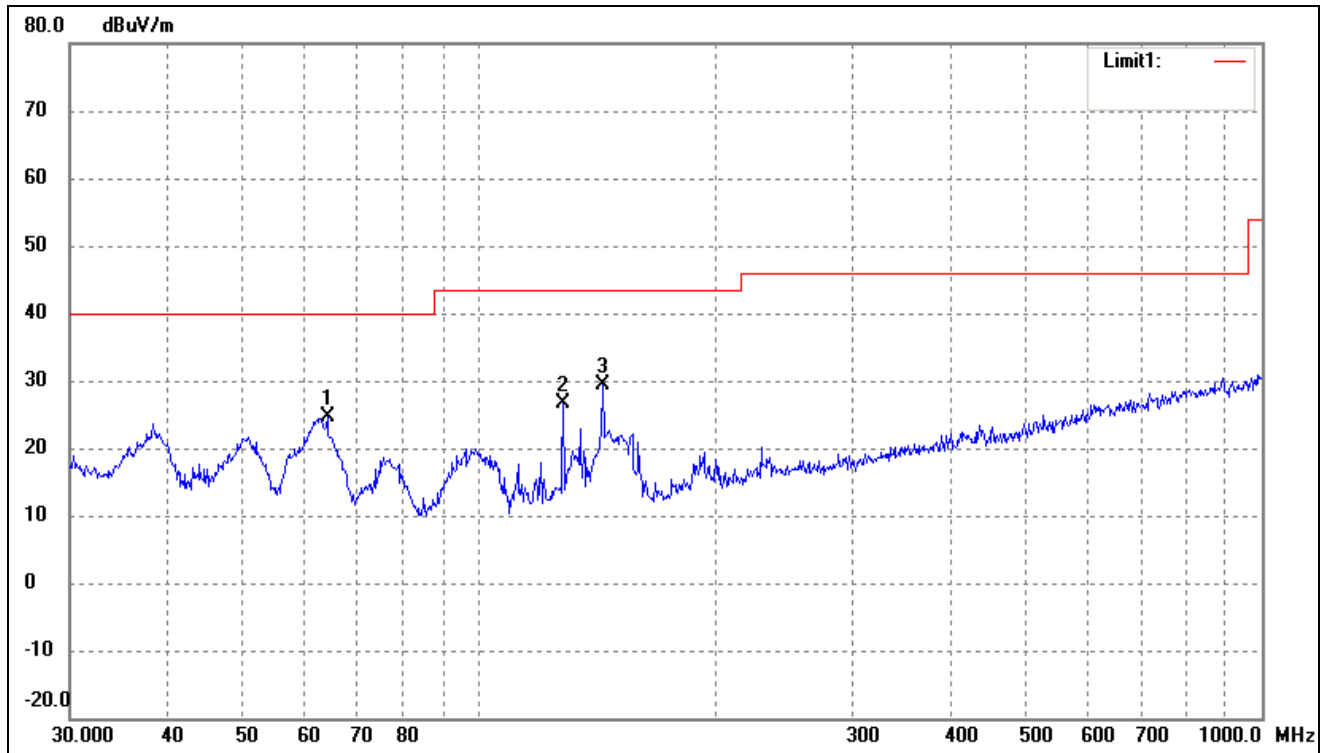
Comment: Adapter DC9.5V

Test Specification: Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV)	dB	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	119.4361	35.47	-10.59	24.88	43.50	-18.62	115	100	peak
2	143.8295	36.29	-10.94	25.35	43.50	-18.15	224	100	peak
3	199.9856	37.70	-8.16	29.54	43.50	-13.96	297	100	peak

Test Specification: Vertical

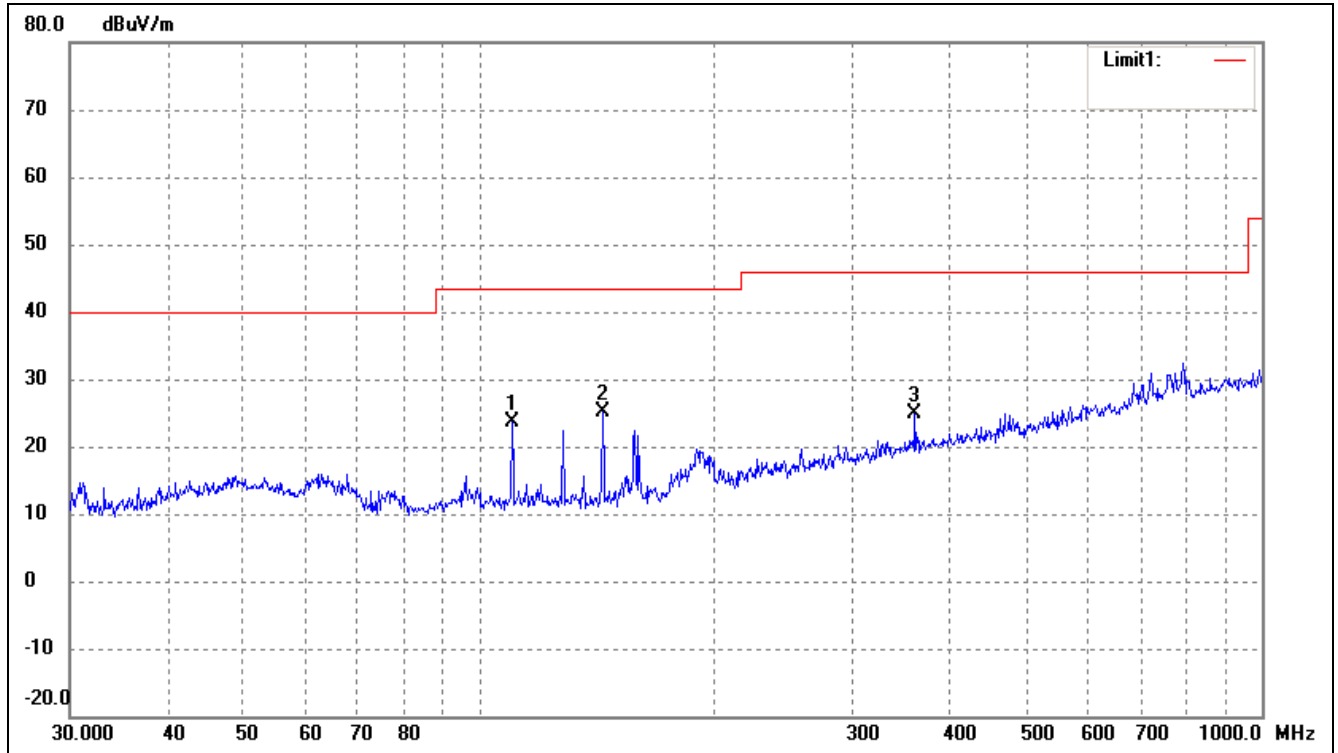


No.	Frequency (MHz)	Reading (dBuV)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	63.9828	35.87	-11.28	24.59	40.00	-15.41	187	100	peak
2	128.1130	37.38	-10.70	26.68	43.50	-16.82	265	100	peak
3	143.8295	40.34	-10.94	29.40	43.50	-14.10	325	100	peak

Operating Condition: 802.11n-HT20 Transmitting Middle Channel-2437MHz

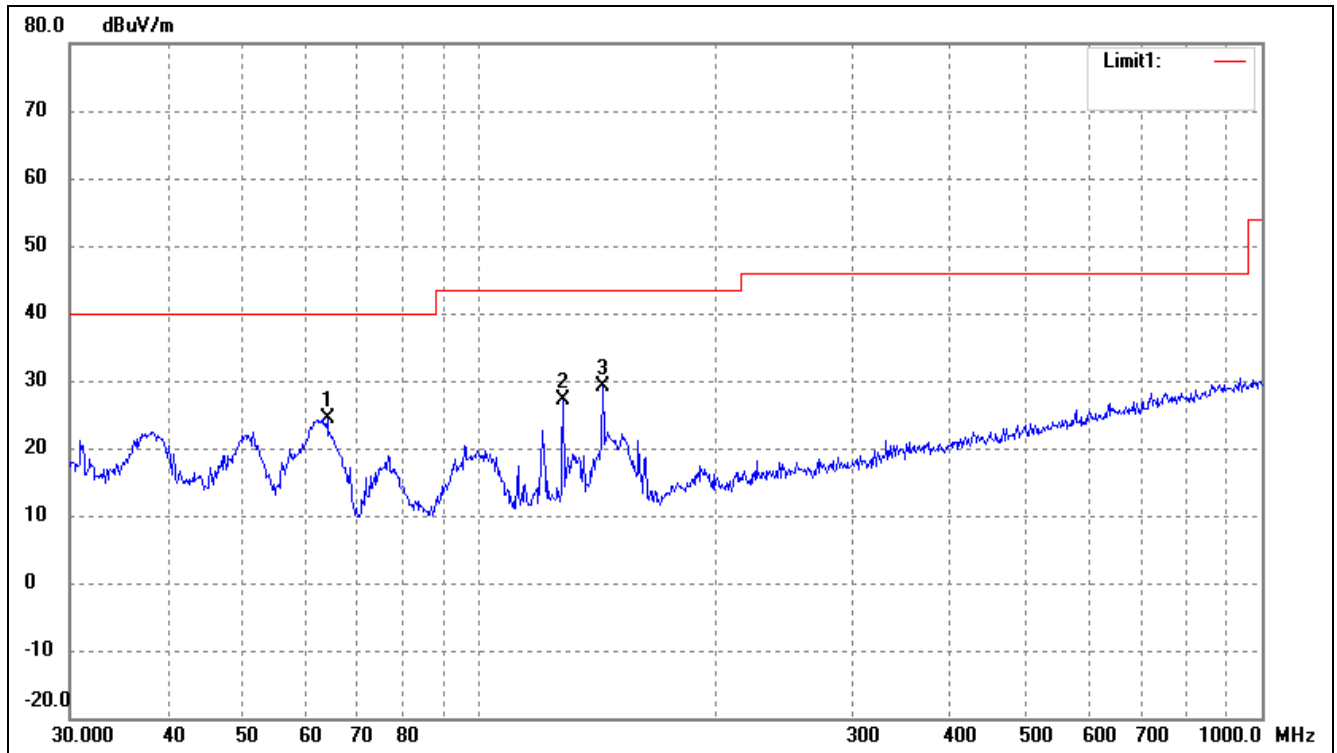
Comment: Adapter DC9.5V

Test Specification: Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV)	dB	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	110.1816	34.18	-10.47	23.71	43.50	-19.79	61	100	peak
2	143.8295	36.16	-10.94	25.22	43.50	-18.28	121	100	peak
3	360.4477	27.93	-3.15	24.78	46.00	-21.22	79	100	peak

Test Specification: Vertical

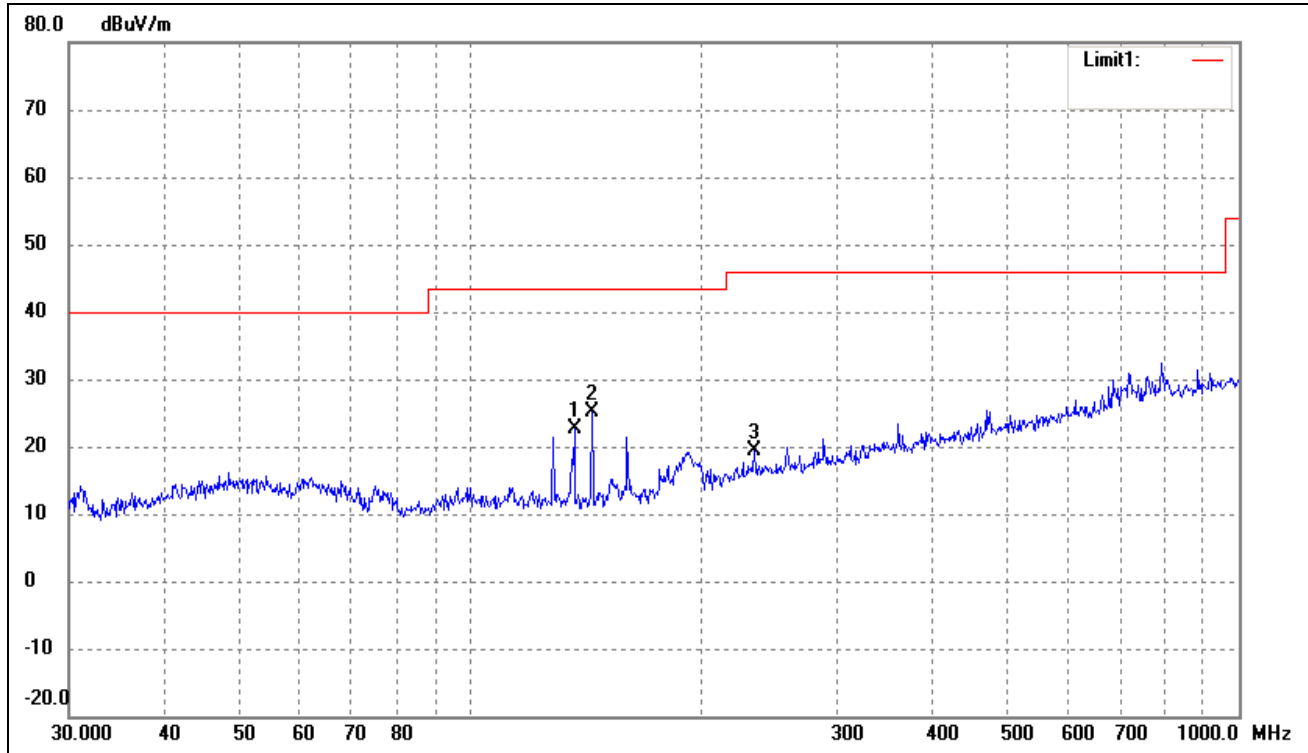


No.	Frequency (MHz)	Reading (dBuV)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	63.9828	35.77	-11.28	24.49	40.00	-15.51	187	100	peak
2	128.1130	37.75	-10.70	27.05	43.50	-16.45	121	100	peak
3	143.8295	39.97	-10.94	29.03	43.50	-14.47	321	100	peak

Operating Condition: 802.11n-HT20 Transmitting High Channel-2462MHz

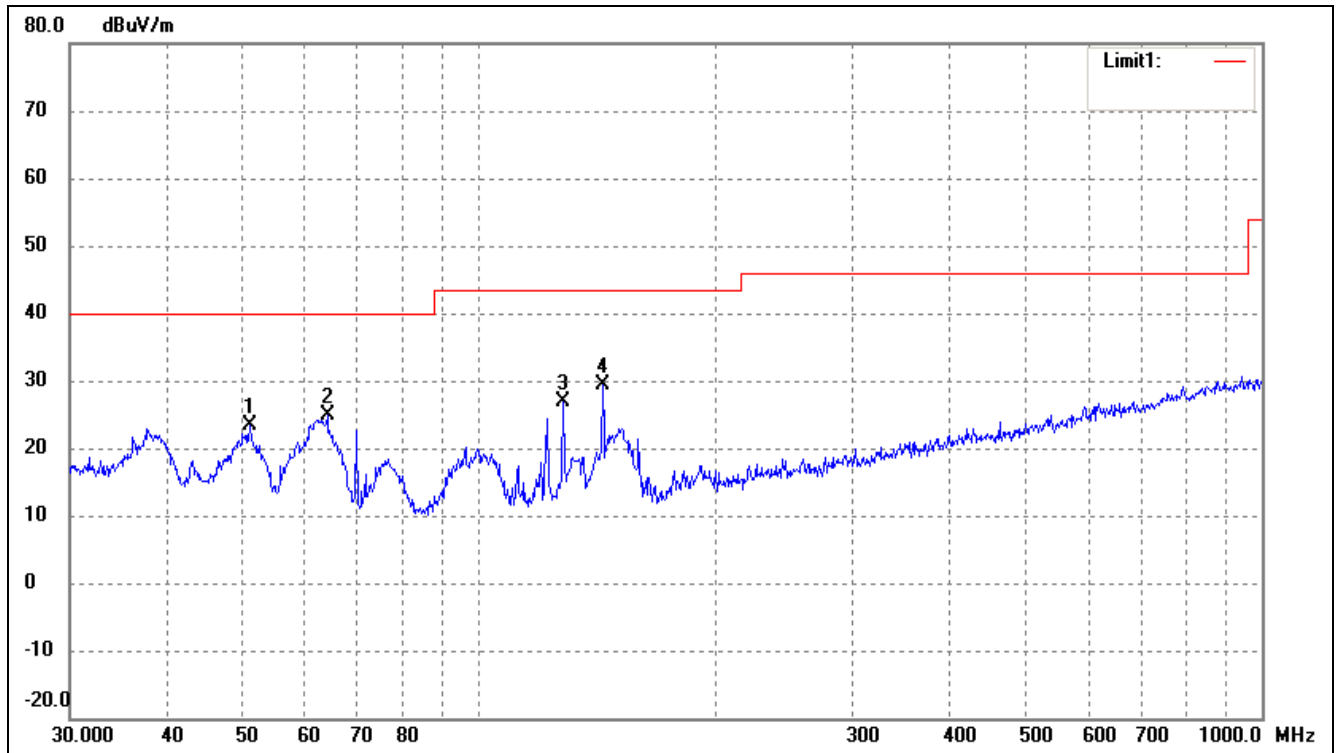
Comment: Adapter DC9.7V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	136.4598	33.38	-10.83	22.55	43.50	-20.95	159	100	peak
2	143.8295	36.10	-10.94	25.16	43.50	-18.34	21	100	peak
3	234.1684	25.92	-6.63	19.29	46.00	-26.71	170	100	peak

Test Specification: Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	50.9420	31.99	-8.54	23.45	40.00	-16.55	154	100	peak
2	63.9828	36.07	-11.28	24.79	40.00	-15.21	27	100	peak
3	128.1130	37.53	-10.70	26.83	43.50	-16.67	311	100	peak
4	143.8295	40.27	-10.94	29.33	43.50	-14.17	92	100	peak

Spurious Emissions Above 1GHz

Test Mode: 802.11b

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2412MHz							
4824.000	54.48	-3.87	50.61	74.00	-23.39	H	PK
4824.000	38.15	-3.87	34.28	54.00	-19.72	H	AV
7236.000	46.65	1.14	47.79	74.00	-26.21	H	PK
7236.000	34.15	1.19	35.34	54.00	-18.66	H	AV
4824.000	57.54	-3.86	53.68	74.00	-20.32	V	PK
4824.000	40.15	-3.86	36.29	54.00	-17.71	V	AV
7236.000	49.65	1.10	50.75	74.00	-23.25	V	PK
7236.000	37.16	1.10	38.26	54.00	-15.74	V	AV
Middle Channel-2437MHz							
4874.000	54.15	-3.74	50.41	74.00	-23.59	H	PK
4874.000	39.21	-3.74	35.47	54.00	-18.53	H	AV
7311.000	47.56	1.47	49.03	74.00	-24.97	H	PK
7311.000	33.21	1.47	34.68	54.00	-19.32	H	AV
4874.000	53.65	-3.74	49.91	74.00	-24.09	V	PK
4874.000	40.15	-3.74	36.41	54.00	-17.59	V	AV
7311.000	47.45	1.47	48.92	74.00	-25.08	V	PK
7311.000	34.25	1.47	35.72	54.00	-18.28	V	AV
High Channel-2462MHz							
4924.000	55.65	-3.59	52.06	74.00	-21.94	H	PK
4924.000	41.24	-3.59	37.65	54.00	-16.35	H	AV
7386.000	46.64	1.79	48.43	74.00	-25.57	H	PK
7386.000	34.54	1.79	36.33	54.00	-17.67	H	AV
4924.000	54.56	-3.59	50.97	74.00	-23.03	V	PK
4924.000	42.46	-3.59	38.87	54.00	-15.13	V	AV
7386.000	47.26	1.79	49.05	74.00	-24.95	V	PK
7386.000	35.25	1.79	37.04	54.00	-16.96	V	AV

Test Mode: 802.11g

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2412MHz							
4824.000	55.56	-3.86	51.70	74.00	-22.30	H	PK
4824.000	42.16	-3.86	38.30	54.00	-15.70	H	AV
7236.000	48.26	1.10	49.36	74.00	-24.64	H	PK
7236.000	34.42	1.10	35.52	54.00	-18.48	H	AV
4824.000	55.71	-3.86	51.85	74.00	-22.15	V	PK
4824.000	42.56	-3.86	38.70	54.00	-15.30	V	AV
7236.000	49.18	1.10	50.28	74.00	-23.72	V	PK
7236.000	35.46	1.10	36.56	54.00	-17.44	V	AV
Middle Channel-2437MHz							
4874.000	55.07	-3.74	51.33	74.00	-22.67	H	PK
4874.000	43.16	-3.74	39.42	54.00	-14.58	H	AV
7311.000	47.26	1.47	48.73	74.00	-25.27	H	PK
7311.000	35.15	1.47	36.62	54.00	-17.38	H	AV
4874.000	57.05	-3.74	53.31	74.00	-20.69	V	PK
4874.000	43.74	-3.74	40.00	54.00	-14.00	V	AV
7311.000	48.32	1.47	49.79	74.00	-24.21	V	PK
7311.000	35.25	1.47	36.72	54.00	-17.28	V	AV
High Channel-2462MHz							
4924.000	54.09	-3.59	50.50	74.00	-23.50	H	PK
4924.000	40.61	-3.59	37.02	54.00	-16.98	H	AV
7386.000	47.15	1.79	48.94	74.00	-25.06	H	PK
7386.000	34.76	1.79	36.55	54.00	-17.45	H	AV
4924.000	56.14	-3.59	52.55	74.00	-21.45	V	PK
4924.000	42.67	-3.59	39.08	54.00	-14.92	V	AV
7386.000	48.57	1.79	50.36	74.00	-23.64	V	PK
7386.000	35.65	1.79	37.44	54.00	-16.56	V	AV

Test Mode: 802.11n-HT20

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2412MHz							
4824.000	55.46	-3.86	51.60	74.00	-22.40	H	PK
4824.000	40.39	-3.86	36.53	54.00	-17.47	H	AV
7236.000	47.56	1.10	48.66	74.00	-25.34	H	PK
7236.000	34.54	1.10	35.64	54.00	-18.36	H	AV
4824.000	56.64	-3.86	52.78	74.00	-21.22	V	PK
4824.000	43.09	-3.86	39.23	54.00	-14.77	V	AV
7236.000	49.27	1.10	50.37	74.00	-23.63	V	PK
7236.000	35.64	1.10	36.74	54.00	-17.26	V	AV
Middle Channel-2437MHz							
4874.000	54.25	-3.74	50.51	74.00	-23.49	H	PK
4874.000	42.31	-3.74	38.57	54.00	-15.43	H	AV
7311.000	48.65	1.47	50.12	74.00	-23.88	H	PK
7311.000	33.12	1.47	34.59	54.00	-19.41	H	AV
4874.000	54.82	-3.74	51.08	74.00	-22.92	V	PK
4874.000	42.65	-3.74	38.91	54.00	-15.09	V	AV
7311.000	48.49	1.47	49.96	74.00	-24.04	V	PK
7311.000	35.10	1.47	36.57	54.00	-17.43	V	AV
High Channel-2462MHz							
4924.000	53.85	-3.59	50.26	74.00	-23.74	H	PK
4924.000	43.16	-3.59	39.57	54.00	-14.43	H	AV
7386.000	48.21	1.79	50.00	74.00	-24.00	H	PK
7386.000	36.08	1.79	37.87	54.00	-16.13	H	AV
4924.000	55.62	-3.59	52.03	74.00	-21.97	V	PK
4924.000	41.42	-3.59	37.83	54.00	-16.17	V	AV
7386.000	48.43	1.79	50.22	74.00	-23.78	V	PK
7386.000	35.24	1.79	37.03	54.00	-16.97	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 v03r03, 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 V03r03, 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.

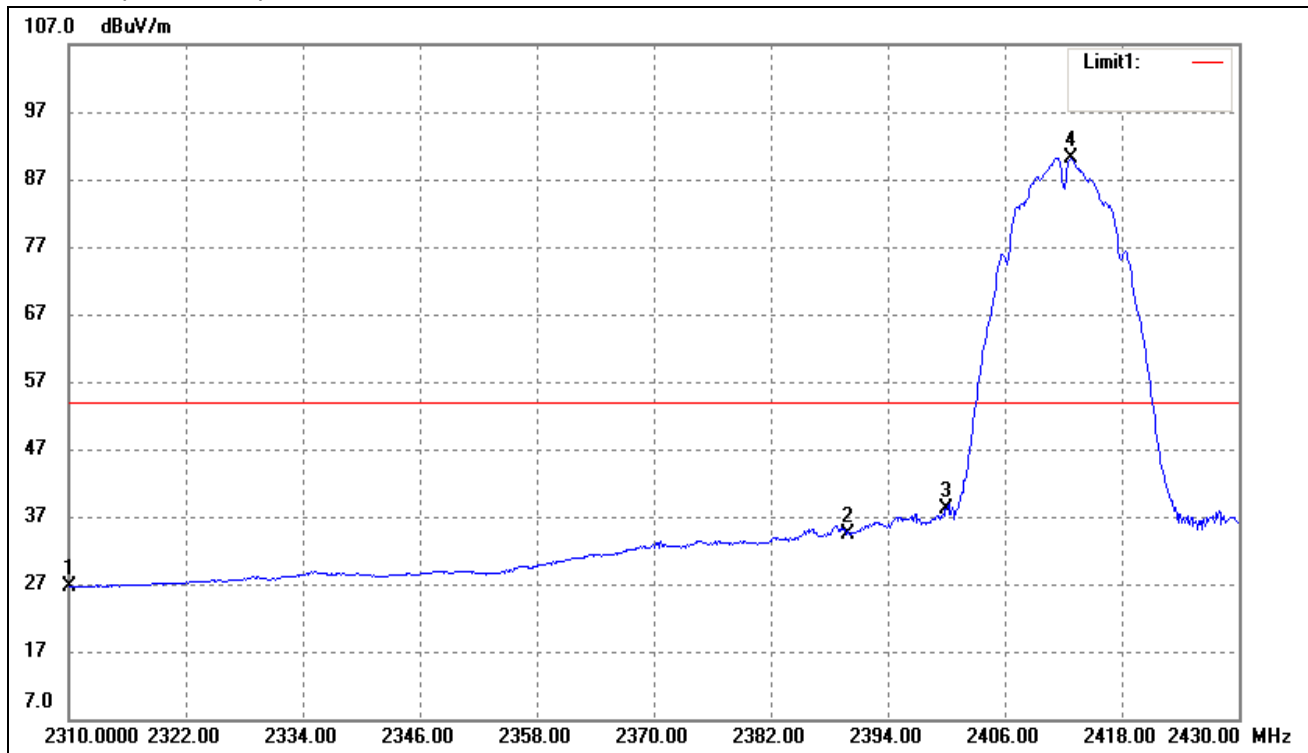
9.3 Environmental Conditions

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

9.4 Summary of Test Results/Plots

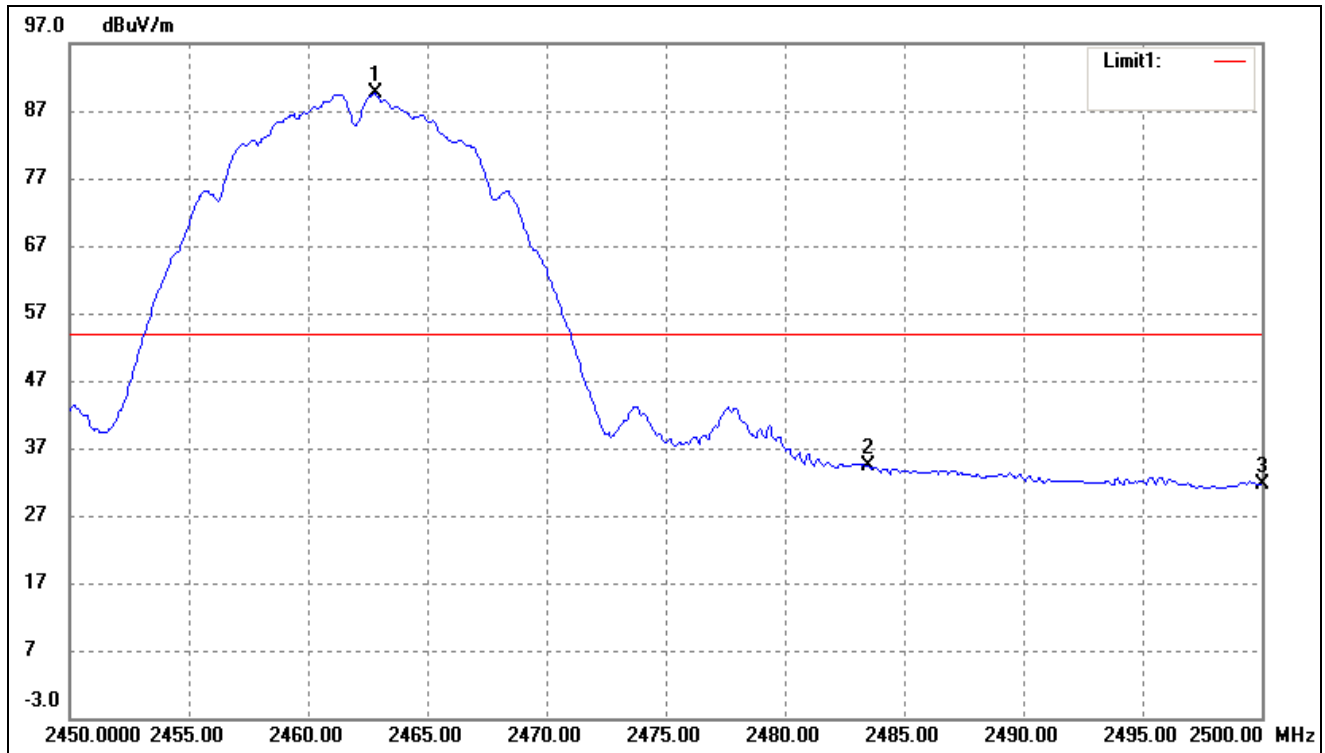
802.11b-Lowest Bandedge

Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	30.27	-3.71	26.56	54.00	-27.44	Average Detector
	2310.000	42.60	-3.71	38.89	74.00	-35.11	Peak Detector
2	2390.000	38.00	-3.54	34.46	54.00	-19.54	Average Detector
	2390.000	51.53	-3.54	47.99	74.00	-26.01	Peak Detector
3	2400.000	41.75	-3.51	38.24	Delta = 52.01dBc		Average Detector
4	2412.720	93.73	-3.48	90.25			Average Detector

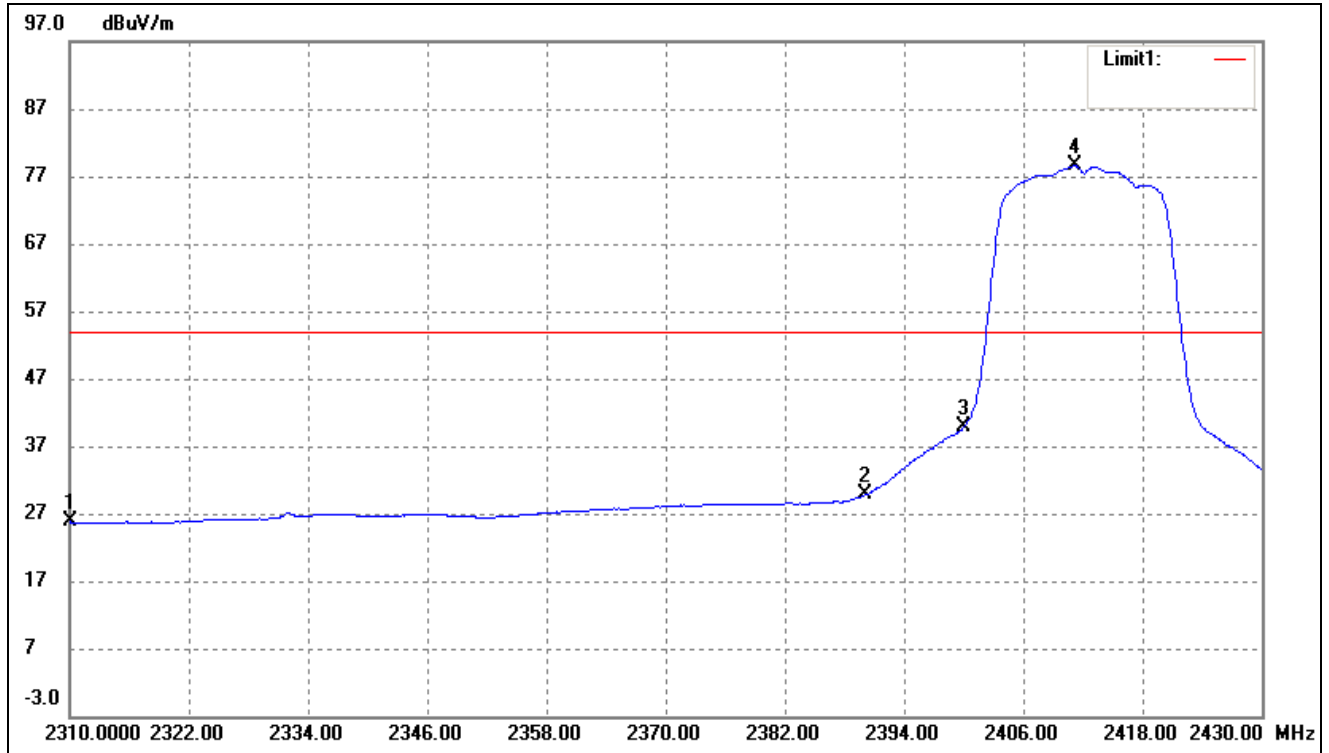
802.11b-Highest Bandedge
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2462.850	93.05	-3.37	89.68	/	/	Average Detector
	2462.950	97.98	-3.37	94.61	/	/	Peak Detector
2	2483.500	Delta = 57.36dBc		32.29	54.00	-21.61	Average Detector
	2483.500			37.25	74.00	-36.75	Peak Detector
3	2500.000	34.98	-3.28	31.70	54.00	-22.30	Average Detector
	2500.000	46.83	-3.28	43.55	74.00	-30.45	Peak Detector

802.11g-Lowest Bandedge

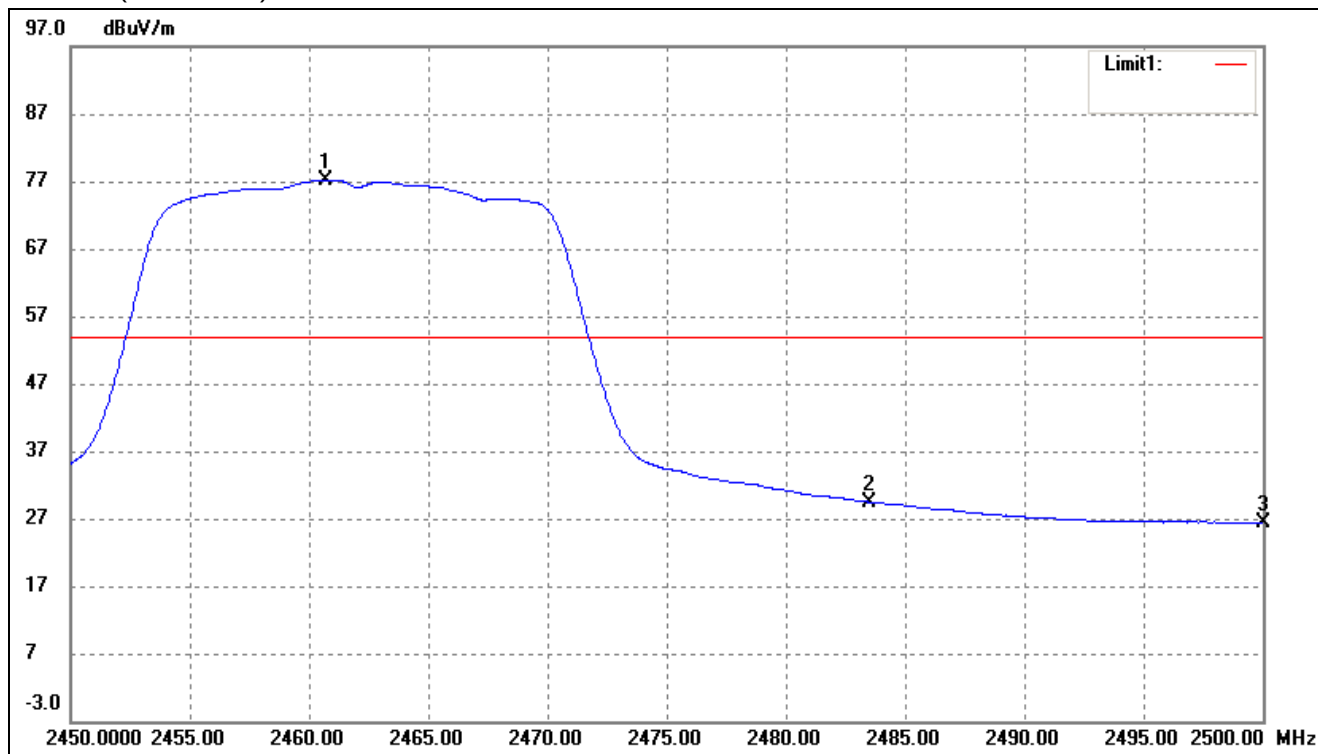
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	29.51	-3.71	25.80	54.00	-28.20	Average Detector
	2310.000	41.73	-3.71	38.02	74.00	-35.98	Peak Detector
2	2390.000	33.32	-3.54	29.78	54.00	-24.22	Average Detector
	2390.000	47.51	-3.54	43.97	74.00	-30.03	Peak Detector
3	2400.000	43.36	-3.51	39.85	Delta = 38.69dBc		Average Detector
4	2411.160	82.02	-3.48	78.54			Average Detector

802.11g-Highest Bandedge

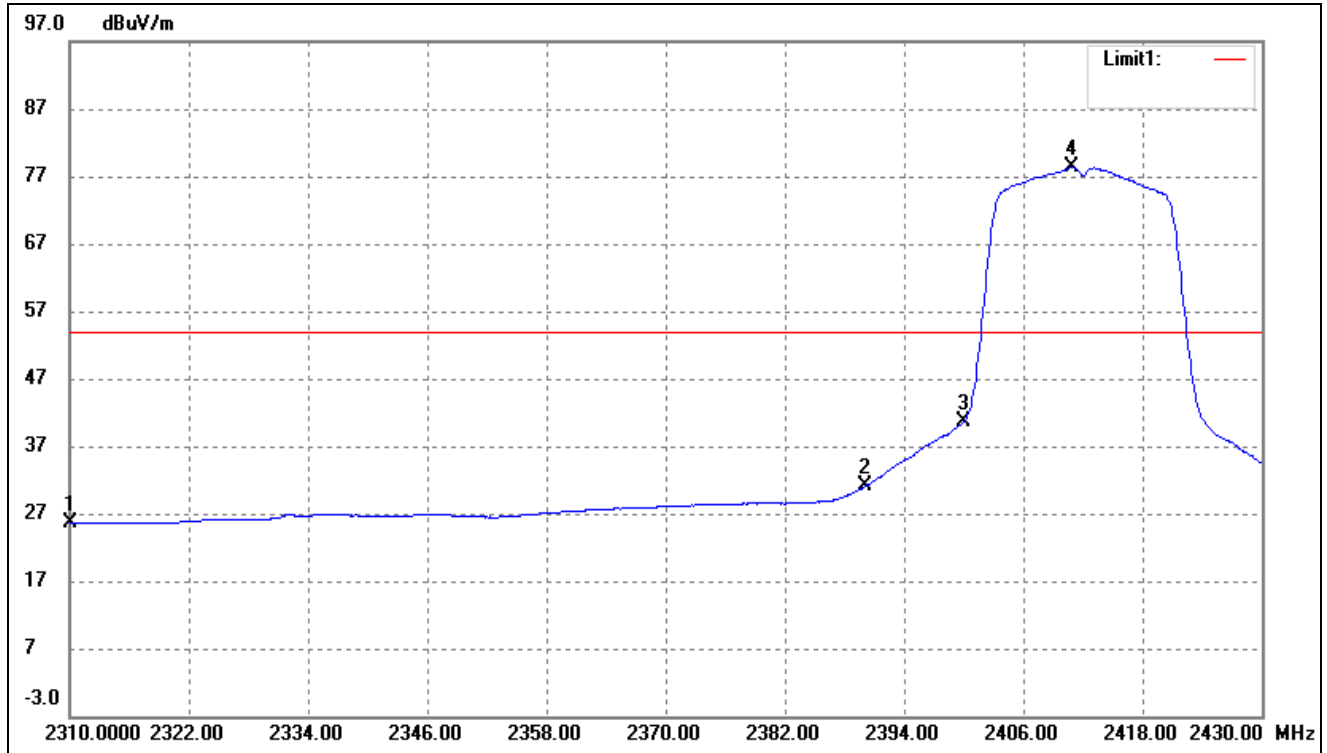
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2	2460.700	80.60	-3.37	77.23	/	/	Average Detector
	2463.450	91.85	-3.36	88.49	/	/	Peak Detector
1	2483.500	Delta = 46.90dBc		30.33	54.00	-23.67	Average Detector
	2483.500			41.59	74.00	-32.41	Peak Detector
3	2500.000	29.60	-3.28	26.32	54.00	-27.68	Average Detector
	2500.000	42.55	-3.28	39.27	74.00	-34.73	Peak Detector

802.11n-HT20-Lowest Bandedge

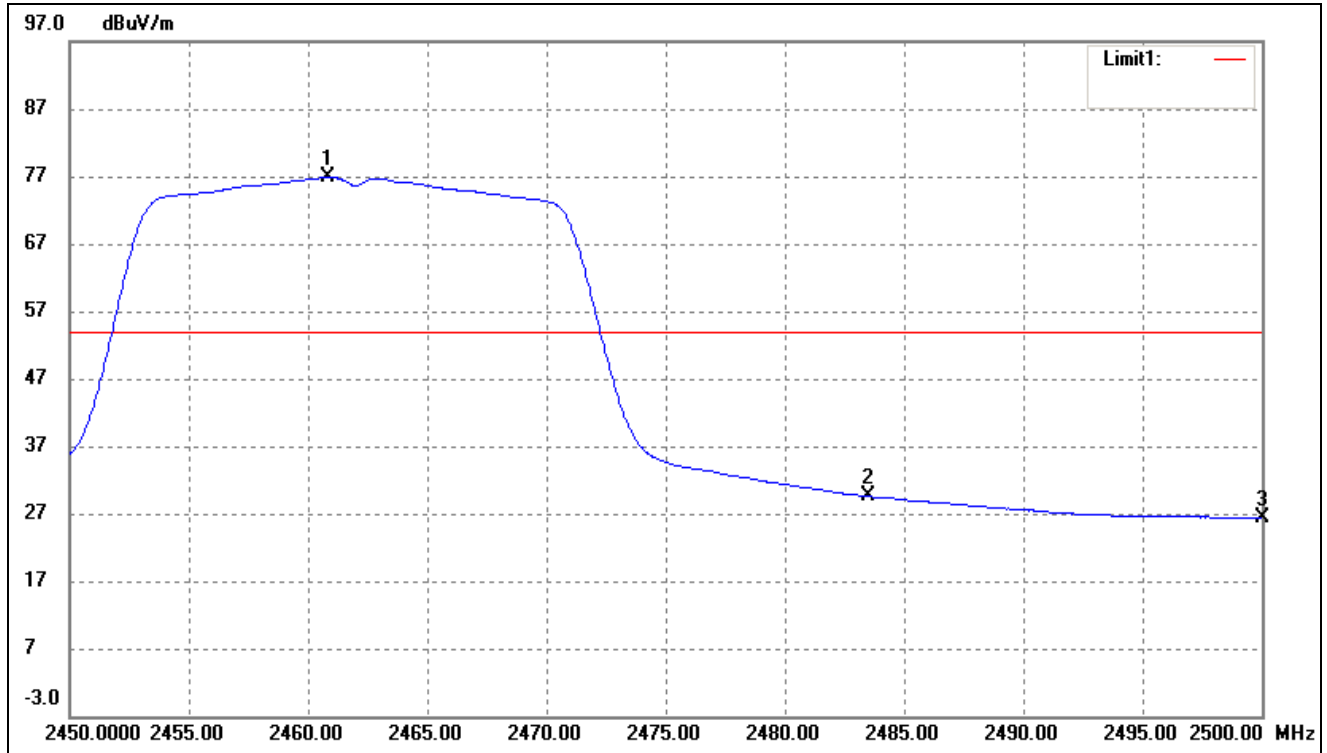
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	29.43	-3.71	25.72	54.00	-28.28	Average Detector
	2310.000	42.34	-3.71	38.63	74.00	-35.37	Peak Detector
2	2390.000	34.55	-3.54	31.01	54.00	-22.99	Average Detector
	2390.000	51.10	-3.54	47.56	74.00	-26.44	Peak Detector
3	2400.000	44.09	-3.51	40.58	Delta = 37.95dBc		Average Detector
4	2410.920	81.81	-3.48	78.33			Average Detector

802.11n-HT20-Highest Bandedge

Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2460.850	80.29	-3.37	76.92	/	/	Average Detector
	2461.400	91.78	-3.37	88.41	/	/	Peak Detector
2	2483.500	Delta = 48.25dBc		28.67	54.00	-25.33	Average Detector
	2483.500			40.16	74.00	-33.84	Peak Detector
3	2500.000	29.63	-3.28	26.35	54.00	-27.65	Average Detector
	2500.000	41.59	-3.28	38.31	74.00	-35.69	Peak Detector

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.

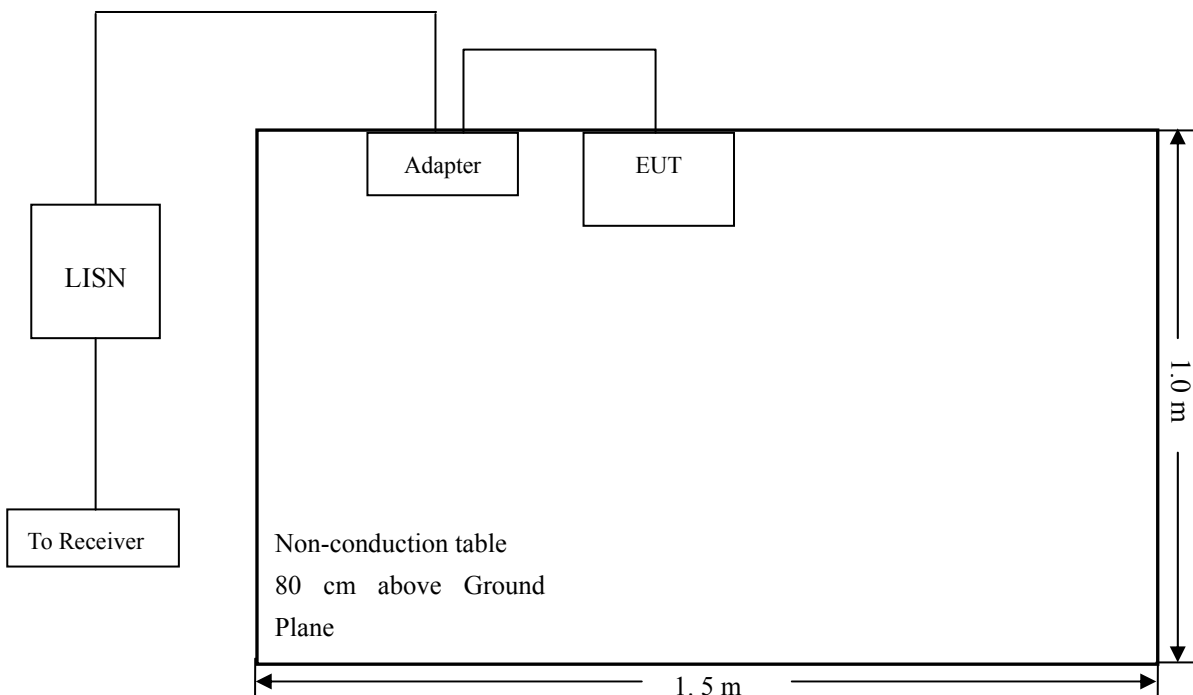
10.2 Test Procedure

The setup of EUT is according with per ANSI C63.4-2014 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 reading of:

-1.56 dB at 0.1499 MHz in the Neutral mode, Peak detector, 0.15-30MHz

10.7 Conducted Emissions Test Data

Plot of Conducted Emissions Test Data

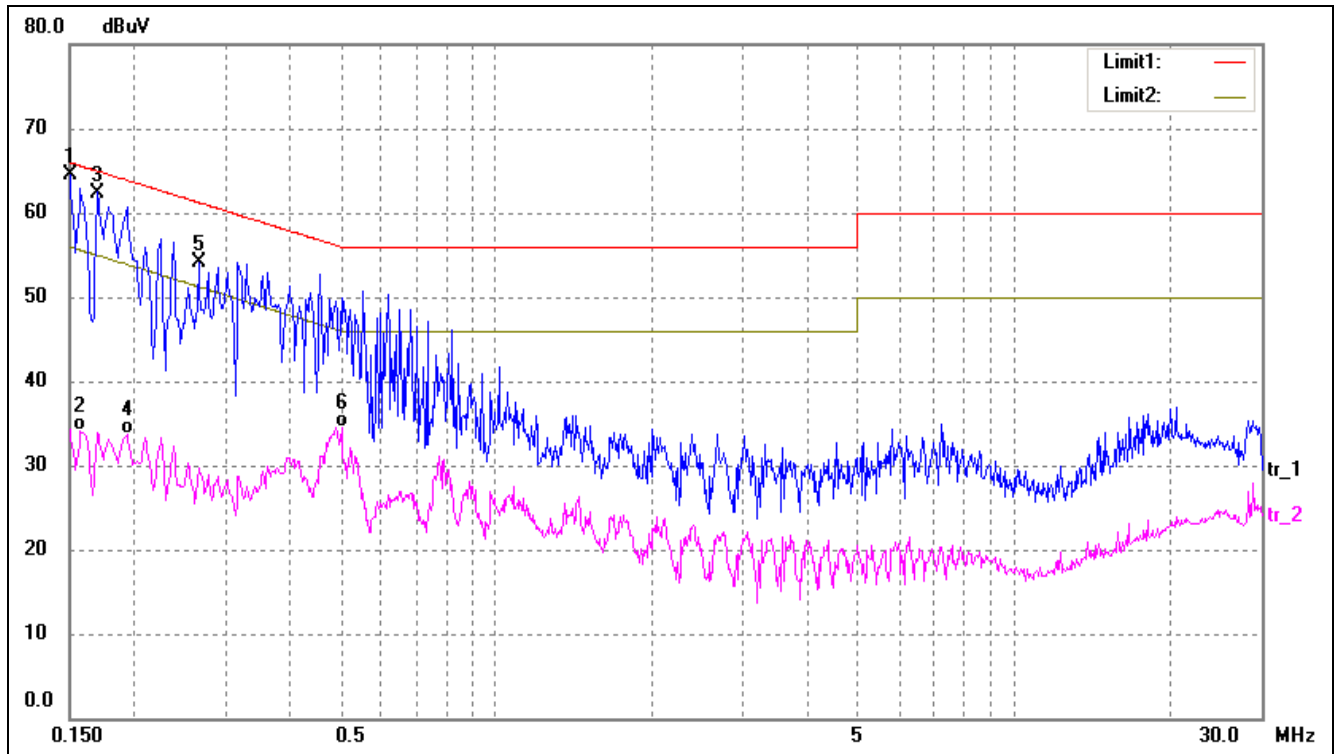
EUT: MaceAlert Smart Panel

Tested Model: WS136

Operating Condition: Transmitting(Wi-Fi)

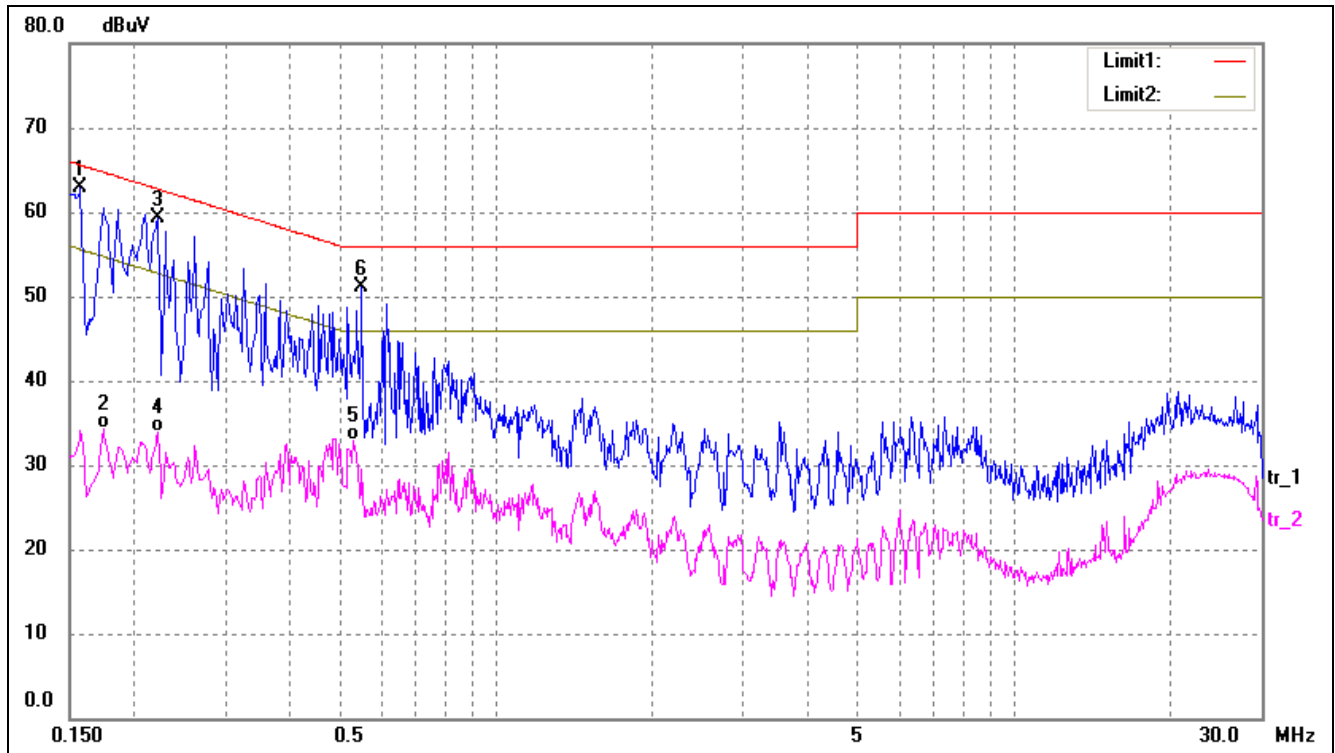
Comment: Adapter DC9.5V

Test Specification: Neutral



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1499	51.94	12.50	64.44	66.00	-1.56	peak
2	0.1580	21.52	12.50	34.02	55.56	-21.54	AVG
3	0.1700	49.90	12.50	62.40	64.96	-2.56	peak
4	0.1940	21.11	12.50	33.61	53.86	-20.25	AVG
5	0.2660	41.68	12.50	54.18	61.24	-7.06	peak
6	0.5020	22.09	12.50	34.59	46.00	-11.41	AVG

Test Specification: Live



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1580	50.39	12.50	62.89	65.56	-2.67	peak
2	0.1740	21.84	12.50	34.34	54.76	-20.42	AVG
3	0.2220	46.79	12.50	59.29	62.74	-3.45	peak
4	0.2220	21.40	12.50	33.90	52.74	-18.84	AVG
5	0.5300	20.30	12.53	32.83	46.00	-13.17	AVG
6	0.5500	38.51	12.55	51.06	56.00	-4.94	peak

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