

FCC 47 CFR PART 15 SUBPART C

for

Prodrone byrd

Model: MGP01-A

Brand: ProDrone

Test Report Number: A151222682F

Issued Date: December 18, 2015

Issued for

Prodrone Technology(Shenzhen) Co.,Ltd

**8th Floor, Beike Building, South High Technology Park,
Nanshan District, Shenzhen**

Issued by: Shenzhen CTL Electron Technology Co.,Ltd.

Note:

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	December 18, 2015	Initial Issue	ALL	Andy Zhang

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1 TEST CERTIFICATION

Product	Prodrone byrd
Model	MGP01-A
Brand	ProDrone
Tested	December 15~ December 18, 2015
Applicant	Prodrone Technology(Shenzhen) Co.,Ltd 8th Floor, Beike Building, South High Technology Park, Nanshan District, Shenzhen
Manufacturer	Prodrone Technology(Shenzhen) Co.,Ltd 8th Floor, Beike Building, South High Technology Park, Nanshan District, Shenzhen

APPLICABLE STANDARDS			
Standard	Test Type	Standard	Test Type
15.207(a)	Power Line Conducted Emissions	15.247(d) 15.209(a)	● Spurious Emissions ● Conducted Measurement ● Radiated Emissions
15.247(a)(2)	6dB Bandwidth Measurement	15.247(b)(3) 15.247(b)(4)	Peak Power Measurement
15.247(d)	Band Edges Measurement	15.247(e)	Peak Power Spectral Density

We hereby certify that:

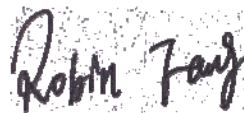
The above equipment was tested by Dongguan Dongdian Testing Service Co.,Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in **ANSI C63.10: 2013** and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.247.

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

Approved by:



Reviewed by:



2 TEST RESULT SUMMARY

APPLICABLE STANDARDS			
Standard	Test Type	Result	Remark
15.247(a)(2)	6dB Bandwidth Measurement	Pass	Meet the requirement of limit.
15.247(b)(3) 15.247(b)(4)	Peak Power Measurement	Pass	Meet the requirement of limit.
15.247(d)	Band Edges Measurement	Pass	Meet the requirement of limit.
15.247(e)	Peak Power Spectral Density	Pass	Meet the requirement of limit.
15.247(d) 15.209(a)	● Spurious Emissions ● Conducted Measurement ● Radiated Emissions	Pass	Meet the requirement of limit.
15.207(a)	Power line Conducted Emissions	Pass	Meet the requirement of limit.

Note: 1. The statements of test result on the above are decided by the request of test standard only; the measurement uncertainties are not factored into this compliance determination.

2. The information of measurement uncertainty is available upon the customer's request.

3 EUT DESCRIPTION

Product	Prodrone byrd
Model Number	MGP01-A
Brand	ProDrone
Model Discrepancy	N/A
Identify Number	
Received Date	December 15, 2015
Power Supply	Internal Li-ion Battery 14.2V
Transmit Power	IEEE 802.11b mode: 12.51dBm IEEE 802.11g mode: 19.37dBm IEEE 802.11n HT20 MHz mode: 19.23dBm
Modulation Technique	IEEE 802.11b mode: DSSS(CCK, QPSK, BPSK) IEEE 802.11g mode: OFDM (BPSK/QPSK/16QAM/64QAM) IEEE 802.11n HT20 MHz mode: OFDM (BPSK/QPSK/16QAM/64QAM)
Transmit Data Rate	IEEE 802.11b: 11Mbps(CCK) with fall back rates of 5.5/2/1Mbps IEEE 802.11g: 54Mbps with fall back rates of 48/36/24/18/12/9 /6Mbps IEEE 802.11n HT20: 130Mbps with fall back rates of 130/117/104/78/52/39/26/13Mbps
Number of Channels	IEEE 802.11b mode: 11 Channels IEEE 802.11g mode: 11 Channels IEEE 802.11n HT20 MHz mode: 11 Channels
Antenna Specification	Dipole Antenna with 3.0dBi gain (Max)
Channels Spacing	IEEE 802.11b/g ,802.11n HT20: 5MHz
Temperature Range	
Hardware Version	
Software Version	

Note: 1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.

2. This submittal(s) (test report) is intended for FCC ID: **2AGKH-PD-BYRD-0102** filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.

4 TEST METHODOLOGY

4.1. DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.

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

Test Item	Test mode	Worse mode
Conducted Emission	Mode 1: Charge	☒
Radiated Emission	Mode 1: TX	☒

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz, which worst case was in normal link mode only, and power line conducted emission below 30MHz, which worst case was in normal link mode.

IEEE802.11b mode: Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 1Mbps data rate were chosen for full testing.

IEEE802.11g mode: Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 6Mbps data rate were chosen for full testing.

IEEE 802.11n HT20 MHz mode: Channel Low (2412MHz), Channel Mid(2437MHz) and Channel High (2462MHz) with 13Mbps data rate were chosen for full testing.

5 SETUP OF EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Equipment	Model No.	Serial No.	FCC ID	Brand	Data Cable	Power Cord

Note:

Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

5.2. CONFIGURATION OF SYSTEM UNDER TEST

See test photographs attached in Appendix II for the actual connections between EUT and support equipment.

6 FACILITIES AND ACCREDITATIONS

6.1. FACILITIES

All measurement facilities used to collect the measurement data are located at Dongguan Dongdian Testing Service Co.,Ltd.

The sites are constructed in conformance with the requirements of ANSI C63.10, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

6.2. ACCREDITATIONS

The test facility is recognized, certified, or accredited by the following organizations:

IC Registration No.: 10288A-1

The 3m alternate test site of Dongguan Dongdian Testing Service Co.,Ltd EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 10288A-1 on May, 2012.

FCC-Registration No.: 270092

Dongguan Dongdian Testing Service 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. Registration 270092, Mar, 2015.

6.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Parameter	Uncertainty
Radiated Emission, 30 to 200 MHz Test Site : 966(2)	+/-3.6880dB
Radiated Emission, 200 to 1000 MHz Test Site : 966(2)	+/-3.6695dB
Radiated Emission, 1 to 8 GHz	+/-5.1782dB
Radiated Emission, 8 to 18 GHz	+/-5.2173dB
Conducted Emissions	+/-3.6836dB
Band Width	178kHz
Peak Output Power MU	+/-1.906dB
Band Edge MU	+/-0.182dB
Channel Separation MU	416.178Hz
Duty Cycle MU	0.054ms
Frequency Stability MU	226Hz

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

The measured result is above (below) the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95% level of confidence. However, the result indicates that compliance (non-compliance) is more probable than non-compliance) with the specification limit.

7 FCC PART 15.247 REQUIREMENTS

7.1. POWER LINE CONDUCTED EMISSIONS MEASUREMENT

7.1.1. LIMITS OF CONDUCTED EMISSIONS MEASUREMENT

According to §15.207(a), except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

NOTE:

- (1) The lower limit shall apply at the transition frequencies.
- (2) The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
- (3) All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

7.1.2. TEST INSTRUMENTS

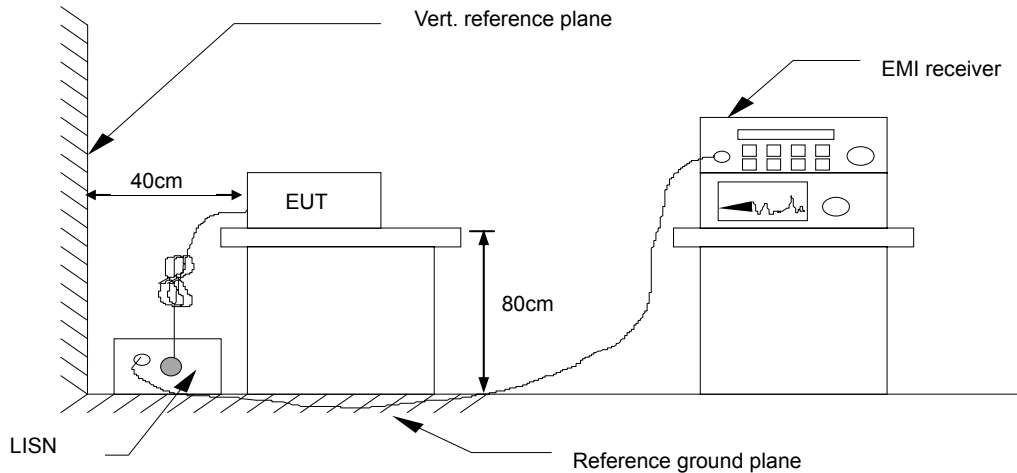
Conducted Emission Test Site					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Cal. Interval
Artificial Mains	Rohde&Schwarz	ENV216	101109	2015/10/22	1 years
Artificial Mains	Rohde&Schwarz	ESH3-Z5	100309	2015/10/22	1 years
EMI Test Receiver	Rohde&Schwarz	ESU8	100316	2015/10/22	1 years
Pulse Limiter	Rohde&Schwarz	ESH3-Z2	101242	2015/10/22	1 years
EMI TEST Software	Audix	E3	6.111111	N/A	N/A

- NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. N.C.R = No Calibration Request.

7.1.3. TEST PROCEDURES (please refer to measurement standard)

- The EUT and Support equipment, if needed, was placed on a non-conducted table, which is 0.8m above the ground plane and 0.4m away from the conducted wall.
- The test equipment EUT installed received AC main power, through a Line Impedance Stabilization Network (LISN), which supplied power source and was grounded to the ground plane. All support equipment power received from a second LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- The EUT test program was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.
- The frequency range from 150 kHz to 30 MHz was searched. The test data of the worst-case condition(s) was recorded. Emission levels under limit 20dB were not recorded.

7.1.4. TEST SETUP



For the actual test configuration, please refer to the related item - Photographs of the Test Configuration.

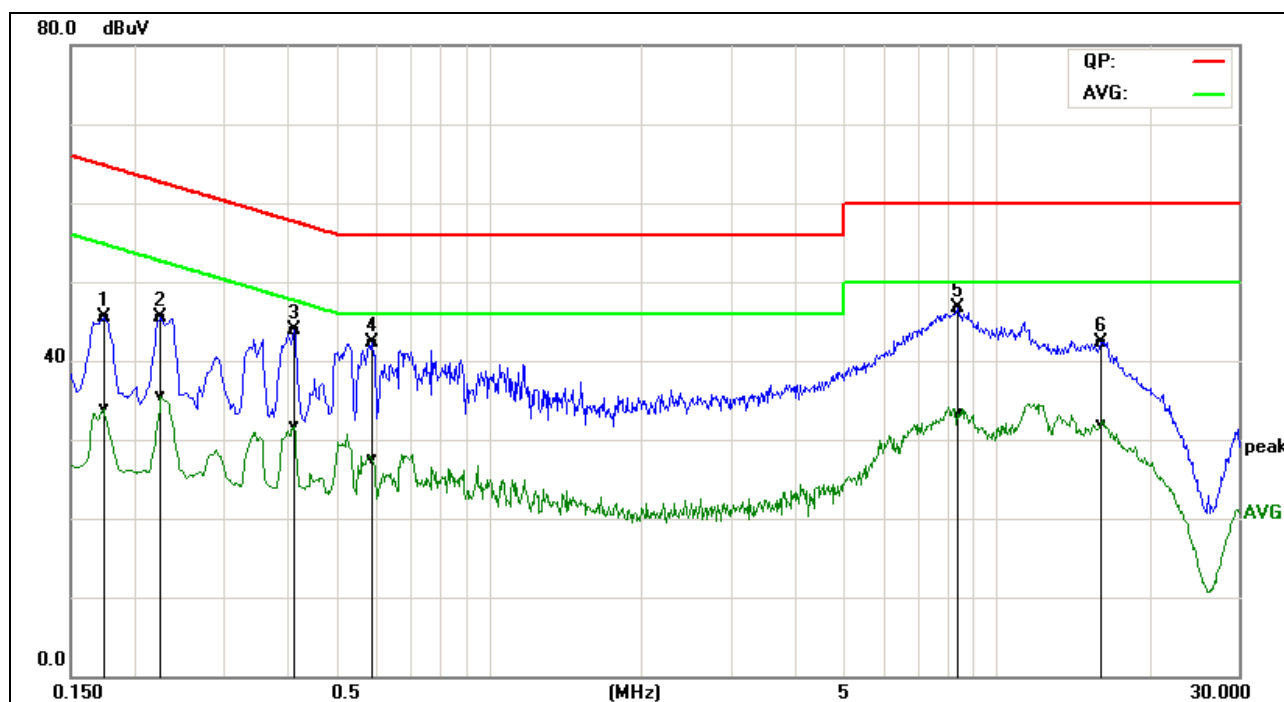
7.1.5. DATA SAMPLE

Frequency (MHz)	QuasiPeak Reading (dBuV)	Average Reading (dBuV)	Correction Factor (dB)	QuasiPeak Result (dBuV)	Average Result (dBuV)	QuasiPeak Limit (dBuV)	Average Limit (dBuV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
X.XXXX	32.69	25.65	11.52	44.21	37.17	65.78	55.79	-21.57	-18.62	Pass

Factor = Insertion loss of LISN + Cable Loss
 Result = Quasi-peak Reading/ Average Reading + Factor
 Limit = Limit stated in standard
 Margin = Result (dBuV) – Limit (dBuV)

7.1.6. TEST RESULTS

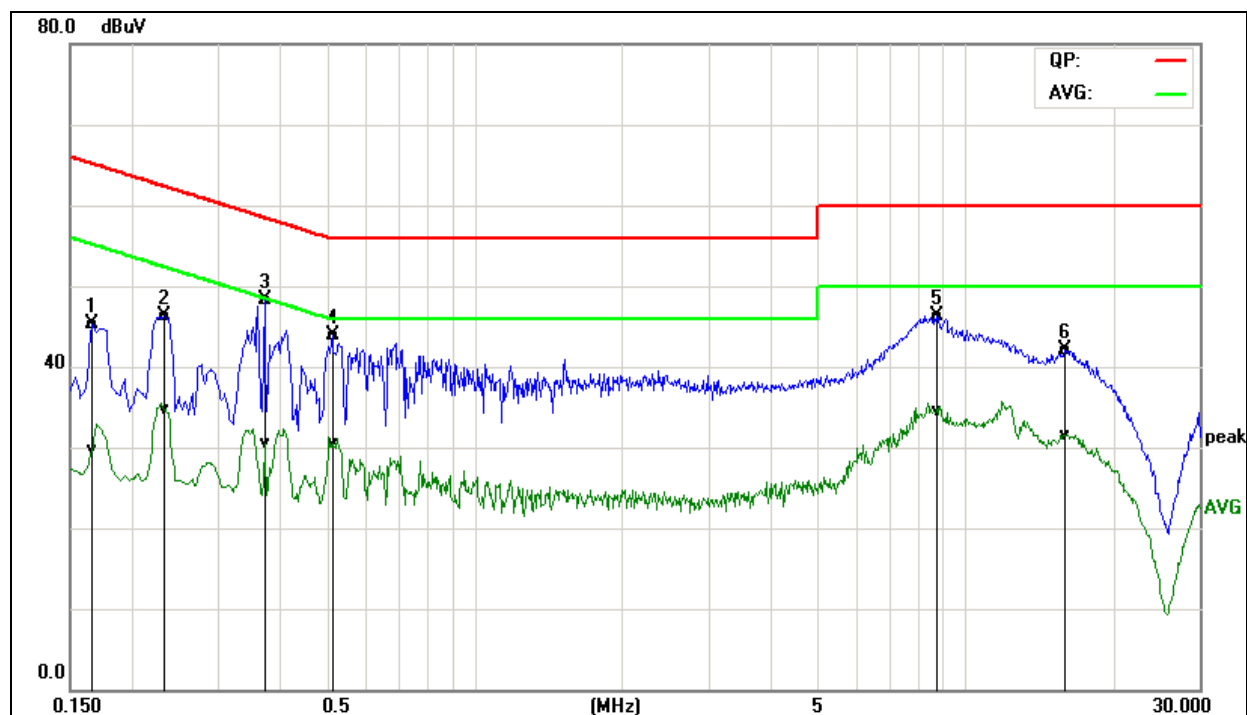
Model No.	MGP01-A	RBW,VBW	9 kHz
Environmental Conditions	22°C, 45% RH	Test Mode	Mode 1
Tested by	Eve Wang	Line	L1
Test Date	2015/12/16		



Frequency (MHz)	QuasiPeak Reading (dBuV)	Average Reading (dBuV)	Correction Factor (dB)	QuasiPeak Result (dBuV)	Average Result (dBuV)	QuasiPeak Limit (dBuV)	Average Limit (dBuV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
0.1740	35.87	24.36	9.63	45.50	33.99	64.76	54.77	-19.26	-20.78	Pass
0.2260	35.88	25.75	9.69	45.57	35.44	62.59	52.60	-17.02	-17.16	Pass
0.4140	34.22	21.95	9.68	43.90	31.63	57.57	47.57	-13.67	-15.94	Pass
0.5899	32.50	17.83	9.72	42.22	27.55	56.00	46.00	-13.78	-18.45	Pass
8.3740	36.77	23.55	9.83	46.60	33.38	60.00	50.00	-13.40	-16.62	Pass
16.1220	32.48	21.92	9.89	42.37	31.81	60.00	50.00	-17.63	-18.19	Pass

REMARKS: L1 = Line One (Live Line)

Model No.	MGP01-A	RBW,VBW	9 kHz
Environmental Conditions	22°C, 45% RH	Test Mode	Mode 1
Tested by	Eve Wang	Line	L1
Test Date	2015/12/16		



Frequency (MHz)	QuasiPeak Reading (dBuV)	Average Reading (dBuV)	Correction Factor (dB)	QuasiPeak Result (dBuV)	Average Result (dBuV)	QuasiPeak Limit (dBuV)	Average Limit (dBuV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
0.1660	35.56	19.89	9.78	45.34	29.67	65.15	55.16	-19.81	-25.49	Pass
0.2340	36.53	24.91	9.78	46.31	34.69	62.30	52.31	-15.99	-17.62	Pass
0.3740	38.52	20.76	9.72	48.24	30.48	58.41	48.41	-10.17	-17.93	Pass
0.5140	34.30	20.77	9.68	43.98	30.45	56.00	46.00	-12.02	-15.55	Pass
8.7540	36.42	24.73	9.83	46.25	34.56	60.00	50.00	-13.75	-15.44	Pass
16.0060	32.42	21.89	9.71	42.13	31.60	60.00	50.00	-17.87	-18.40	Pass

REMARKS: L2 = Line Two (Neutral Line)

7.2. SPURIOUS EMISSIONS MEASUREMENT

7.2.1. CONDUCTED EMISSIONS MEASUREMENT

7.2.1.1. LIMITS OF CONDUCTED EMISSIONS MEASUREMENT

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

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

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

In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).

7.2.1.2. TEST INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Due Calibration
PXA Signal Analyzer	Agilent	N9030A	JTT-E003	2015/04/22	2016/04/21

7.2.1.3. TEST PROCEDURE (please refer to measurement standard)

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

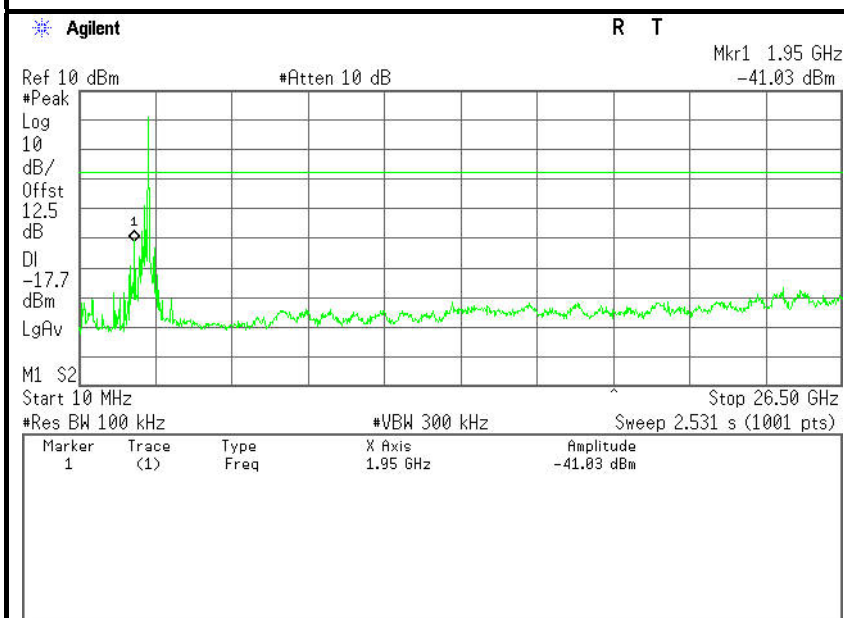
Measurements are made over the 10MHz to 26GHz range with the transmitter set to the lowest, middle, and highest channels. No emission found between lowest internal used/generated frequency to 10MHz, it is only recorded 10MHz to 26GHz.

7.2.1.4. TEST RESULTS

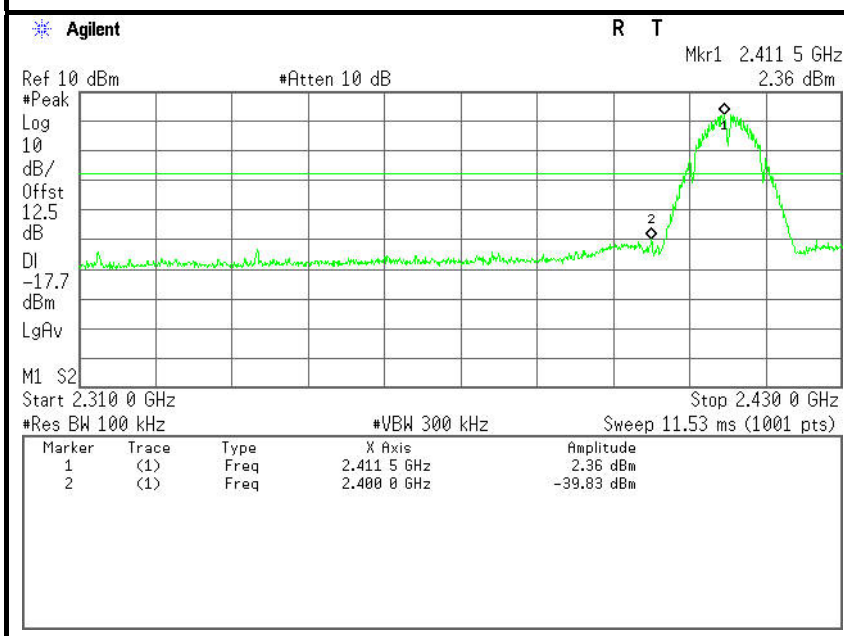
Test Plot

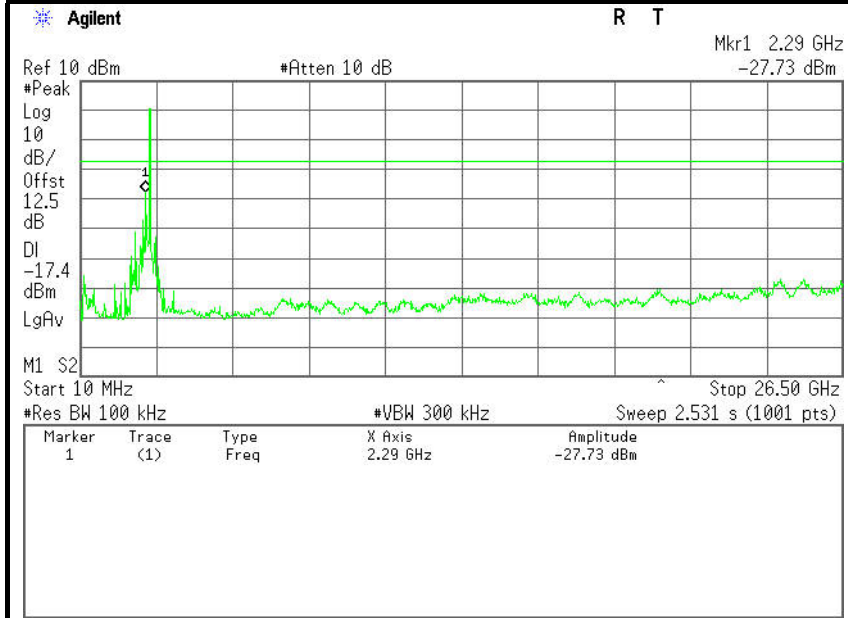
IEEE 802.11b mode

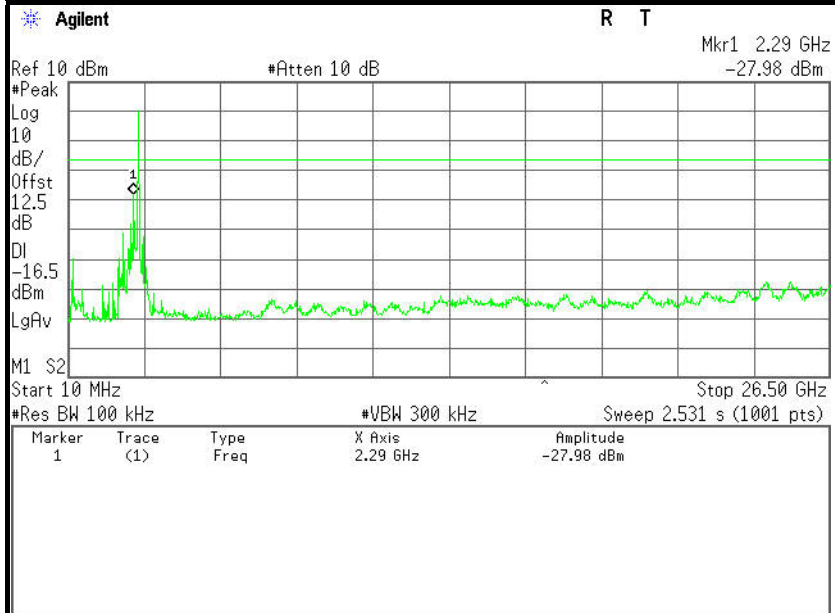
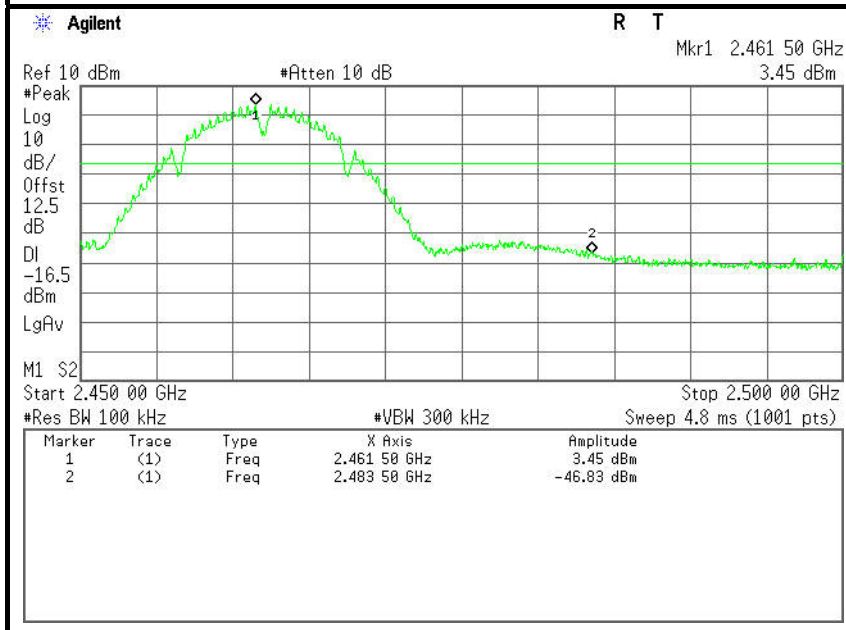
CH Low (10MHz ~26.5GHz)

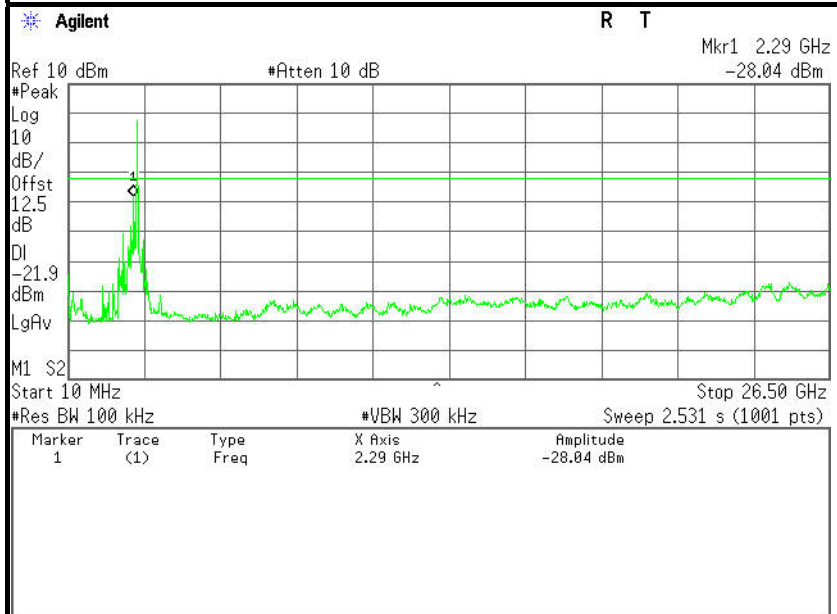
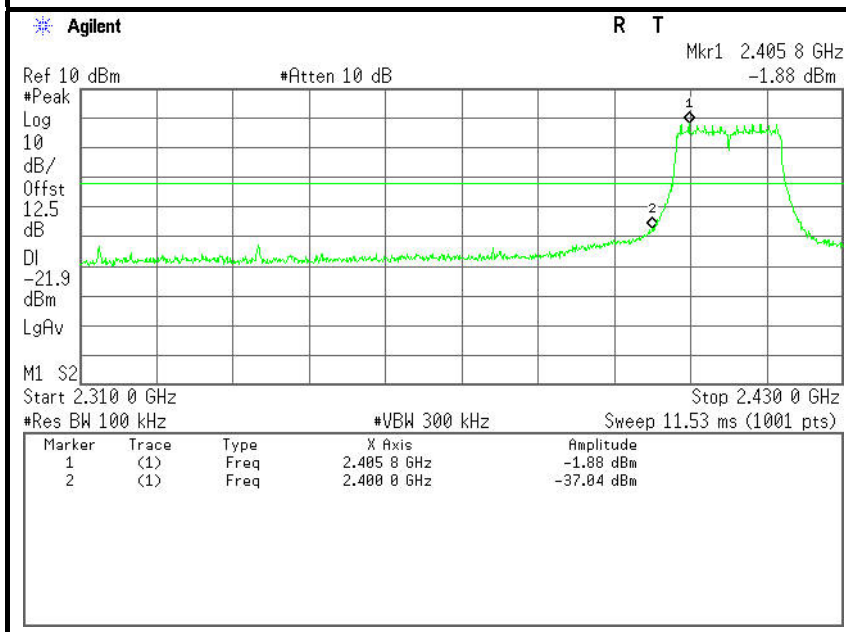


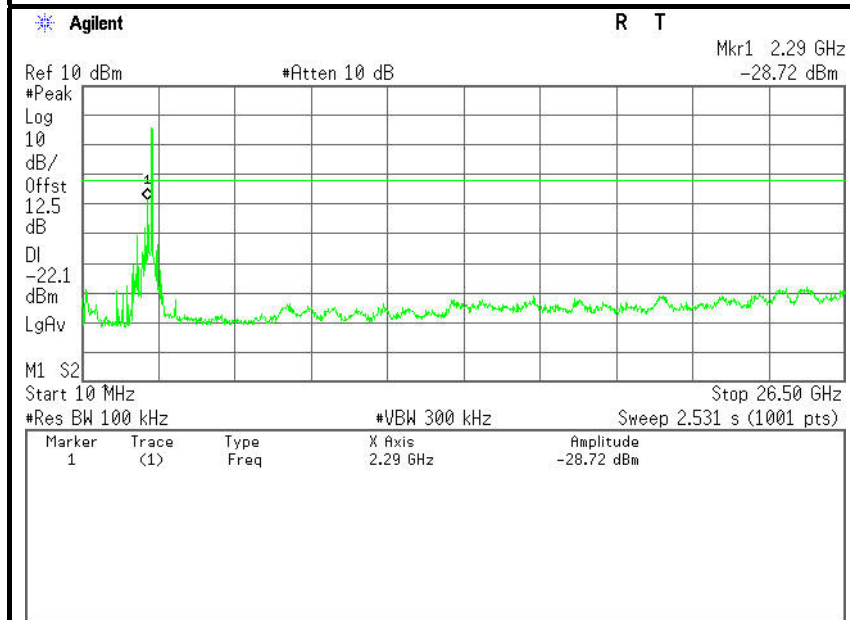
CH Low (2.31GHz ~2.43GHz)

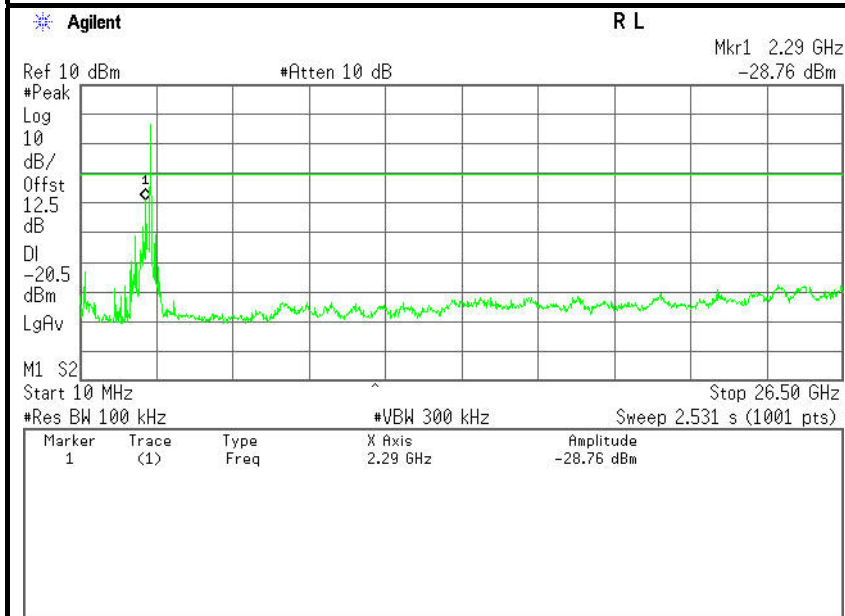
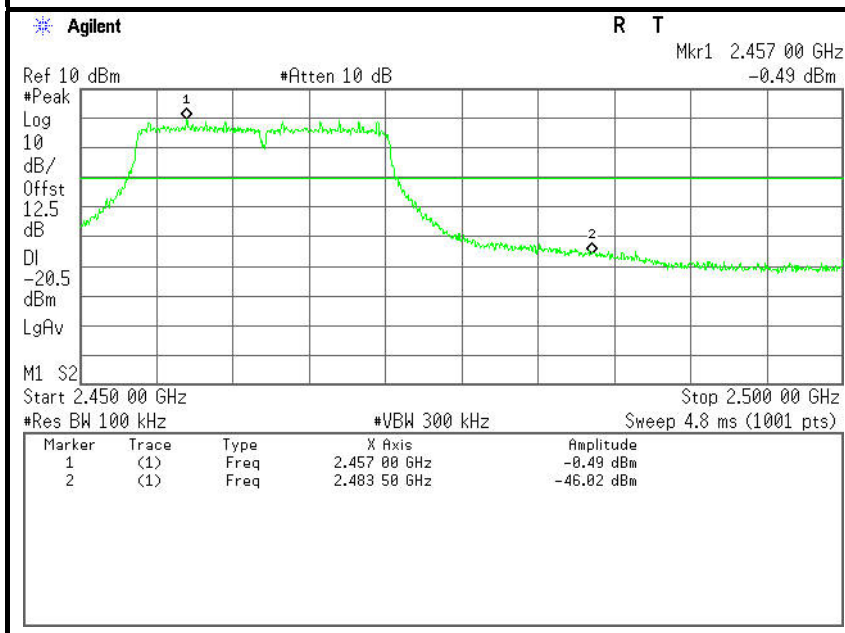


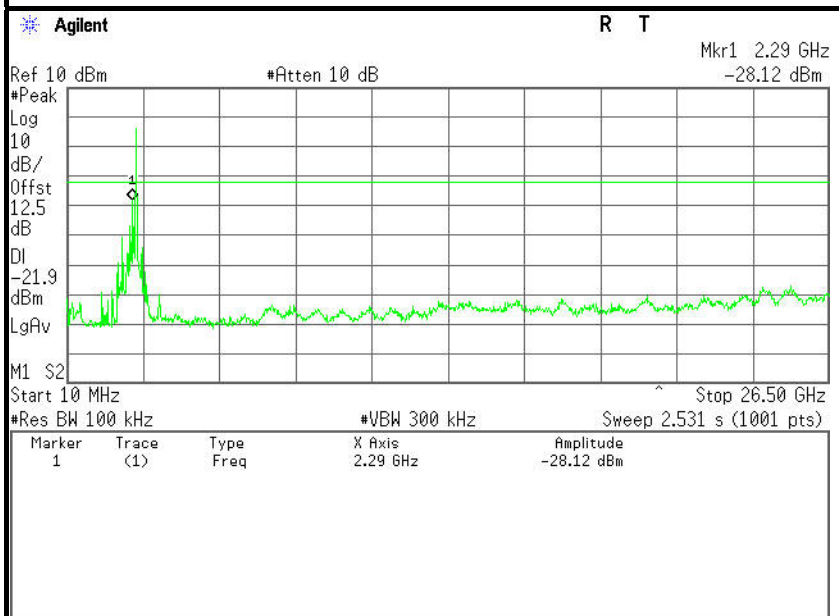
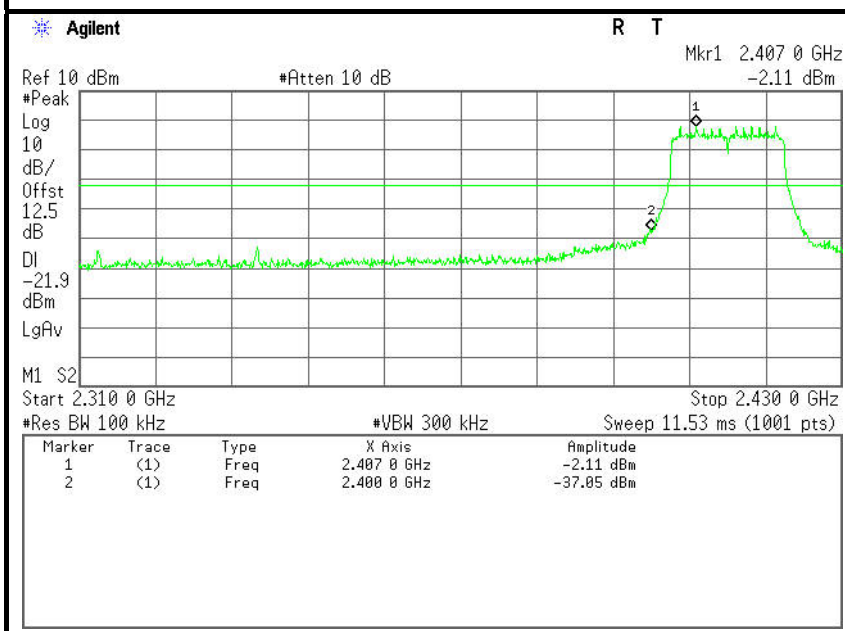
CH Mid (10MHz ~26.5GHz)

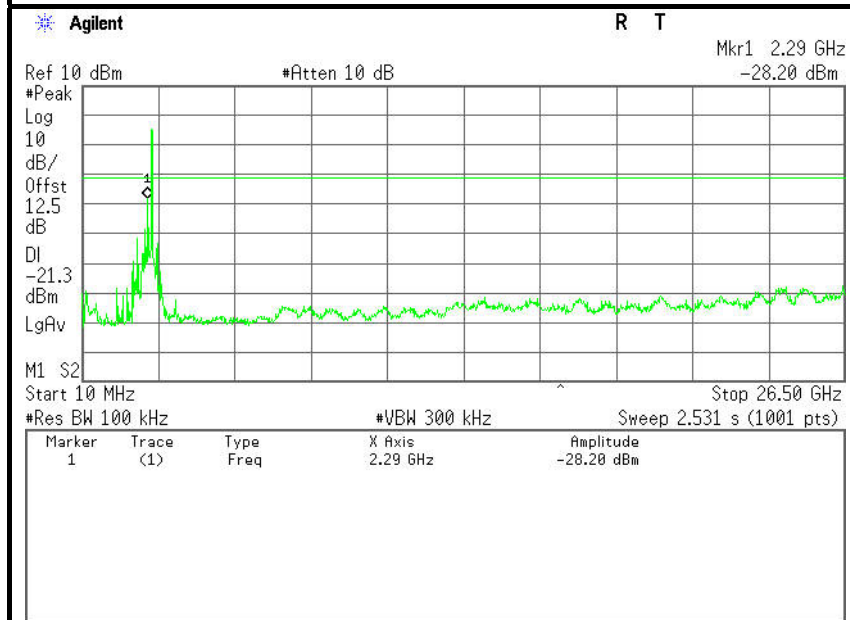
CH High (10MHz ~26.5GHz)**CH High (2.45GHz ~2.5GHz)**

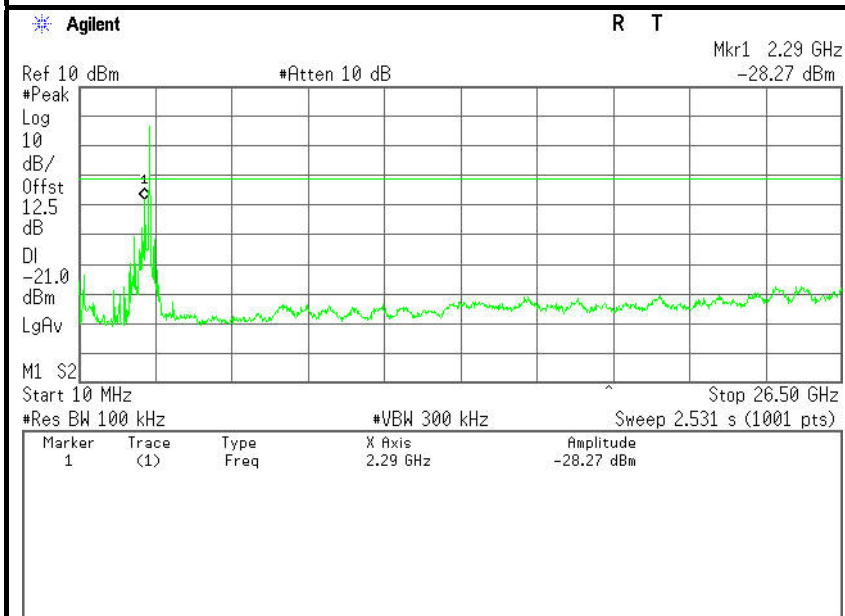
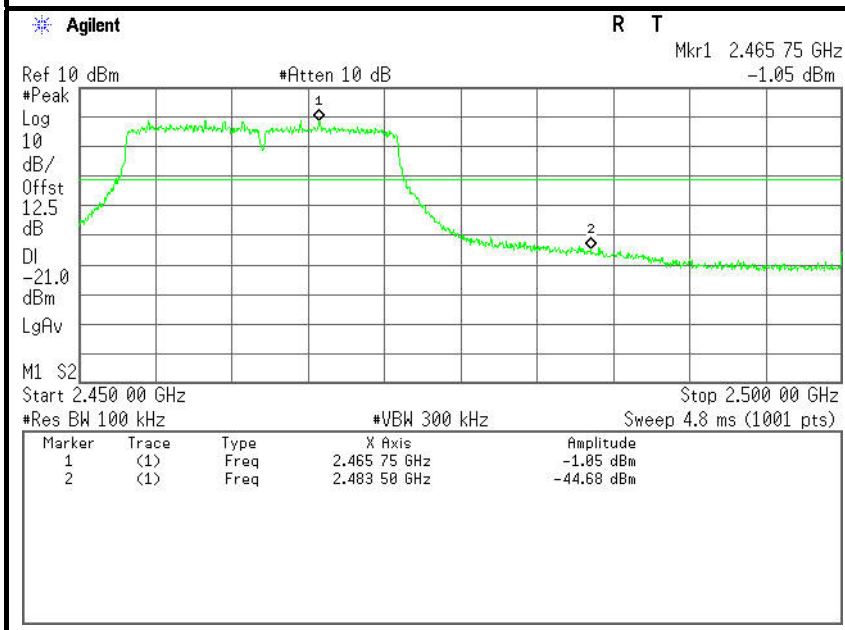
IEEE 802.11g mode**CH Low (10MHz ~26.5GHz)****CH Low (2.31GHz ~2.43GHz)**

CH Mid (10MHz ~26.5GHz)

CH High (10MHz ~26.5GHz)**CH High (2.45GHz ~2.5GHz)**

IEEE 802.11n HT20 MHz mode**CH Low (10MHz ~26.5GHz)****CH Low (2.31GHz ~2.43GHz)**

CH Mid (10MHz ~26.5GHz)

CH High (10MHz ~26.5GHz)**CH High (2.45GHz ~2.5GHz)**

7.2.2. RADIATED EMISSIONS MEASUREMENT

7.2.2.1. LIMITS OF RADIATED EMISSIONS MEASUREMENT

According to §15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (mV/m)	Measurement Distance (m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

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

1. In the emission table above, the tighter limit applies at the band edges.

Frequency (MHz)	Field Strength ($\mu\text{V/m}$ at 3-meter)	Field Strength (dB $\mu\text{V/m}$ at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

NOTE:(1) The lower limit shall apply at the transition frequencies.
 (2) Emission level (dB $\mu\text{V/m}$) = 20 log Emission level ($\mu\text{V/m}$).

7.2.2.2. TEST INSTRUMENTS

Radiated Emission Test Site					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Cal. Interval
Ultra-Broadband Antenna	ShwarzBeck	VULB9163	462	2014/04/12	3 years
EMI TEST Receiver	Rohde&Schwarz	ESU8	100316	2015/10/21	1 years
EMI TEST Software	Audix	E3	6.111111	N/A	N/A
Horn Antennna	EMCO	3116	00060095	2014/04/12	3 years
Pre-Amplifer	Rohde&Schwarz	SCU-01	10049	2015/10/21	1 years
Pre-Amplifer	A.H.	PAM0-0118	360	2015/10/21	1 years
Pre-Amplifer	A.H.	PAM-1840VH	562	2015/10/21	1 years
Double Ridged Horn Antenna	Rohde&Schwarz	HF907	100265	2014/04/12	3 years
Active Loop Antenna	Schwarz beck	FMZB1519	0.38	2014/04/12	3 years
TURNTABLE	MATURO	TT2.0	----	N/A	N/A
ANTENNA MAST	MATURO	TAM-4.0-P	----	N/A	N/A
Spectrum Analyzer	Rohde&Schwarz	FSU26	1166.1660.26	2015/10/21	1 years
Ultra-Broadband Antenna	ShwarzBeck	VULB9163	462	2014/04/12	3 years

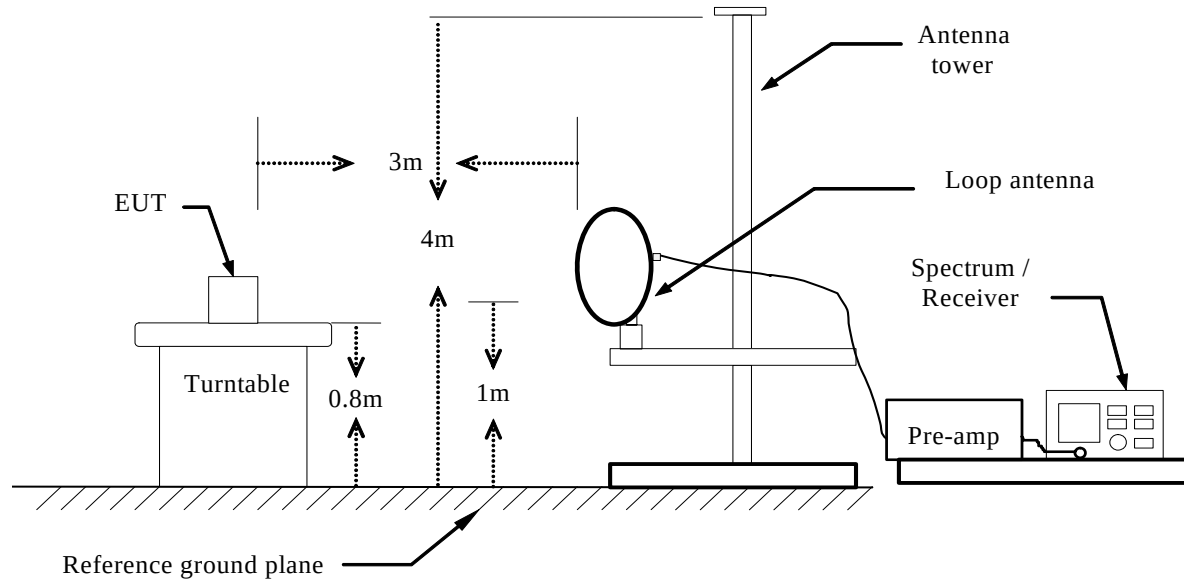
NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The FCC Site Registration number is 101879.
 3. N.C.R = No Calibration Required.

7.2.2.3. TEST PROCEDURE (please refer to measurement standard)

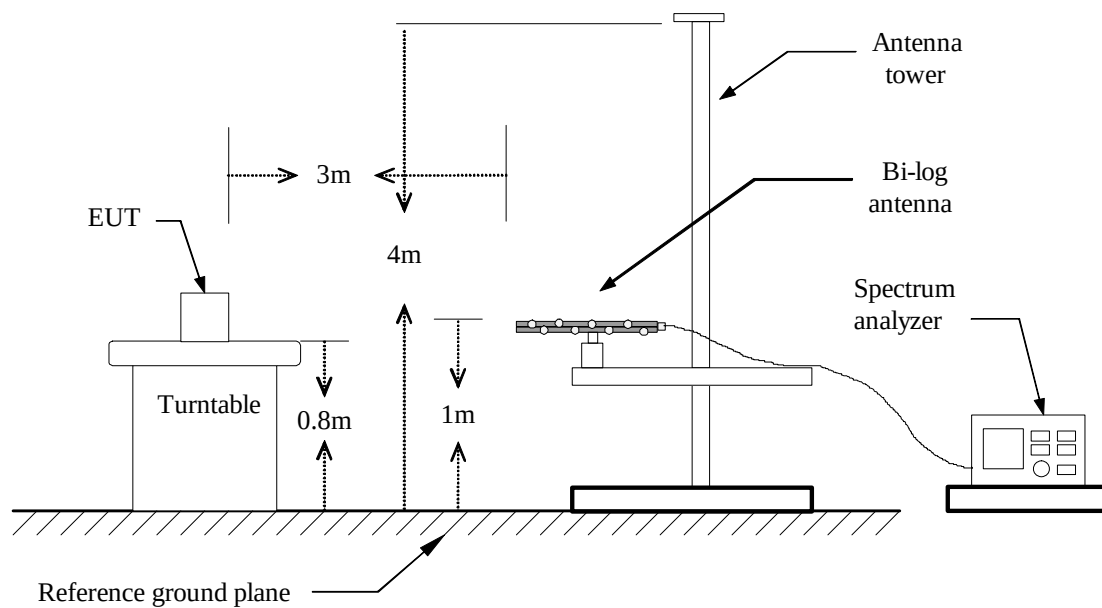
1. The EUT is placed on a turntable, which is 0.8m or 1.5m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:
Below 1GHz:
RBW=100kHz / VBW=300kHz / Sweep=AUTO
Above 1GHz:
(a) PEAK: RBW=1MHz,VBW=3MHz / Sweep=AUTO
(b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
7. Repeat above procedures until the measurements for all frequencies are complete.

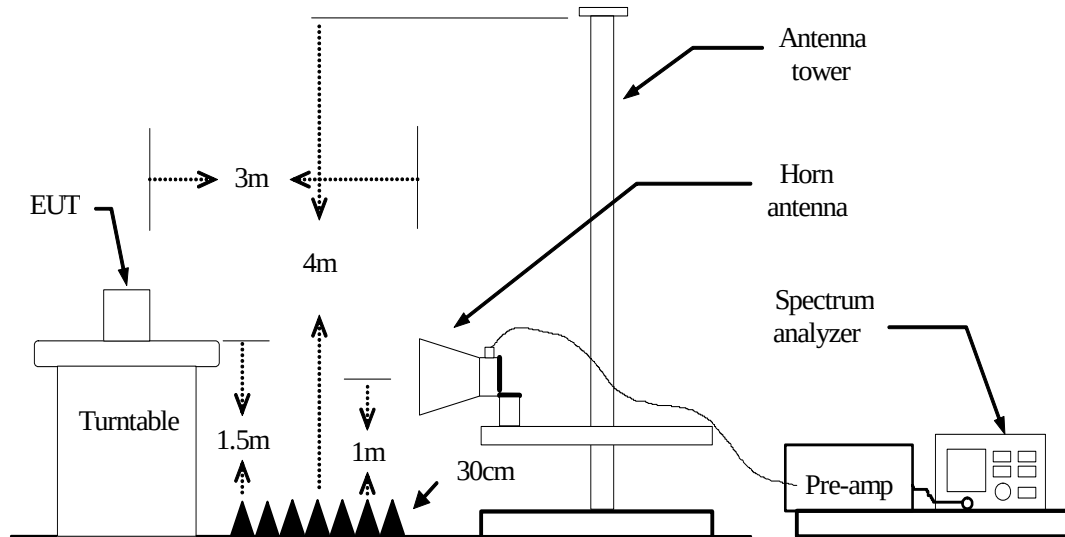
7.2.2.4. TEST SETUP

Below 30MHz



Below 1 GHz



Above 1 GHz

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.2.2.5. DATA SAPLE**Below 1GHz**

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
XXX.XXXX	36.37	-12.20	24.17	40.00	-15.83	V	QP

Frequency (MHz) = Emission frequency in MHz
 Reading (dBuV) = Uncorrected Analyzer / Receiver reading
 Correct Factor (dB/m) = Antenna factor + Cable loss – Amplifier gain
 Result (dBuV/m) = Reading (dBuV) + Corr. Factor (dB/m)
 Limit (dBuV/m) = Limit stated in standard
 Margin (dB) = Result (dBuV/m) – Limit (dBuV/m)
 Q.P. = Quasi-peak Reading

Above 1GHz

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
XXXX.XXXX	62.09	-11.42	50.67	74.00	-23.33	V	Peak
XXXX.XXXX	49.78	-11.42	38.36	54.00	-15.64	V	AVG

Frequency (MHz) = Emission frequency in MHz
 Reading (dBuV) = Uncorrected Analyzer / Receiver reading
 Correction Factor (dB/m) = Antenna factor + Cable loss – Amplifier gain
 Result (dBuV/m) = Reading (dBuV) + Corr. Factor (dB/m)
 Limit (dBuV/m) = Limit stated in standard
 Margin (dB) = Result (dBuV/m) – Limit (dBuV/m)
 Peak = Peak Reading
 AVG = Average Reading

Calculation Formula

Margin (dB) = Result (dBuV/m) – Limits (dBuV/m)
 Result (dBuV/m) = Reading (dBuV) + Correction Factor

7.2.2.6. TEST RESULTS**Below 1 GHz****Test Mode:** TX**Tested by:** Ad Gan**Ambient temperature:** 24°C **Relative humidity:** 52% RH **Date:** December 17, 2015

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
434.4900	50.01	-15.63	34.38	46.00	-11.62	V	QP
512.0900	49.19	-14.22	34.97	46.00	-11.03	V	QP
547.0100	48.49	-13.15	35.34	46.00	-10.66	V	QP
639.1600	48.06	-12.47	35.59	46.00	-10.41	V	QP
719.6700	48.55	-11.86	36.69	46.00	-9.31	V	QP
783.6900	49.10	-11.20	37.90	46.00	-8.10	V	QP
409.2700	50.83	-15.64	35.19	46.00	-10.81	H	QP
507.2400	49.95	-14.27	35.68	46.00	-10.32	H	QP
551.8600	49.84	-13.13	36.71	46.00	-9.29	H	QP
655.6500	48.96	-12.44	36.52	46.00	-9.48	H	QP
694.4500	50.24	-12.08	38.16	46.00	-7.84	H	QP
767.2000	49.12	-11.10	38.02	46.00	-7.98	H	QP

****Remark:** No emission found between lowest internal used/generated frequency to 30MHz.**Notes:**

1. Radiated emissions measured in frequency range from 9kHz to 1GHz were made with an instrument using Quasi-peak detector mode.
2. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
3. The IF bandwidth of Receiver between 30MHz to 1GHz was 120kHz.
4. Frequency (MHz). = Emission frequency in MHz
 Reading (dBuV/m) = Receiver reading
 Correction Factor (dB) = Antenna factor + Cable loss – Amplifier gain
 Limit (dBuV/m) = Limit stated in standard
 Margin (dB) = Measured (dBuV/m) – Limits (dBuV/m)
 Antenna Pole (H/V) = Current carrying line of reading

Above 1 GHz**Test Mode:** TX / IEEE 802.11b(CH Low)**Tested by:** Ad Gan**Ambient temperature:** 24°C **Relative humidity:** 52% RH **Date:** December 17, 2015

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
2170.000	44.64	-4.07	40.57	74.00	-33.43	V	peak
2494.000	45.08	-2.29	42.79	74.00	-31.21	V	peak
3637.000	42.38	0.06	42.44	74.00	-31.56	V	peak
4825.000	42.75	4.41	47.16	74.00	-26.84	V	peak
5446.000	41.61	5.77	47.38	74.00	-26.62	V	peak
5923.000	40.73	6.05	46.78	74.00	-27.22	V	peak
2512.000	45.46	-2.24	43.22	74.00	-30.78	H	Peak
3286.000	44.45	-0.88	43.57	74.00	-30.43	H	peak
4501.000	41.69	3.35	45.04	74.00	-28.96	H	peak
4825.000	45.24	4.41	49.65	74.00	-24.35	H	peak
5356.000	41.66	5.61	47.27	74.00	-26.73	H	peak
5752.000	41.34	5.98	47.32	74.00	-26.68	H	peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Test Mode: TX / IEEE 802.11b (CH Mid)**Tested by:** Ad Gan**Ambient temperature:** 24°C **Relative humidity:** 52% RH **Date:** December 17, 2015

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1288.000	46.87	-7.47	39.40	74.00	-34.60	V	Peak
2566.000	45.47	-2.14	43.33	74.00	-30.67	V	Peak
4879.000	42.67	4.59	47.26	74.00	-26.74	V	Peak
5689.000	41.13	5.95	47.08	74.00	-26.92	V	Peak
6139.000	41.31	6.31	47.62	74.00	-26.38	V	Peak
6940.000	41.24	7.60	48.84	74.00	-25.16	V	Peak
1594.000	50.18	-6.71	43.47	74.00	-30.53	H	Peak
2539.000	45.32	-2.19	43.13	74.00	-30.87	H	Peak
3790.000	41.88	0.70	42.58	74.00	-31.42	H	Peak
4717.000	41.25	4.06	45.31	74.00	-28.69	H	Peak
5338.000	41.25	5.58	46.83	74.00	-27.17	H	Peak
5896.000	40.79	6.04	46.83	74.00	-27.17	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Test Mode: TX / IEEE 802.11b (CH High)**Tested by:** Ad Gan**Ambient temperature:** 24°C **Relative humidity:** 52% RH **Date:** December 17, 2015

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
2566.000	45.85	-2.14	43.71	74.00	-30.29	V	Peak
3412.000	44.09	-0.67	43.42	74.00	-30.58	V	Peak
3979.000	43.03	1.50	44.53	74.00	-29.47	V	Peak
4924.000	42.38	4.73	47.11	74.00	-26.89	V	Peak
6166.000	40.30	6.35	46.65	74.00	-27.35	V	Peak
7219.000	40.82	8.13	48.95	74.00	-25.05	V	Peak
2557.000	45.37	-2.16	43.21	74.00	-30.79	H	Peak
4105.000	42.06	1.96	44.02	74.00	-29.98	H	Peak
4924.000	41.98	4.73	46.71	74.00	-27.29	H	Peak
5698.000	41.18	5.95	47.13	74.00	-26.87	H	Peak
6265.000	40.89	6.51	47.40	74.00	-26.60	H	Peak
6742.000	41.28	7.28	48.56	74.00	-25.44	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Test Mode: TX / IEEE 802.11g(CH Low)**Tested by:** Ad Gan**Ambient temperature:** 24°C **Relative humidity:** 52% RH **Date:** December 17, 2015

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
2602.000	45.01	-2.08	42.93	74.00	-31.07	V	Peak
4087.000	42.38	1.90	44.28	74.00	-29.72	V	Peak
4834.000	41.86	4.44	46.30	74.00	-27.70	V	Peak
5284.000	42.29	5.49	47.78	74.00	-26.22	V	Peak
6094.000	40.48	6.23	46.71	74.00	-27.29	V	Peak
6724.000	41.41	7.25	48.66	74.00	-25.34	V	Peak
2521.000	45.84	-2.22	43.62	74.00	-30.38	H	Peak
3322.000	44.07	-0.82	43.25	74.00	-30.75	H	Peak
4474.000	41.78	3.26	45.04	74.00	-28.96	H	Peak
5185.000	41.20	5.31	46.51	74.00	-27.49	H	Peak
5878.000	41.32	6.03	47.35	74.00	-26.65	H	Peak
6652.000	41.79	7.14	48.93	74.00	-25.07	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Test Mode: TX / IEEE 802.11g (CH Mid)**Tested by:** Ad Gan**Ambient temperature:** 24°C **Relative humidity:** 52% RH **Date:** December 17, 2015

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1765.000	45.71	-6.35	39.36	74.00	-34.64	V	Peak
2548.000	45.41	-2.17	43.24	74.00	-30.76	V	Peak
3187.000	44.09	-1.05	43.04	74.00	-30.96	V	Peak
4024.000	42.54	1.67	44.21	74.00	-29.79	V	Peak
4870.000	41.84	4.56	46.40	74.00	-27.60	V	Peak
5338.000	40.82	5.58	46.40	74.00	-27.60	V	Peak
2134.000	46.09	-4.27	41.82	74.00	-32.18	H	Peak
2818.000	44.39	-1.69	42.70	74.00	-31.30	H	Peak
4465.000	41.41	3.23	44.64	74.00	-29.36	H	Peak
4924.000	42.05	4.73	46.78	74.00	-27.22	H	Peak
5590.000	40.94	5.91	46.85	74.00	-27.15	H	Peak
6526.000	40.28	6.93	47.21	74.00	-26.79	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Test Mode: TX / IEEE 802.11g (CH High)**Tested by:** Ad Gan**Ambient temperature:** 24°C **Relative humidity:** 52% RH **Date:** December 17, 2015

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1765.000	46.77	-6.35	40.42	74.00	-33.58	V	Peak
2548.000	45.58	-2.17	43.41	74.00	-30.59	V	Peak
2854.000	44.68	-1.62	43.06	74.00	-30.94	V	Peak
4474.000	41.45	3.26	44.71	74.00	-29.29	V	Peak
4960.000	42.04	4.85	46.89	74.00	-27.11	V	Peak
5860.000	41.49	6.02	47.51	74.00	-26.49	V	Peak
1594.000	48.02	-6.71	41.31	74.00	-32.69	H	Peak
2584.000	44.92	-2.11	42.81	74.00	-31.19	H	Peak
3358.000	43.48	-0.76	42.72	74.00	-31.28	H	Peak
3970.000	42.21	1.46	43.67	74.00	-30.33	H	Peak
5014.000	42.12	5.00	47.12	74.00	-26.88	H	Peak
5590.000	41.68	5.91	47.59	74.00	-26.41	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Test Mode: TX / IEEE 802.11n HT20 MHz (CH Low)**Tested by:** Ad Gan**Ambient temperature:** 24°C**Relative humidity:** 52% RH**Date:** December 17, 2015

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
2503.000	46.63	-2.25	44.38	74.00	-29.62	V	Peak
3574.000	42.79	-0.21	42.58	74.00	-31.42	V	Peak
4987.000	41.02	4.94	45.96	74.00	-28.04	V	Peak
5410.000	40.89	5.71	46.60	74.00	-27.40	V	Peak
5770.000	41.44	5.98	47.42	74.00	-26.58	V	Peak
7120.000	40.45	7.93	48.38	74.00	-25.62	V	Peak
1594.000	50.44	-6.71	43.73	74.00	-30.27	H	Peak
2548.000	45.54	-2.17	43.37	74.00	-30.63	H	Peak
3151.000	44.19	-1.11	43.08	74.00	-30.92	H	Peak
4141.000	42.56	2.09	44.65	74.00	-29.35	H	Peak
5482.000	40.90	5.84	46.74	74.00	-27.26	H	Peak
6031.000	40.98	6.13	47.11	74.00	-26.89	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Test Mode: TX / IEEE 802.11n HT20 MHz (CH Mid)**Tested by:** Ad Gan**Ambient temperature:** 24°C**Relative humidity:** 52% RH**Date:** December 17, 2015

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
2584.000	44.32	-2.11	42.21	74.00	-31.79	V	Peak
4078.000	42.17	1.86	44.03	74.00	-29.97	V	Peak
4978.000	41.30	4.91	46.21	74.00	-27.79	V	Peak
5446.000	40.83	5.77	46.60	74.00	-27.40	V	Peak
6148.000	40.75	6.32	47.07	74.00	-26.93	V	Peak
6580.000	41.15	7.02	48.17	74.00	-25.83	V	Peak
1594.000	50.52	-6.71	43.81	74.00	-30.19	H	Peak
2575.000	46.05	-2.12	43.93	74.00	-30.07	H	Peak
3835.000	42.37	0.89	43.26	74.00	-30.74	H	Peak
5275.000	41.59	5.47	47.06	74.00	-26.94	H	Peak
5590.000	41.44	5.91	47.35	74.00	-26.65	H	Peak
6949.000	41.64	7.62	49.26	74.00	-24.74	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Test Mode: TX / EEE 802.11n HT20 MHz (CH High)**Tested by:** Ad Gan**Ambient temperature:** 24°C **Relative humidity:** 52% RH **Date:** December 17, 2015

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1252.000	46.66	-7.60	39.06	74.00	-34.94	V	Peak
2539.000	44.05	-2.19	41.86	74.00	-32.14	V	Peak
2827.000	42.58	-1.67	40.91	74.00	-33.09	V	Peak
4537.000	40.48	3.47	43.95	74.00	-30.05	V	Peak
5446.000	39.86	5.77	45.63	74.00	-28.37	V	Peak
6472.000	39.60	6.84	46.44	74.00	-27.56	V	Peak
1594.000	48.32	-6.71	41.61	74.00	-32.39	H	Peak
2539.000	44.61	-2.19	42.42	74.00	-31.58	H	Peak
3241.000	43.31	-0.96	42.35	74.00	-31.65	H	Peak
4474.000	40.37	3.26	43.63	74.00	-30.37	H	Peak
5113.000	40.41	5.18	45.59	74.00	-28.41	H	Peak
5671.000	40.32	5.94	46.26	74.00	-27.74	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

7.3. 6dB BANDWIDTH MEASUREMENT

7.3.1. LIMITS

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.

7.3.2. TEST INSTRUMENTS

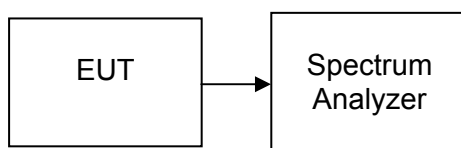
Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Calibration Due
PXA Signal Analyzer	Agilent	N9030A	JTT-E003	2015/04/22	2016/04/21

7.3.3. TEST PROCEDURES (please refer to measurement standard)

8.1 Option 1:

- 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.

7.3.4. TEST SETUP



7.3.5. TEST RESULTS*No non-compliance noted***Test Data****Test mode: IEEE 802.11b**

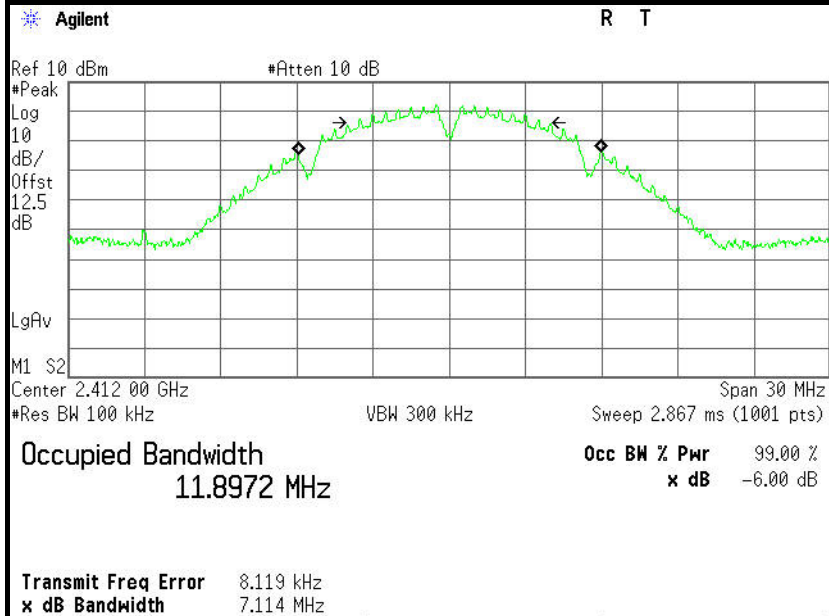
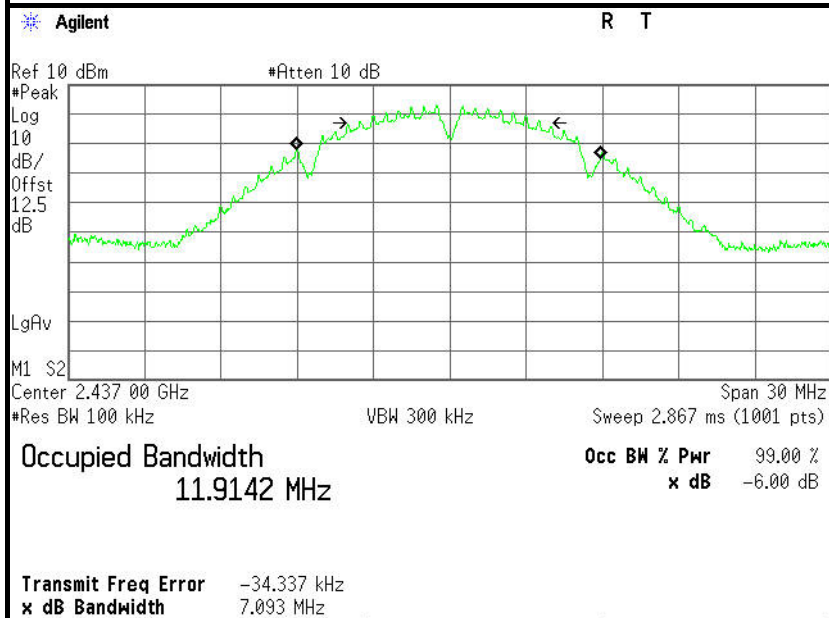
Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	7114	>500	PASS
Mid	2437	7093		PASS
High	2462	7092		PASS

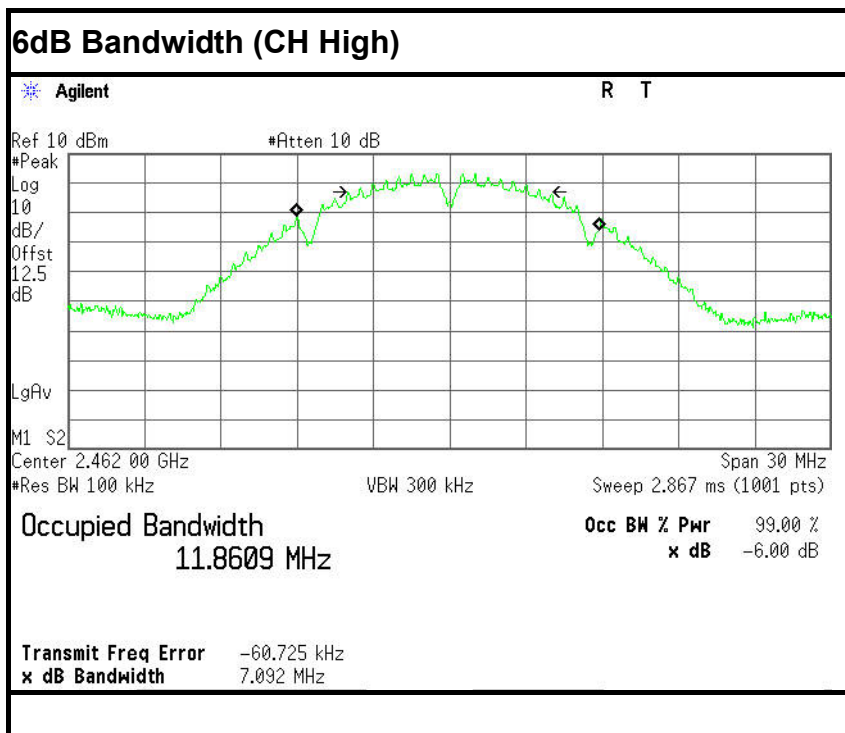
Test mode: IEEE 802.11g

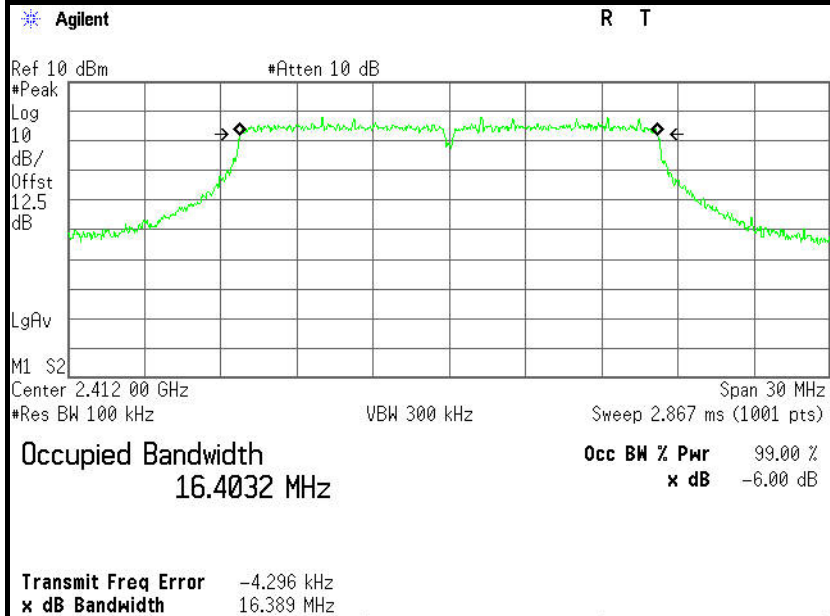
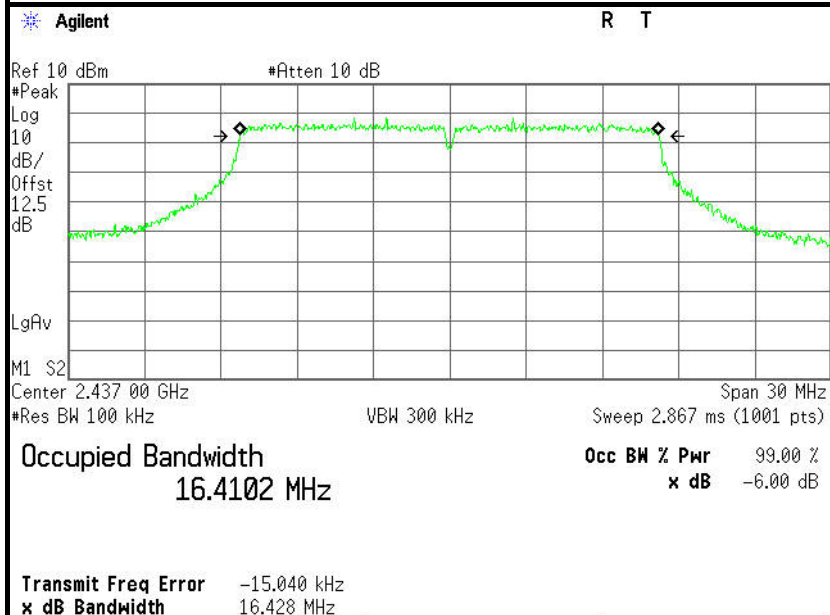
Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	16389	>500	PASS
Mid	2437	16428		PASS
High	2462	16447		PASS

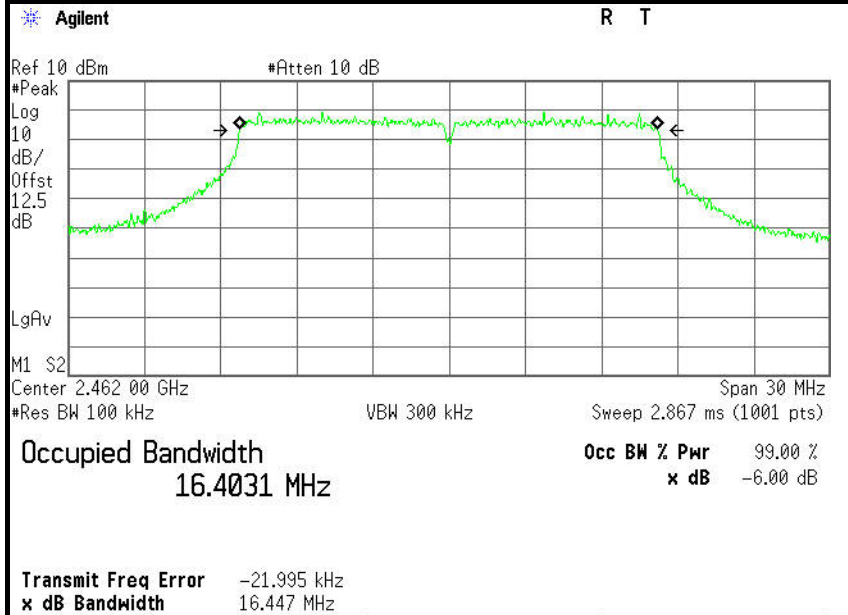
Test mode: IEEE 802.11n HT20 MHz

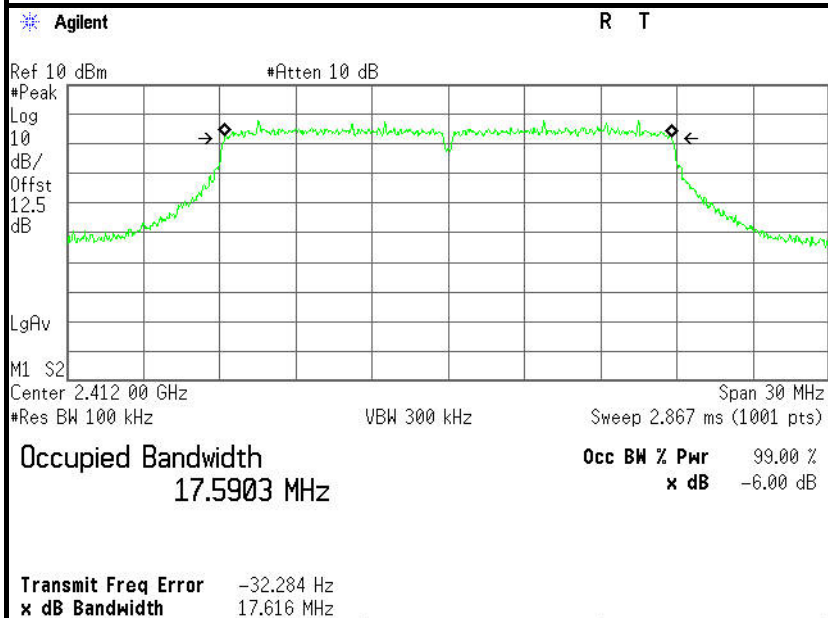
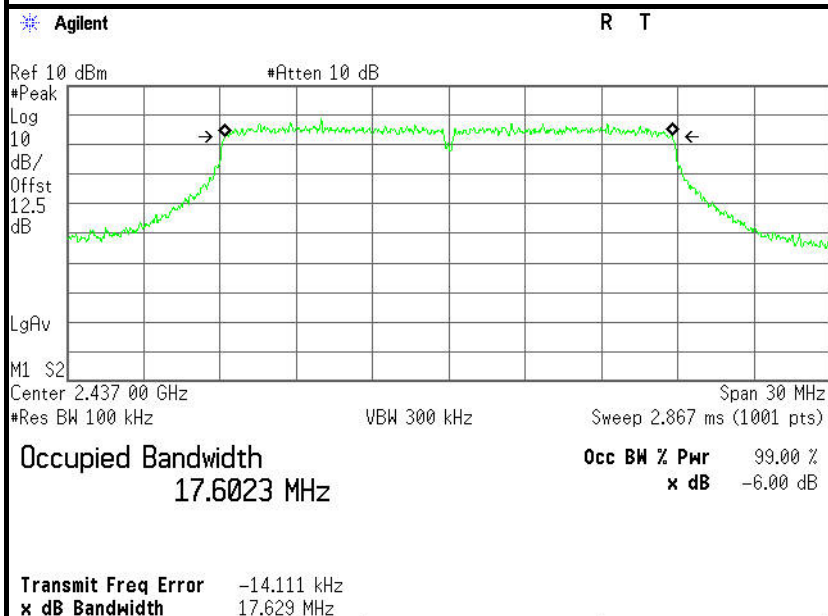
Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	17616	>500	PASS
Mid	2437	17629		PASS
High	2462	17626		PASS

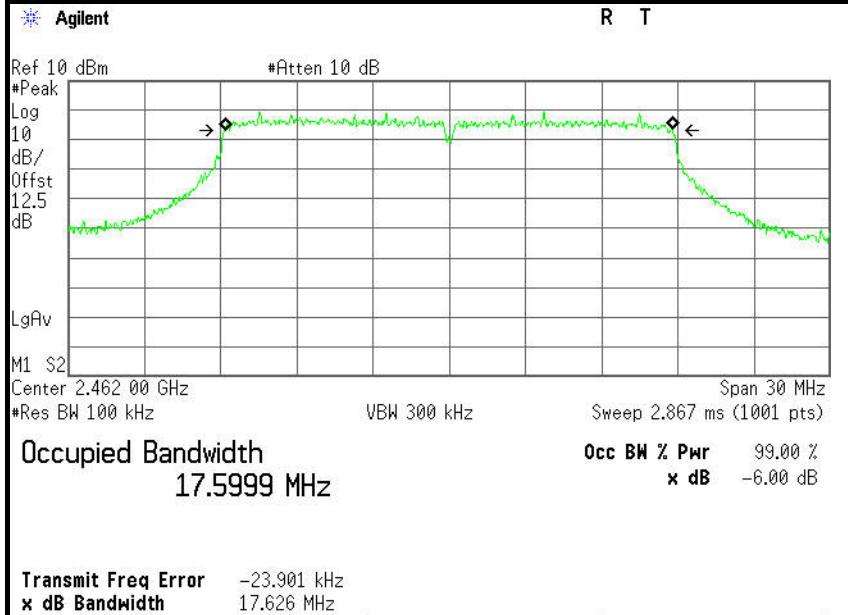
Test Plot**IEEE 802.11b mode****6dB Bandwidth (CH Low)****6dB Bandwidth (CH Mid)**



IEEE 802.11g mode**6dB Bandwidth (CH Low)****6dB Bandwidth (CH Mid)**

6dB Bandwidth (CH High)

IEEE 802.11n HT20 MHz mode**6dB Bandwidth (CH Low)****6dB Bandwidth (CH Mid)**

6dB Bandwidth (CH High)

7.4. ANTENNA GAIN

MEASUREMENT

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module. For normal WLAN devices, the DSSS mode is used.

MEASUREMENT PARAMETERS

Measurement parameter	
Detector	Peak
Sweep time	Auto
Resolution bandwidth	3 MHz
Video bandwidth	3 MHz
Trace-Mode	Max hold

LIMITS

FCC	IC
Antenna Gain	
6dBi	

TEST RESULTS

IEEE 802.11b mode

T_{nom}	V_{nom}	Lowest channel 2412MHz	Middle channel 2437MHz	Highest channel 2462MHz
Conducted power [dBm/MHz] Measured with DSSS modulation		1.75	1.67	1.71
Radiated power [dBm/MHz] Measured with DSSS modulation		1.70	1.95	2.20
Gain [dBi] Calculated		-0.05	0.28	0.49
Measurement uncertainty		± 1.5 dB (cond.) / ± 3 dB (rad.)		

7.5. PEAK OUTPUT POWER

7.5.1. LIMITS

The maximum peak output power of the intentional radiator shall not exceed the following:

1. According to §15.247(b)(3), for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 Watt.
2. According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

7.5.2. TEST INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Calibration Due
Power Sensor	Rohde&Schwarz	NRP-Z81	102638	2015/10/28	2016/10/27
Spectrum Analyzer	Rohde&Schwarz	FSU26	1166.1660.26	2015/10/21	2016/10/20

7.5.3. TEST PROCEDURES (please refer to measurement standard)

9.1.1 RBW $\geq$ DTS bandwidth

This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the *DTS bandwidth*.

- a) Set the RBW $\geq$ DTS bandwidth.
- b) Set VBW $\geq$ 3 RBW.
- c) Set span $\geq$ 3 x RBW
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

9.1.2 Integrated band power method

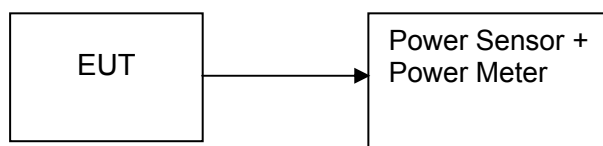
This procedure may be used when the maximum available RBW of the measurement instrument is less than the *DTS bandwidth*.

- a) Set the RBW = 1 MHz.
- b) Set the VBW ≥ 3 RBW
- c) Set the span $\geq 1.5 \times$ DTS bandwidth.
- d) Detector = peak.
- e) Sweep time = auto couple.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges (for some instruments, this may require a manual override to select peak detector). If the instrument does not have a band power function, sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the DTS bandwidth.

9.1.3 PKPM1 Peak power meter method

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

7.5.4. TEST SETUP



7.5.5. TEST RESULTS*No non-compliance noted***Test Data****Test mode: IEEE 802.11b**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Peak/AVG	Result
Low	2412	12.51	0.01782	1	Peak	PASS
Mid	2437	12.43	0.01750			PASS
High	2462	12.45	0.01785			PASS
Low	2412	9.37	0.00865	1	AVG	PASS
Mid	2437	9.30	0.00851			PASS
High	2462	9.43	0.00877			PASS

Test mode: IEEE 802.11g

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Peak/AVG	Result
Low	2412	19.37	0.08650	1	Peak	PASS
Mid	2437	19.18	0.08279			PASS
High	2462	19.33	0.08570			PASS
Low	2412	9.53	0.00897	1	AVG	PASS
Mid	2437	9.58	0.00908			PASS
High	2462	9.77	0.00948			PASS

Test mode: IEEE 802.11n HT20 MHz

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Peak/AVG	Result
Low	2412	19.14	0.08204	1	Peak	PASS
Mid	2437	19.23	0.08375			PASS
High	2462	19.23	0.08375			PASS
Low	2412	9.62	0.00916	1	AVG	PASS
Mid	2437	9.62	0.00916			PASS
High	2462	9.68	0.00929			PASS

7.6. BAND EDGES MEASUREMENT

7.6.1. LIMITS

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).

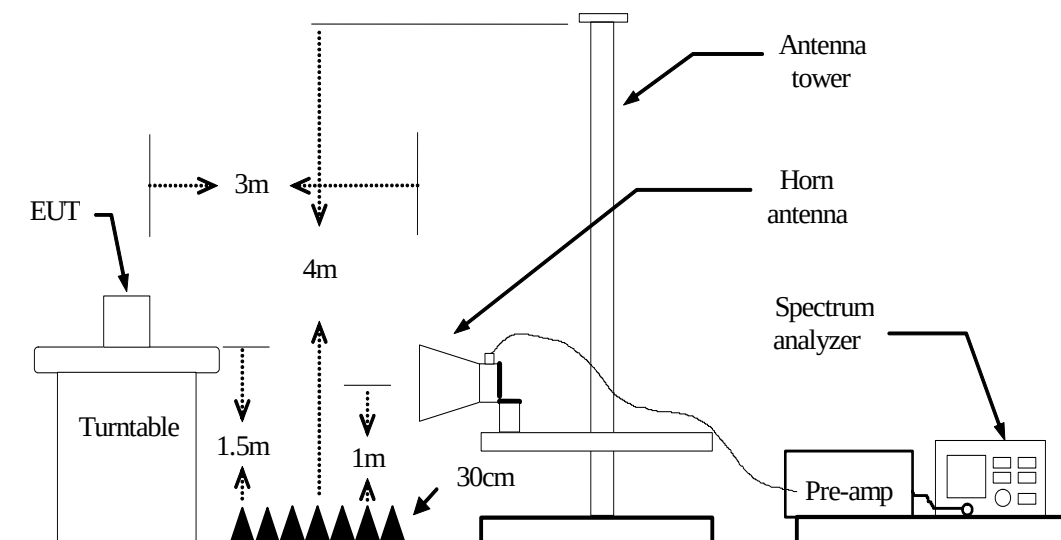
7.6.2. TEST INSTRUMENTS

Radiated Emission Test Site					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Cal. Interval
Ultra-Broadband Antenna	ShwarzBeck	VULB9163	462	2014/04/12	3 years
EMI TEST Receiver	Rohde&Schwarz	ESU8	100316	2015/10/21	1 years
EMI TEST Software	Audix	E3	6.111111	N/A	N/A
Horn Antenna	EMCO	3116	00060095	2014/04/12	3 years
Pre-Amplifier	Rohde&Schwarz	SCU-01	10049	2015/10/21	1 years
Pre-Amplifier	A.H.	PAM0-0118	360	2015/10/21	1 years
Pre-Amplifier	A.H.	PAM-1840VH	562	2015/10/21	1 years
Double Ridged Horn Antenna	Rohde&Schwarz	HF907	100265	2014/04/12	3 years
Active Loop Antenna	Schwarz beck	FMZB1519	0.38	2014/04/12	3 years
TURNTABLE	MATURO	TT2.0	----	N/A	N/A
ANTENNA MAST	MATURO	TAM-4.0-P	----	N/A	N/A
Spectrum Analyzer	Rohde&Schwarz	FSU26	1166.1660.26	2015/10/21	1 years
Ultra-Broadband Antenna	ShwarzBeck	VULB9163	462	2014/04/12	3 years

- NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The FCC Site Registration number is 101879.
 3. N.C.R = No Calibration Required.

7.6.3. TEST PROCEDURES (please refer to measurement standard)

1. The EUT is placed on a turntable, which is 1.5m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
 - (a) PEAK: RBW=1MHz / VBW=1MHz / Sweep=AUTO
 - (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

7.6.4. TEST SETUP

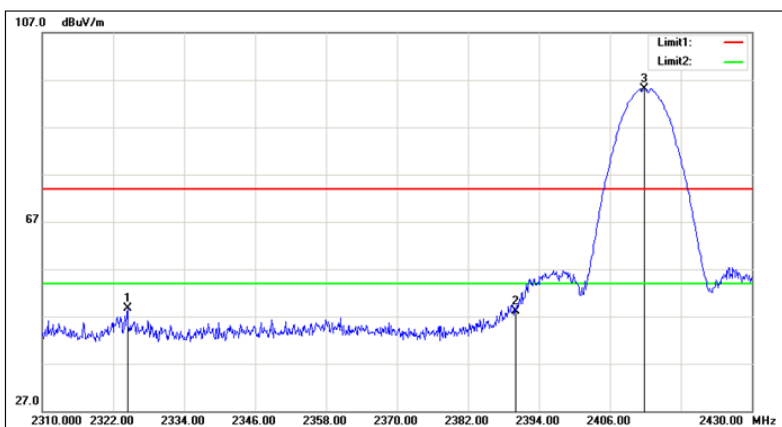
7.6.5. TEST RESULTS

Test Plot

IEEE 802.11b mode

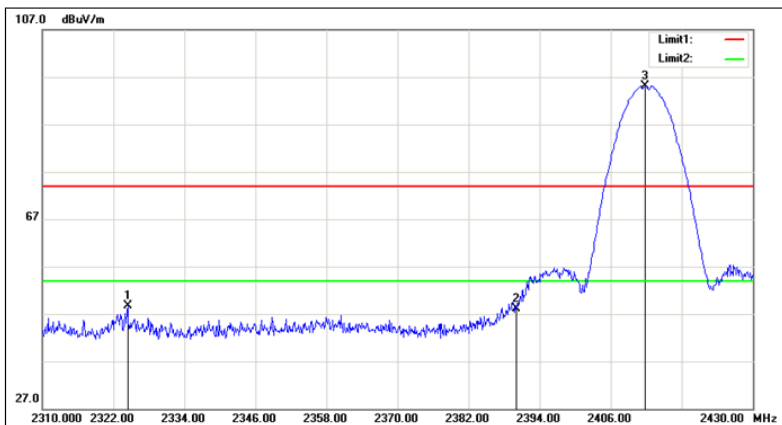
Band Edges (CH Low)

Polarity: Vertical

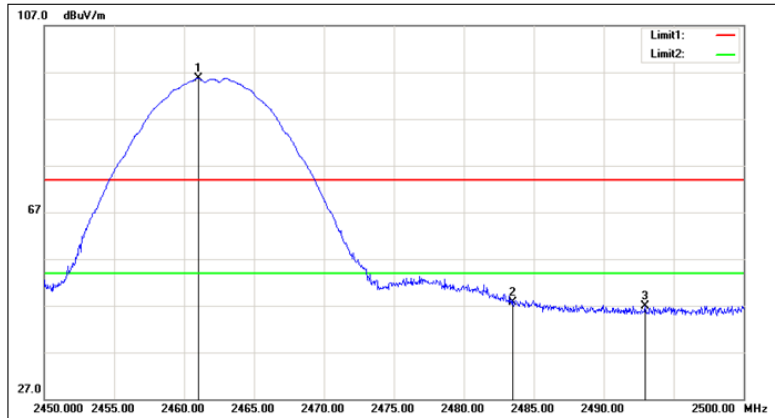


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	2324.400	51.87	-3.22	48.65	74.00	-25.35			peak
2	2390.000	50.91	-2.86	48.05	74.00	-25.95			peak
3*	2411.880	97.87	-2.74	95.13					peak

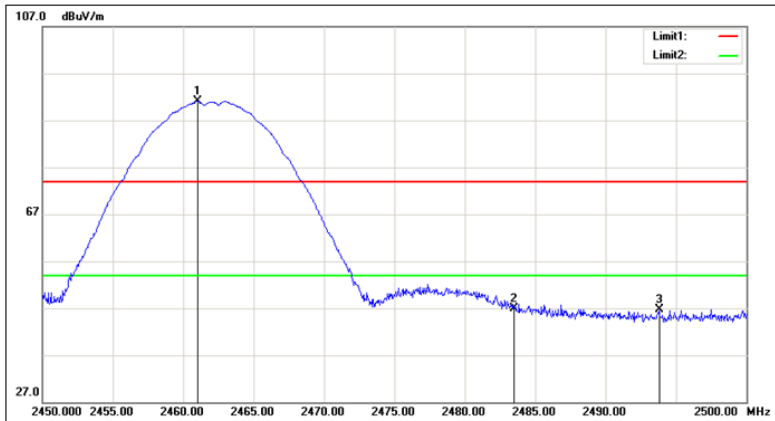
Polarity: Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	2324.400	51.87	-3.22	48.65	74.00	-25.35			peak
2	2390.000	50.91	-2.86	48.05	74.00	-25.95			peak
3*	2411.880	97.87	-2.74	95.13					peak

Band Edges (CH-High)**Vertical****Polarity:**

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1*	2461.050	98.17	-2.47	95.70					peak
2	2483.500	50.01	-2.35	47.66	74.00	-26.34			peak
3	2492.950	49.26	-2.30	46.96	74.00	-27.04			peak

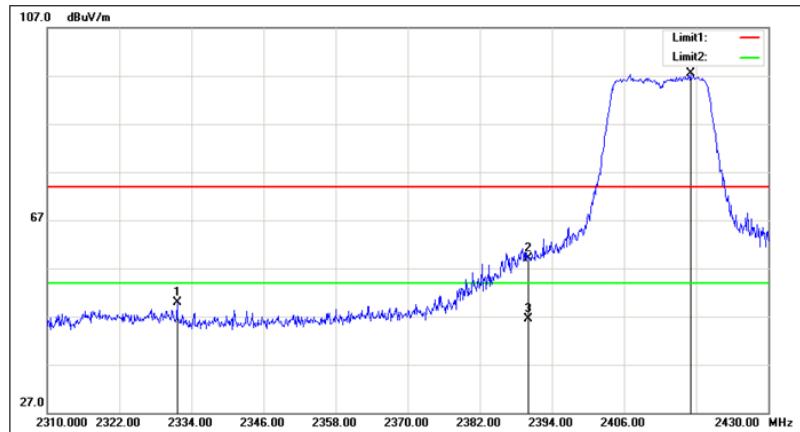
Polarity: Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1*	2461.000	93.58	-2.47	91.11					peak
2	2483.500	49.22	-2.35	46.87	74.00	-27.13			peak
3	2493.800	49.01	-2.29	46.72	74.00	-27.28			peak

IEEE 802.11g mode

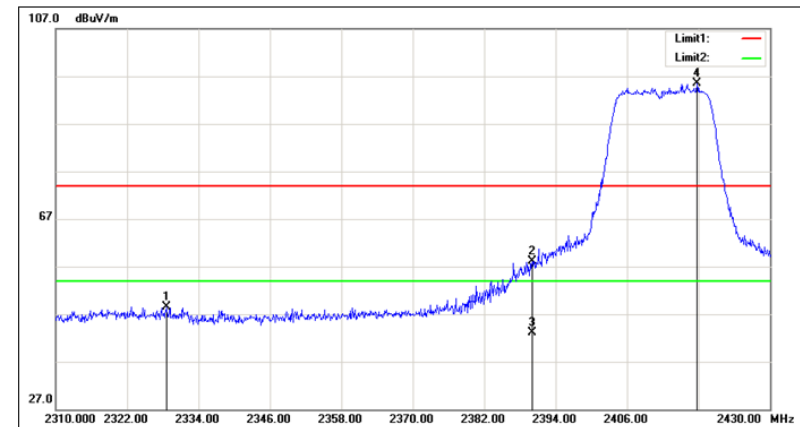
Band Edges (CH Low)

Polarity: Vertical

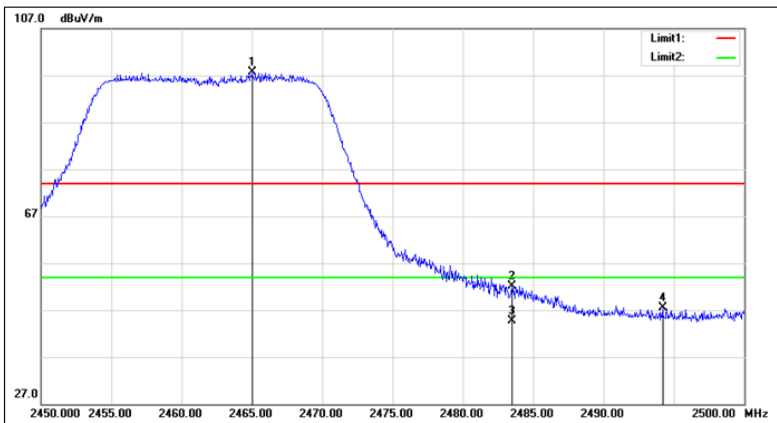


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	2331.600	53.06	-3.18	49.88	74.00	-24.12			peak
2	2390.000	62.04	-2.86	59.18	74.00	-14.82			peak
3	2390.000	49.36	-2.86	46.50	54.00	-7.50			AVG
4*	2417.040	100.18	-2.71	97.47					peak

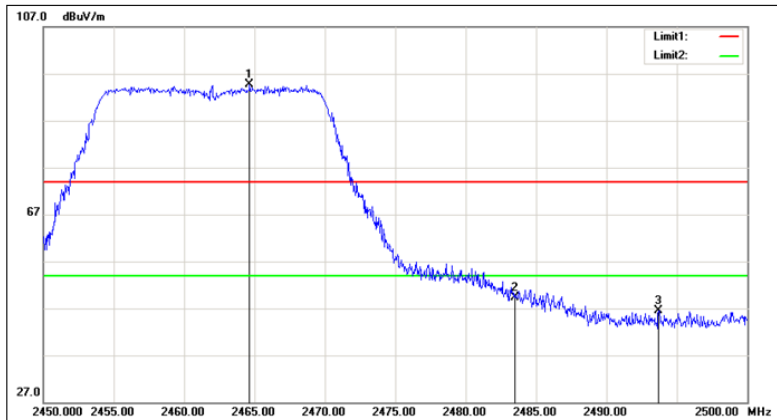
Polarity: Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	2328.600	51.71	-3.20	48.51	74.00	-25.49			peak
2	2390.000	60.90	-2.86	58.04	74.00	-15.96			peak
3	2390.000	45.99	-2.86	43.13	54.00	-10.87			AVG
4*	2417.760	98.16	-2.71	95.45					peak

Band Edges (CH-High)**Vertical****Polarity:**

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1*	2465.000	100.19	-2.45	97.74					peak
2	2483.500	54.45	-2.35	52.10	74.00	-21.90			peak
3	2483.500	47.04	-2.35	44.69	54.00	-9.31			AVG
4	2494.200	49.78	-2.29	47.49	74.00	-26.51			peak

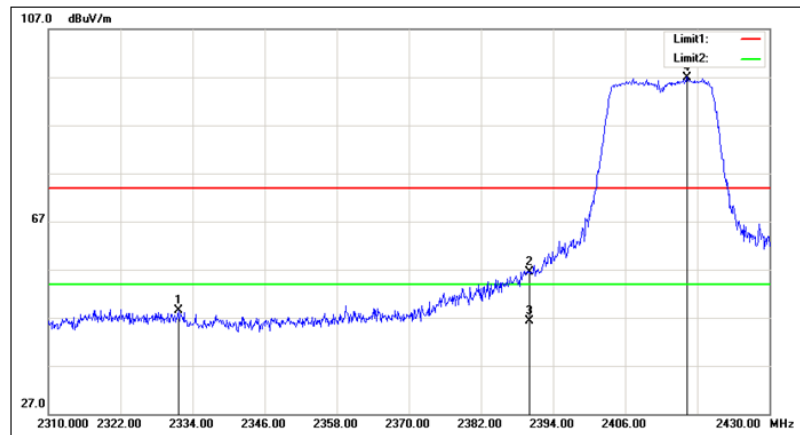
Polarity: Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1*	2464.650	97.08	-2.45	94.63					peak
2	2483.500	51.58	-2.35	49.23	74.00	-24.77			peak
3	2493.700	48.83	-2.29	46.54	74.00	-27.46			peak

IEEE 802. 11n HT20 mode

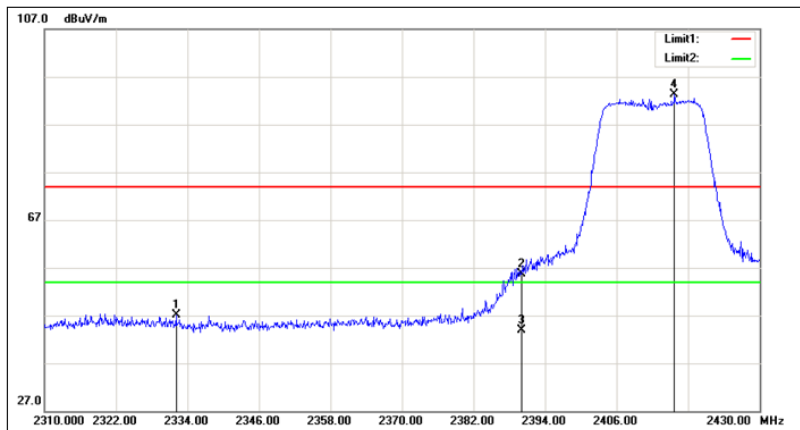
Band Edges (CH Low)

Polarity: Vertical

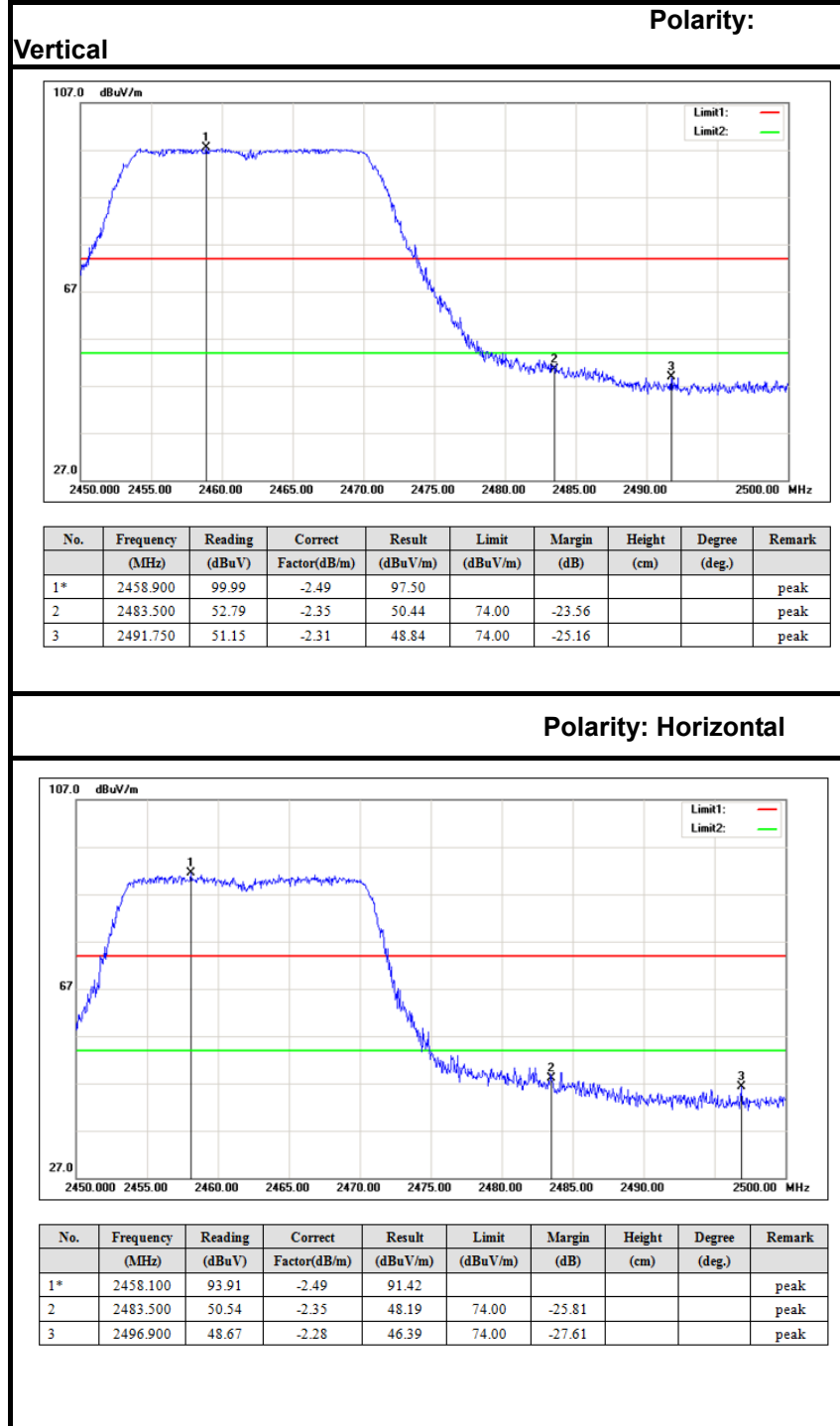


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	2331.600	51.63	-3.18	48.45	74.00	-25.55			peak
2	2390.000	59.36	-2.86	56.50	74.00	-17.50			peak
3	2390.000	49.12	-2.86	46.26	54.00	-7.74			AVG
4*	2416.320	99.72	-2.72	97.00					peak

Polarity: Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	2332.080	50.28	-3.18	47.10	74.00	-26.90			peak
2	2390.000	58.57	-2.86	55.71	74.00	-18.29			peak
3	2390.000	46.73	-2.86	43.87	54.00	-10.13			AVG
4*	2415.720	96.06	-2.72	93.34					peak

Band Edges (CH-High)

7.7. PEAK POWER SPECTRAL DENSITY MEASUREMENT

7.7.1. LIMITS

According to §15.247(e), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

According to §15.247(f), the digital modulation operation of the hybrid system, with the frequency hopping turned off, shall comply with the power density requirements of paragraph (d) of this section.

7.7.2. TEST INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Calibration Due
PXA Signal Analyzer	Agilent	N9030A	JTT-E003	2015/04/22	2016/04/21

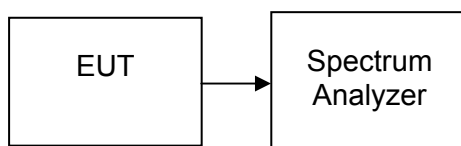
7.7.3. TEST PROCEDURES (please refer to measurement standard)

§15.247(e) specifies a conducted power spectral density (PSD) limit of 8 dBm in any 3 kHz band segment within the fundamental EBW during any time interval of continuous transmission. The same method as used to determine the conducted output power shall be used to determine the power spectral density (i.e., if peak-detected fundamental power was measured then use the peak PSD procedure and if average fundamental power was measured then use the average PSD procedure).

10.2 Method PKPSD (peak PSD)

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
4. Set the VBW $\geq 3 \times \text{RBW}$.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

7.7.4. TEST SETUP



7.7.5. TEST RESULTS*No non-compliance noted***Test Data****Test mode: IEEE 802.11b**

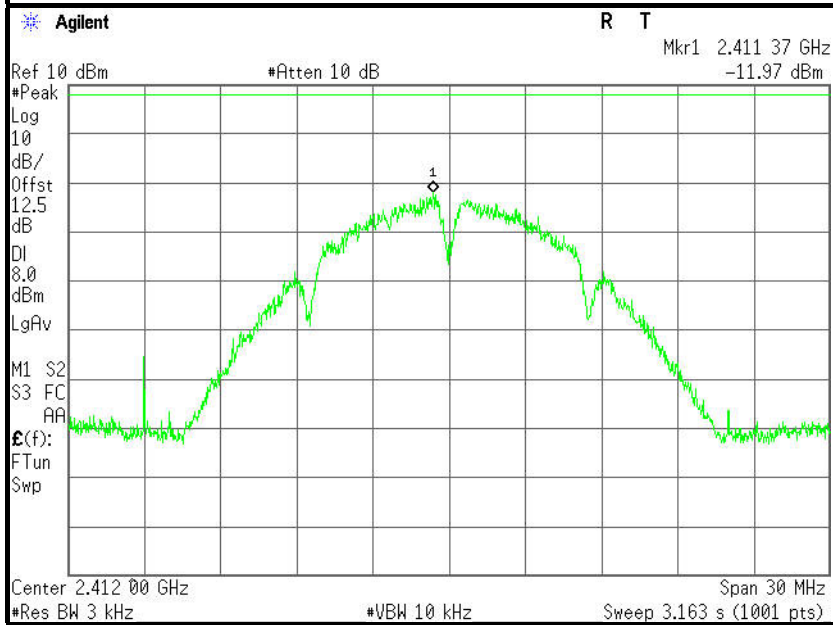
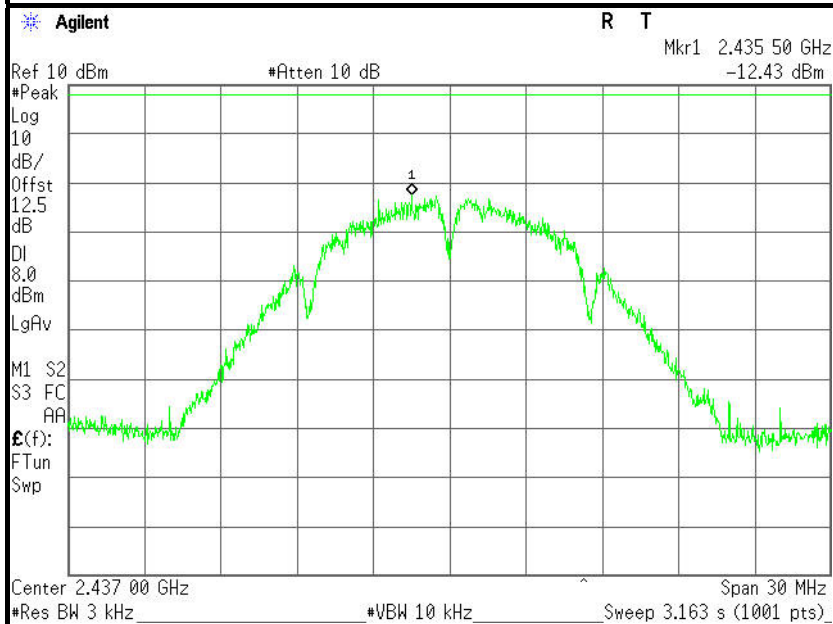
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-11.97	8	PASS
Mid	2437	-12.43		PASS
High	2462	-9.32		PASS

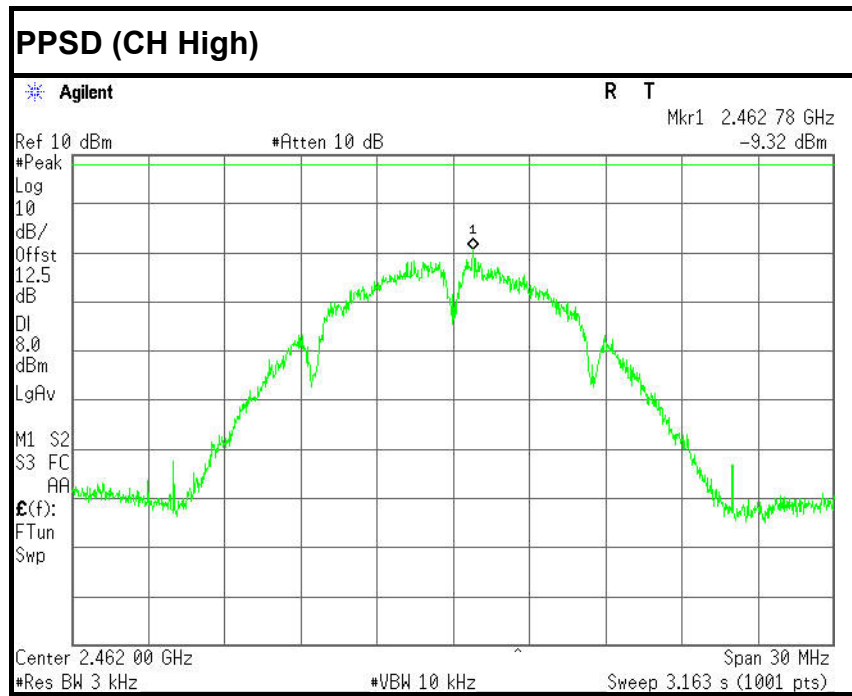
Test mode: IEEE 802.11g

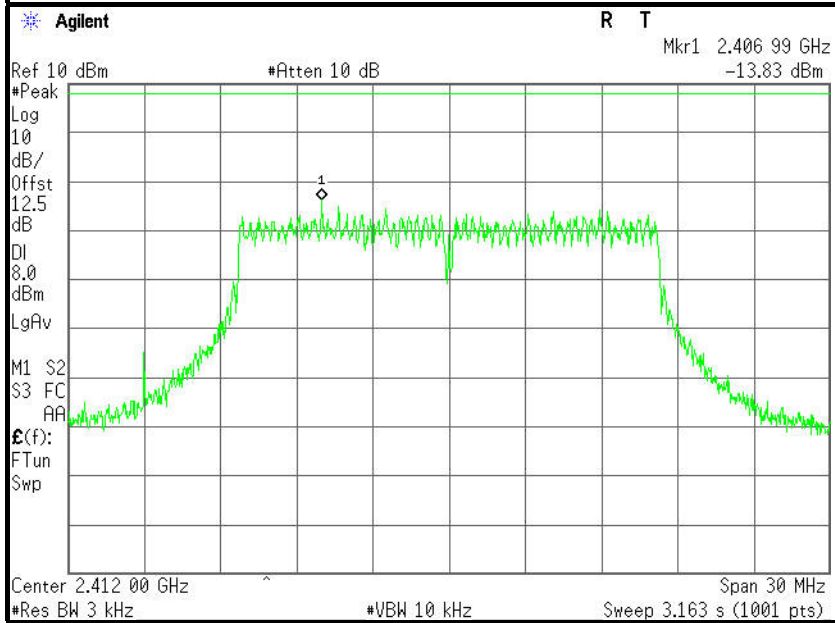
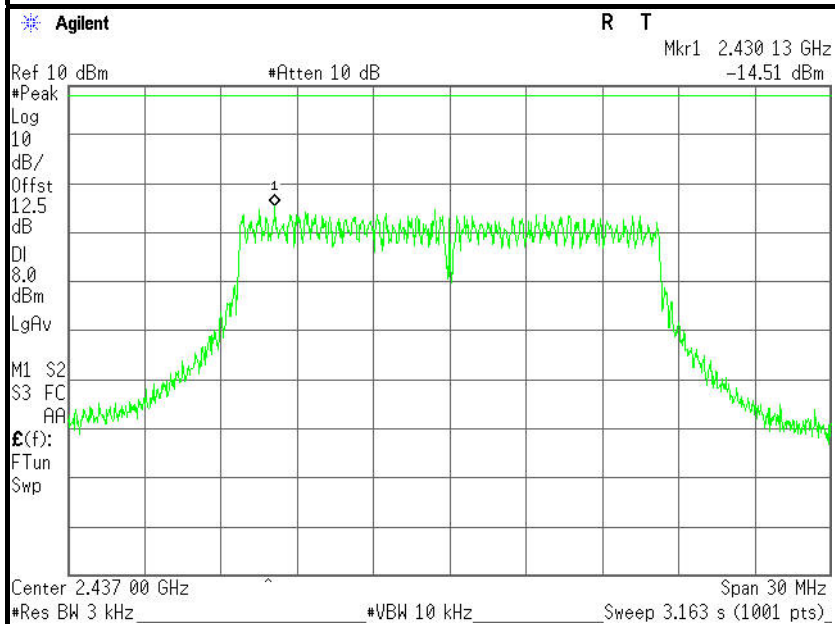
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-13.83	8	PASS
Mid	2437	-14.51		PASS
High	2462	-14.77		PASS

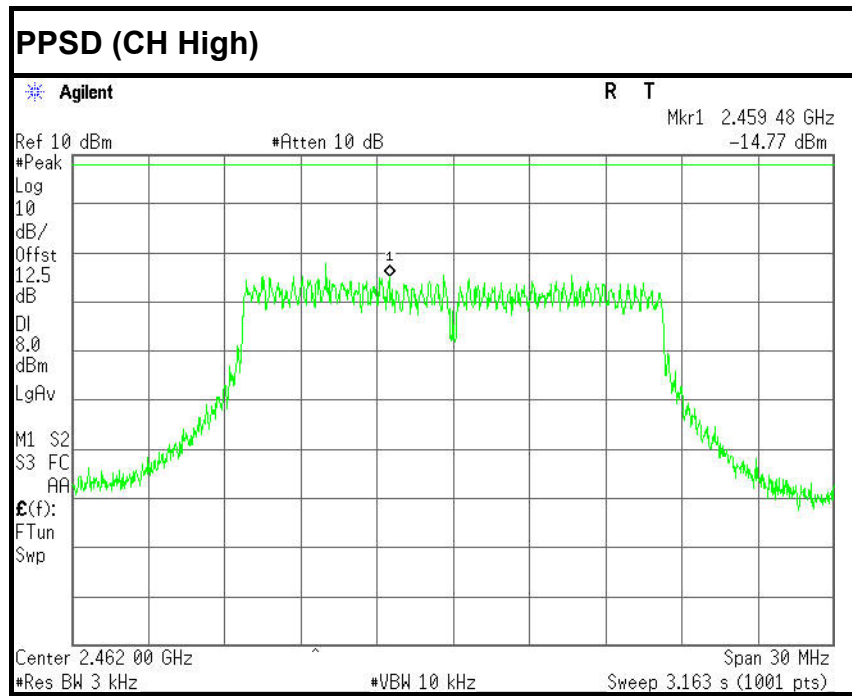
Test mode: IEEE 802.11n HT20 MHz

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-16.25	8	PASS
Mid	2437	-15.25		PASS
High	2462	-14.66		PASS

Test Plot**IEEE 802.11b mode****PPSD (CH Low)****PPSD (CH Mid)**

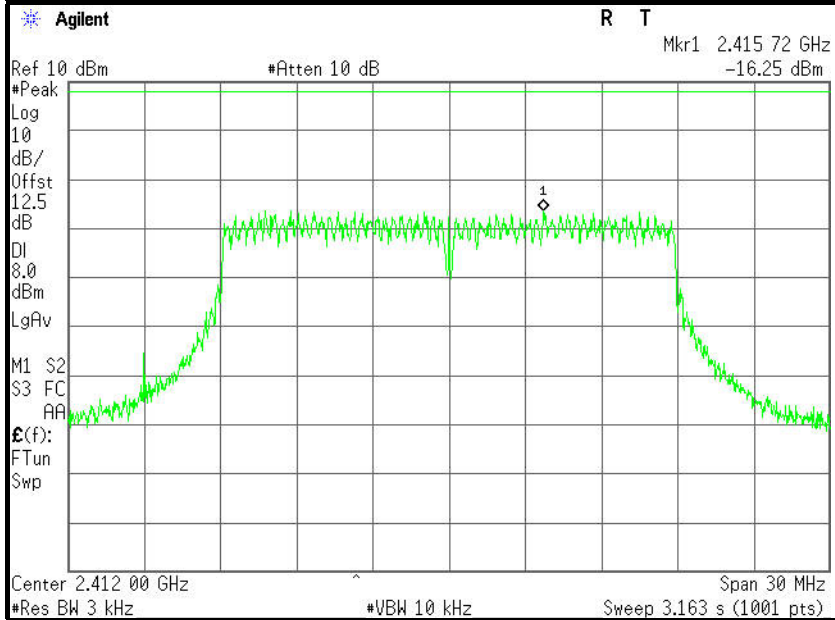


IEEE 802.11g mode**PPSD (CH Low)****PPSD (CH Mid)**



IEEE 802.11n HT20 MHz mode

PPSD (CH Low)



PPSD (CH Mid)

