



FCC 47 CFR PART 15 SUBPART C

for

360526 Module

Model: MP7QCFS

Brand: N/A

Test Report Number:

C160918Z02-RP1-3

Issued Date: October 13, 2016

Issued for

WANLIDA GROUP CO., LTD

No. 618 JIAHE ROAD XIAMEN FUJIAN China

Issued by:

Compliance Certification Services (Shenzhen) Inc.

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TESTING CERT #2861.01

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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	October 13, 2016	Initial Issue	ALL	Nancy Fu



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1 TEST CERTIFICATION

Product	360526 Module
Model	MP7QCFS
Brand	N/A
Tested	September 18~ October 13, 2016
Applicant	WANLIDA GROUP CO., LTD No. 618 JIAHE ROAD XIAMEN FUJIAN China
Manufacturer	WANLIDA GROUP CO., LTD No. 618 JIAHE ROAD XIAMEN FUJIAN China

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 Compliance Certification Services (Shenzhen) Inc. 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:

Sunday Hu
Supervisor of EMC Dept.
Compliance Certification Services (Shenzhen) Inc.

Ruby Zhang
Supervisor of Report Dept.
Compliance Certification Services (Shenzhen) Inc.



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	360526 Module
Model Number	MP7QCFS
Brand	N/A
Model Discrepancy	N/A
Identify Number	C160918Z02-RP1-3
Received Date	September 18, 2016
Power Supply	DC 12V supplied by adapter
Transmit Power	IEEE 802.11b mode: 19.06dBm IEEE 802.11g mode: 24.23dBm IEEE 802.11n HT20 MHz mode: 23.69dBm
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 65.0/58.5/52.0/ 39.0/26.0/19.5/13.0/6.5Mbps
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	Internal Antenna with 3.62dBi gain (Max)
Channels Spacing	IEEE 802.11b/g ,802.11n HT20 : 5MHz
Temperature Range	0°C ~ +35°C
Hardware Version	9505c
Software Version	Model number AOSP on Drone

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: **SMFOMC360526A** 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: Normal	Mode 1
Radiated Emission	Mode 1: TX	Mode 1

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 6.5Mbps 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
1	Adapter	MPA-630	N/A	N/A	Malata	N/A	Unshielded 1.50m

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 **No.10-1 Mingkeda Logistics park, No.18, Huanguan South Rd., Guan Lan Town, Baoan District, Shenzhen, China**

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

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

USA	A2LA
China	CNAS

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

USA	FCC
Japan	VCCI (C-4815,R-4320,T-2317, G-10624)
Canada	INDUSTRY CANADA

Copies of granted accreditation certificates are available for downloading from our web site, <http://www.ccssz.com>

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	Due Calibration
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	02/21/2016	02/20/2017
LISN(EUT)	ROHDE&SCHWARZ	ENV216	101543-WX	02/21/2016	02/20/2017
LISN	EMCO	3825/2	8901-1459	02/21/2016	02/20/2017
Temp. / Humidity Meter	VICTOR	HTC-1	N/A	02/21/2016	02/20/2017
Test S/W	FARAD	EZ-EMC/ CCS-3A1-CE			

- 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.

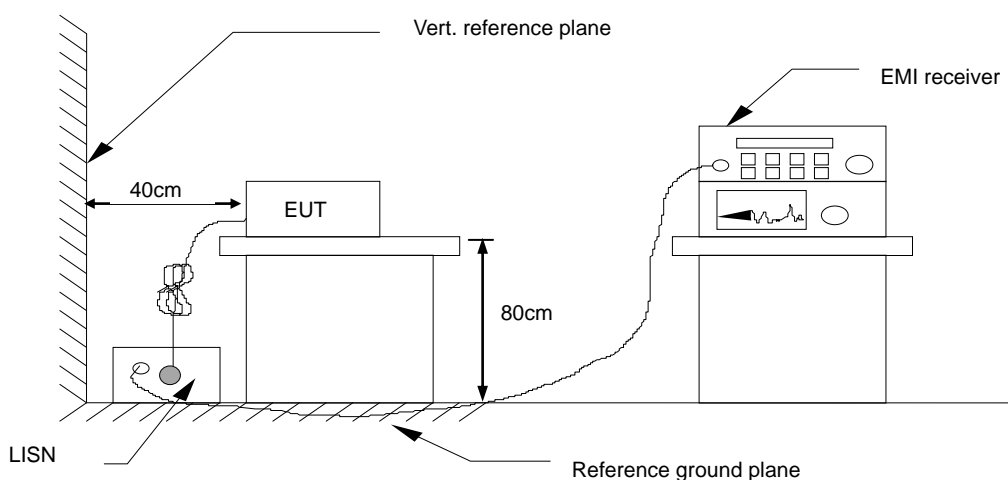


7.1.3. TEST PROCEDURES (please refer to measurement standard)

- 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

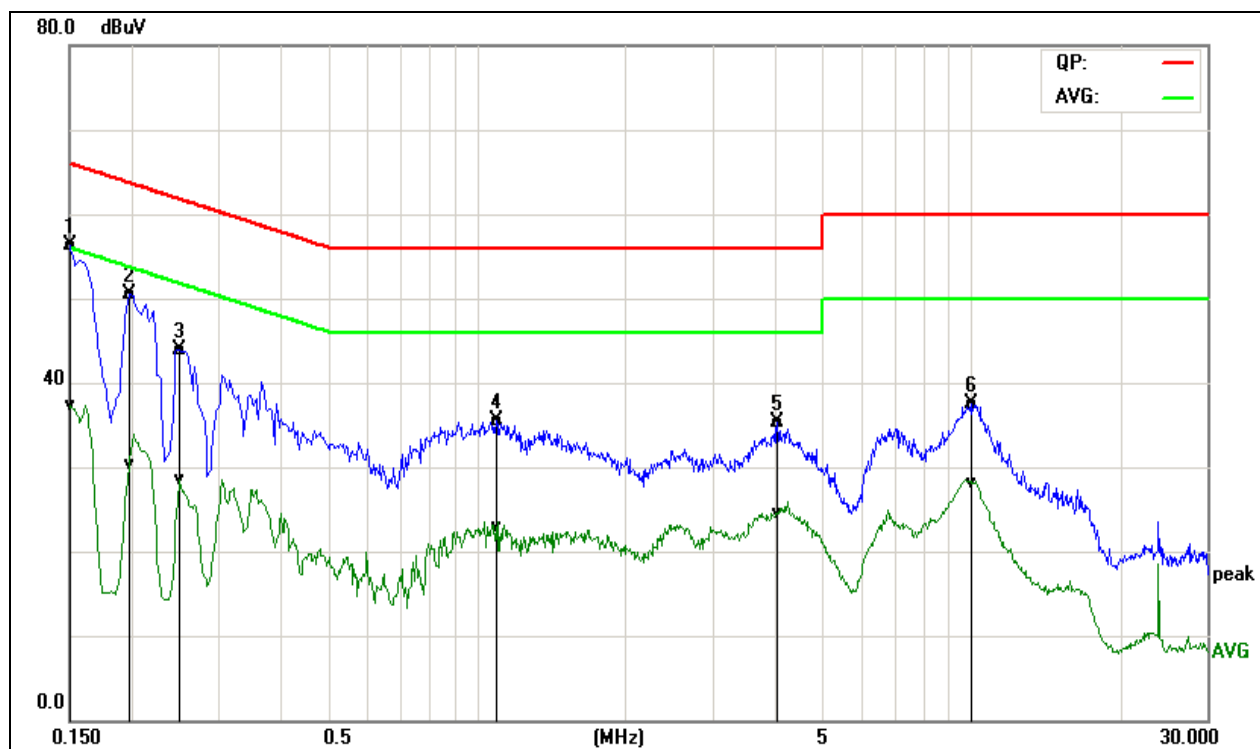
Limit = Limit stated in standard

Margin = Result (dBuV) – Limit (dBuV)



7.1.6. TEST RESULTS

Model No.	MP7QCFS	RBW,VBW	9 kHz
Environmental Conditions	22°C, 45% RH	Test Mode	Mode 1
Tested by	Saber Huang	Line	L1
Test Date	September 19, 2016		

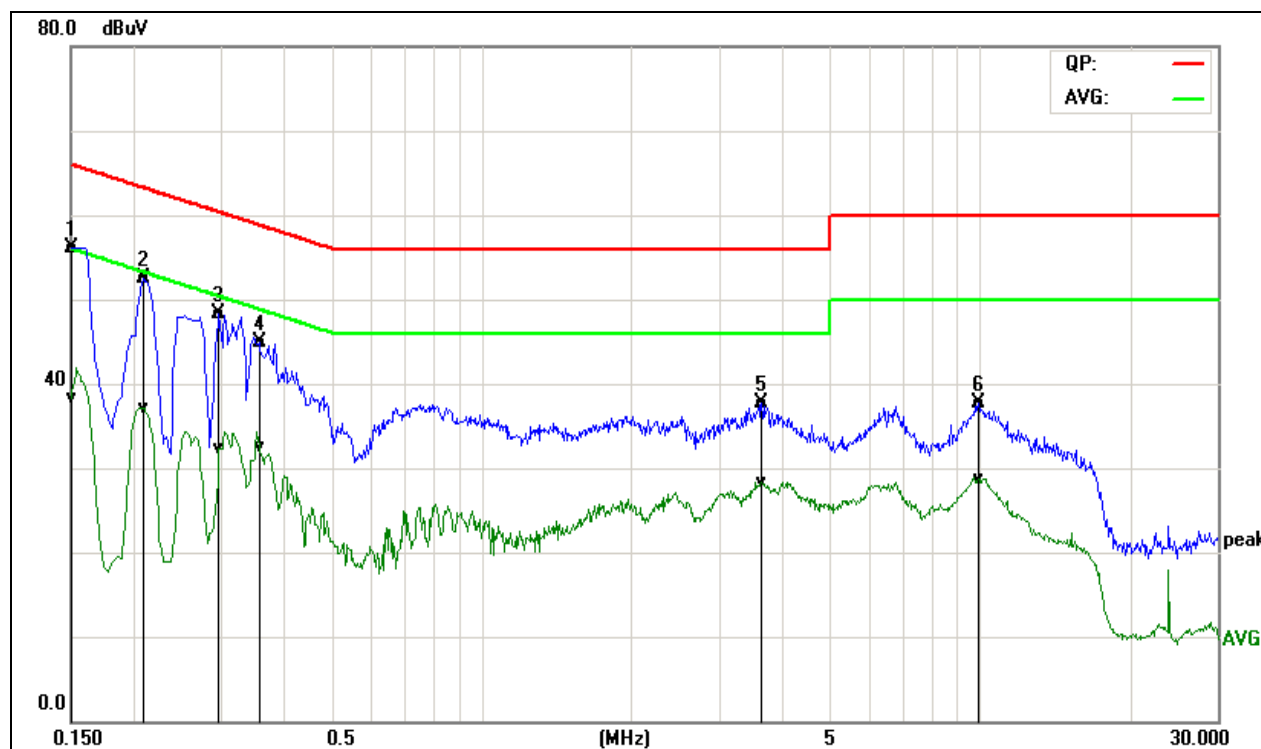


Frequency (MHz)	QuasiPeak Reading (dBuV)	Average Reading (dBuV)	Correction Factor (dB)	QuasiPeak Result (dBuV)	Average Result (dBuV)	QuasiPeak Limit (dBuV)	Average Limit (dBuV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
0.1500	46.39	27.33	9.98	56.37	37.31	65.99	56.00	-9.62	-18.69	Pass
0.1980	40.57	20.37	9.99	50.56	30.36	63.69	53.69	-13.13	-23.33	Pass
0.2500	33.93	18.49	9.99	43.92	28.48	61.75	51.76	-17.83	-23.28	Pass
1.0940	25.41	12.90	10.01	35.42	22.91	56.00	46.00	-20.58	-23.09	Pass
4.0580	25.19	14.25	10.20	35.39	24.45	56.00	46.00	-20.61	-21.55	Pass
9.9700	27.28	17.77	10.27	37.55	28.04	60.00	50.00	-22.45	-21.96	Pass

REMARKS: L1 = Line One (Live Line)



Model No.	MP7QCFS	RBW,VBW	9 kHz
Environmental Conditions	22°C, 45% RH	Test Mode	Mode 1
Tested by	Saber Huang	Line	L2
Test Date	September 19, 2016		



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)
0.1500	46.21	28.23	9.98	56.19	38.21	65.99	56.00	-9.80	-17.79	Pass
0.2100	42.42	27.13	9.99	52.41	37.12	63.20	53.21	-10.79	-16.09	Pass
0.2980	38.22	22.25	9.99	48.21	32.24	60.30	50.30	-12.09	-18.06	Pass
0.3580	34.93	22.59	9.98	44.91	32.57	58.77	48.77	-13.86	-16.20	Pass
3.6420	27.50	18.09	10.17	37.67	28.26	56.00	46.00	-18.33	-17.74	Pass
9.9220	27.45	18.36	10.27	37.72	28.63	60.00	50.00	-22.28	-21.37	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
Spectrum Analyzer	Agilent	N9010A	MY55370330	02/21/2016	02/20/2017

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.

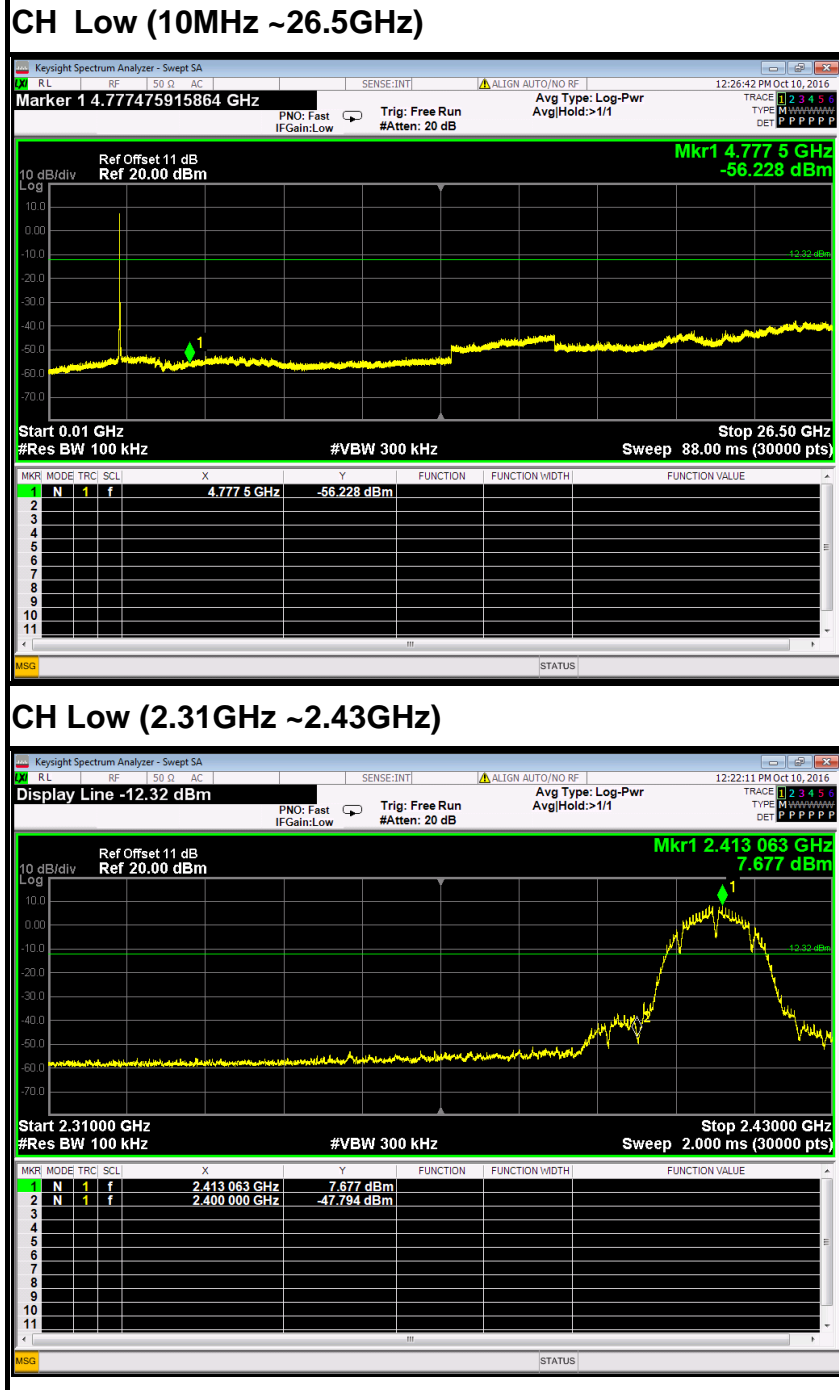
Measurements are made over the 10MHz to 26GHz range with the transmitter set to the lowest, middle, and highest channels. No emission found between lowest internal used/generated frequency to 10MHz, it is only recorded 10MHz to 26GHz.



7.2.1.4. TEST RESULTS

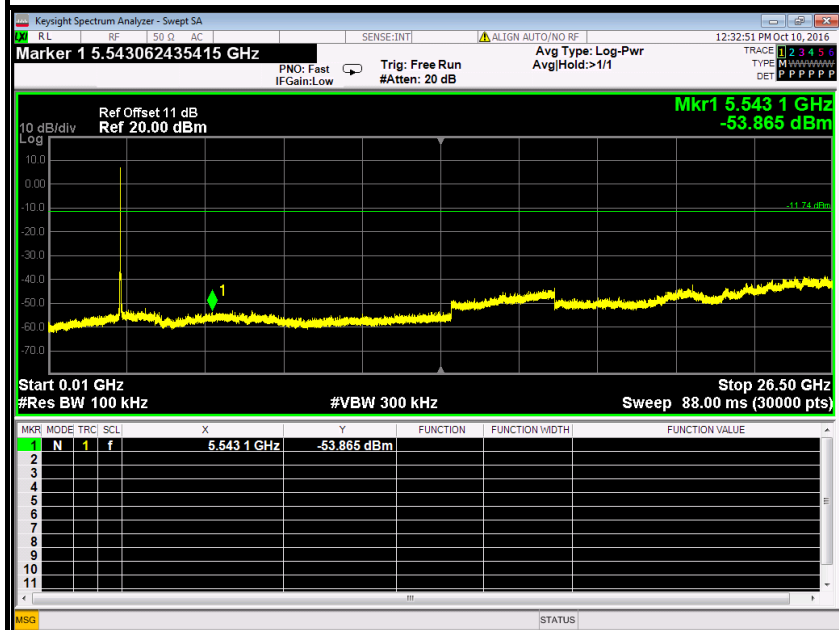
Test Plot

IEEE 802.11b mode

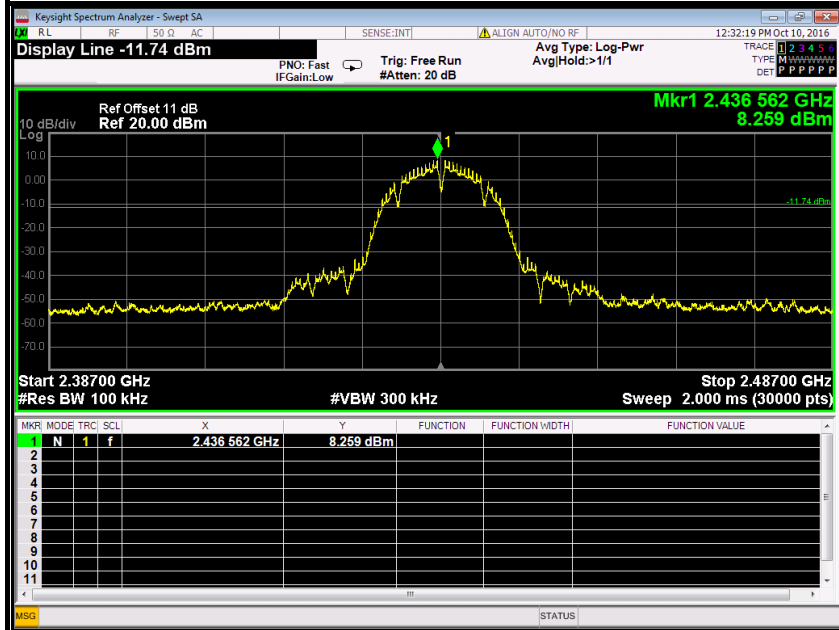




CH Mid (10MHz ~26.5GHz)

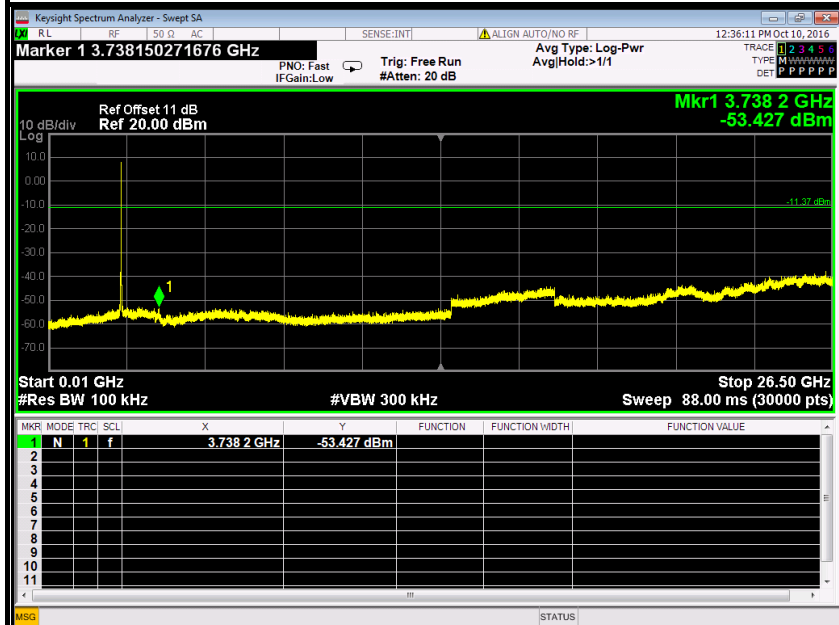


CH Mid (2.387MHz ~2.487MHz)

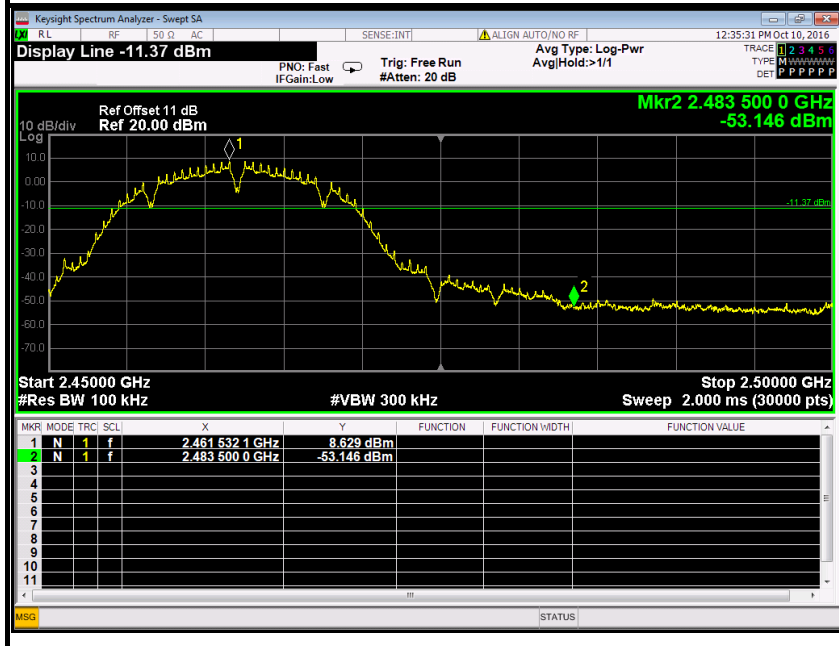




CH High (10MHz ~26.5GHz)



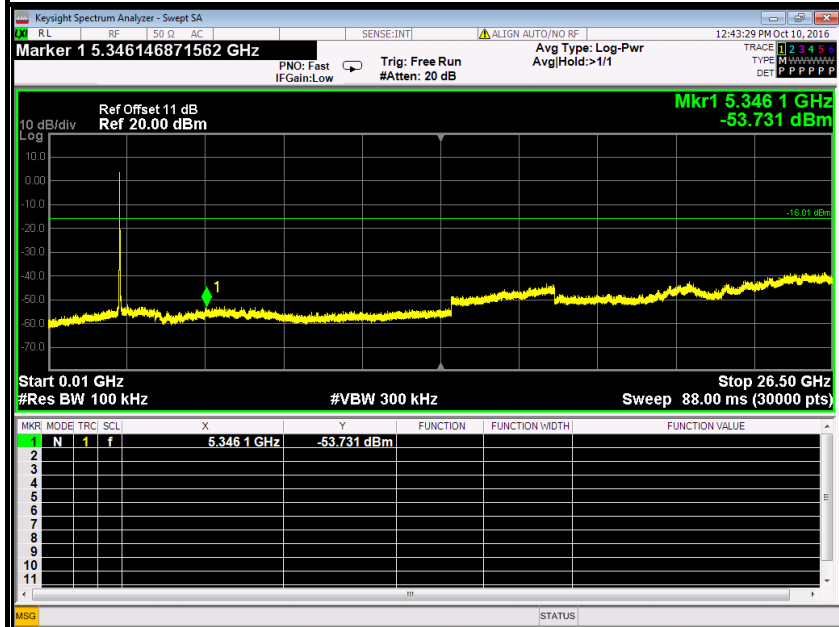
CH High (2.45GHz ~2.5GHz)



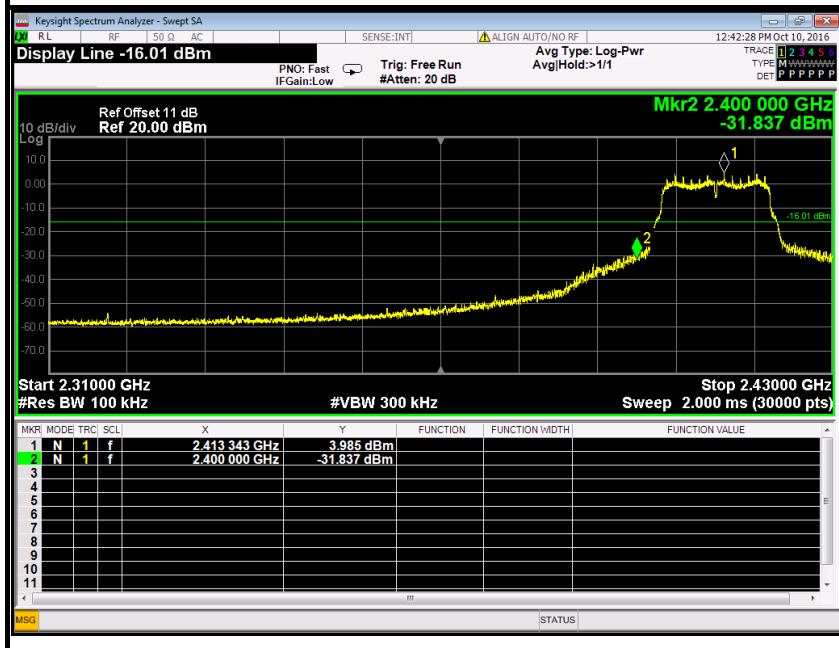


IEEE 802.11g mode

CH Low (10MHz ~26.5GHz)

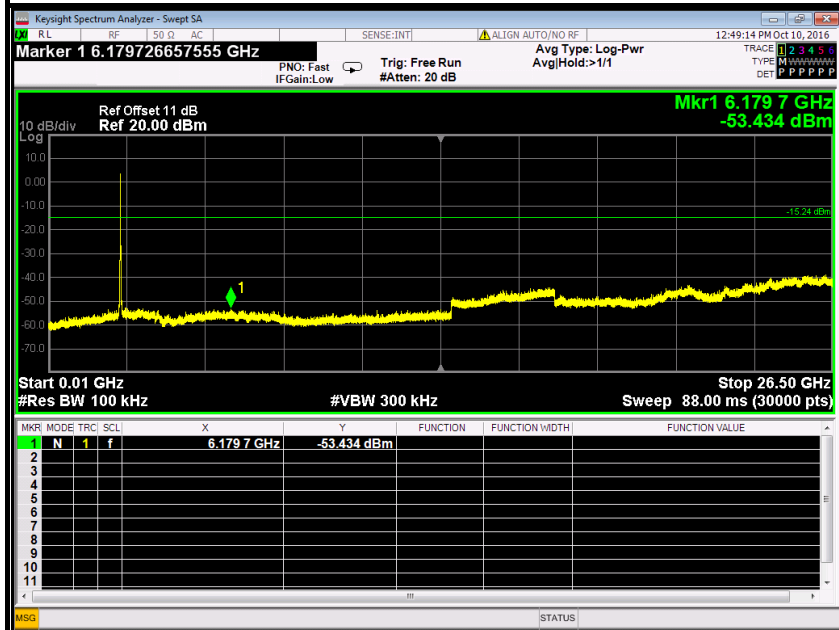


CH Low (2.31GHz ~2.43GHz)

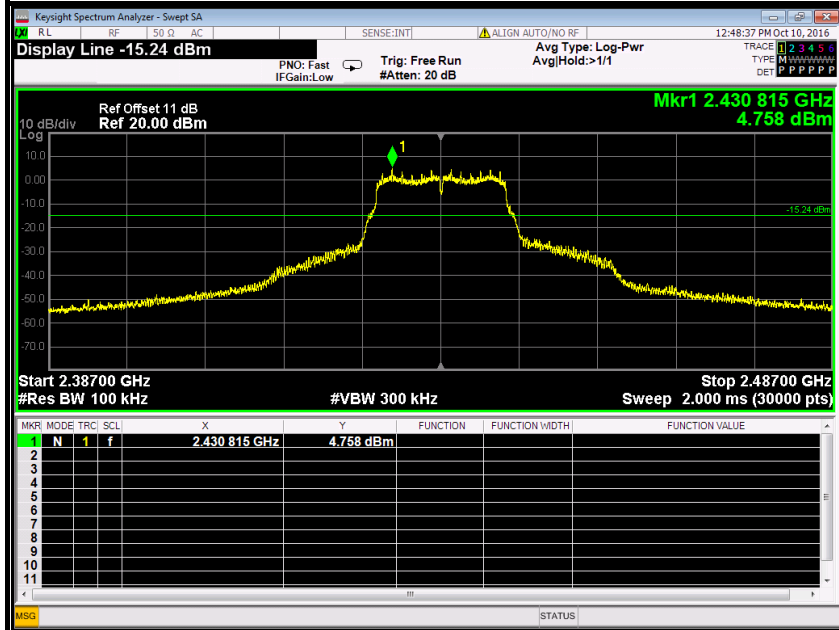




CH Mid (10MHz ~26.5GHz)

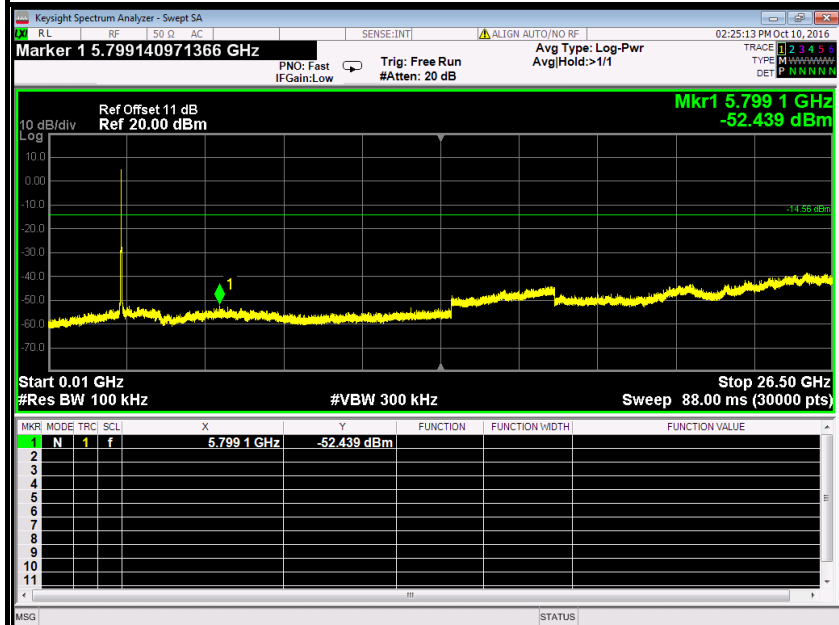


CH Mid (2.387MHz ~2.487MHz)

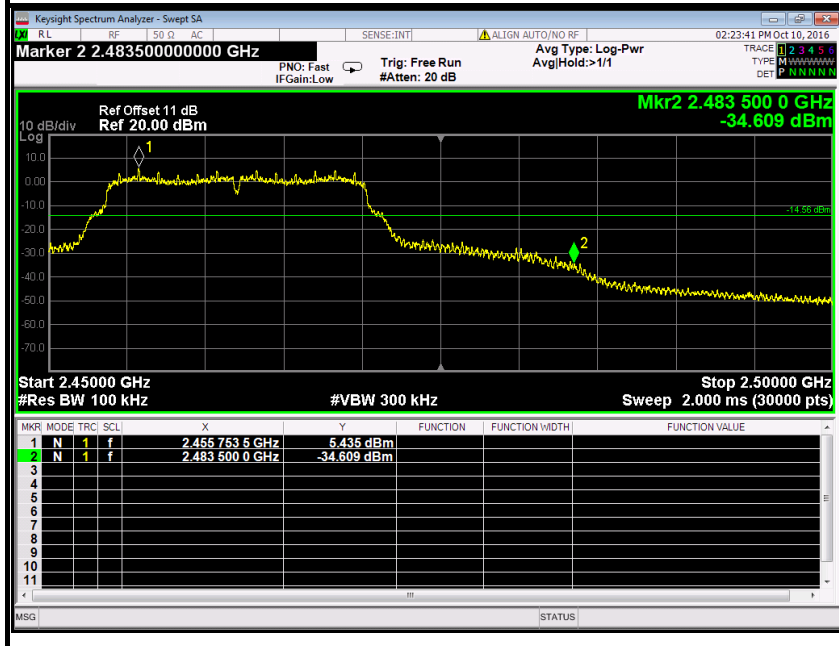




CH High (10MHz ~26.5GHz)

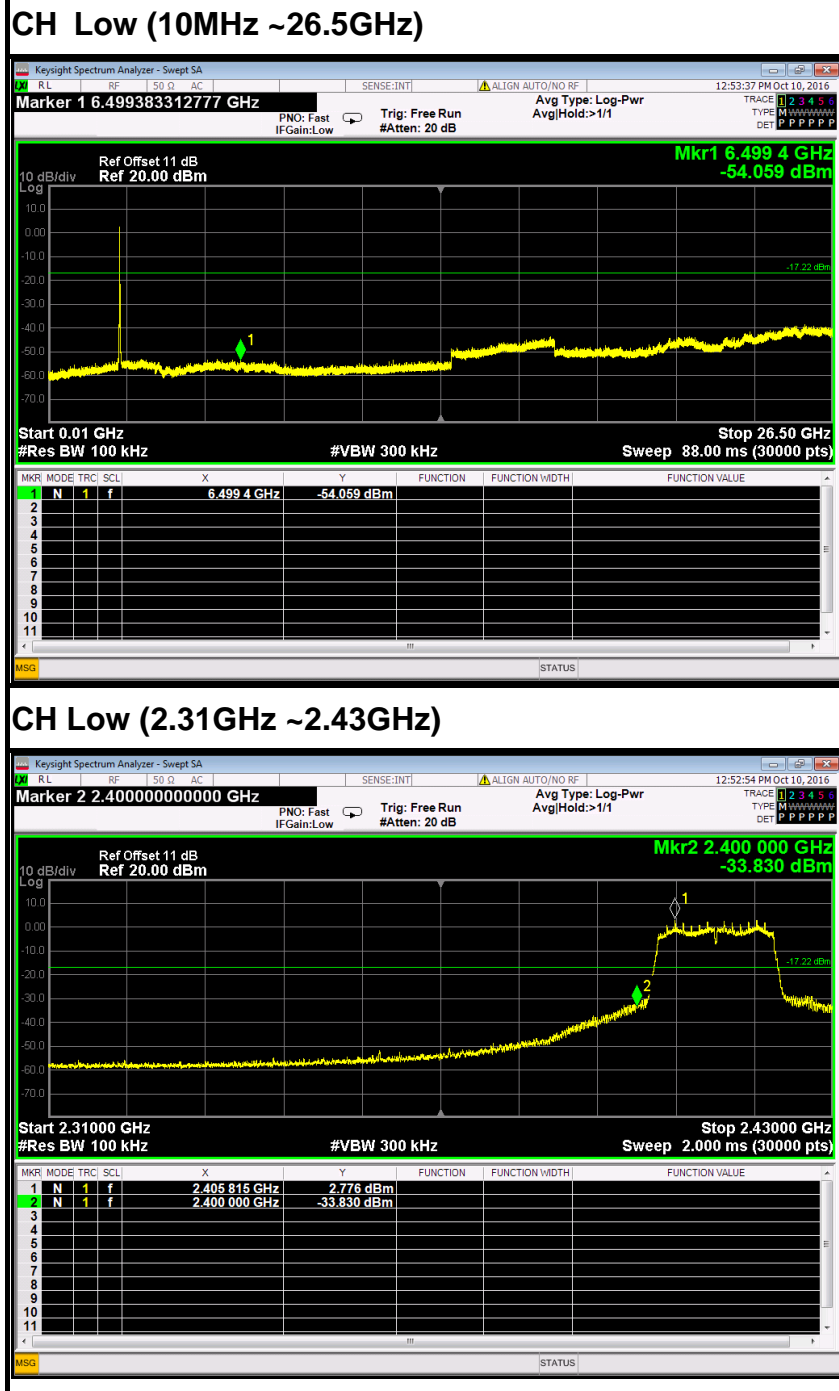


CH High (2.45GHz ~2.5GHz)



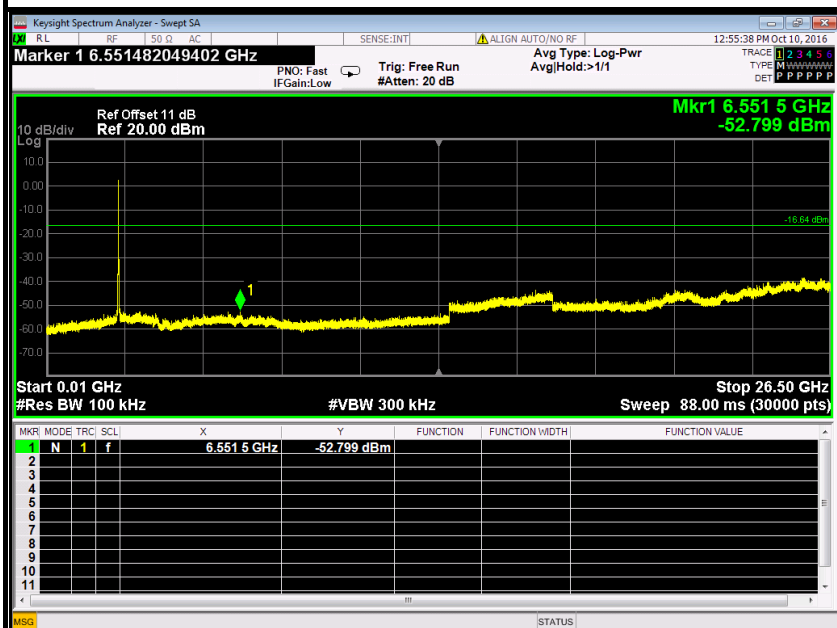


IEEE 802.11n HT20 MHz mode

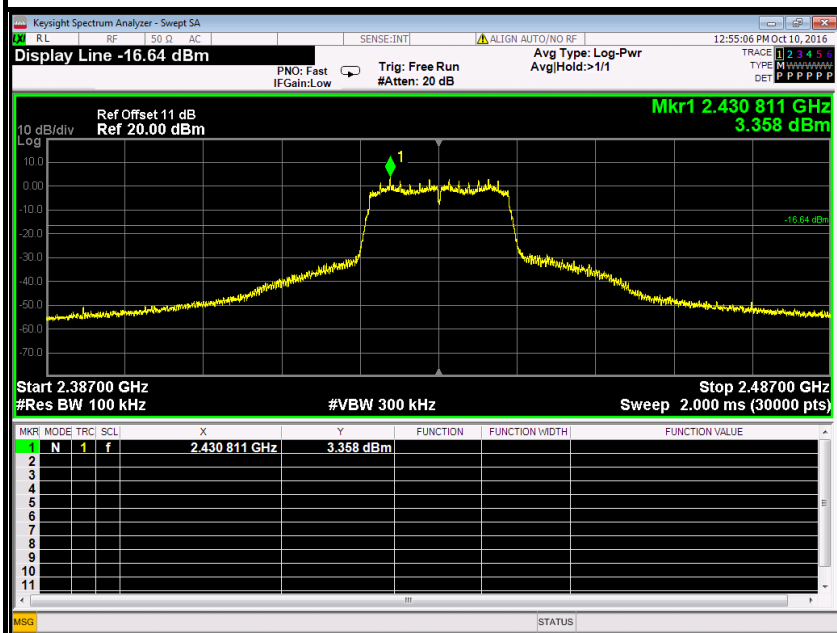




CH Mid (10MHz ~26.5GHz)

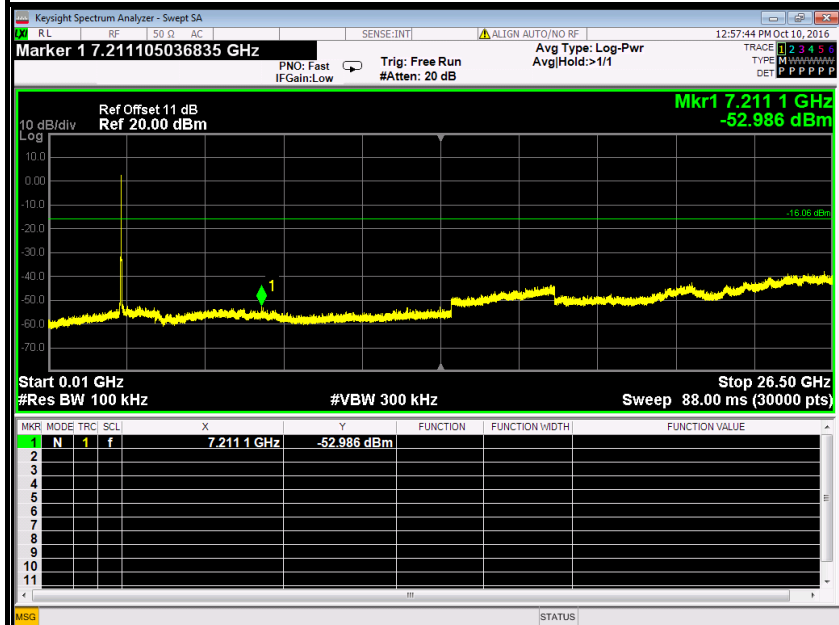


CH Mid (2.387MHz ~2.487MHz)

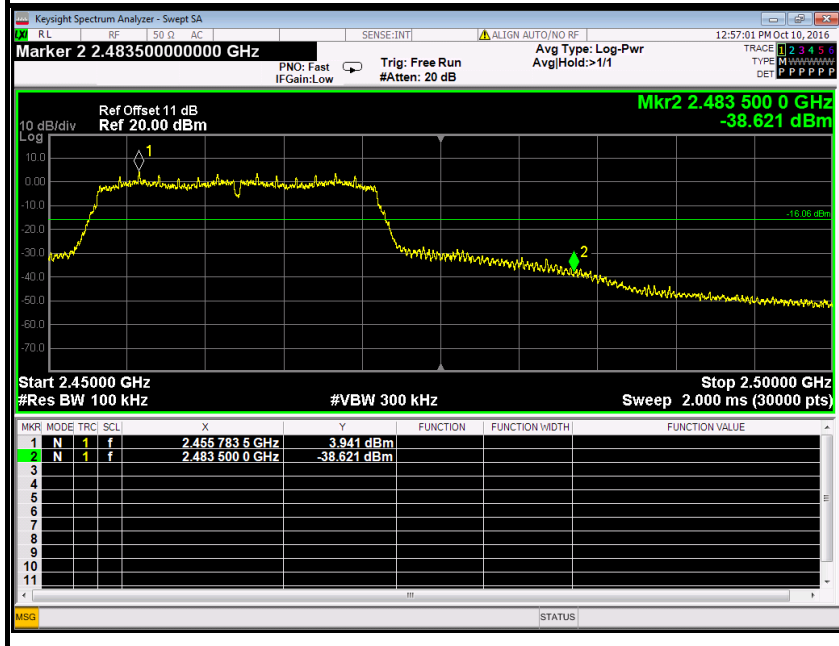




CH High (10MHz ~26.5GHz)



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 ($\text{dB}\mu\text{V/m}$ 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 ($\text{dB}\mu\text{V/m}$) = $20 \log$ Emission level ($\mu\text{V/m}$).

**7.2.2.2. TEST INSTRUMENTS**

Radiated Emission Test Site 966(2)					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
PSA Series Spectrum Analyzer	Agilent	E4446A	US44300399	02/21/2016	02/20/2017
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	02/21/2016	02/20/2017
Amplifier	EMEC	EM330	060661	03/18/2016	03/17/2017
High Noise Amplifier	Agilent	8449B	3008A01838	02/21/2016	02/20/2017
Loop Antenna	COM-POWER	AL-130	121044	09/25/2015	09/24/2016
Bilog Antenna	SCHAFFNER	CBL6143	5082	02/21/2016	02/20/2017
Horn Antenna	SCHWARZBECK	BBHA9120	D286	02/28/2016	02/27/2017
Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170-497	02/28/2016	02/27/2017
Turn Table	N/A	N/A	N/A	N.C.R	N.C.R
Antenna Tower	SUNOL	TLT2	N/A	N.C.R	N.C.R
Controller	Sunol Sciences	SC104V	022310-1	N.C.R	N.C.R
Controller	CT	N/A	N/A	N.C.R	N.C.R
Temp. / Humidity Meter	Anymetre	JR913	N/A	02/21/2016	02/20/2017
Test S/W	FARAD	LZ-RF / CCS-SZ-3A2			

- 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. Measuring Instruments and Setting

The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 2.4kHz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 2.4kHz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP/AVG
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP/AVG
Start ~ Stop Frequency	30MHz~1000MHz / RB 100kHz for QP

7.2.2.4. TEST PROCEDURE (please refer to measurement standard)

1) Sequence of testing 9 kHz to 30 MHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Pre measurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna height is 0.8 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions



Final measurement:

--- Identified emissions during the pre measurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the pre measurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Pre measurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.



Final measurement:

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ($\pm 45^\circ$) and antenna movement between 1 and 4 meter.
- The final measurement will be done with QP detector with an EMI receiver.
- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 18 GHz

Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

Pre measurement:

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height scan range is 1 meter to 2.5 meter.
- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.



Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ($\pm 45^\circ$) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the pre measurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 1 meter.

--- The EUT was set into operation.

Pre measurement:

--- The antenna is moved spherical over the EUT in different polarisations of the antenna.

Final measurement:

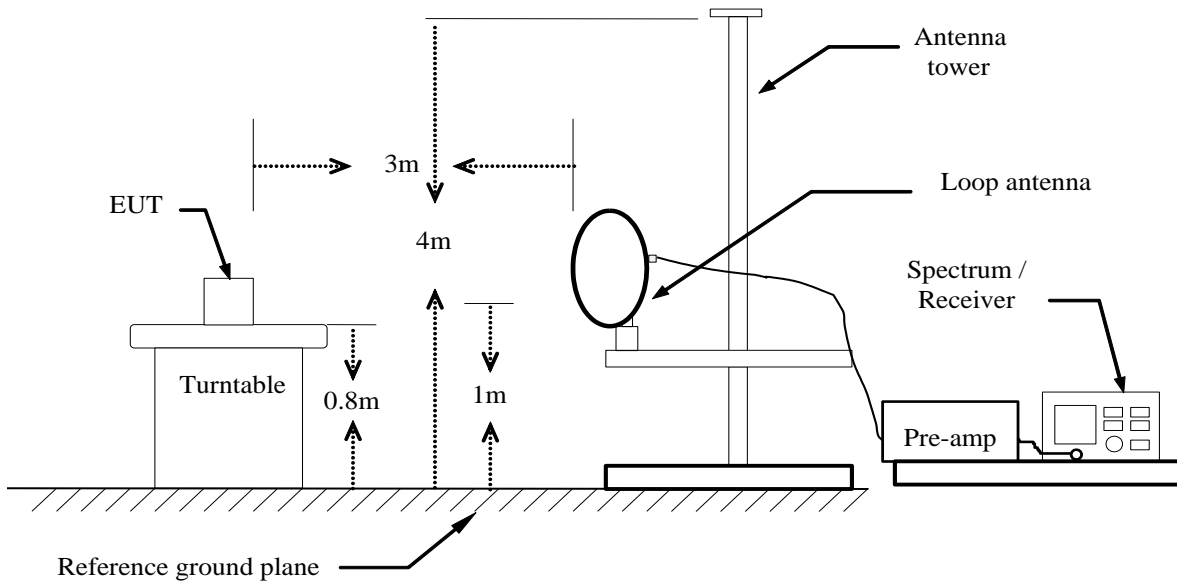
--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

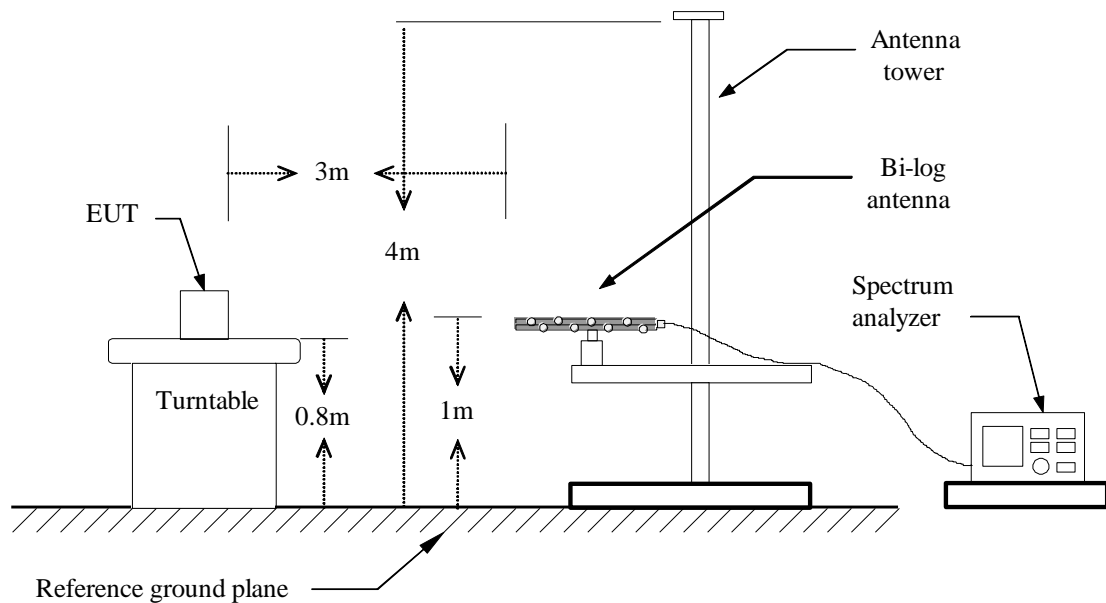


7.2.2.5. TEST SETUP

Below 30MHz

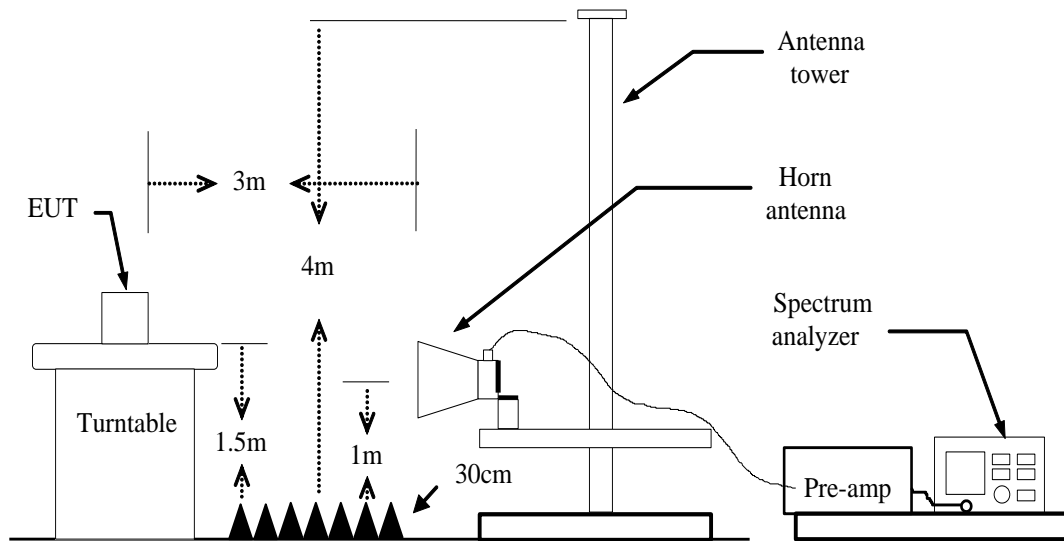


Below 1 GHz





Above 1 GHz



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

**7.2.2.6. 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

**7.2.2.7. TEST RESULTS****Below 1 GHz****Test Mode:** TX**Tested by:** Saber Huang**Ambient temperature:** 24°C **Relative humidity:** 52% RH **Date:** October 12, 2016

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
33.8800	41.48	-11.40	30.08	40.00	-9.92	V	QP
101.7800	45.53	-14.02	31.51	43.50	-11.99	V	QP
170.6500	45.83	-12.82	33.01	43.50	-10.49	V	QP
188.1100	44.68	-13.11	31.57	43.50	-11.93	V	QP
307.4200	44.75	-9.96	34.79	46.00	-11.21	V	QP
375.3200	45.10	-8.53	36.57	46.00	-9.43	V	QP
33.8800	41.24	-11.40	29.84	40.00	-10.16	H	QP
101.7800	44.23	-14.02	30.21	43.50	-13.29	H	QP
170.6500	46.09	-12.82	33.27	43.50	-10.23	H	QP
187.1400	43.39	-13.19	30.20	43.50	-13.30	H	QP
307.4200	44.64	-9.96	34.68	46.00	-11.32	H	QP
375.3200	45.27	-8.53	36.74	46.00	-9.26	H	QP

****Remark:** 1. No emission found between lowest internal used/generated frequency to 30MHz.

2. Pre-scan all mode and recorded the worst case results in this report (802.11b (Low Channel))

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 Pol e(H/V) = Current carrying line of reading

**Above 1 GHz****Antenna 0****Test Mode:** TX / IEEE 802.11b(CH Low)**Tested by:** Saber Huang**Ambient temperature:** 24°C **Relative humidity:** 52% RH**Date:** September 19, 2016

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1144.000	48.65	-8.00	40.65	74.00	-33.35	V	peak
2566.000	47.63	-2.14	45.49	74.00	-28.51	V	peak
3619.000	46.28	-0.02	46.26	74.00	-27.74	V	peak
4537.000	43.33	3.47	46.80	74.00	-27.20	V	peak
5104.000	42.43	5.17	47.60	74.00	-26.40	V	peak
5509.000	42.86	5.87	48.73	74.00	-25.27	V	peak
1216.000	48.44	-7.73	40.71	74.00	-33.29	H	Peak
1864.000	45.93	-5.86	40.07	74.00	-33.93	H	Peak
2539.000	45.96	-2.19	43.77	74.00	-30.23	H	Peak
3259.000	44.11	-0.92	43.19	74.00	-30.81	H	peak
3997.000	43.14	1.58	44.72	74.00	-29.28	H	peak
4609.000	42.68	3.71	46.39	74.00	-27.61	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:** Saber Huang**Ambient temperature:** 24°C**Relative humidity:** 52% RH**Date:** September 19, 2016

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1144.000	48.20	-8.00	40.20	74.00	-33.80	V	Peak
1612.000	46.71	-6.67	40.04	74.00	-33.96	V	Peak
2521.000	46.45	-2.22	44.23	74.00	-29.77	V	Peak
3655.000	45.09	0.13	45.22	74.00	-28.78	V	Peak
4195.000	42.69	2.28	44.97	74.00	-29.03	V	Peak
5437.000	41.37	5.76	47.13	74.00	-26.87	V	Peak
1297.000	46.51	-7.44	39.07	74.00	-34.93	H	Peak
1711.000	46.02	-6.46	39.56	74.00	-34.44	H	Peak
2539.000	45.63	-2.19	43.44	74.00	-30.56	H	Peak
3241.000	43.26	-0.96	42.30	74.00	-31.70	H	Peak
4384.000	42.02	2.94	44.96	74.00	-29.04	H	Peak
4915.000	41.00	4.70	45.70	74.00	-28.30	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. $\text{Margin (dB)} = \text{Remark result (dBuV/m)} - \text{Average limit (dBuV/m)}$.

**Test Mode:** TX / IEEE 802.11b (CH High)**Tested by:** Saber Huang**Ambient temperature:** 24°C**Relative humidity:** 52% RH**Date:** September 19, 2016

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1252.000	46.90	-7.60	39.30	74.00	-34.70	V	Peak
2458.000	46.80	-2.49	44.31	74.00	-29.69	V	Peak
3691.000	45.44	0.29	45.73	74.00	-28.27	V	Peak
4303.000	43.30	2.66	45.96	74.00	-28.04	V	Peak
5221.000	41.44	5.37	46.81	74.00	-27.19	V	Peak
5860.000	41.79	6.02	47.81	74.00	-26.19	V	Peak
1288.000	47.31	-7.47	39.84	74.00	-34.16	H	Peak
1612.000	46.07	-6.67	39.40	74.00	-34.60	H	Peak
2458.000	45.04	-2.49	42.55	74.00	-31.45	H	Peak
3691.000	44.01	0.29	44.30	74.00	-29.70	H	Peak
5032.000	41.56	5.04	46.60	74.00	-27.40	H	Peak
5635.000	40.87	5.93	46.80	74.00	-27.20	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. $\text{Margin (dB)} = \text{Remark result (dBuV/m)} - \text{Average limit (dBuV/m)}$.

**Test Mode:** TX / IEEE 802.11g(CH Low)**Tested by:** Saber Huang**Ambient temperature:** 24°C **Relative humidity:** 52% RH **Date:** September 19, 2016

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1630.000	45.96	-6.64	39.32	74.00	-34.68	V	Peak
2107.000	44.90	-4.41	40.49	74.00	-33.51	V	Peak
2557.000	45.79	-2.16	43.63	74.00	-30.37	V	Peak
3619.000	44.48	-0.02	44.46	74.00	-29.54	V	Peak
4672.000	41.16	3.91	45.07	74.00	-28.93	V	Peak
5671.000	41.16	5.94	47.10	74.00	-26.90	V	Peak
1054.000	46.70	-8.35	38.35	74.00	-35.65	H	Peak
1612.000	45.33	-6.67	38.66	74.00	-35.34	H	Peak
2539.000	46.12	-2.19	43.93	74.00	-30.07	H	Peak
3358.000	42.68	-0.76	41.92	74.00	-32.08	H	Peak
4159.000	42.05	2.15	44.20	74.00	-29.80	H	Peak
5230.000	40.90	5.39	46.29	74.00	-27.71	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:** Saber Huang**Ambient temperature:** 24°C**Relative humidity:** 52% RH**Date:** September 19, 2016

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1198.000	46.94	-7.80	39.14	74.00	-34.86	V	Peak
1882.000	44.21	-5.75	38.46	74.00	-35.54	V	Peak
2836.000	43.95	-1.66	42.29	74.00	-31.71	V	Peak
3250.000	42.71	-0.94	41.77	74.00	-32.23	V	Peak
4051.000	40.82	1.77	42.59	74.00	-31.41	V	Peak
5131.000	40.66	5.21	45.87	74.00	-28.13	V	Peak
1252.000	46.60	-7.60	39.00	74.00	-35.00	H	Peak
1603.000	45.67	-6.69	38.98	74.00	-35.02	H	Peak
2188.000	43.58	-3.97	39.61	74.00	-34.39	H	Peak
2818.000	42.73	-1.69	41.04	74.00	-32.96	H	Peak
3745.000	40.78	0.51	41.29	74.00	-32.71	H	Peak
4510.000	40.28	3.38	43.66	74.00	-30.34	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:** Saber Huang**Ambient temperature:** 24°C**Relative humidity:** 52% RH**Date:** September 19, 2016

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1288.000	46.40	-7.47	38.93	74.00	-35.07	V	Peak
1954.000	48.09	-5.29	42.80	74.00	-31.20	V	Peak
2458.000	44.89	-2.49	42.40	74.00	-31.60	V	Peak
3160.000	42.02	-1.09	40.93	74.00	-33.07	V	Peak
3898.000	41.64	1.16	42.80	74.00	-31.20	V	Peak
4636.000	40.67	3.79	44.46	74.00	-29.54	V	Peak
1252.000	46.25	-7.60	38.65	74.00	-35.35	H	Peak
1954.000	44.65	-5.29	39.36	74.00	-34.64	H	Peak
2593.000	43.72	-2.09	41.63	74.00	-32.37	H	Peak
3286.000	42.84	-0.88	41.96	74.00	-32.04	H	Peak
4051.000	41.36	1.77	43.13	74.00	-30.87	H	Peak
4807.000	40.51	4.35	44.86	74.00	-29.14	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:** Saber Huang**Ambient temperature:** 24°C**Relative humidity:** 52% RH**Date:** September 19, 2016

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1306.000	45.85	-7.40	38.45	74.00	-35.55	V	Peak
1504.000	45.91	-6.87	39.04	74.00	-34.96	V	Peak
2494.000	43.74	-2.29	41.45	74.00	-32.55	V	Peak
3619.000	45.03	-0.02	45.01	74.00	-28.99	V	Peak
4960.000	39.86	4.85	44.71	74.00	-29.29	V	Peak
5851.000	39.95	6.02	45.97	74.00	-28.03	V	Peak
1306.000	46.24	-7.40	38.84	74.00	-35.16	H	Peak
1486.000	44.51	-6.91	37.60	74.00	-36.40	H	Peak
2152.000	43.39	-4.17	39.22	74.00	-34.78	H	Peak
3241.000	42.07	-0.96	41.11	74.00	-32.89	H	Peak
4807.000	40.05	4.35	44.40	74.00	-29.60	H	Peak
5293.000	39.85	5.50	45.35	74.00	-28.65	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:** Saber Huang**Ambient temperature:** 24°C **Relative humidity:** 52% RH **Date:** September 19, 2016

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1072.000	45.90	-8.28	37.62	74.00	-36.38	V	Peak
2503.000	44.92	-2.25	42.67	74.00	-31.33	V	Peak
3655.000	44.14	0.13	44.27	74.00	-29.73	V	Peak
4348.000	40.15	2.81	42.96	74.00	-31.04	V	Peak
4942.000	39.86	4.79	44.65	74.00	-29.35	V	Peak
5608.000	40.00	5.92	45.92	74.00	-28.08	V	Peak
1198.000	46.57	-7.80	38.77	74.00	-35.23	H	Peak
2080.000	44.36	-4.56	39.80	74.00	-34.20	H	Peak
3205.000	42.15	-1.02	41.13	74.00	-32.87	H	Peak
3898.000	40.71	1.16	41.87	74.00	-32.13	H	Peak
4312.000	40.25	2.69	42.94	74.00	-31.06	H	Peak
5212.000	40.88	5.36	46.24	74.00	-27.76	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:** Saber Huang**Ambient temperature:** 24°C**Relative humidity:** 52% RH**Date:** September 19, 2016

Frequency (MHz)	Reading (dBUV)	Correction Factor (dB/m)	Result (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1396.000	45.32	-7.07	38.25	74.00	-35.75	V	Peak
2098.000	43.86	-4.46	39.40	74.00	-34.60	V	Peak
3691.000	42.67	0.29	42.96	74.00	-31.04	V	Peak
4231.000	40.13	2.40	42.53	74.00	-31.47	V	Peak
4870.000	39.66	4.56	44.22	74.00	-29.78	V	Peak
5203.000	39.32	5.34	44.66	74.00	-29.34	V	Peak
1234.000	45.81	-7.67	38.14	74.00	-35.86	H	Peak
1999.000	43.26	-5.01	38.25	74.00	-35.75	H	Peak
2593.000	43.25	-2.09	41.16	74.00	-32.84	H	Peak
3763.000	40.81	0.59	41.40	74.00	-32.60	H	Peak
4258.000	40.04	2.50	42.54	74.00	-31.46	H	Peak
4915.000	39.29	4.70	43.99	74.00	-30.01	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

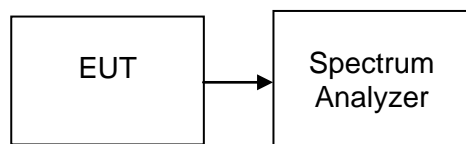
Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Calibration Due
Spectrum Analyzer	Agilent	N9010A	MY52221469	02/21/2016	02/20/2017

7.3.3. TEST PROCEDURES (please refer to measurement standard)

8.1 Option 2:

The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described above (i.e., RBW = 100 kHz, VBW \geq 3 RBW, peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be \geq 6 dB.

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	9543	>500	PASS
Mid	2437	9043		PASS
High	2462	9053		PASS

Test mode: IEEE 802.11g

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	16080	>500	PASS
Mid	2437	16050		PASS
High	2462	15770		PASS

Test mode: IEEE 802.11n HT20 MHz

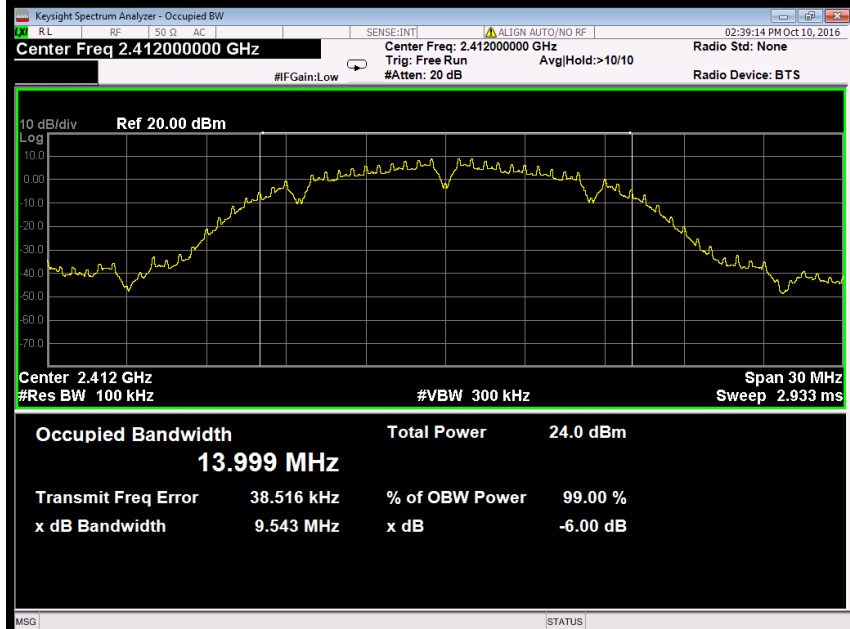
Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	17560	>500	PASS
Mid	2437	17560		PASS
High	2462	17540		PASS



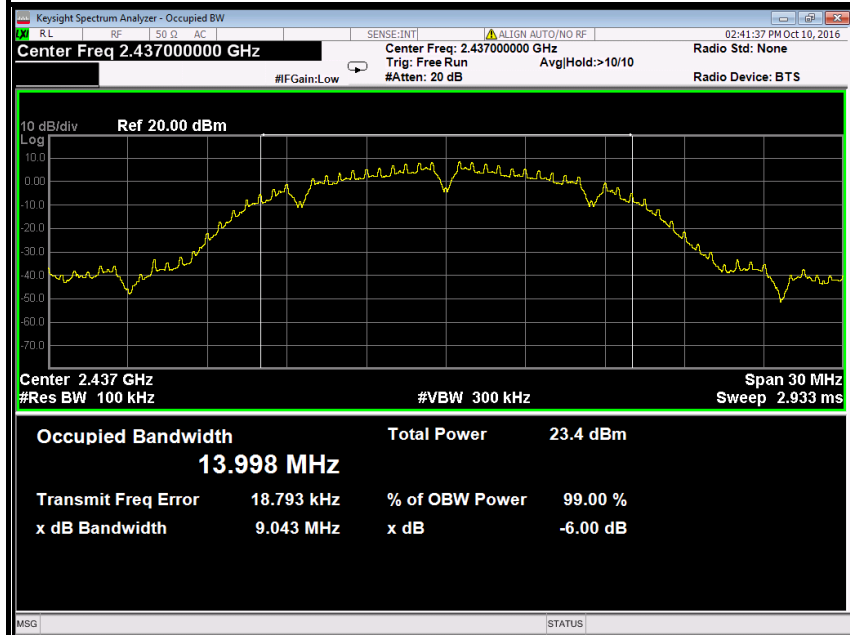
Test Plot

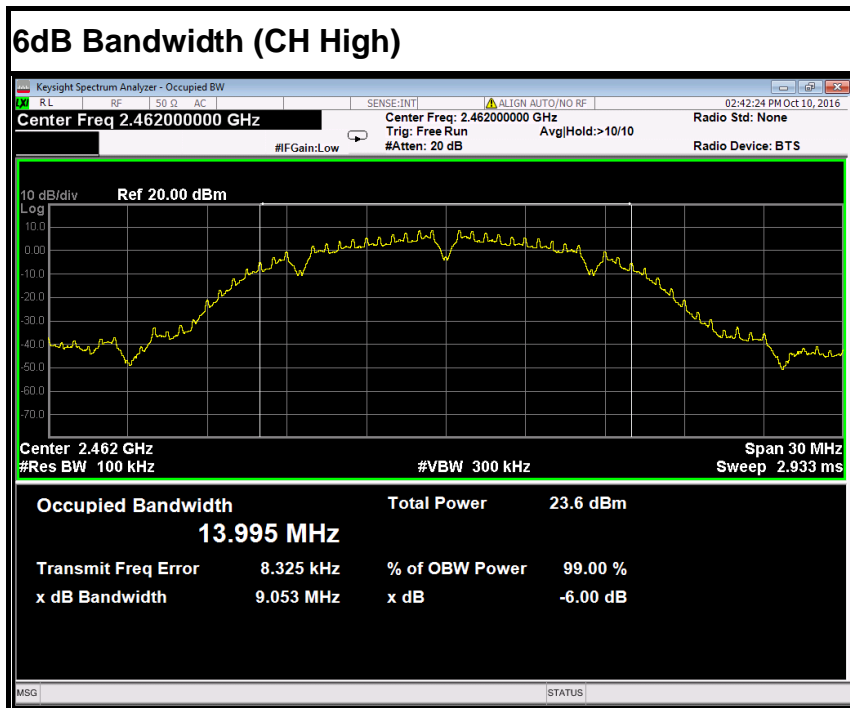
IEEE 802.11b mode

6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

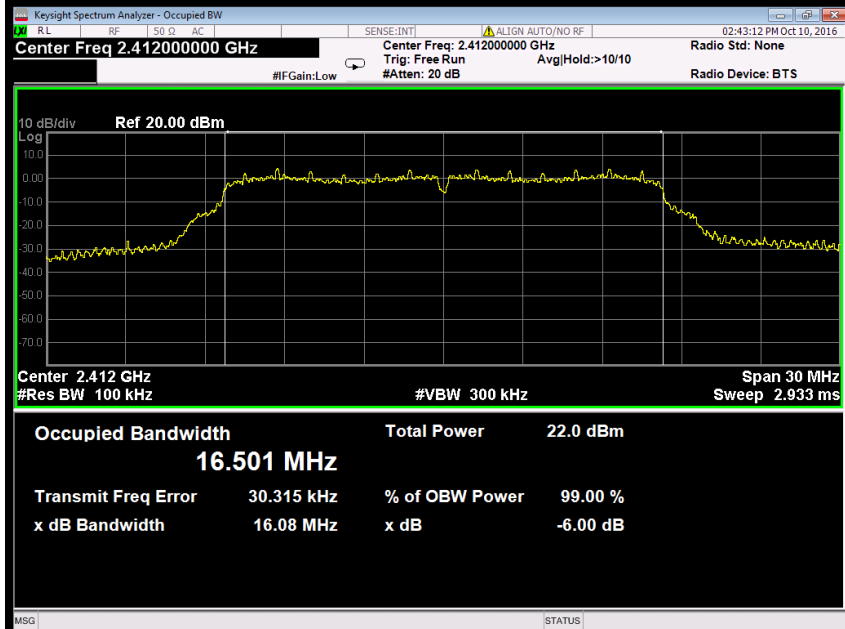




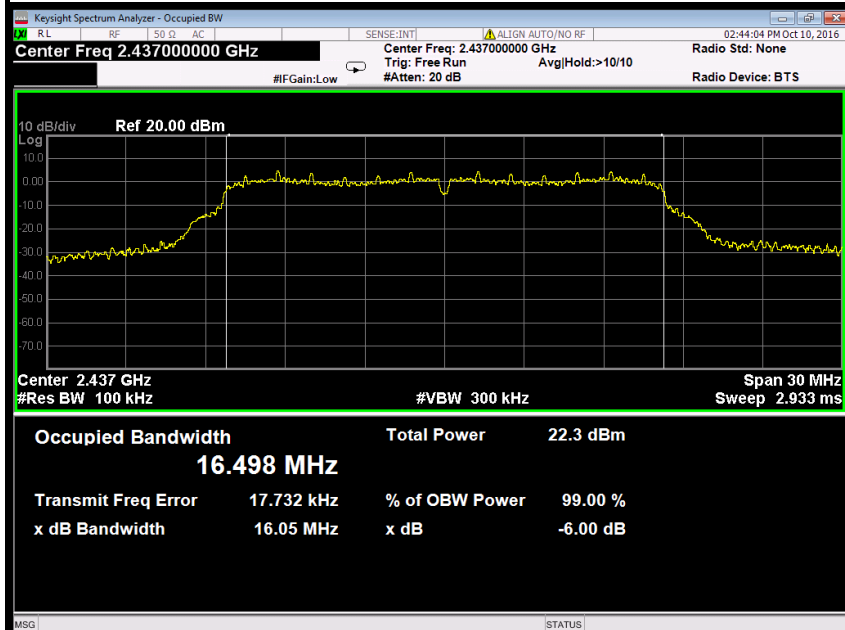


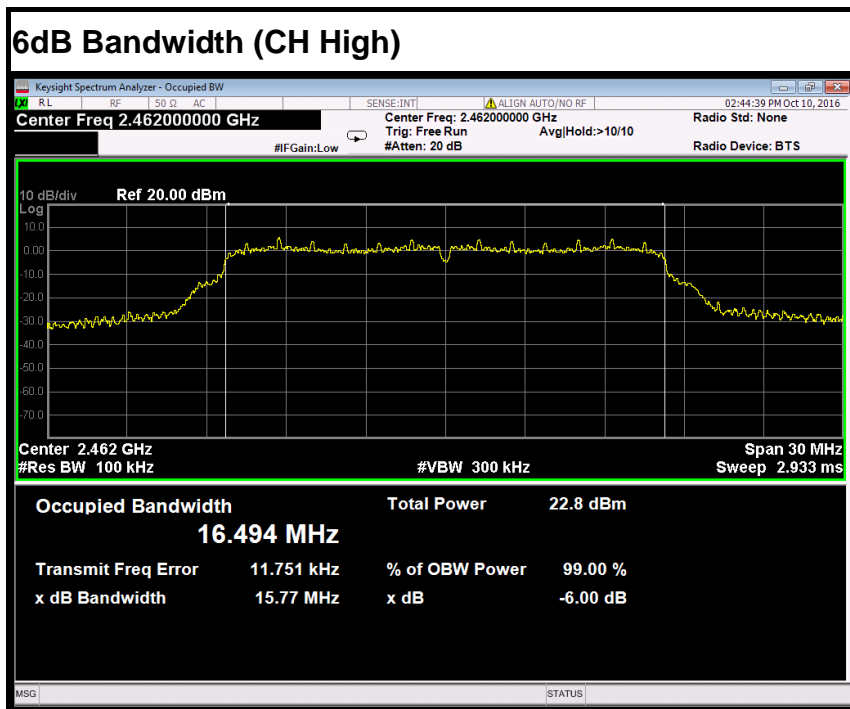
IEEE 802.11g mode

6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

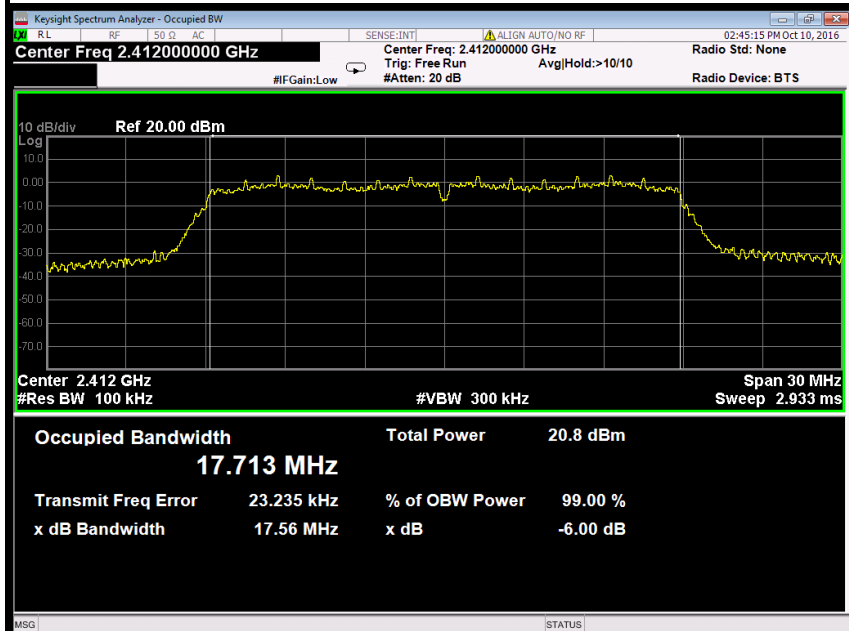




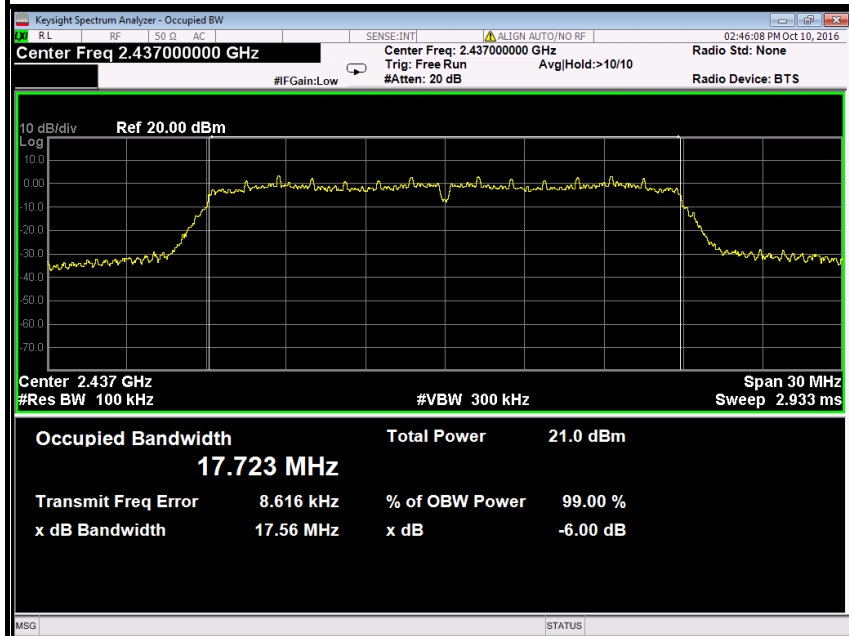


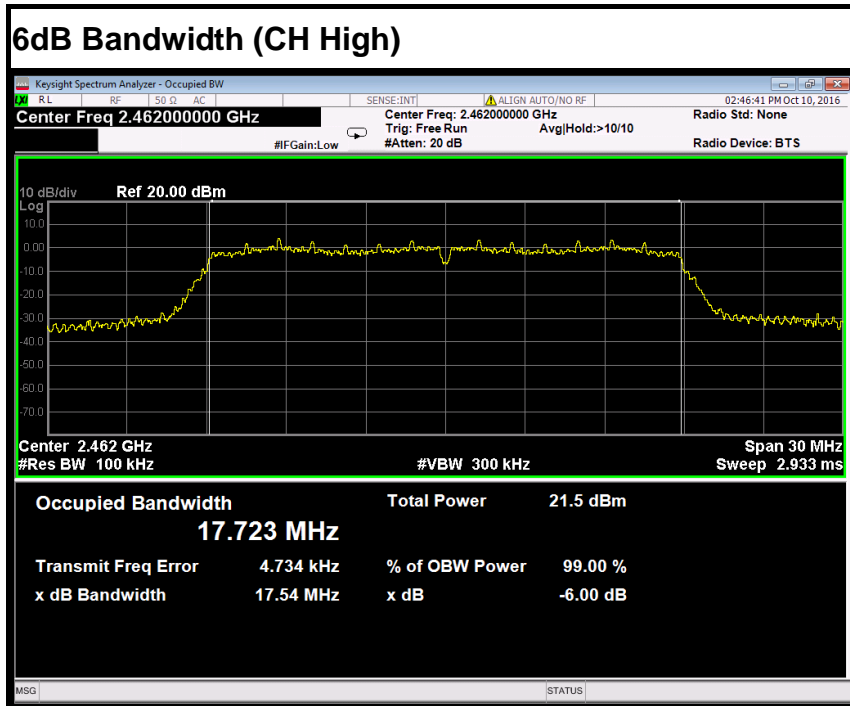
IEEE 802.11n HT20 MHz mode

6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)







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	
6 dBi	

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		6.90	7.22	7.60
Radiated power [dBm/MHz] Measured with DSSS modulation		9.87	9.98	10.17
Gain [dBi] Calculated		2.97	2.76	2.57
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 Meter	Anritsu	ML2495A	1204003	02/21/2016	02/20/2017
Power Sensor	Anritsu	MA2411B	1126150	02/21/2016	02/20/2017

7.5.3. TEST PROCEDURES (please refer to measurement standard)

9.1.1 $RBW \geq DTS$ bandwidth

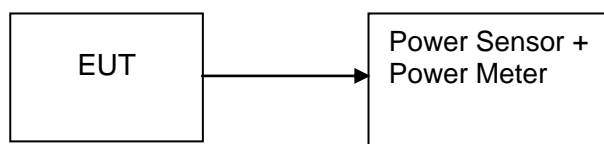
This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the *DTS bandwidth*.

- a) Set the $RBW \geq DTS$ bandwidth.
- b) Set $VBW \geq 3$ RBW.
- c) Set span $\geq 3 \times RBW$
- 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 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)	Peak / AVG	Limit (W)	Result
Low	2412	18.36	0.06855	Peak	1	PASS
Mid	2437	18.68	0.07379			PASS
High	2462	19.06	0.08054			PASS
Low	2412	16.22	0.04188	AVG	1	PASS
Mid	2437	16.50	0.04467			PASS
High	2462	16.85	0.04842			PASS

Test mode: IEEE 802.11g

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Peak / AVG	Limit (W)	Result
Low	2412	23.68	0.23335	Peak	1	PASS
Mid	2437	23.95	0.24831			PASS
High	2462	24.23	0.26485			PASS
Low	2412	15.20	0.03311	AVG	1	PASS
Mid	2437	15.87	0.03864			PASS
High	2462	16.03	0.04009			PASS

Test mode: IEEE 802.11n HT20 MHz

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Peak / AVG	Result
Low	2412	22.65	0.18408	1	Peak	PASS
Mid	2437	23.39	0.21827			PASS
High	2462	23.69	0.23388			PASS
Low	2412	14.15	0.02600	1	AVG	PASS
Mid	2437	14.49	0.02812			PASS
High	2462	14.95	0.03126			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 966(2)					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
PSA Series Spectrum Analyzer	Agilent	N9010A	MY55370330	02/21/2016	02/20/2017
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	02/21/2016	02/20/2017
Amplifier	EMEC	EM330	060661	03/18/2016	03/17/2017
High Noise Amplifier	Agilent	8449B	3008A01838	02/21/2016	02/20/2017
Loop Antenna	COM-POWER	AL-130	121044	09/25/2016	09/24/2017
Bilog Antenna	SCHAFFNER	CBL6143	5082	02/21/2016	02/20/2017
Horn Antenna	SCHWARZBECK	BBHA9120	D286	02/28/2016	02/27/2017
Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170-497	02/28/2016	02/27/2017
Turn Table	N/A	N/A	N/A	N.C.R	N.C.R
Antenna Tower	SUNOL	TLT2	N/A	N.C.R	N.C.R
Controller	Sunol Sciences	SC104V	022310-1	N.C.R	N.C.R
Controller	CT	N/A	N/A	N.C.R	N.C.R
Temp. / Humidity Meter	Anymetre	JR913	N/A	02/21/2016	02/20/2017
Test S/W	FARAD	LZ-RF / CCS-SZ-3A2			

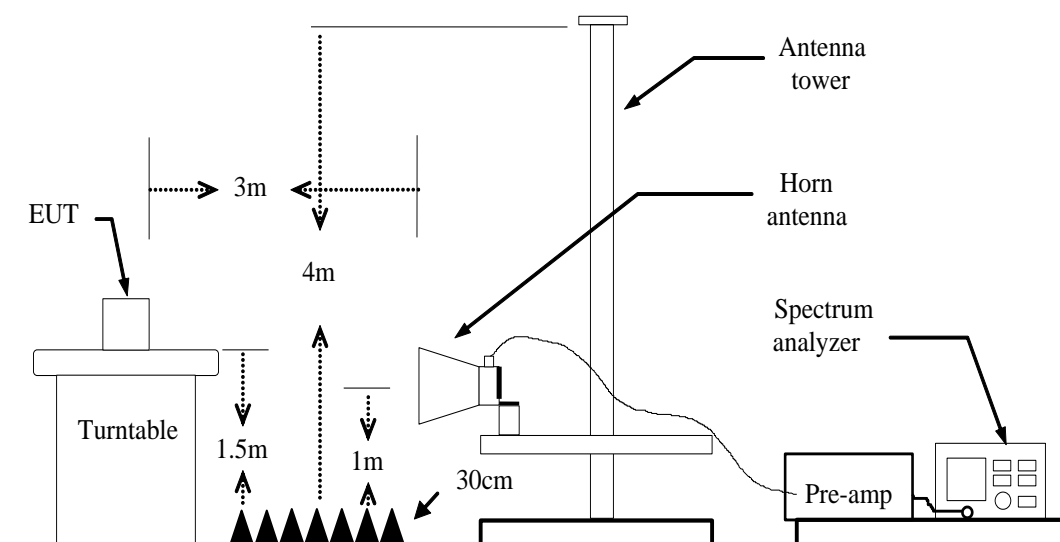
NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The FCC Site Registration number is 101879.
3. N.C.R = No Calibration Required.



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=3MHz / Sweep=AUTO
 - (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO / Detector=PEAK
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

7.6.4. TEST SETUP



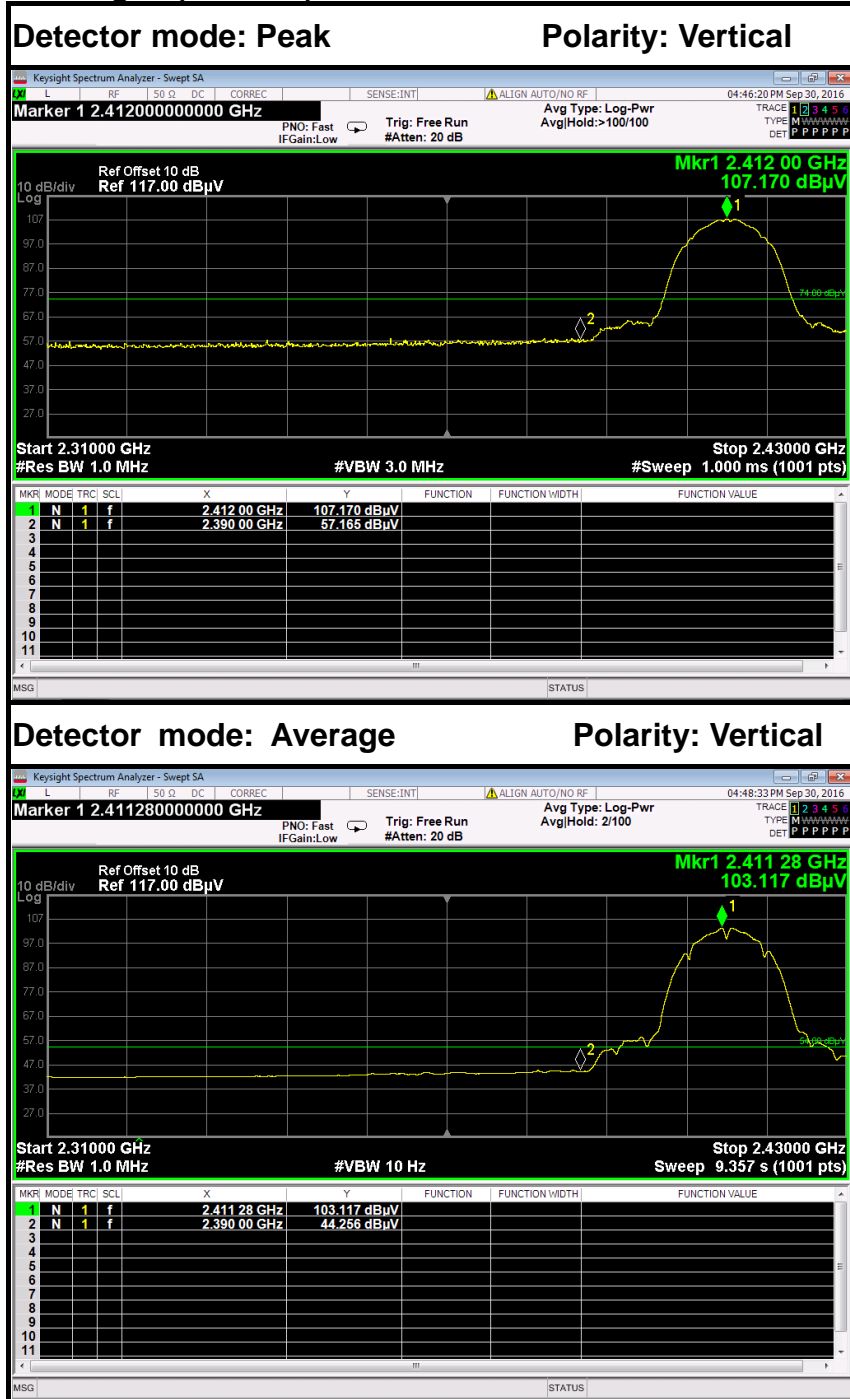


7.6.5. TEST RESULTS

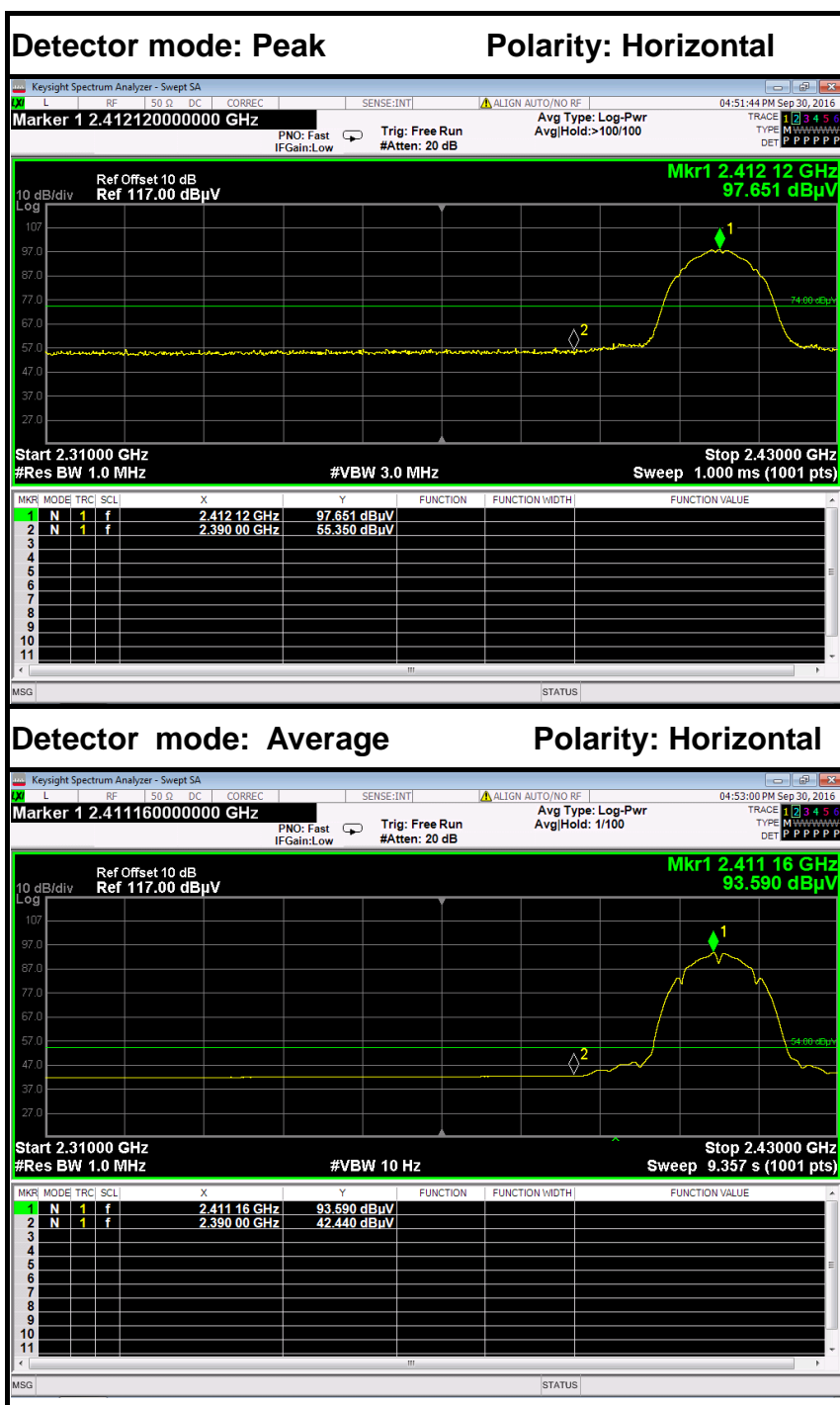
Test Plot

IEEE 802.11b mode

Band Edges (CH Low)



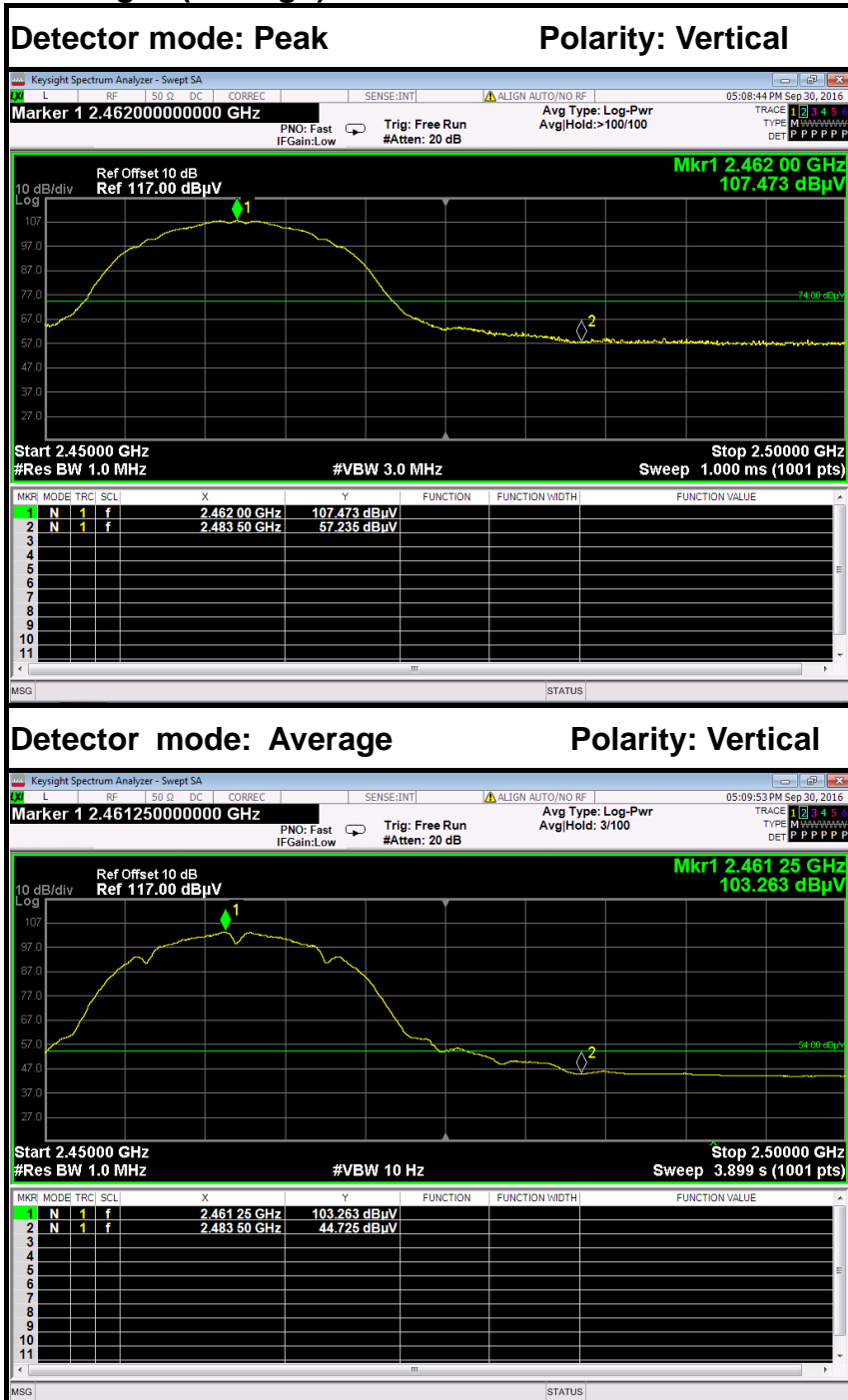
No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2390.0000	50.57	-6.60	57.17	74.00	-16.84	Peak	Vertical
2	2390.0000	37.66	-6.60	44.26	54.00	-9.74	Average	Vertical



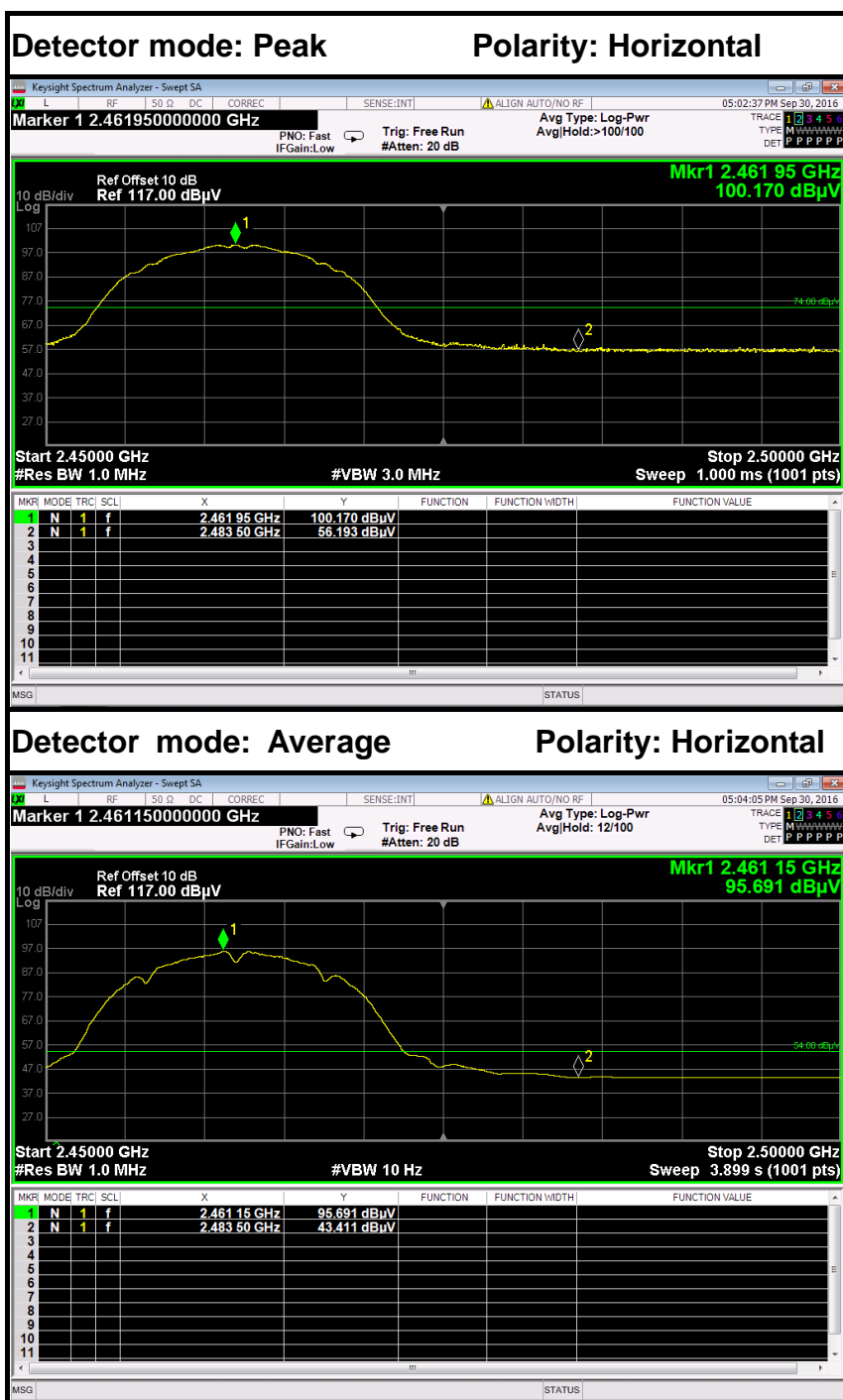
No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2390.0000	48.75	-6.60	55.35	74.00	-18.65	Peak	Horizontal
2	2390.0000	35.84	-6.60	42.44	54.00	-11.56	Average	Horizontal



Band Edges (CH High)



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2483.5000	51.00	-6.24	57.24	74.00	-16.77	Peak	Vertical
2	2483.5000	38.49	-6.24	44.73	54.00	-9.28	Average	Vertical

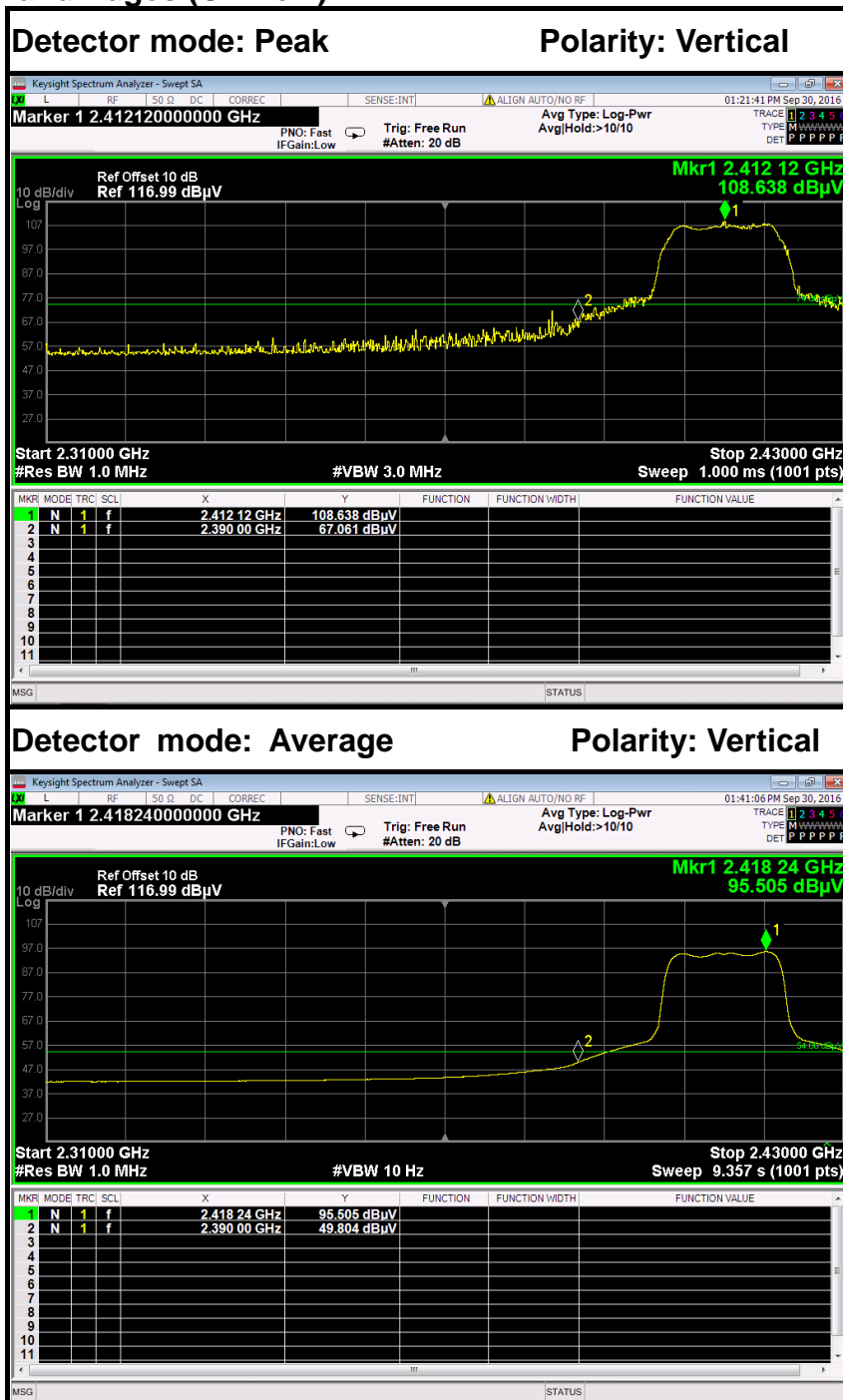


No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2483.5000	49.95	-6.24	56.19	74.00	-17.81	Peak	Horizontal
2	2483.5000	37.17	-6.24	43.41	54.00	-10.59	Average	Horizontal

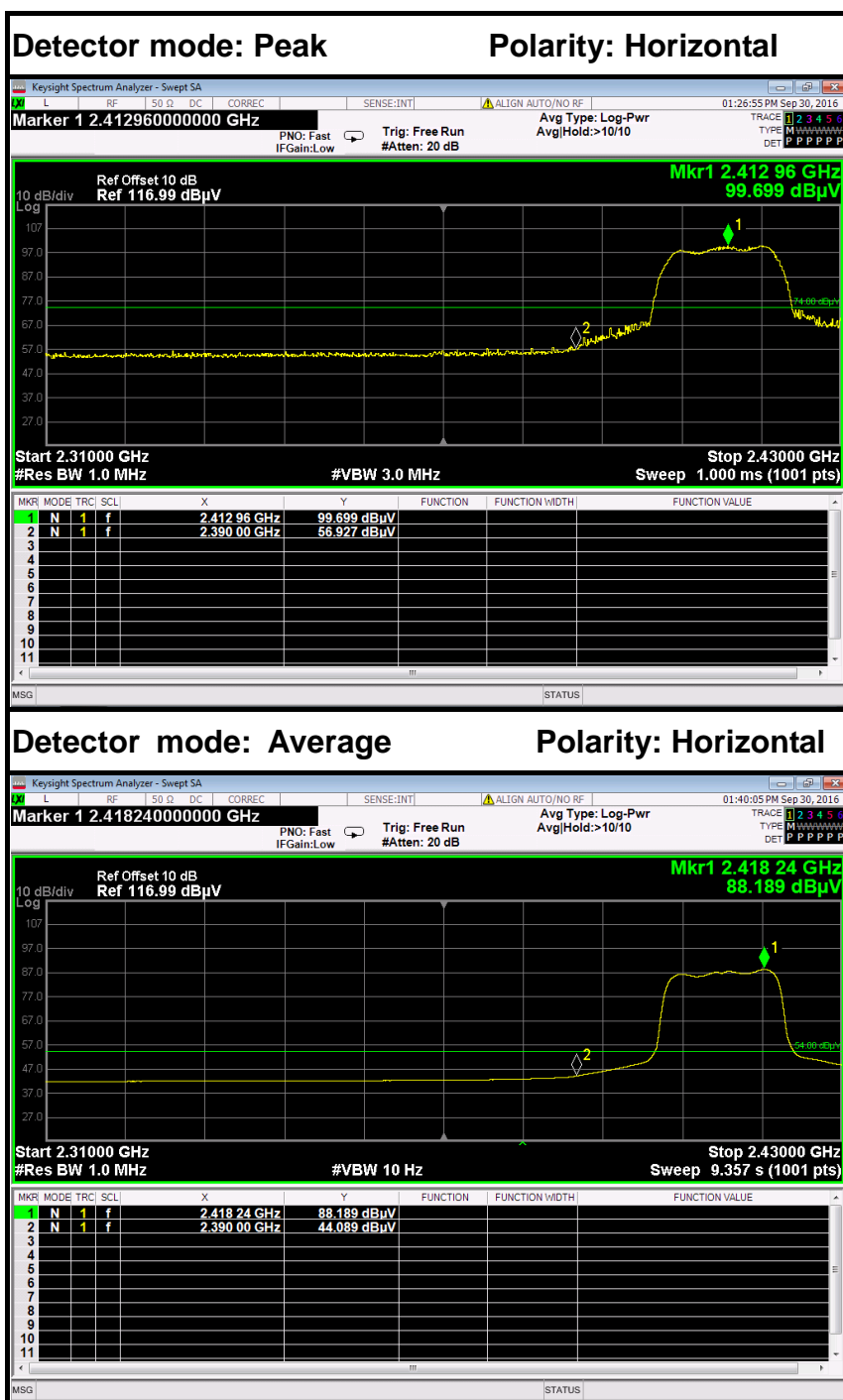


IEEE 802.11g mode

Band Edges (CH Low)



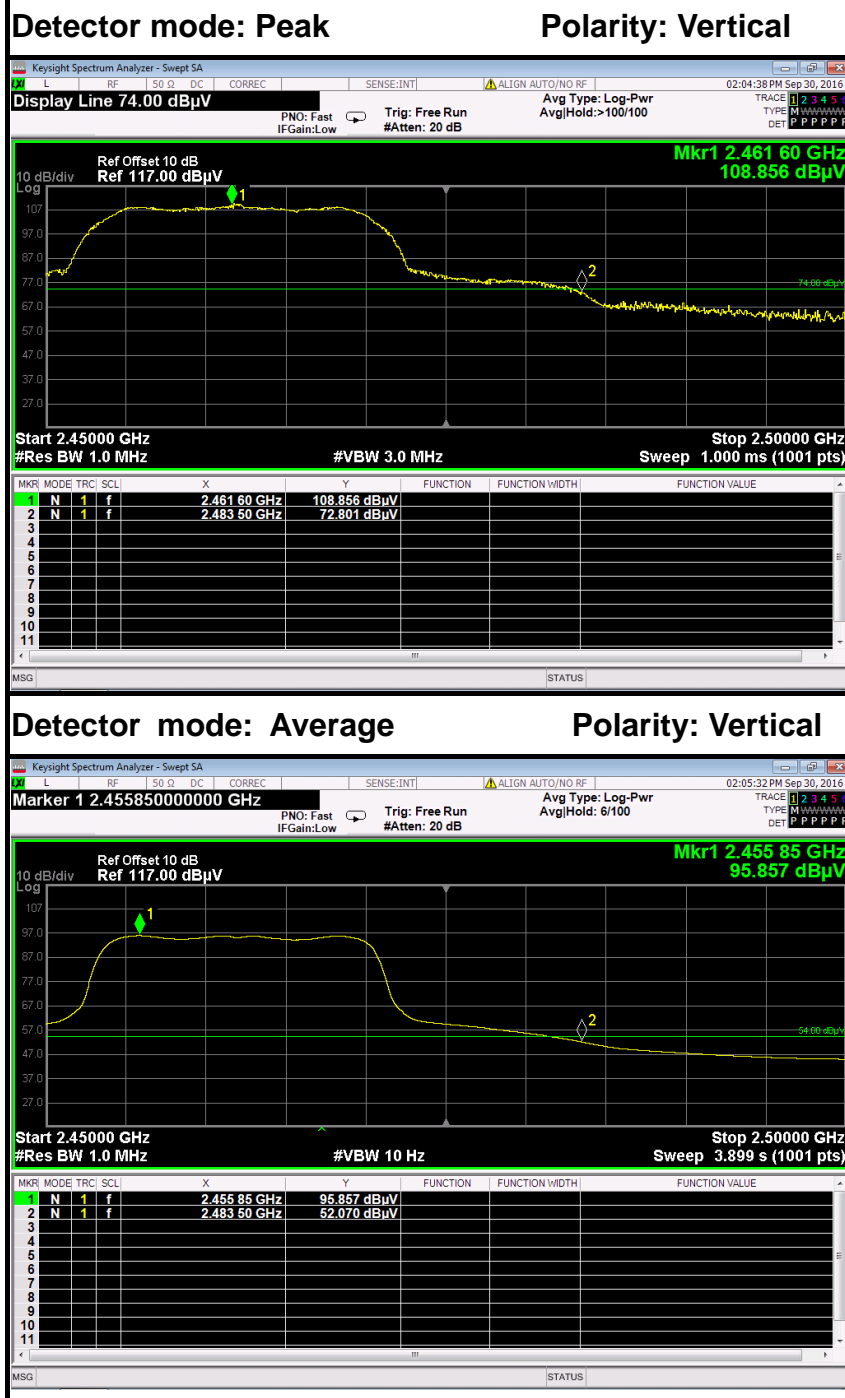
No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2390.0000	60.46	-6.60	67.06	74.00	-6.94	Peak	Vertical
2	2390.0000	43.20	-6.60	49.80	54.00	-4.20	Average	Vertical



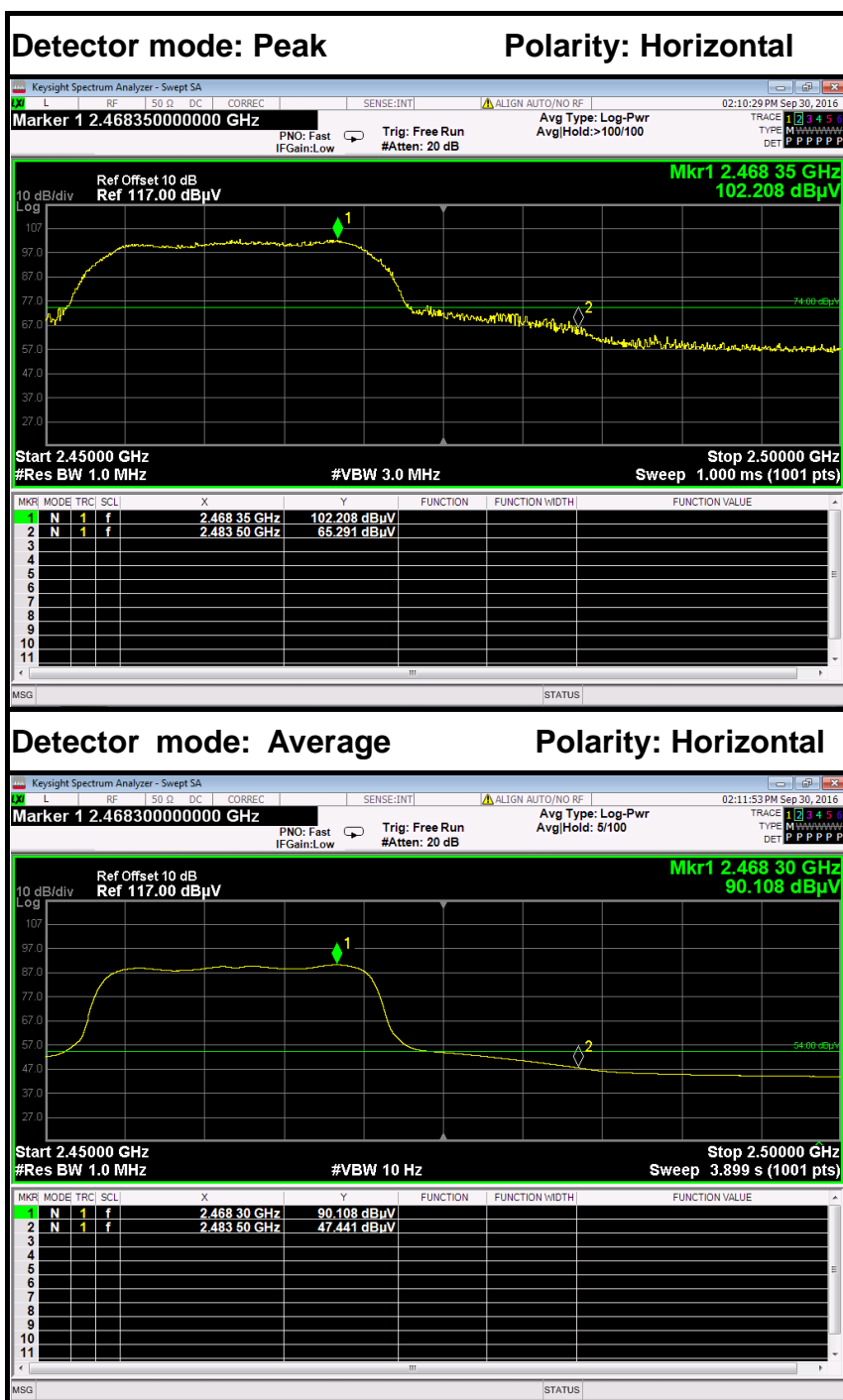
No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2390.0000	50.33	-6.60	56.93	74.00	-17.07	Peak	Horizontal
2	2390.0000	37.49	-6.60	44.09	54.00	-9.91	Average	Horizontal



Band Edges (CH High)



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2483.5000	66.56	-6.24	72.80	74.00	-1.20	Peak	Vertical
2	2483.5000	45.83	-6.24	52.07	54.00	-1.93	Average	Vertical

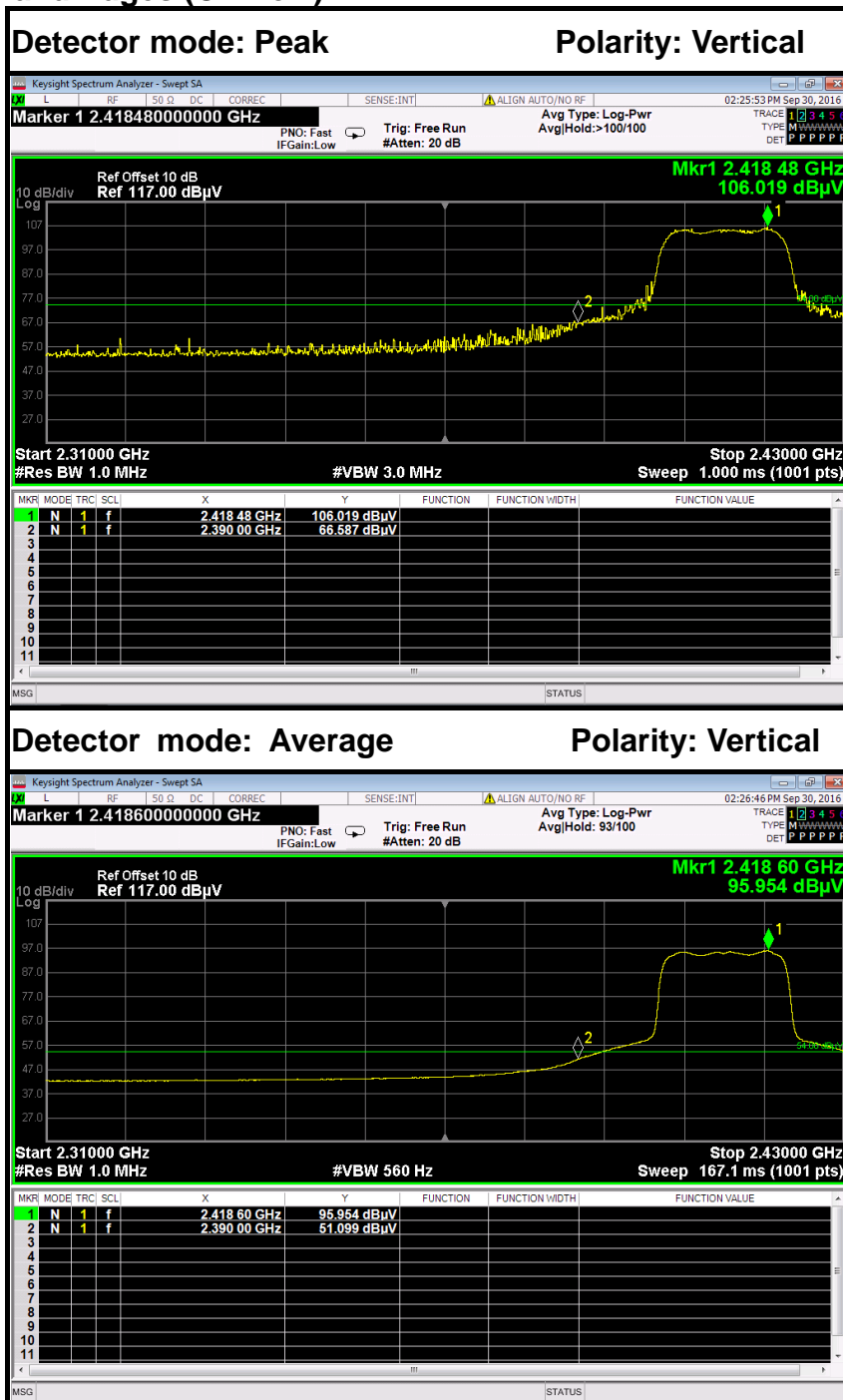


No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2483.5000	59.05	-6.24	65.29	74.00	-8.71	Peak	Horizontal
2	2483.5000	41.20	-6.24	47.44	54.00	-6.56	Average	Horizontal

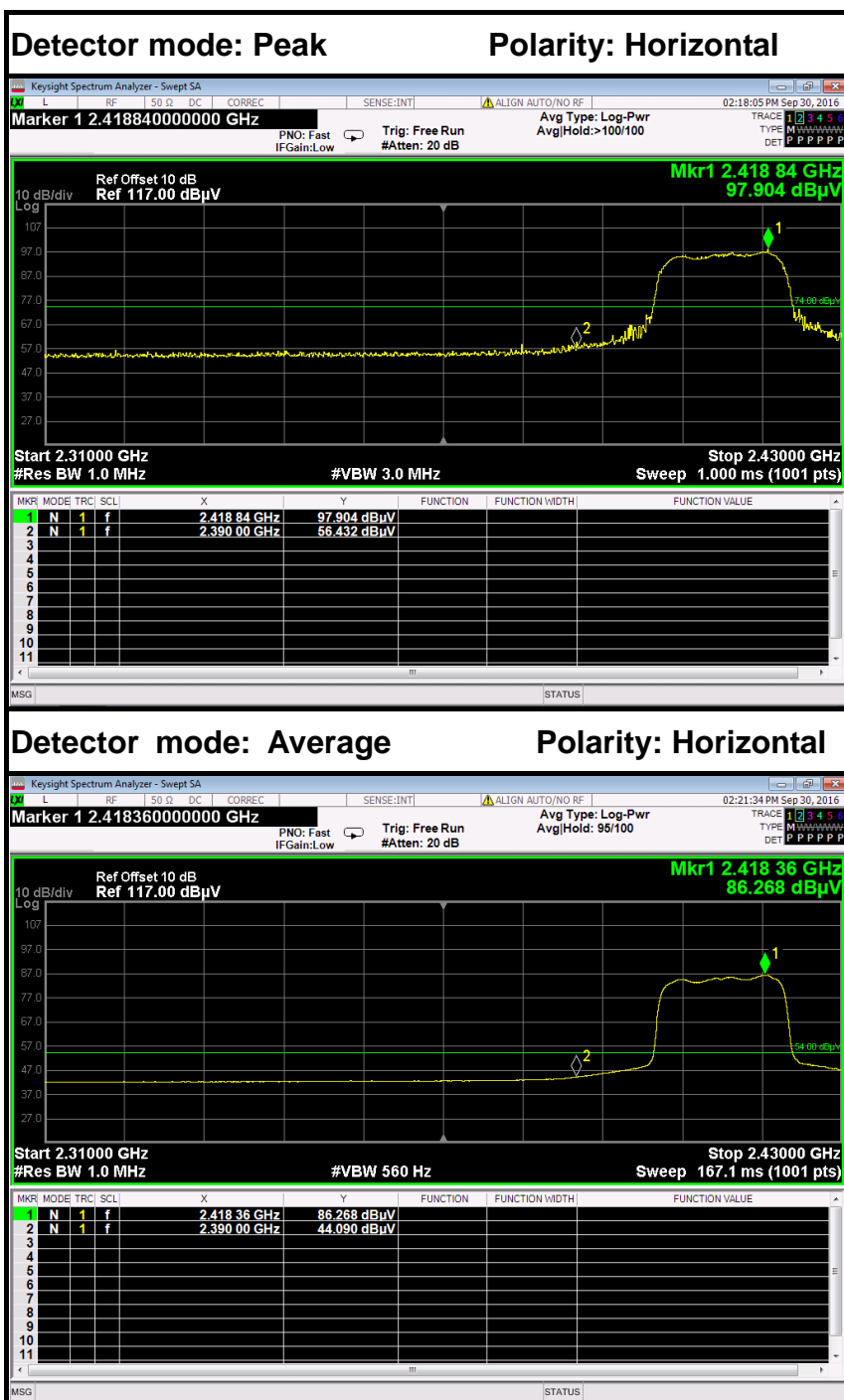


IEEE 802.11n HT20 MHz mode

Band Edges (CH Low)



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2390.0000	59.99	-6.60	66.59	74.00	-7.41	Peak	Vertical
2	2390.0000	44.50	-6.60	51.10	54.00	-2.90	Average	Vertical



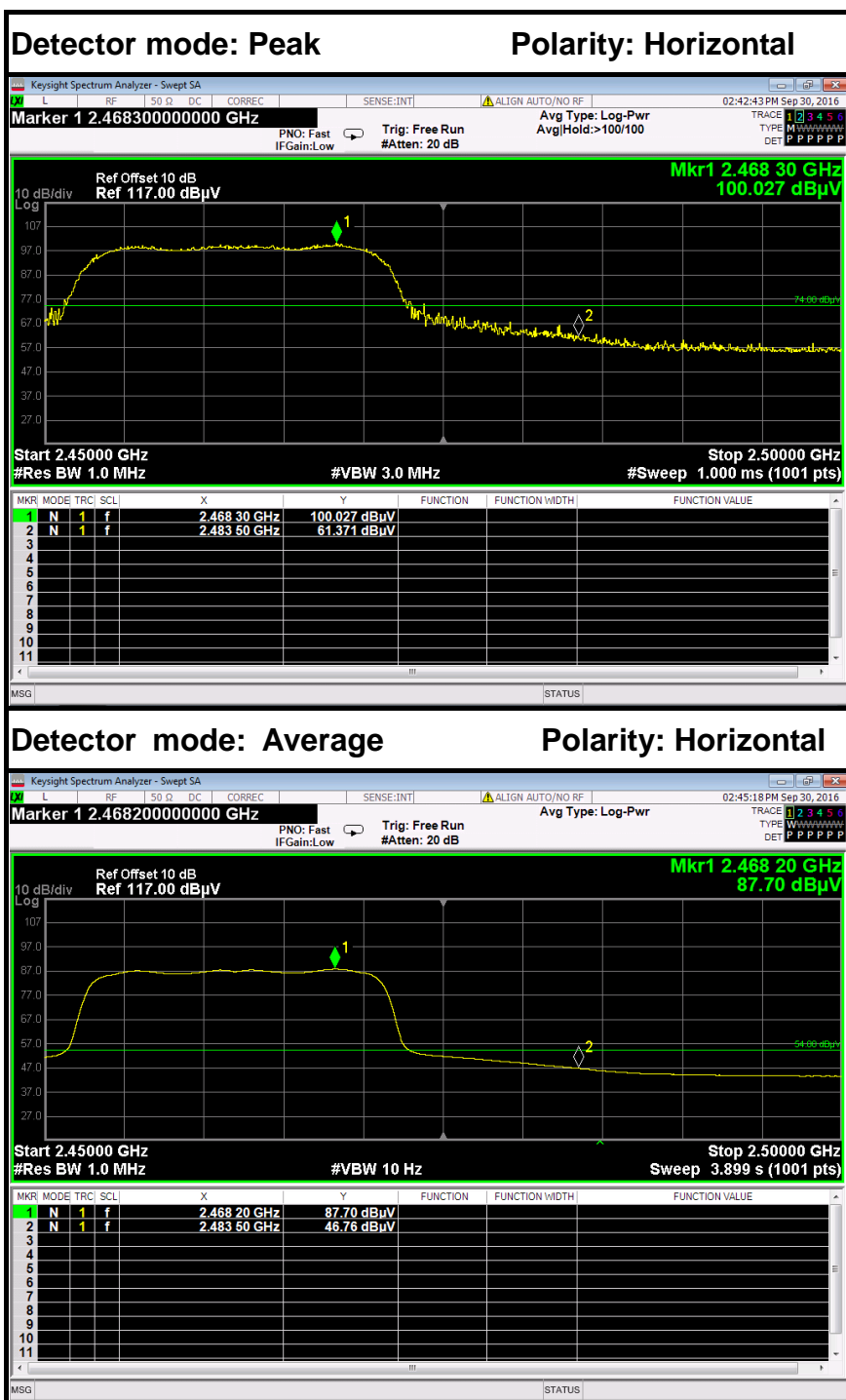
No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2390.0000	49.83	-6.60	56.43	74.00	-17.57	Peak	Horizontal
2	2390.0000	37.49	-6.60	44.09	54.00	-9.91	Average	Horizontal



Band Edges (CH High)



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2483.5000	65.19	-6.24	71.43	74.00	-2.57	Peak	Vertical
2	2483.5000	46.44	-6.24	52.68	54.00	-1.32	Average	Vertical



No.	Frequency (MHz)	Reading (dBμV)	Corrected (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Pole
1	2483.5000	55.13	-6.24	61.37	74.00	-12.63	Peak	Horizontal
2	2483.5000	40.52	-6.24	46.76	54.00	-7.24	Average	Horizontal



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
Spectrum Analyzer	Agilent	N9010A	MY52221469	02/21/2016	02/20/2017

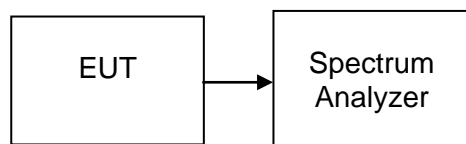
7.7.3. TEST PROCEDURES (please refer to measurement standard)

§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	-3.829	8	PASS
Mid	2437	-4.079		PASS
High	2462	-6.161		PASS

Test mode: IEEE 802.11g

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-9.302	8	PASS
Mid	2437	-8.638		PASS
High	2462	-8.318		PASS

Test mode: IEEE 802.11n HT20 MHz

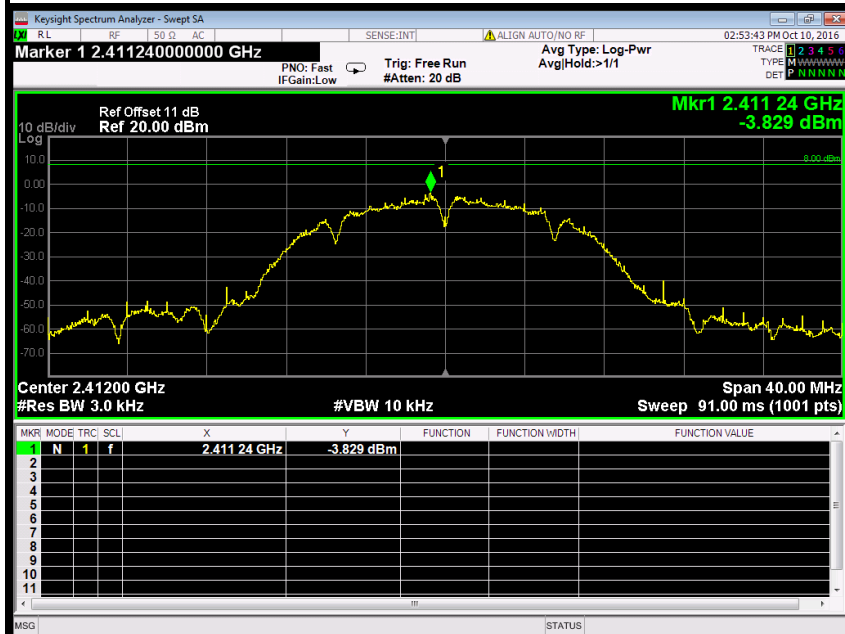
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-9.034	8	PASS
Mid	2437	-10.922		PASS
High	2462	-8.569		PASS



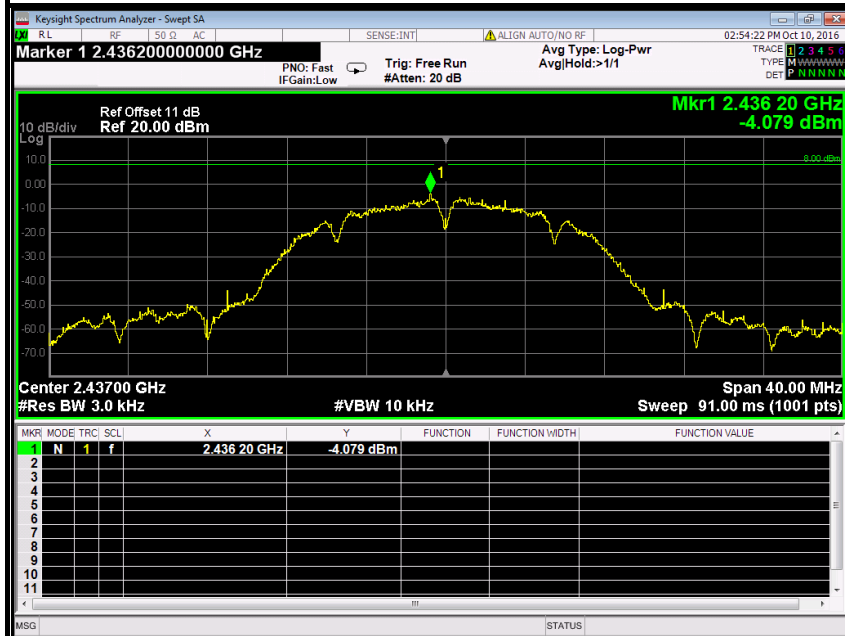
Test Plot

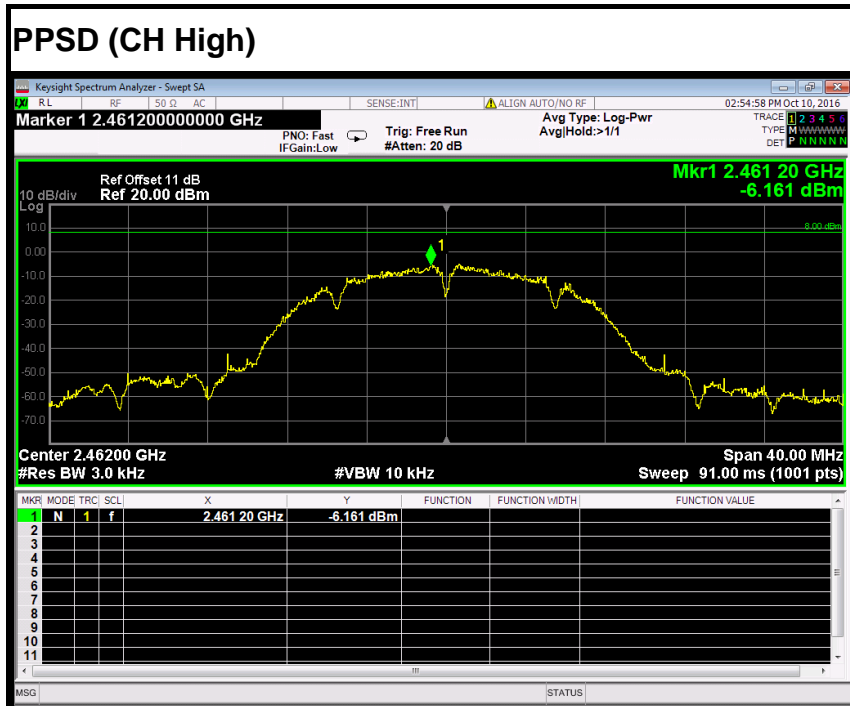
IEEE 802.11b mode

PPSD (CH Low)



PPSD (CH Mid)

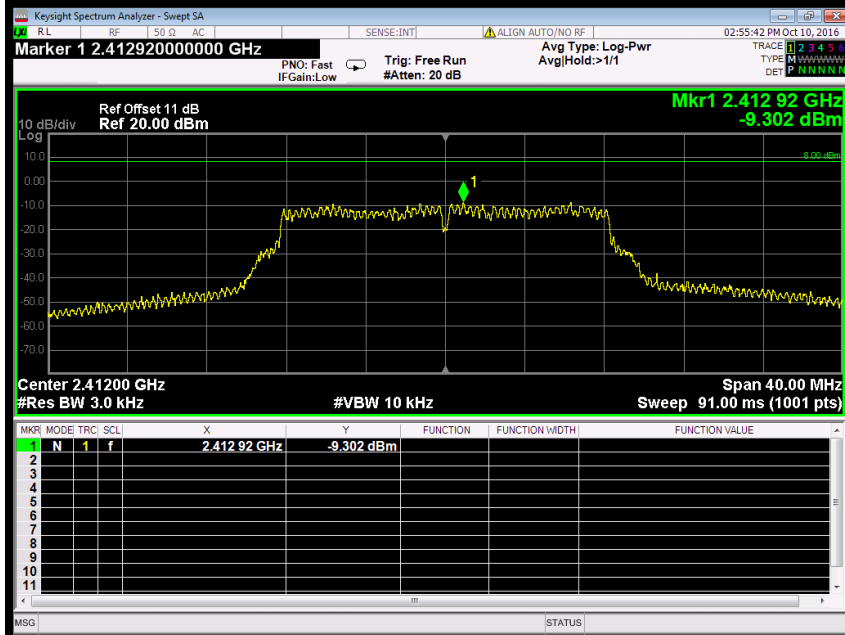




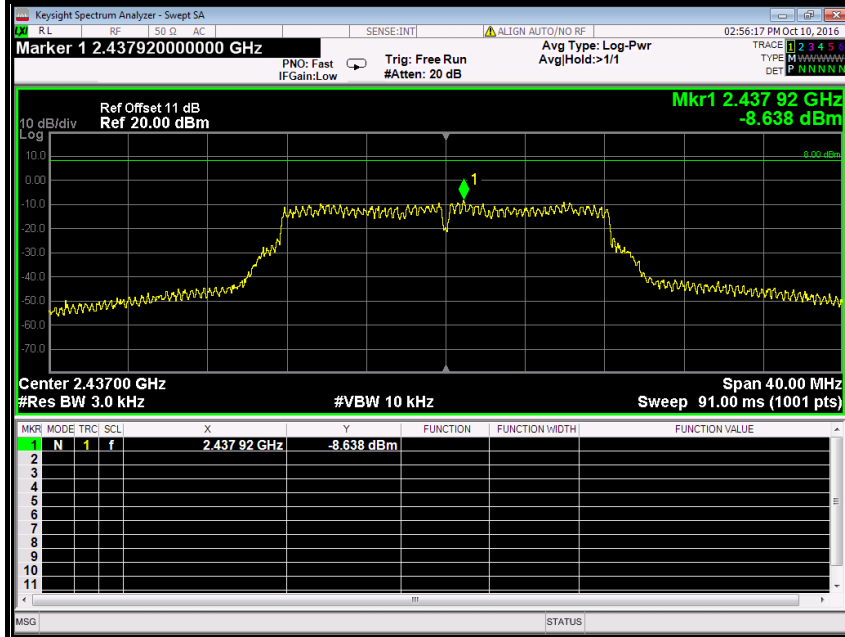


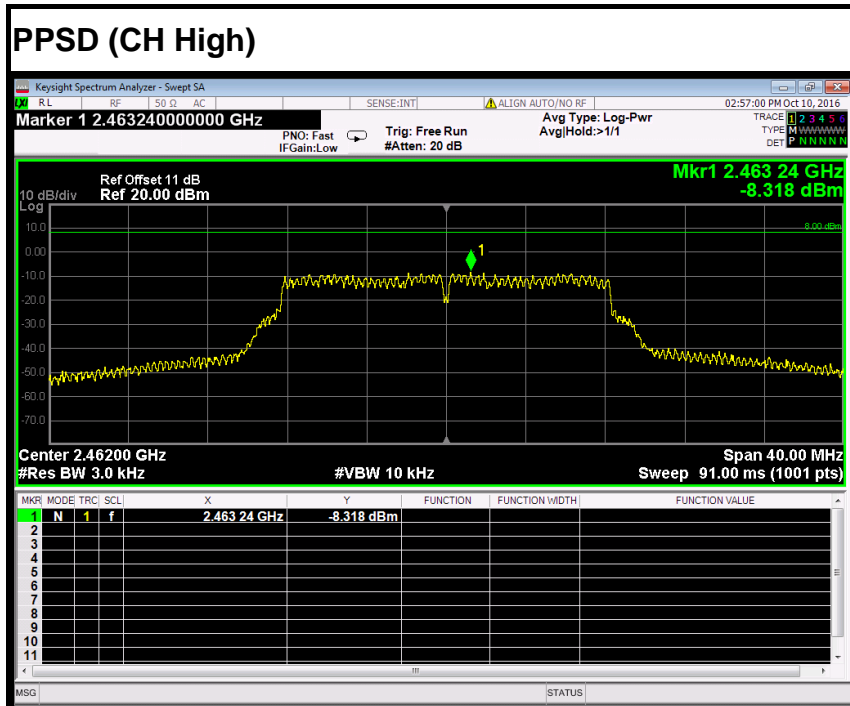
IEEE 802.11g mode

PPSD (CH Low)



PPSD (CH Mid)

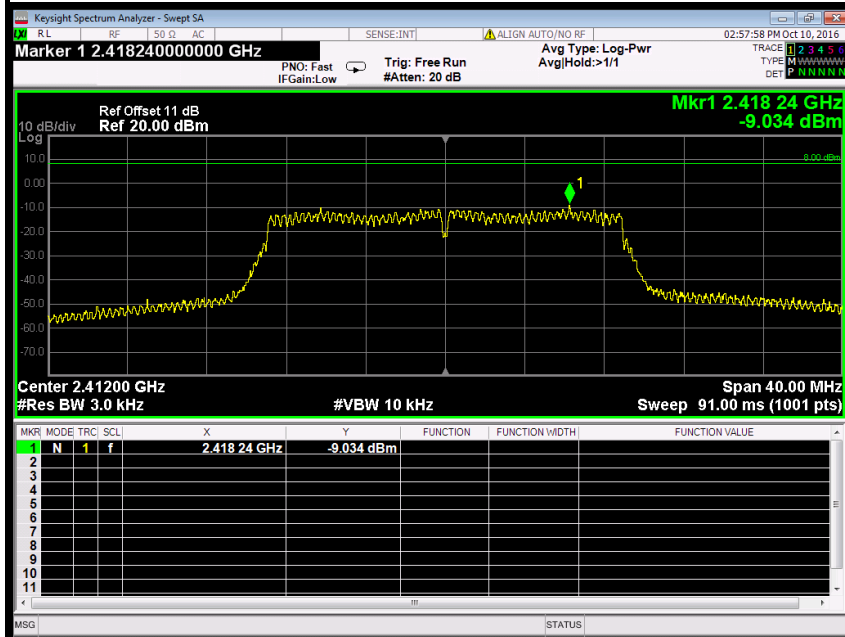






IEEE 802.11n HT20 MHz mode

PPSD (CH Low)



PPSD (CH Mid)

