



EMCE Engineering

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MEASUREMENT REPORT

FCC PART15.247 / ISED RSS-247 WLAN(802.11b/g/n(20MHz)) – 2.4GHz Band

Applicant Name: Stem Innovation, LLC dBa Iconoscope, LLC 21 G Street, Salt Lake City, UT 84102 USA	Date of Issue : 11/27/2017 Test Site/Location: EMCE ENGINEERING 1726 Ringwood Avenue, San Jose, CA 95131 USA Report No.: 4325-3 EMCE FRN: 0007198120
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FCC ID : IC :	YM780-9500 9637A-809500
Application Type:	Certification
Model:	80-9500
Additional FCC Model(s):	N/A
EUT Type:	IP Camera
Max. RF Output Power:	Wi-Fi 802.11b (15.61 dBm) 36.39 mW Wi-Fi 802.11g (15.71 dBm) 37.23 mW Wi-Fi 802.11n (10.03 dBm) 10.06 mW
Frequency Range:	2412 MHz - 2462 MHz
Modulation type	CCK/DSSS/OFDM
FCC Classification:	Digital Transmission System(DTS)
FCC Rule Part(s): ISED Rule Part(s):	Part 15.247 RSS-247 Issue 2(Feb. 2017) / RSS-GEN Issue 4 (Nov. 2014)
Test Procedure(s):	ANSI C63.10-2013

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this Equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. **EMCE Engineering** Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a)

Report prepared by
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Approved by
: Bob Cole
President
EMCE Engineering

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FCC PT.15.247 TEST REPORT	FCC Part 15.247 WLAN(802.11b/g/n(20MHz)) – 2.4GHz Test Report		FCC ID : YM780-9500
Test Report No. 4325-2	Date of Issue: 11/27/2017	EUT : IP Camera	IC : 9637A-809500

Version

TEST REPORT NO.	DATE	DESCRIPTION
4325-2	11/27/2017	- First Approval Report

FCC PT.15.247 TEST REPORT	FCC Part 15.247 WLAN(802.11b/g/n(20MHz)) – 2.4GHz Test Report		FCC ID : YM780-9500
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1. GENERAL INFORMATION

Applicant	Stem Innovation, LLC dBa Iconoscope, LLC
Applicant Address	21 G Street, Salt Lake City, UT 84102 USA
FCC ID	YM780-9500
IC	9637A-809500
EUT Type	IP Camera
Model name(s)	80-9500
Additional Model name(s):	N/A
Date(s) of Tests:	07/10/2017 – 10/20/2017
Place of Tests:	EMCE ENGINEERING 1726 Ringwood Avenue, San Jose, CA 95131 USA

2. EUT DESCRIPTION

EUT Type	IP Camera	
Model Name	80-9500	
Additional Model Name(s)	N/A	
Power Supply	5 VDC	
Battery type	Li-ion Battery(Standard)	
Frequency Range(TX/RX)	2412 MHz - 2462 MHz (2.4 GHz Band – 20 MHz)	
Max. RF Output Power	Peak	Wi-Fi 802.11b (15.61 dBm) 36.39 mW Wi-Fi 802.11g (15.71 dBm) 37.23 mW Wi-Fi 802.11n (10.03 dBm) 10.06 mW
Modulation Type	DSSS/CCK(802.11b), OFDM(802.11g, 802.11n)	
Antenna Specification	Manufacturer: MOLEX Antenna type: 2.4 / 5 GHz Balance Flex Antenna 1461530100 Peak Gain : 3.2 dBi (2.4 GHz Band), 4.75 dBi (5.8 GHz Band)	

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3. TEST METHODOLOGY

FCC KDB 558074 D01 DTS Meas. Guidance v4 dated April 04, 2017 entitled “Guidance for Performing Compliance Measurements on Digital Transmission Systems(DTS) and the measurement procedure described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013) Operating Under §15.247” were used in the measurement.

3.1 EUT CONFIGURATION

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

3.2 EUT EXERCISE

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

3.3 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.3.1 of ANSI C63.10 – 2013. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane for the range of .009 – 1000 MHz, 1.5 Meters above the ground plane for measurements >1000 MHz. According to the requirements in Section 6.3.1 of ANSI C63.10 – 2013. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in ANSI C63.10. - 2013

Conducted Antenna Terminal

See Section from 9.1 to 9.2.(558074 D01 DTS Meas Guidance v04)

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3.4 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Channel low, mid and high with highest data rate (worst case) is chosen for full testing.

4. INSTRUMENT CALIBRATION

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

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

The SAC (Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 1726 Ringwood Ave. San Jose, CA 95131 USA. The site is constructed in conformance with the requirements of ANSI C63.4 - 2014) and CISPR Publication 22. Detailed description of test facility was submitted to the NVLAP, designated US0125.

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

6. ANTENNA REQUIREMENTS

According to FCC 47 CFR §15.203:

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

* The antennas of this E.U.T use a uFL connector and are inaccessible to the end user.

*The E.U.T Complies with the requirement of §15.203

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7. SUMMARY TEST OF RESULTS

[FCC Part]

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
6 dB Bandwidth	§15.247(a)(2)	> 500 kHz	CONDUCTED	PASS
Conducted Maximum Peak Output Power	§15.247(b)(3)	< 1 Watt		PASS
Power Spectral Density	§15.247(e)	< 8 dBm / 3 kHz Band		PASS
Band Edge (Out of Band Emissions)	§15.247(d)	Conducted < 20 dBc		PASS
AC Power line Conducted Emissions	§15.207	cf. Section 9.8		N/A
Radiated Spurious Emissions	§15.205, 15.209	cf. Section 9.7.1	RADIATED	PASS
Radiated Restricted Band Edge	§15.247(d), 15.205, 15.209	cf. Section 9.7.2		PASS

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[ISED Part]

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
6 dB Bandwidth	RSS-247, 5.2	> 500 kHz	CONDUCTED	PASS
99% Bandwidth	RSS-Gen, 6.6	N/A		N/A
Conducted Maximum Peak Output Power and e.i.r.p.	RSS-247, 5.4.d.	< 1 Watt < 4 Watt(e.i.r.p.)		PASS
Power Spectral Density	RSS-247, 5.2	< 8 dBm / 3 kHz Band		PASS
Band Edge (Out of Band Emissions)	RSS-247, 5.5	Conducted < 20 dBc		PASS
AC Power line Conducted Emissions	RSS-Gen, 8.8	cf. Section 8.7		N/A
Radiated Spurious Emissions	RSS-Gen, 8.9	RSS-Gen Section 8.9 table 4,5	RADIATED	PASS
Radiated Restricted Band Edge	RSS-Gen, 8.10	RSS-Gen Section 8.10 table 6		PASS

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8. TEST RESULT

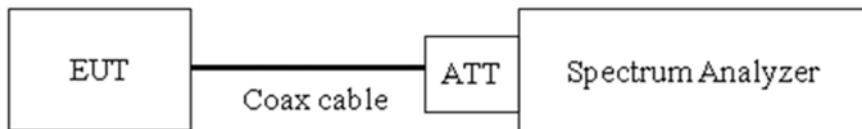
8.1 6dB BANDWIDTH (802.11 b/g/n)

Test Requirements and limit, §15.247(a)(2)

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

The 6dB bandwidth limit is </= 500 kHz.

■ TEST CONFIGURATION



■ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer.

The Spectrum Analyzer is set to (Page 5 in KDB 558074, issued 04/09/2013)

RBW = 100 kHz

VBW \geq 3 x RBW

Detector = Peak

Trace mode = max hold

Sweep = auto couple

Allow the trace to stabilize

Note : 6 dB bandwidth tested using the automatic bandwidth measurement capability of a spectrum analyzer. X dB is set 6 dB.

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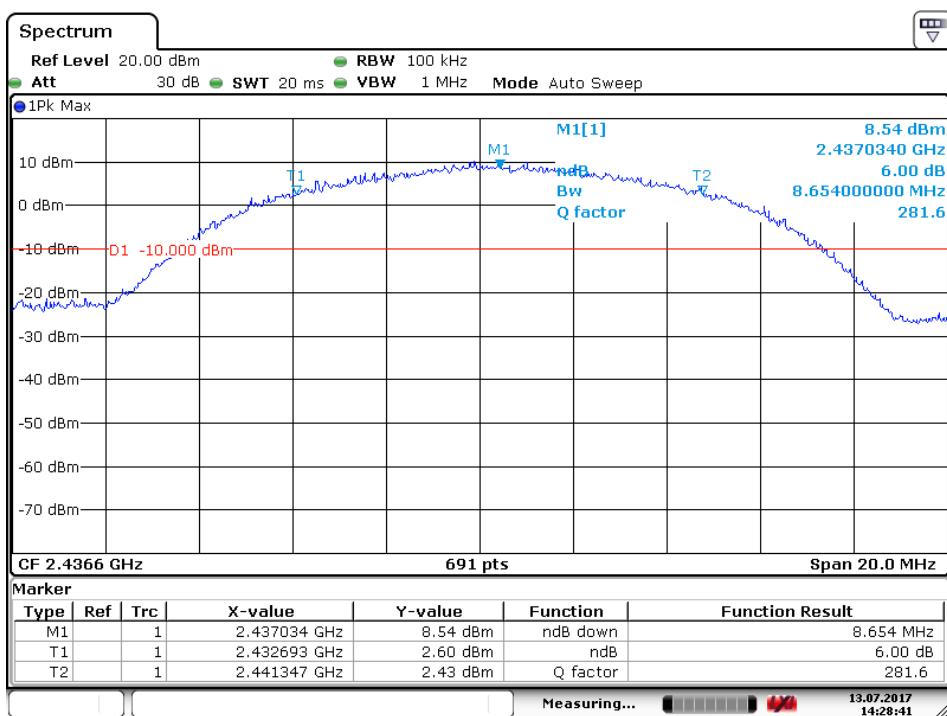
TEST RESULTS

Note : In order to simplify the report, worst case plots for each mode are shown.

2.4 GHz Band

Conducted 6dB Bandwidth Measurements for 802.11b

802.11b Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	8.425	0.500	Pass
2437	6	8.654	0.500	Pass
2462	11	8.584	0.500	Pass

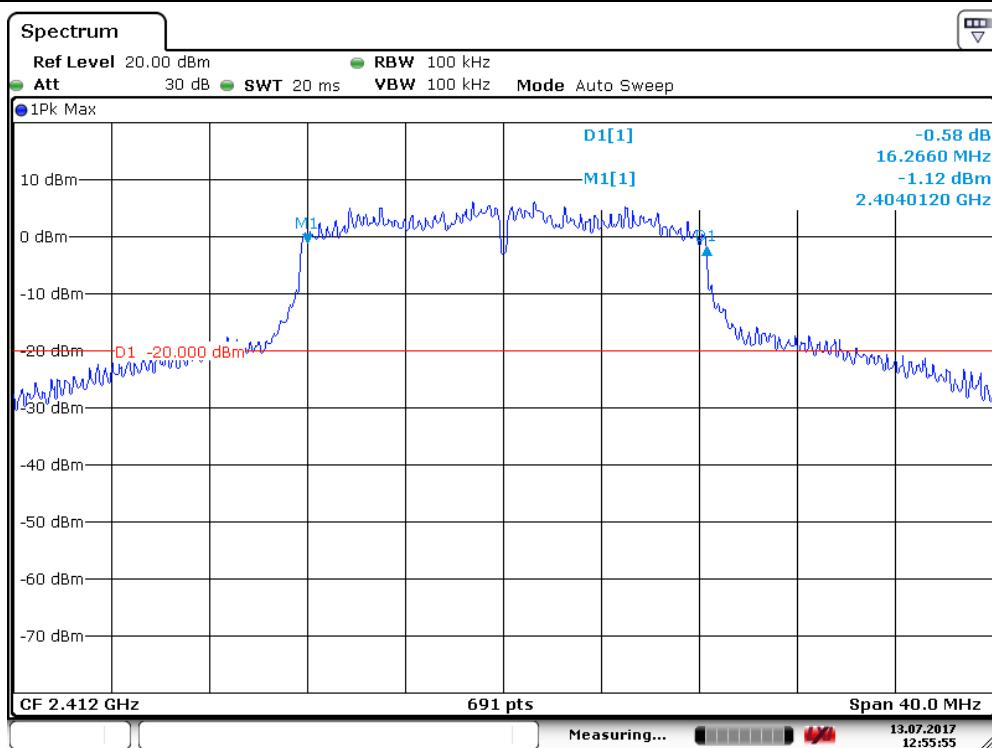


Date: 13 JUL 2017 14:28:42

FCC PT.15.247 TEST REPORT	FCC Part 15.247 WLAN(802.11b/g/n(20MHz)) – 2.4GHz Test Report		FCC ID : YM780-9500
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Conducted 6dB Bandwidth Measurements for 802.11g

802.11g Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	16.226	0.500	Pass
2437	6	16.216	0.500	Pass
2462	11	16.211	0.500	Pass

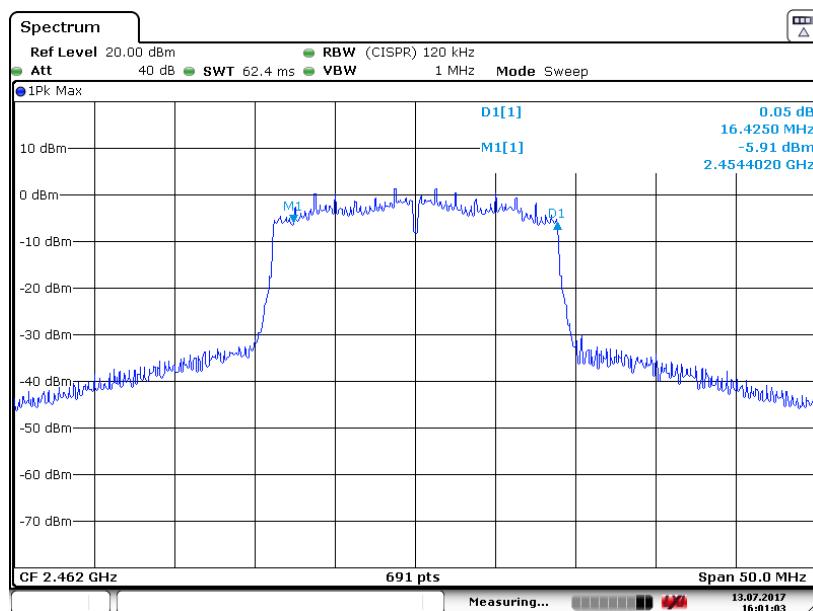


Date: 13 JUL 2017 12:55:55

FCC PT.15.247 TEST REPORT	FCC Part 15.247 WLAN(802.11b/g/n(20MHz)) – 2.4GHz Test Report	FCC ID : YM780-9500
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Conducted 6dB Bandwidth Measurements for 802.11n 20 MHz BW

802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	16.379	0.500	Pass
2437	6	16.324	0.500	Pass
2462	11	16.425	0.500	Pass



Date: 13 JUL 2017 16:01:03

FCC PT.15.247 TEST REPORT	FCC Part 15.247 WLAN(802.11b/g/n(20MHz)) – 2.4GHz Test Report		FCC ID : YM780-9500
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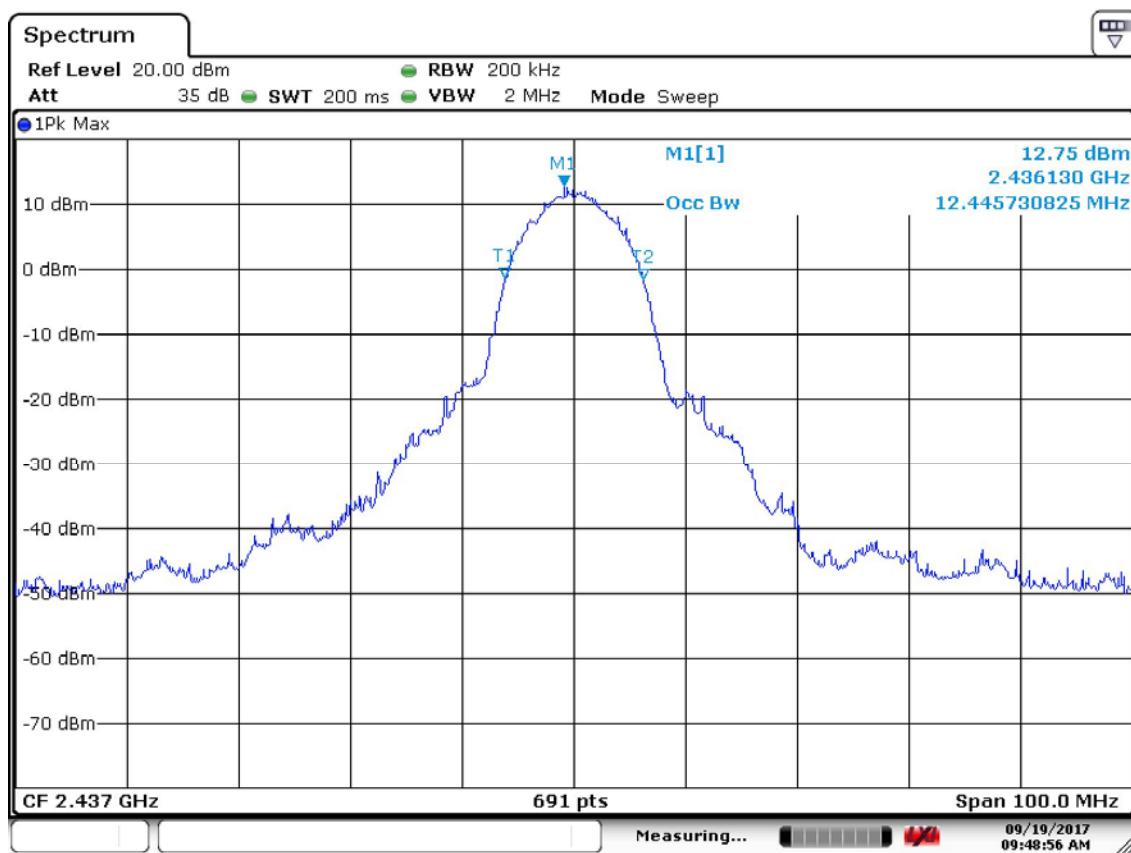
TEST RESULTS

Note : In order to simplify the report, worst case plots for each mode are shown.

2.4 GHz Band

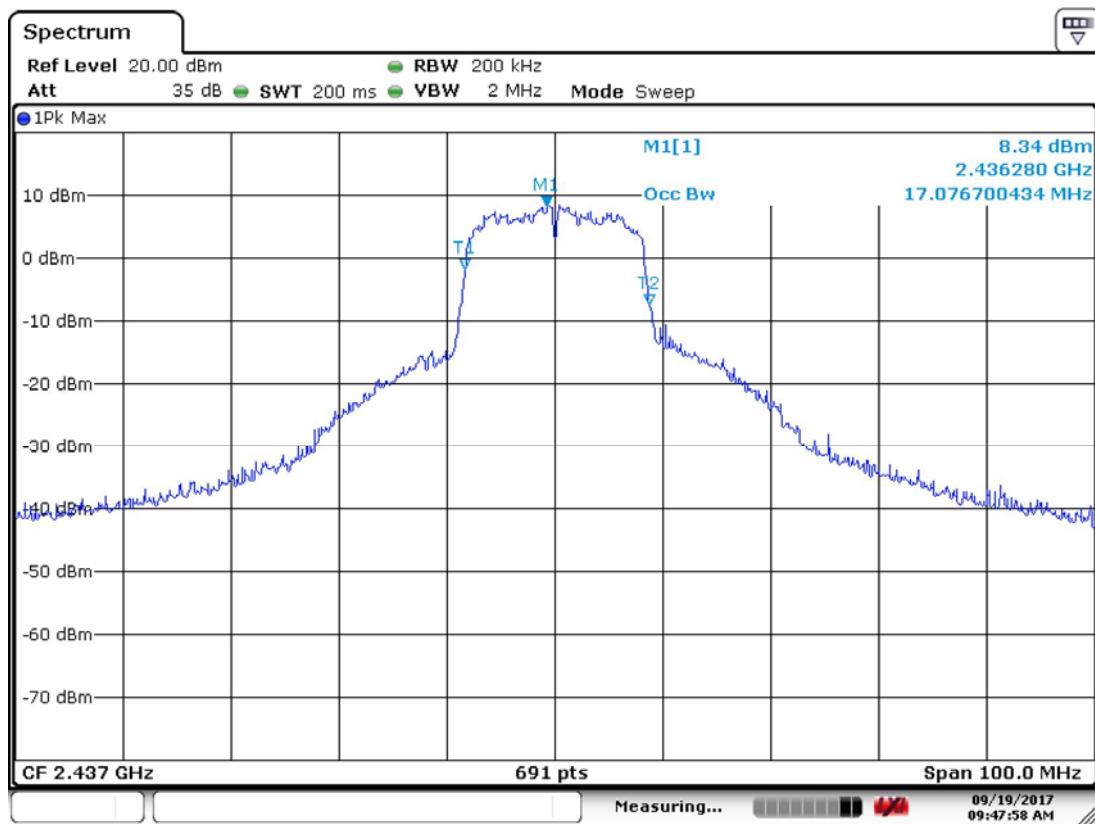
Conducted 99% Bandwidth Measurements

		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	mode			
2437	802.11b	12.4457	-	-
2437	802.11g	17.0767	-	-
2437	802.11n	18.0897	-	-

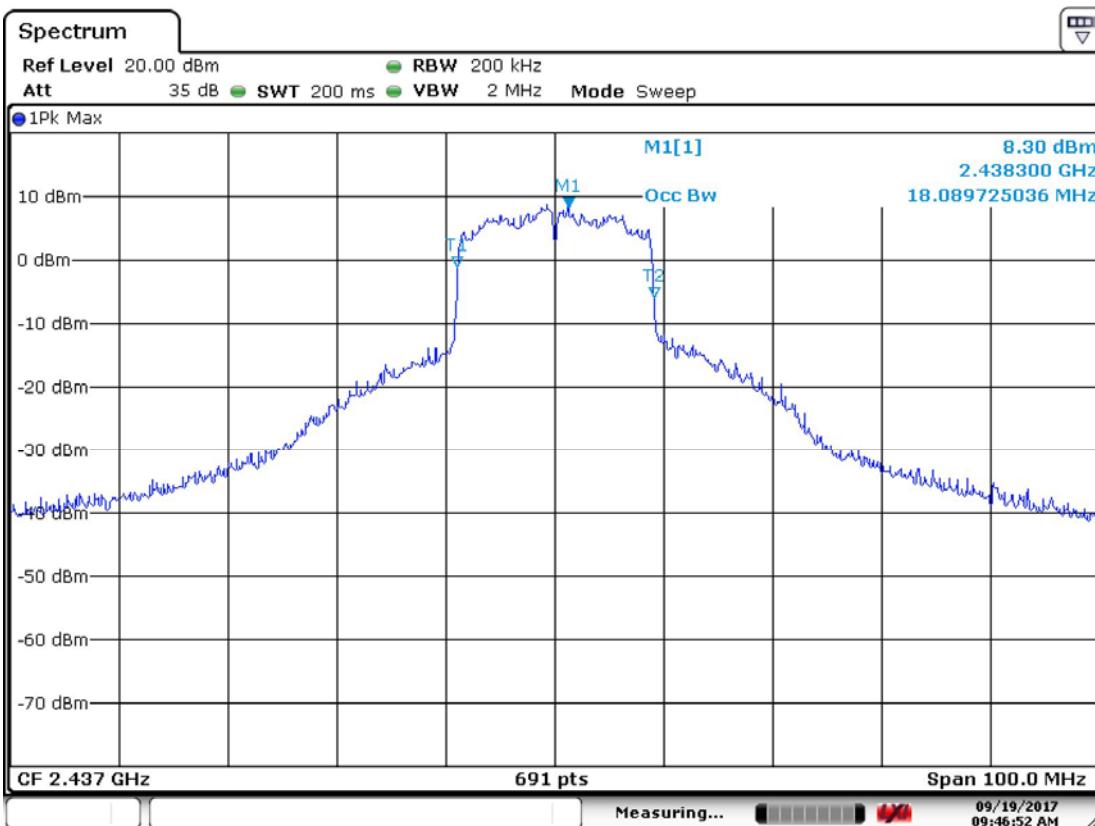


Date: 19.SEP.2017 09:48:57

FCC PT.15.247 TEST REPORT	FCC Part 15.247 WLAN(802.11b/g/n(20MHz)) – 2.4GHz Test Report		FCC ID : YM780-9500
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Date: 19.SEP.2017 09:47:58



Date: 19.SEP.2017 09:46:52

FCC PT.15.247 TEST REPORT	FCC Part 15.247 WLAN(802.11b/g/n(20MHz)) – 2.4GHz Test Report		FCC ID : YM780-9500
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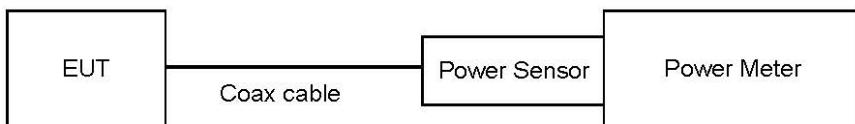
8.2 OUTPUT POWER (802.11 b/g/n)

Test Requirements and limit, §15.247(b)(3)

The transmitter output is connected to the input of an RF power sensor. Measurement is made using a broadband power meter capable of making peak and average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

The maximum permissible conducted output power is 1 Watt.

□ TEST CONFIGURATION (20 MHz BW)



□ TEST PROCEDURE (20 MHz BW)

- Peak Power (Procedure 9.1.3 in KDB 558074, issued 04/09/2013)
 1. Measure the peak power of the transmitter.
- Average Power (Procedure 9.2.3.1 in KDB 558074, issued 04/09/2013)
 1. Measure the duty cycle.
 2. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
 3. Add $10 \log (1/x)$, where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

Sample Calculation

Output Power = Reading Value + ATT loss + Cable loss(1 ea)

Output Power = 10 dBm + 20 dB + 0.8 dB + 0.2 dB = 31.0 dBm

□ TEST RESULTS-Peak

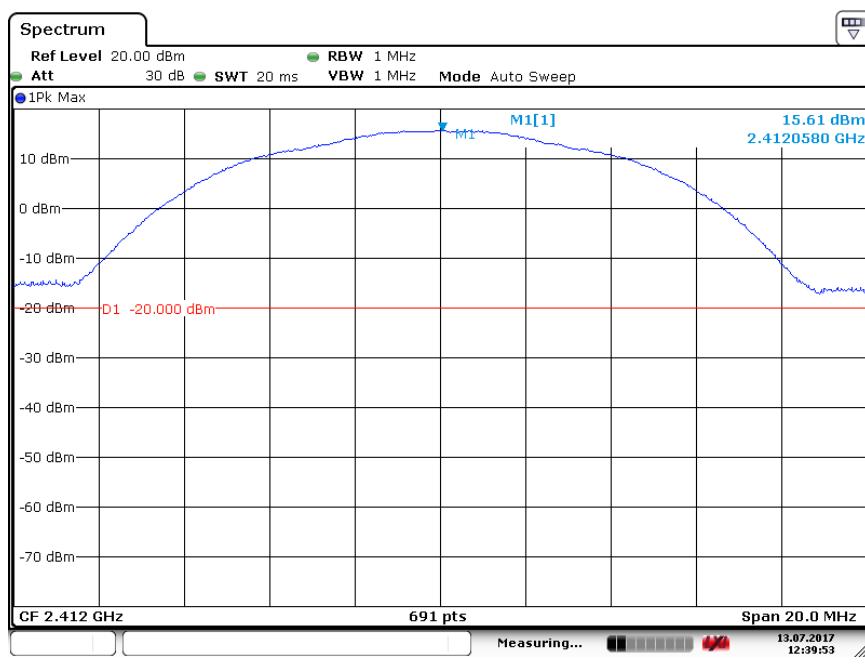
Mode	Channel	Bandwidth	Frequency	Data Rate / MCS	Power (dBm)
2.4 GHz					
802.11b	6	20	2437	11	15.61
802.11g	6	20	2437	54	15.71
802.11n	6	20	2437	54	10.03

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RESULT PLOTS-Peak

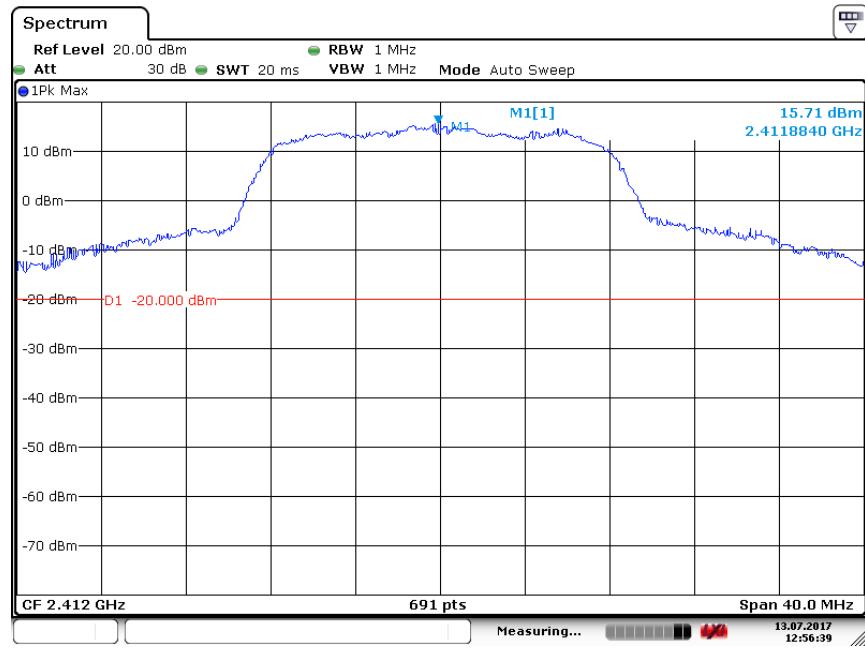
2.4 GHz Band

802.11b



Date: 13 JUL 2017 12:39:53

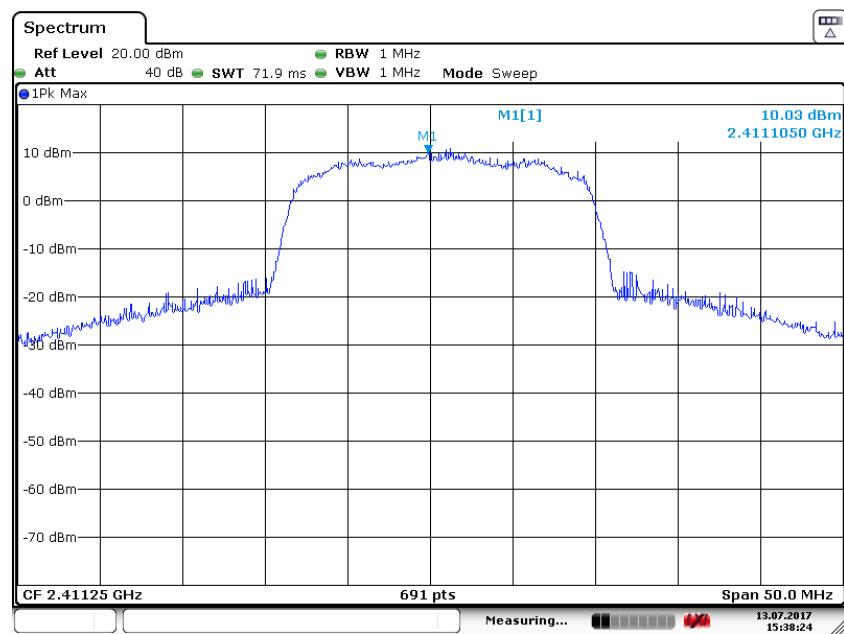
802.11g



Date: 13 JUL 2017 12:56:39

FCC PT.15.247 TEST REPORT	FCC Part 15.247 WLAN(802.11b/g/n(20MHz)) – 2.4GHz Test Report		FCC ID : YM780-9500
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802.11n



Date: 13 JUL 2017 15:38:24

FCC PT.15.247 TEST REPORT	FCC Part 15.247 WLAN(802.11b/g/n(20MHz)) – 2.4GHz Test Report		FCC ID : YM780-9500
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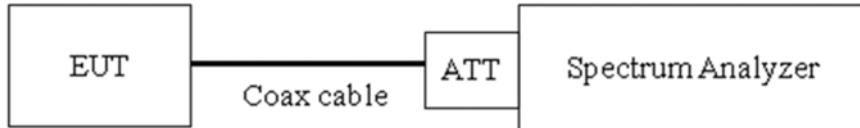
8.3 POWER SPECTRAL DENSITY (802.11 b/g/n)

Test Requirements and limit, §15.247(e)

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

Minimum Standard – 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.

□ TEST CONFIGURATION



□ TEST PROCEDURE

We tested according to Procedure 10.2 in KDB 558074, issued 04/09/2013

The spectrum analyzer is set to :

Set analyzer center frequency to DTS channel center frequency.

Span = 1.5 times the DTS channel bandwidth.

RBW = 3 kHz \leq RBW \leq 100 kHz.

VBW \geq 3 x RBW.

Sweep = auto couple

Detector = peak

Trace Mode = max hold

Allow trace to fully stabilize.

Use the peak marker function to determine the maximum amplitude level within the RBW.

If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

□ Sample Calculation

PSD = Reading Value + ATT loss + Cable loss(1 ea)

$$= -5 \text{ dBm} + 10 \text{ dB} + 0.8 \text{ dB} = 5.8 \text{ dBm}$$

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TEST RESULTS

Conducted Power Density Measurements

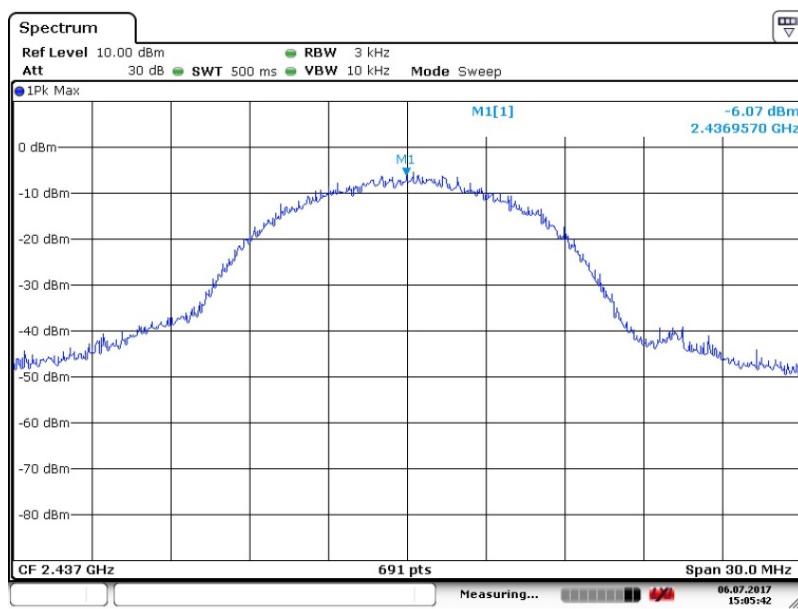
Note : In order to simplify the report, the attached plots are only the highest PSD channels.

Mode	Channel	Bandwidth	Frequency	Data Rate / MCS	PSD (dBm)
2.4 GHz					
802.11b	6	20	2437	11	-6.07
802.11g	6	20	2437	54	-9.04
802.11n	6	20	2437	54	-7.92

RESULT PLOTS

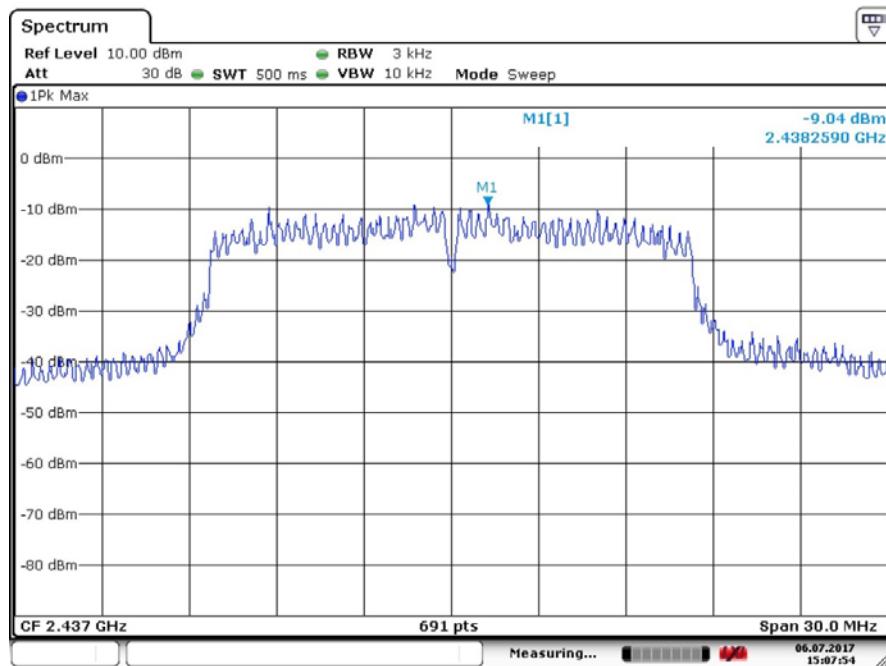
2.4 GHz Band

802.11b



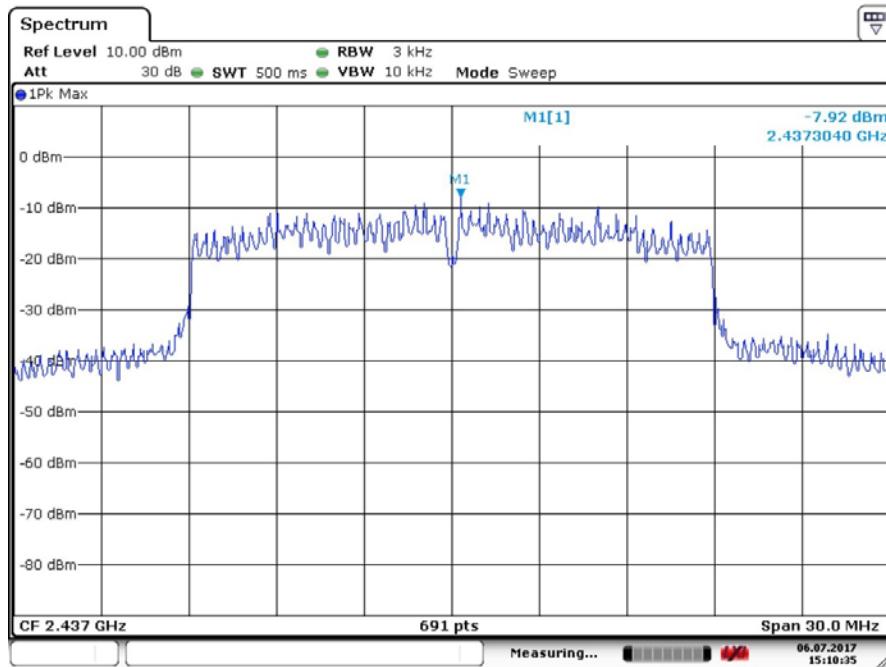
FCC PT.15.247 TEST REPORT	FCC Part 15.247 WLAN(802.11b/g/n(20MHz)) – 2.4GHz Test Report		FCC ID : YM780-9500
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802.11g



Date: 6 JUL 2017 15:07:54

802.11n



Date: 6 JUL 2017 15:10:35

FCC PT.15.247 TEST REPORT	FCC Part 15.247 WLAN(802.11b/g/n(20MHz)) – 2.4GHz Test Report		FCC ID : YM780-9500
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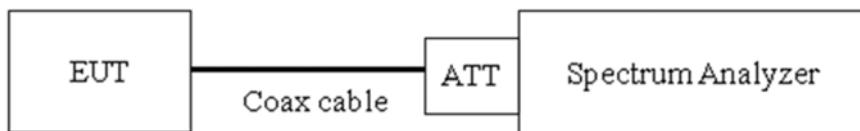
8.4 OUT OF BAND EMISSIONS AT THE BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS

Test Requirements and limit, §15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

Limit : 20 dBc

■ TEST CONFIGURATION



■ TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. (Procedure 11.0 in KDB 558074, issued 04/09/2013)

RBW = 100 kHz

VBW \geq 3 x RBW

Set span to encompass the spectrum to be examined

Detector = Peak

Trace Mode = max hold

Sweep time = auto couple

Ensure that the number of measurement points \geq 2*Span/RBW

Allow trace to fully stabilize.

Use peak marker function to determine the maximum amplitude level.

Measurements are made over the 30 MHz to 10th harmonic range with the transmitter set to the lowest, middle, and highest channels.

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BAND EDGE DATA

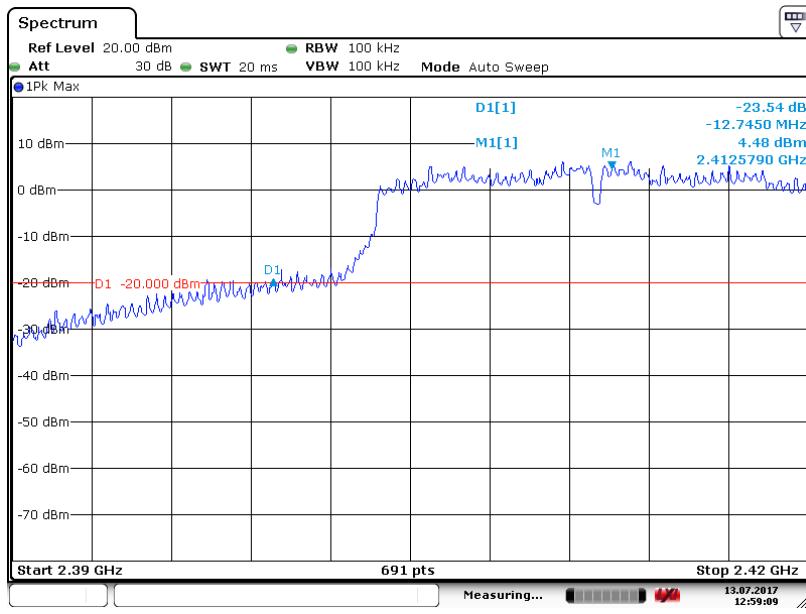
Mode	Bandwidth	Frequency	Data Rate / MCS	Delta Measured	Delta Limit (dB)
2.4 GHz					
802.11b	20	2400	11	41.6	>20
		2483.5	11	58.4	>20
802.11g	20	2400	54	23.4	>20
		2483.5	54	43.8	>20
802.11n	20	2400	54	27.6	>20
		2483.5	54	33.2	>20

In order to simplify the report, attached plots are the worst case channel in each band.

RESULT PLOTS

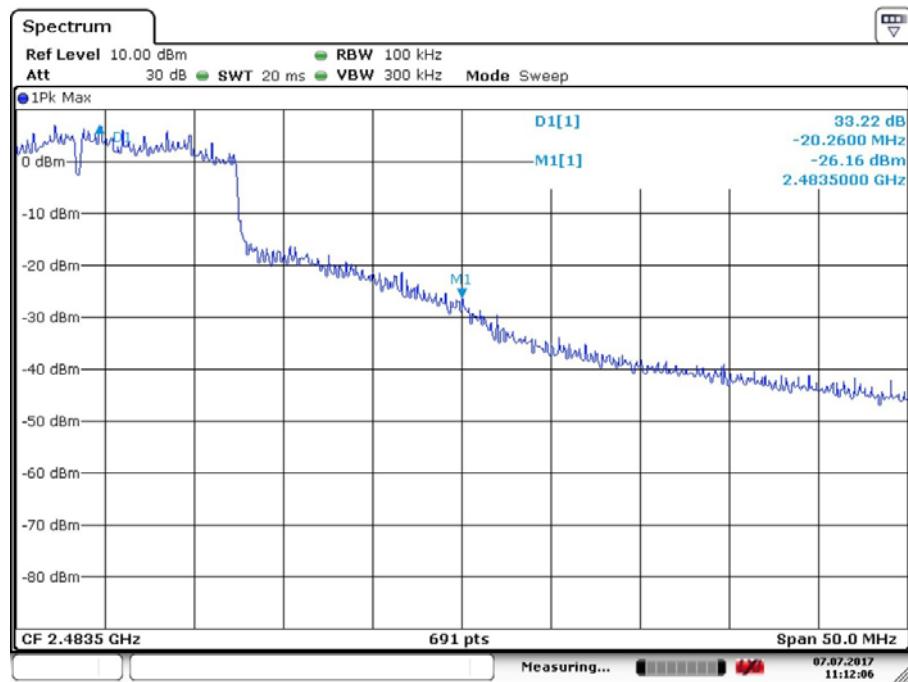
2.4 GHZ Band

2400 MHz Band Edge - 802.11g



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2483.5 MHz Band Edge – 802.11n



Date: 7.JUL.2017 11:12:06

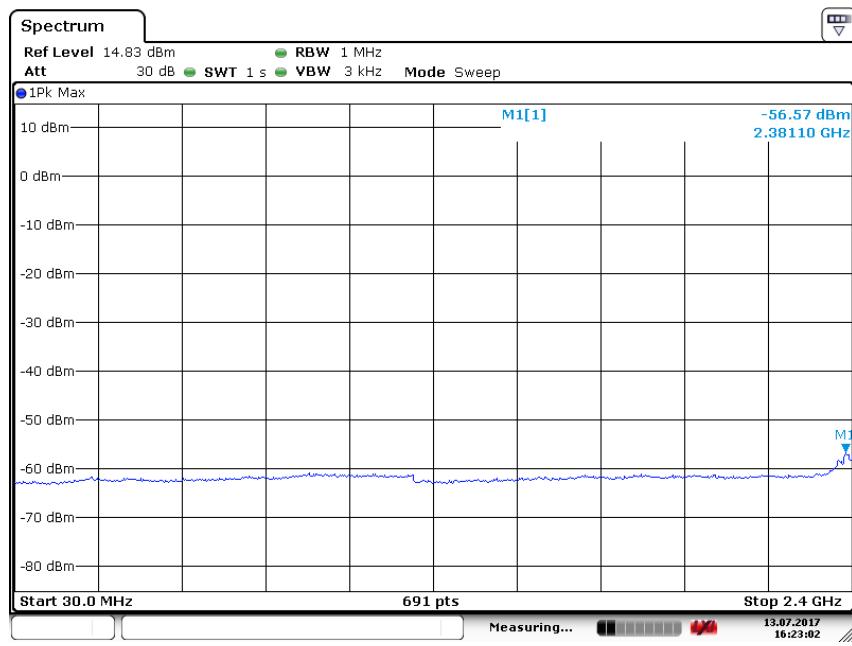
FCC PT.15.247 TEST REPORT	FCC Part 15.247 WLAN(802.11b/g/n(20MHz)) – 2.4GHz Test Report		FCC ID : YM780-9500
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Conducted Spurious Emissions

2.4 GHz Band – Worst Case

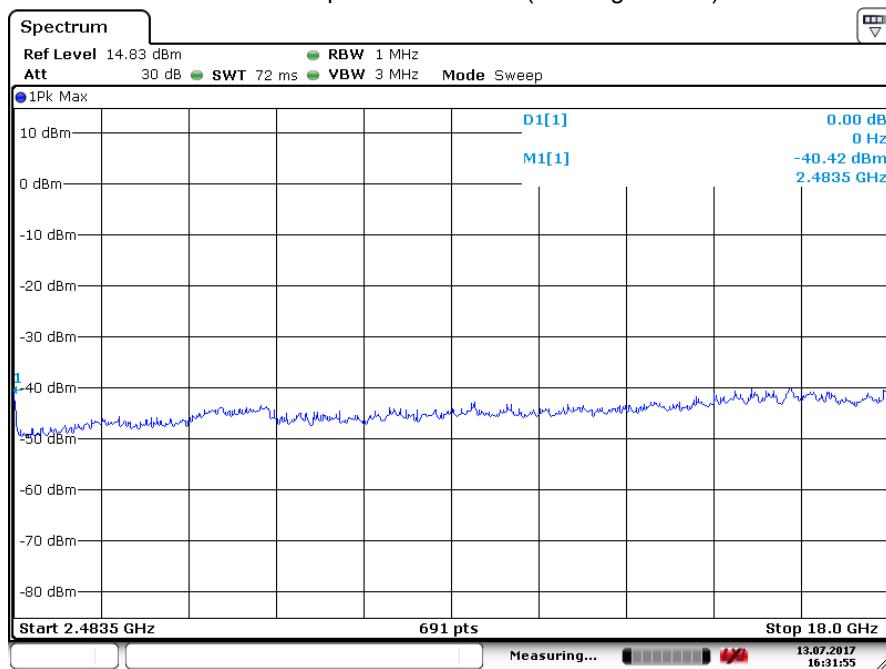
30 MHz - 2.4 GHz

Conducted Spurious Emission (802.11n_20 MHz BW-CH11)



2.4385 - 18 GHz

Conducted Spurious Emission (802.11g - CH11)



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8.5 RADIATED MEASUREMENT

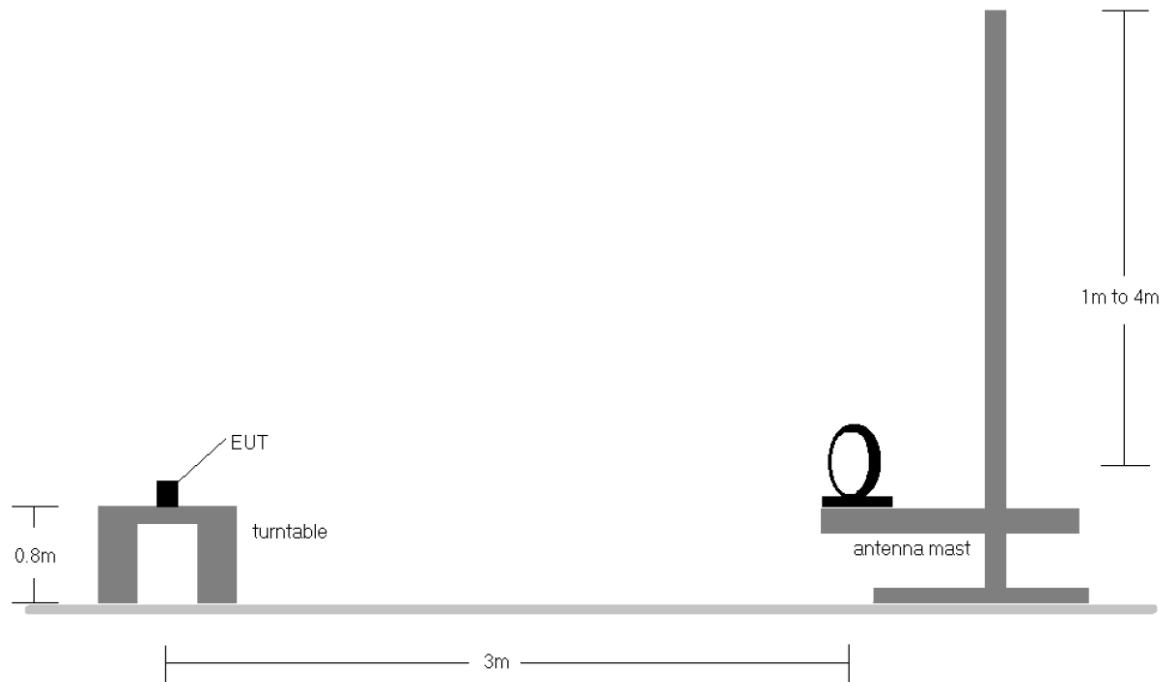
8.5.1 RADIATED SPURIOUS EMISSIONS.

Test Requirements and limit, §15.205, §15.209

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

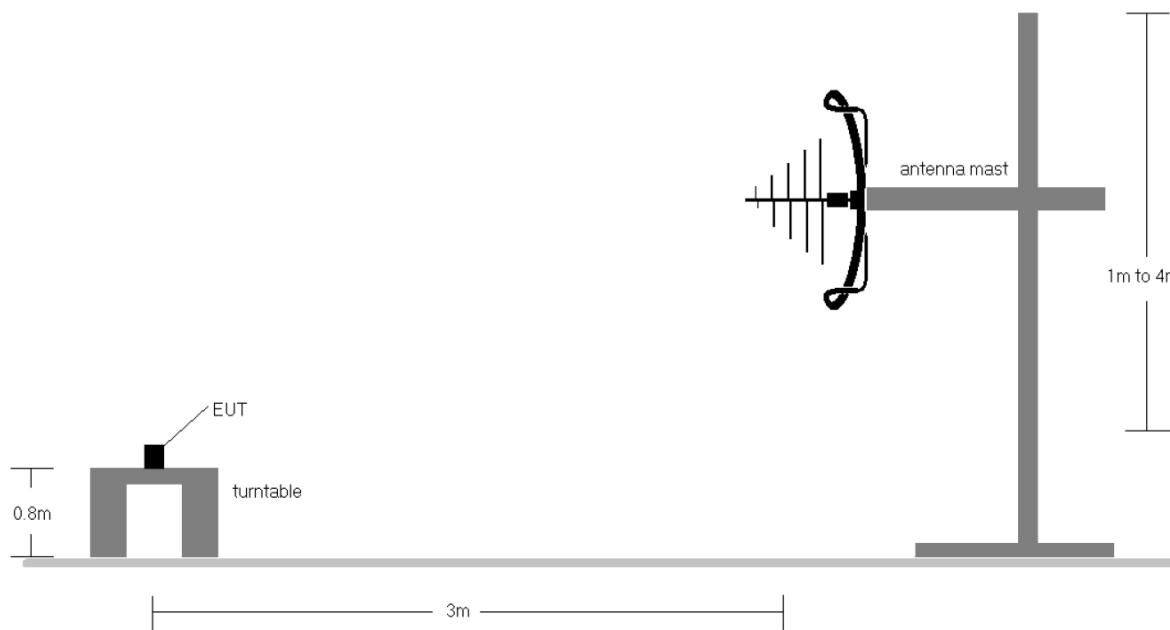
Test Configuration

Below 30 MHz

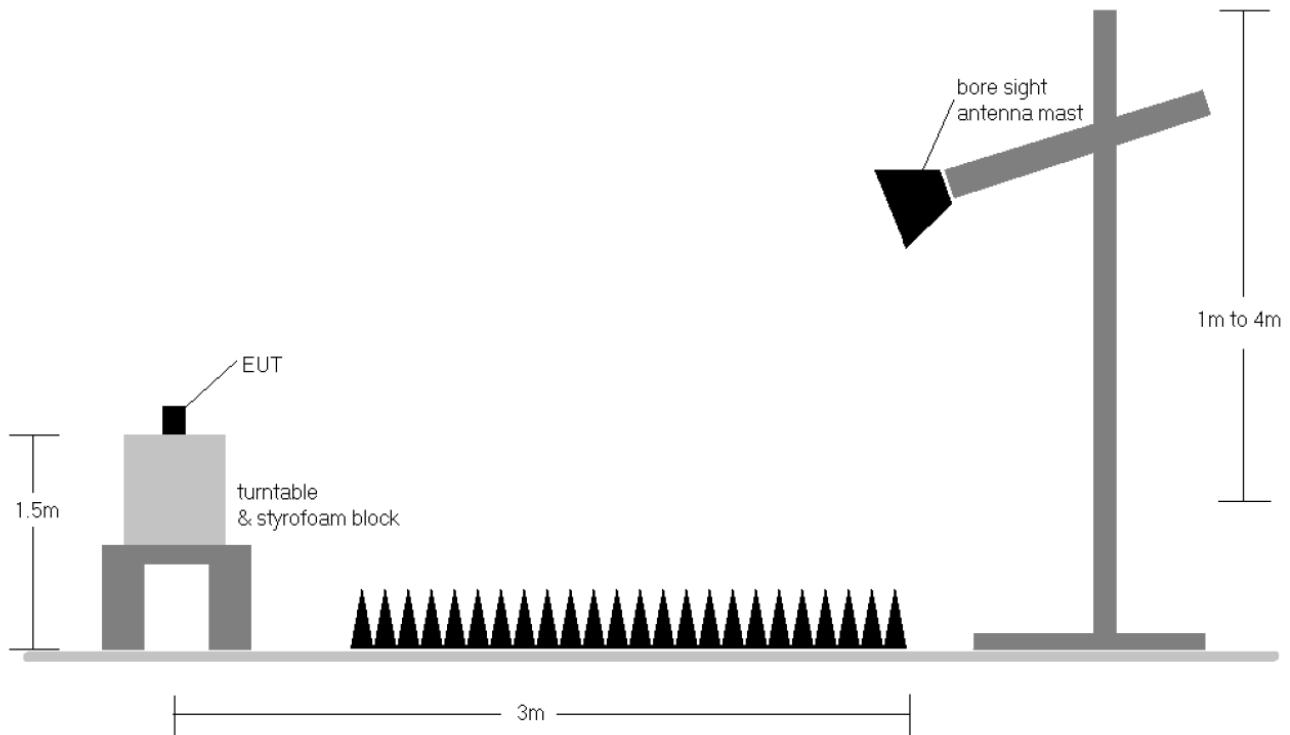


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30 MHz - 1 GHz



Above 1 GHz



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TEST PROCEDURE

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 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. Repeat above procedures until the measurements for all frequencies are complete.
7. Spectrum Setting
 - a. Peak Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 1 MHz.
 - b. AV Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 1 kHz $\geq 1/\tau$ Hz, where τ = pulse width in seconds.

Table 1 —RBW as a function of frequency

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

TEST RESULTS

9 kHz – 30MHz

Operation Mode: Normal Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dB μ V/m	dBm /m	dBm	(H/V)	dB μ V/m	dB μ V/m	dB
No Critical peaks found							

Notes:

1. Measuring frequencies from 9 kHz to the 30MHz.
2. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
3. Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB)
4. Limit line = specific Limits (dB μ V) + Distance extrapolation factor
5. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

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TEST RESULTS

30 MHz - 1 GHz

Operation Mode: Normal Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dB μ N/m	dBm /m	dBm	(H/V)	dB μ N/m	dB μ N/m	dB
No Critical peaks found							

Notes:

1. Measuring frequencies from 30 MHz to the 1 GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

2.4 GHz Band Worst Case Data

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done 802.11ac mode and all data rate. Worst data rate is the lowest data of each mode
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna

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802.11b

Test Conditions: 802.11b 20 MHz								
Frequency (MHz)	Meter dB μ V/m	Corr. Factor	Corr. Reading	Spec	Margin	Detector Type	Polarity	Test Distance
4824.00	34.84	17.65	52.49	74	21.51	PK	V	3 Meters
4824.00	26.35	17.65	44.00	54	10.00	AVE	H	3 Meters
7311.00	37.14	20.23	57.37	74	16.63	PK	V	3 Meters
7311.00	25.90	20.23	46.13	54	7.87	AVE	H	3 Meters
7386.00	35.23	20.30	55.53	74	18.47	PK	V	3 Meters
7386.00	25.37	20.30	45.67	54	8.33	AVE	H	3 Meters

802.11g

Test Conditions: 802.11g 20 MHz								
Frequency (MHz)	Meter dB μ V/m	Corr. Factor	Corr. Reading	Spec	Margin	Detector Type	Polarity	Test Distance
4824.00	38.45	17.65	56.10	74	17.90	PK	V	3 Meters
4824.00	28.34	17.65	45.99	54	8.01	AVE	H	3 Meters
7311.00	38.11	20.23	58.34	74	15.66	PK	V	3 Meters
7311.00	26.33	20.23	46.56	54	7.44	AVE	H	3 Meters
7386.00	26.94	20.30	47.24	74	26.76	PK	V	3 Meters
7386.00	27.44	20.30	47.74	54	6.26	AVE	H	3 Meters

802.11n

Test Conditions: 802.11n 20 MHz								
Frequency (MHz)	Meter dB μ V/m	Corr. Factor	Corr. Reading	Spec	Margin	Detector Type	Polarity	Test Distance
4824.00	36.97	17.65	54.62	74	19.38	PK	V	3 Meters
4824.00	24.09	17.65	41.74	54	12.26	AVE	H	3 Meters
7311.00	35.55	20.23	55.78	74	18.22	PK	V	3 Meters
7311.00	26.08	20.23	46.31	54	7.69	AVE	H	3 Meters
7386.00	33.12	20.30	53.42	74	20.58	PK	V	3 Meters
7386.00	25.31	20.30	45.61	54	8.39	AVE	H	3 Meters

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8.5.2 RADIATED RESTRICTED BAND EDGES

Test Requirements and limit, §15.247(d) §15.205, §15.209

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a) (See section 15.205(c)).

Frequency (MHz)	Meter dB μ V/m	Corr. Factor	Corr. Reading	Spec	Margin	Detector Type	Polarity	Test Distance
802.11b 2412 MHz								
2390.0	38.95	10.37	49.32	74	-24.68	PK	V	3 Meters
2390.0	27.38	10.37	37.75	54	-16.25	AVE	V	3 Meters
2390.0	39.28	10.37	49.65	74	-24.35	PK	H	3 Meters
2390.0	34.31	10.37	44.68	54	-9.32	AVE	H	3 Meters
802.11b 2462 MHz								
2483.5	41.90	10.50	52.40	74	-21.60	PK	V	3 Meters
2483.5	34.56	10.50	45.06	54	-8.94	AVE	V	3 Meters
2483.5	40.11	10.50	50.61	74	-23.39	PK	H	3 Meters
2483.5	32.04	10.50	42.54	54	-11.46	AVE	H	3 Meters

Frequency (MHz)	Meter dB μ V/m	Corr. Factor	Corr. Reading	Spec	Margin	Detector Type	Polarity	Test Distance
802.11g 2412 MHz								
2390.0	39.92	10.37	50.29	74	-23.71	PK	V	3 Meters
2390.0	30.12	10.37	40.49	54	-13.51	AVE	V	3 Meters
2390.0	41.48	10.37	51.85	74	-22.15	PK	H	3 Meters
2390.0	29.35	10.37	39.72	54	-14.28	AVE	H	3 Meters
802.11g 2462 MHz								
2483.5	39.87	10.50	50.37	74	-23.63	PK	V	3 Meters
2483.5	32.09	10.50	42.59	54	-11.41	AVE	V	3 Meters
2483.5	42.18	10.50	52.68	74	-21.32	PK	H	3 Meters
2483.5	30.28	10.50	40.78	54	-13.22	AVE	H	3 Meters

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Frequency (MHz)	Meter dB μ V/m	Corr. Factor	Corr. Reading	Spec	Margin	Detector Type	Polarity	Test Distance
802.11n 2412 MHz								
2390.0	41.25	10.37	51.62	74	-22.38	PK	V	3 Meters
2390.0	28.85	10.37	39.22	54	-14.78	AVE	V	3 Meters
2390.0	40.29	10.37	50.66	74	-23.34	PK	H	3 Meters
2390.0	32.12	10.37	42.49	54	-11.51	AVE	H	3 Meters
802.11n 2462 MHz								
2483.5	37.94	10.50	48.44	74	-25.56	PK	V	3 Meters
2483.5	33.09	10.50	43.59	54	-10.41	AVE	V	3 Meters
2483.5	39.77	10.50	50.27	74	-23.73	PK	H	3 Meters
2483.5	32.51	10.50	43.01	54	-10.99	AVE	H	3 Meters

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8.6 POWERLINE CONDUCTED EMISSIONS

Test Requirements and limit, §15.207

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

Frequency Range (MHz)	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

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

Test Configuration

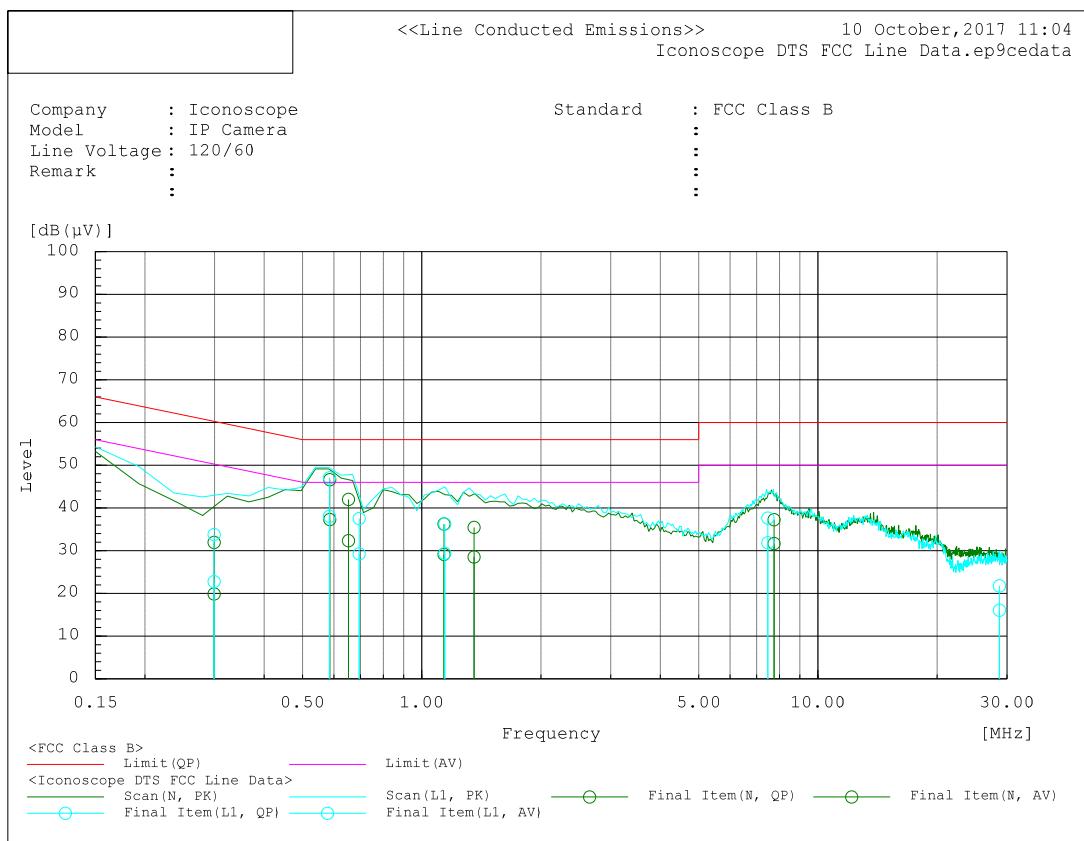
See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

TEST PROCEDURE

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.
5. We are performed the AC Power Line Conducted Emission test for 13 Mbps, Ch.6 and 802.11n_20 MHz BW. Because 802.11n_20 MHz BW mode is worst case.

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Frequency MHz	Line	Reading dB(μV)		Factor dB	Level dB(μV)		Limit dB(μV)		Margin dB		Pass/Fail
		QP	AV		QP	AV	QP	AV	QP	AV	
		23.8	13	10	33.8	22.8	60.3	50.3	26.5	27.5	Pass
0.299	L1	23.8	13	10	33.8	22.8	60.3	50.3	26.5	27.5	Pass
0.585	L1	37.1	28	10	47.1	38.1	56	46	8.9	7.9	Pass
0.695	L1	27.4	19	10.1	37.5	29.3	56	46	18.5	16.7	Pass
1.143	L1	26.1	19	10.1	36.2	29.4	56	46	19.8	16.6	Pass
7.475	L1	27.2	22	10.4	37.6	31.9	60	50	22.4	18.1	Pass
28.71	L1	11	5.3	10.8	21.8	16.1	60	50	38.2	33.9	Pass
0.299	N	21.9	9.9	10	31.9	19.9	60.3	50.3	28.4	30.4	Pass
0.586	N	36.6	27	10	46.6	37.3	56	46	9.4	8.7	Pass
0.653	N	32	22	10	42	32.3	56	46	14	13.7	Pass
1.138	N	26.2	19	10.1	36.3	29.2	56	46	19.7	16.8	Pass
1.355	N	25.4	18	10.1	35.5	28.5	56	46	20.5	17.5	Pass
7.745	N	26.9	21	10.4	37.3	31.7	60	50	22.7	18.3	Pass



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9. LIST OF TEST EQUIPMENT

Manufacturer	Model / Equipment	Calibration Interval	Calibration Due	Serial No.
Omega	IBTHXBP / Temp & Humidity Meter	Annual	07/08/2018	14490199
Fluke	87 / DMM	Annual	07/28/2018	64920001
ETS	EmPower / Power Sensor	Annual	08/09/2018	141000-48SNO051
EMCO	3816-2 / LISN	Annual	08/12/2018	9809-1089
Rohde & Schwarz	FSV40 / Spectrum Analyzer	Annual	07/20/2018	101424
Sunol Sciences	JB6 / Bi-Conilog Antenna	Annual	07/08/2018	A042610
A.H. Systems	SAS- 571 / Horn Antenna	Annual	07/13/2018	236

END OF REPORT

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