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MEASUREMENT REPORT
FCC PART 15.407 WLAN 802.11a/n

FCC ID: TK4WLM200NX

APPLICANT: Compex Systems Pte Ltd

Application Type:	Certification
Product:	WIRELESS-N NETWORK MINI PCI ADAPTER
Model No.:	WLM200NX
Brand Name:	COMPEX
FCC Classification:	Unlicensed National Information Infrastructure (UNII)
FCC Rule Part(s):	Part 15.407
Test Procedure(s):	ANSI C63.10-2013, KDB 662911 D01v02r01 KDB 789033 D02v01r03,
Test Date:	November 08 ~ November 14, 2016

Reviewed By Manager : (Robin Wu)

Approved By CEO : (Marlin Chen)

The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in KDB 789033 D02v01r03. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
1608RSU02701	Rev. 01	Initial report	11-14-2016	Invalid
1608RSU02701	Rev. 02	Revised some description	11-19-2016	Valid

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Description Page

§2.1033 General Information

Applicant:	Compex Systems Pte Ltd
Applicant Address:	No:9 Harrison Road, Harrison Industrial Building, #05-01, Singapore 369651
Manufacturer:	Compex Systems Pte Ltd
Manufacturer Address:	No:9 Harrison Road, Harrison Industrial Building, #05-01, Singapore 369651
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
FCC Registration No.:	809388
FCC Rule Part(s):	Part 15.407
Model No.:	WLM200NX
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering
FCC Classification:	Unlicensed National Information Infrastructure (UNII)

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- **MRT facility is a FCC registered (MRT Reg. No. 809388) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules.**
- **MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.**
- **MRT facility is a VCCI registered (R-4179, G-814, C-4664, T-2206) test laboratory with the site description on file at VCCI Council.**
- **MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications and Radio testing for FCC, Industry Canada, EU and TELEC Rules.**

ilac-MRA A2LA

Accredited Laboratory

A2LA has accredited

MRT TECHNOLOGY (SUZHOU) CO., LTD.

Suzhou, Jiangsu, People's Republic of China

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

Presented this 6th day of September 2016.

Senior Director of Quality and Communications
For the Accreditation Council
Certificate Number 3628.01
Valid to August 31, 2018

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

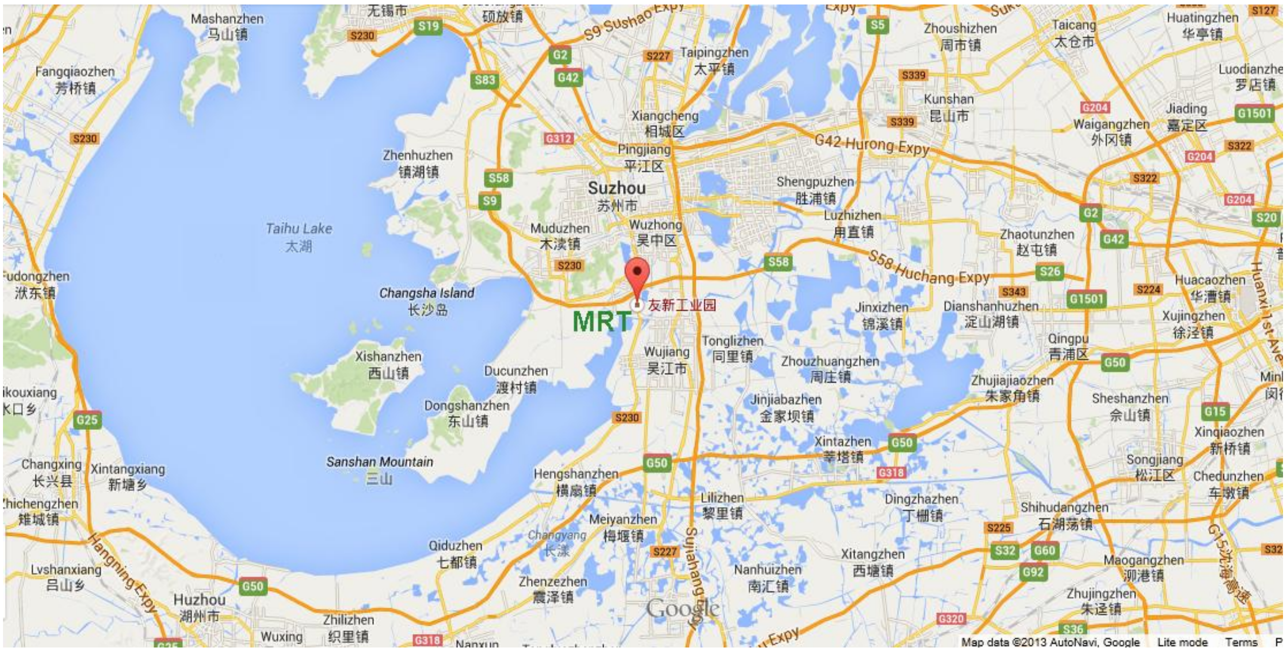
1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on September 30, 2013.



2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name	WIRELESS-N NETWORK MINI PCI ADAPTER
Model No.	WLM200NX
Brand Name	COMPEX
WLAN Specification	**2.4GHz:** For 802.11b/g/n-HT20: 2412 ~ 2462 MHz For 802.11n-HT40: 2422 ~ 2452 MHz **5GHz:** For 802.11a/n-HT20: 5180~5240, 5745~5825MHz For 802.11n-HT40: 5190~5230, 5755~5795MHz

2.2. Product Specification Subjective to this Report

Frequency Range	802.11a/n-HT20: 5180~5240MHz 802.11n-HT40: 5190~5230MHz
Maximum Average Output Power	22.51dBm
Type of Modulation	802.11a/n: OFDM

2.3. Operation Frequency / Channel list

802.11a/n-HT20

Channel	Frequency	Channel	Frequency	Channel	Frequency
36	5180MHz	40	5200 MHz	44	5220 MHz
48	5240 MHz	--	--	--	--

802.11n-HT40

Channel	Frequency	Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz	--	--

2.4. Description of Available Antennas

Antenna Type	Frequency Band (GHz)	Manufacturer	Tx Paths	Max Peak Gain (dBi)	Directional Gain (dBi)	
					For Power	For PSD
Dipole Antenna	2.4	Compex Systems Pte Ltd	2	2	2	5.01
	5		2	2	2	5.01
PCB Antenna	2.4	Taoglas Antenna Solutions	2	3	3	6.01
	5		2	5	5	8.01

Note:

The EUT supports Cyclic Delay Diversity (CDD) mode, and CDD signals are correlated.

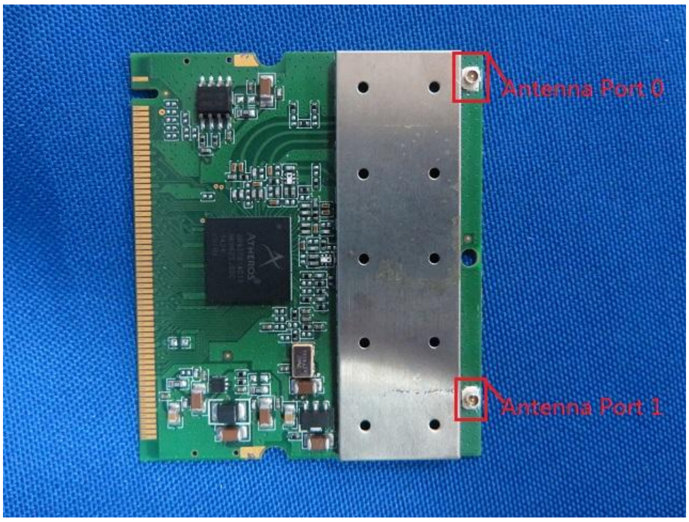
For CDD transmissions, directional gain is calculated as follows, N_{ANT} = 2, N_{SS} = 1.

1. If all antennas have the same gain, G_{ANT}, Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows.
   - For power spectral density (PSD) measurements on all devices,
     Array Gain = 10 log (N_{ANT}/ N_{SS}) dB = 3.01;
   - For power measurements on IEEE 802.11 devices,
     Array Gain = 0 dB for $N_{ANT} \leq 4$;
2. If antenna gains are not equal, the user may use either of the following methods to calculate directional gain, provided that each transmit antenna is driven by only one spatial stream:
   - Directional gain may be calculated by using the formulas applicable to equal gain antennas with G_{ANT} set equal to the gain of the antenna having the highest gain;
   - $$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

$g_{j,k} = 10^{G_k/20}$ if the kth antenna is being fed by spatial stream j, or zero if it is not;

G_k is the gain in dBi of the kth antenna.

2.5. Description of Antenna RF Port

Antenna RF Port


2.6. Test Mode

Test Mode	Mode 1: Transmit by 802.11a
	Mode 2: Transmit by 802.11n-HT20
	Mode 3: Transmit by 802.11n-HT40

2.7. Test Software

The test utility software used during testing was “ART”, and the version was “v09 b27”.

2.8. Device Capabilities

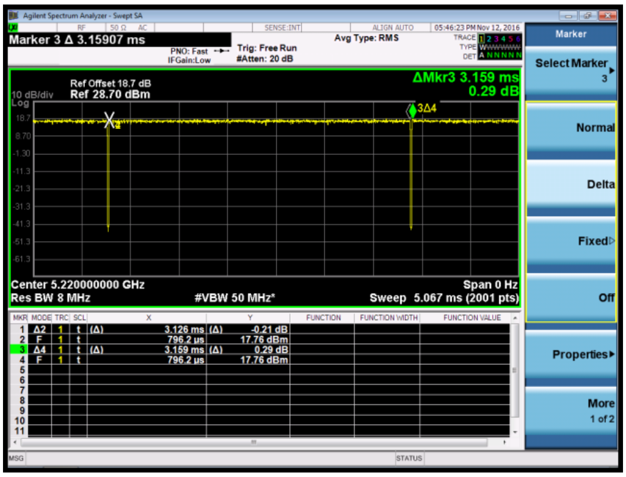
This device contains the following capabilities:

2.4GHz WLAN (DTS) and 5GHz WLAN (NII).

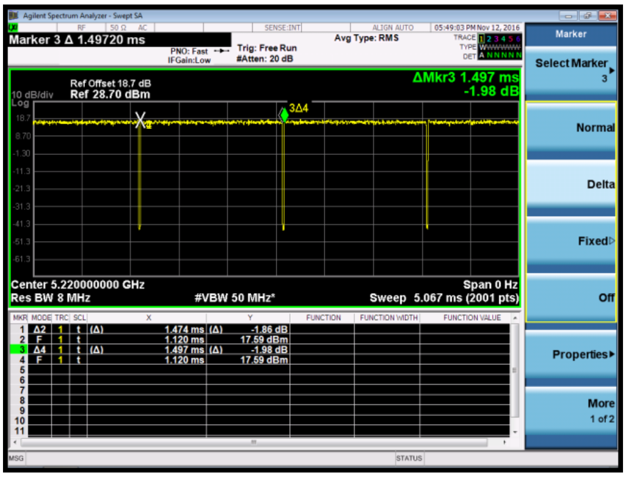
Note: 5GHz (NII) operation is possible in 20MHz and 40MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = average per the guidance of Section B)2)b) of KDB 789033 D02v01r03. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Test Mode	Duty Cycle
802.11a	98.96%
802.11n-HT20	98.46%
802.11n-HT40	97.55%

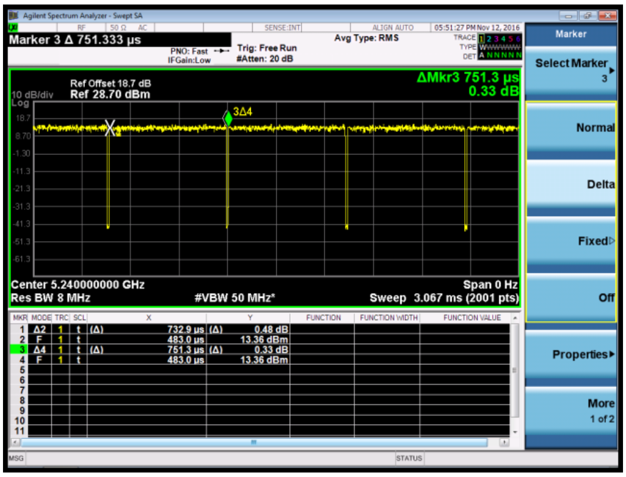
802.11a



802.11n-HT20



802.11n-HT40



2.9. Test Configuration

The **WIRELESS-N NETWORK MINI PCI ADAPTER FCC ID: TK4WLM200NX** was tested per the guidance of KDB 789033 D02v01r03. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

2.10. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

2.11. Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the FCC ID must be displayed on the device per Section 15.19(a)(5). Please see attachment for FCC ID label and label location.

3. DESCRIPTION OF TEST

3.1. Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013), and the guidance provided in KDB 789033 D02v01r03 were used in the measurement of the **WIRELESS-N NETWORK MINI PCI ADAPTER FCC ID: TK4WLM200NX.**

Deviation from measurement procedure…………………………...................................None

3.2. AC Line Conducted Emissions

The line-conducted facility is located inside an 8'x4'x4' shielded enclosure. A 1m x 2m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50uH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference ground-plane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the receiver and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The receiver was scanned from 150kHz to 30MHz. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or data exchange speed, or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions are used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

An extension cord was used to connect to a single LISN which powered by EUT. The extension cord was calibrated with LISN, the impedance and insertion loss are compliance with the requirements as stated in ANSI C63.10-2013.

Line conducted emissions test results are shown in Section 7.10.

3.3. Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. A MF Model 210SS turntable is used for radiated measurement. It is a continuously rotatable, remote controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm high PVC support structure is placed on top of the turntable.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up for frequencies below 1GHz was placed on top of the 0.8 meter high, 1 x 1.5 meter table; and test set-up for frequencies 1-40GHz was placed on top of the 1.5 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions. According to 3dB Beam-Width of horn antenna, the horn antenna should be always directed to the EUT when rising height.

4. ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

"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 antenna of the **Wireless-A/B/G/N Network Mini PCIe Adapter** uses a unique connector.

Antenna Type	Antenna Connector Type
Dipole Antenna	IPEX connector
PCB Antenna	IPEX connector

Conclusion:

The **WIRELESS-N NETWORK MINI PCI ADAPTER FCC ID: TK4WLM200NX** unit complies with the requirement of §15.203.

5. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions - SR2

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	101209	1 year	2017/05/07
Two-Line V-Network	R&S	ENV216	101683	1 year	2017/06/21
Two-Line V-Network	R&S	ENV216	101684	1 year	2017/06/21
Temperature/Humidity Meter	Yuhuaze	HTC-2	N/A	1 year	2016/12/20
Shielding Anechoic Chamber	Mikebang	Chamber-SR2	N/A	1 year	2017/05/10

Radiated Emission - AC1

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cali. Due Date
MXE EMI Receiver	Agilent	N9038A	MY51210182	1 year	2017/08/03
Preamplifier	Agilent	83017A	MY52090106	1 year	2017/03/28
TRILOG Antenna	Schwarzbeck	VULB9162	9162-047	1 year	2017/11/07
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1167	1 year	2017/11/07
Digital Thermometer & Hygrometer	Yuhuaze	HTC-2	N/A	1 year	2016/12/20
RF Cable	HUBER+SUHNER	Cable 01	N/A	1 year	2017/03/29
RF Cable	HUBER+SUHNER	Cable 02	N/A	1 year	2017/03/29
Anechoic Chamber	TDK	Chamber-AC1	N/A	1 year	2017/05/10

Conducted Test Equipment - TR3

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MY52090106	1 year	2017/05/08
USB Wideband Power Sensor	Boonton	55006	8911	1 year	2017/05/08
RF Cable	HUBER+SUHNER	Cable 03	N/A	1 year	2017/03/29
Attenuator	Woken	WATT-218FS-15	N/A	1 year	2017/03/29
DC Block	Woken	00900A1A2A101A	N/A	1 year	2017/03/29
Temperature/Humidity Meter	Yuhuaze	HTC-2	N/A	1 year	2016/12/20

Software	Version	Function
e3	V8.3.5	EMI Test Software

6. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

AC Conducted Emission Measurement - SR2
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 150kHz~30MHz: 3.46dB
Radiated Emission Measurement - AC1
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz ~ 1GHz: 4.18dB 1GHz ~ 40GHz: 4.76dB
Output Power - TR3
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.13dB
Power Spectrum Density - TR3
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.15dB
Occupied Bandwidth - TR3
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.28%

7. TEST RESULT

7.1. Summary

Company Name: **Compex Systems Pte Ltd**

FCC ID: **TK4WLM200NX**

Data Rate(s) Tested: **6Mbps ~ 54Mbps (a);**
13/14.4Mbps ~ 130/144.4Mbps (n-HT20);
27/30Mbps ~ 270/300Mbps (n-HT40);

FCC Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.407(a)	26dB Bandwidth	N/A	Conducted	Pass	Section 7.2
15.407(a)(1)(iv)	Maximum Conducted Output Power	≤ 24 dBm		Pass	Section 7.3
15.407(a)(1)(iv)	Power Spectral Density Measurement	≤ 11 dBm/MHz		Pass	Section 7.4
15.407(g)	Frequency Stability	N/A		Pass	Section 7.5
15.407(b)(1)	Undesirable Emissions	≤ -27dBm/MHz EIRP	Radiated	Pass	Section 7.6 & 7.7
15.205, 15.209 15.407(b)(5), (6), (7)	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		Pass	
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	Pass	Section 7.8

Notes:

1) All channels, modes, and modulations/data rates were investigated among all UNII bands. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.

7.2. 26dB Bandwidth Measurement

7.2.1. Test Limit

N/A

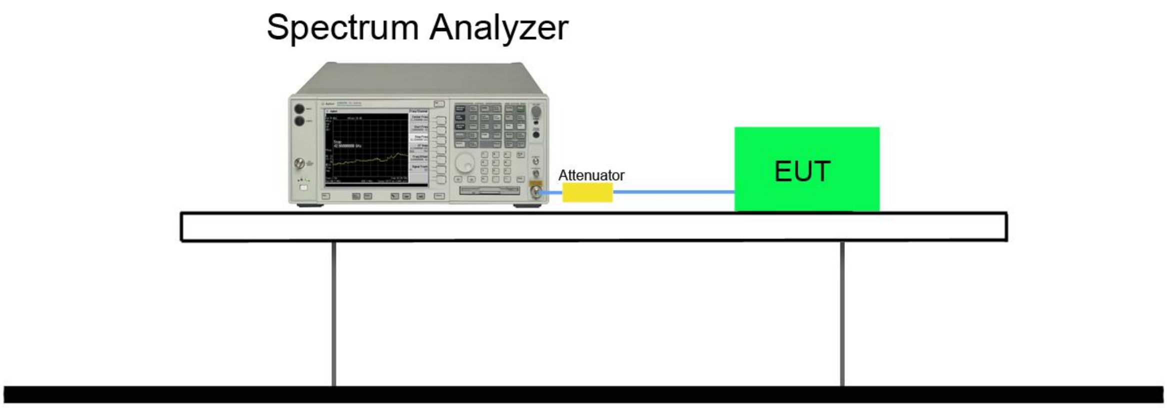
7.2.2. Test Procedure used

KDB 789033 D02v01r03 - Section C.1

7.2.3. Test Setting

1. The analyzers' automatic bandwidth measurement capability was used to perform the 26dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 26. The automatic bandwidth measurement function also has the capability of simultaneously measuring the 99% occupied bandwidth. The bandwidth measurement was not influenced by any intermediated power nulls in the fundamental emission.
2. RBW = approximately 1% of the emission bandwidth.
3. VBW ≥ 3 × RBW.
4. Detector = Peak.
5. Trace mode = max hold.

7.2.4. Test Setup

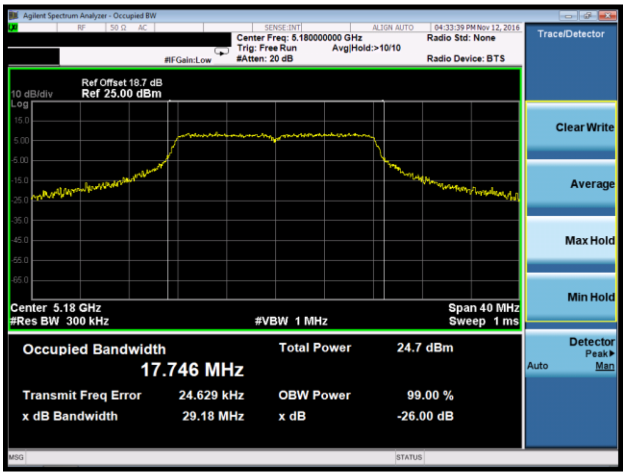


7.2.5. Test Result

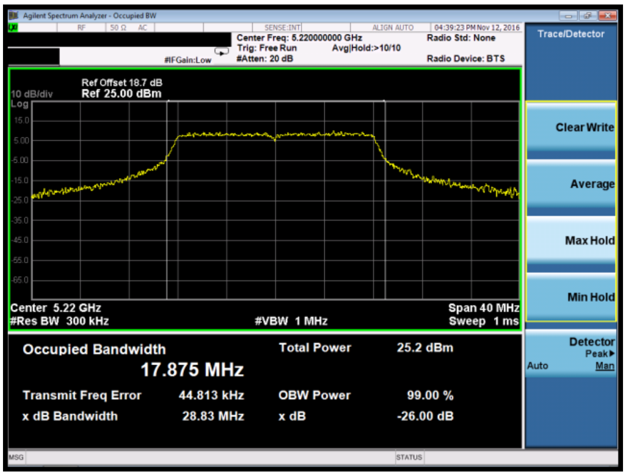
Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
Ant 0						
802.11a	6	36	5180	29.18	17.75	Pass
802.11a	6	44	5220	28.83	17.88	Pass
802.11a	6	48	5240	31.46	18.05	Pass
Ant 1						
802.11a	6	36	5180	28.82	17.81	Pass
802.11a	6	44	5220	31.91	17.75	Pass
802.11a	6	48	5240	30.38	17.86	Pass
Ant 0 / Ant 0 + 1						
802.11n-HT20	13	36	5180	25.57	18.26	Pass
802.11n-HT20	13	44	5220	29.68	18.54	Pass
802.11n-HT20	13	48	5240	32.46	17.92	Pass
802.11n-HT40	27	38	5190	45.32	36.52	Pass
802.11n-HT40	27	46	5230	46.53	36.49	Pass
Ant 1 / Ant 0 + 1						
802.11n-HT20	13	36	5180	25.67	18.22	Pass
802.11n-HT20	13	44	5220	27.27	18.26	Pass
802.11n-HT20	13	48	5240	26.18	18.24	Pass
802.11n-HT40	27	38	5190	46.54	36.54	Pass
802.11n-HT40	27	46	5230	47.49	36.53	Pass

802.11a 26dB Bandwidth & 99% Bandwidth - Ant 0

Channel 36 (5180MHz)



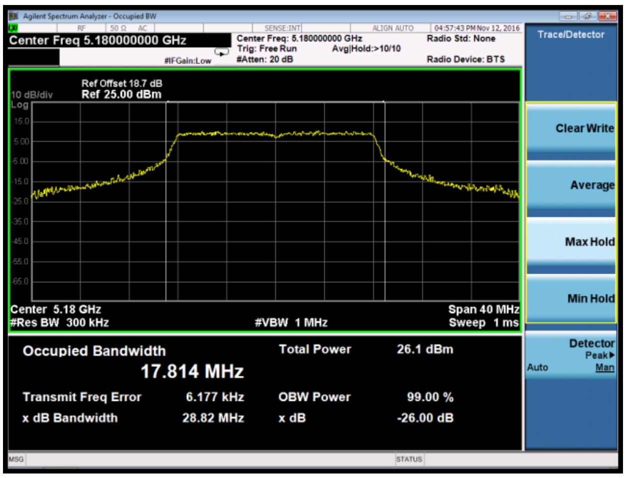
Channel 44 (5220MHz)



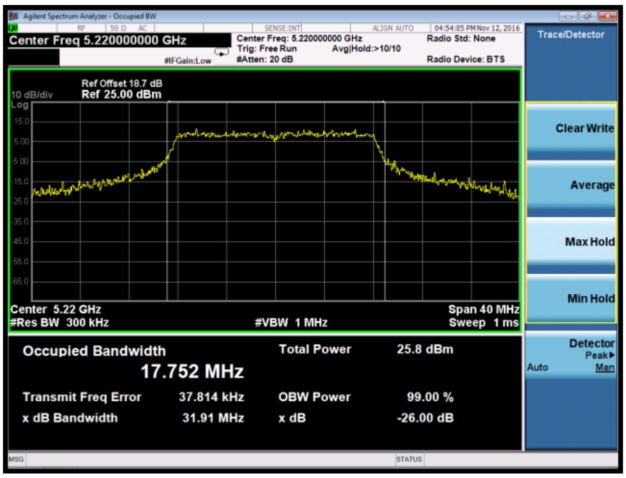
Channel 48 (5240MHz)

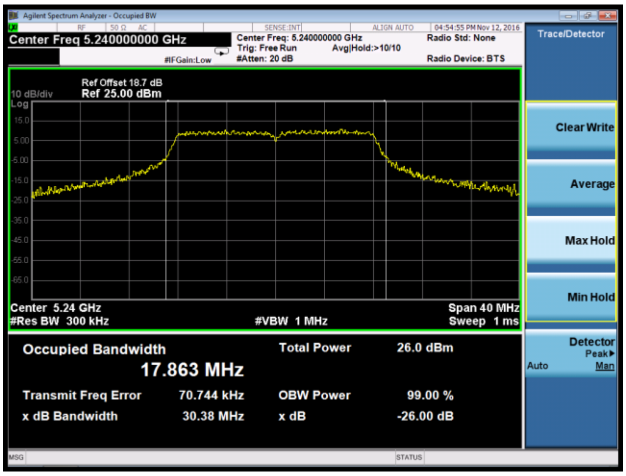
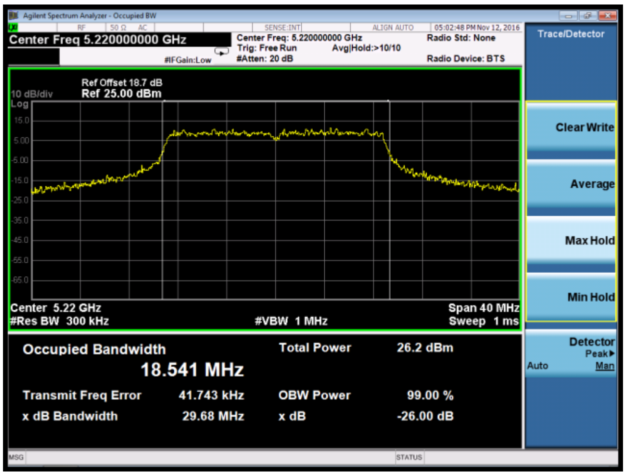
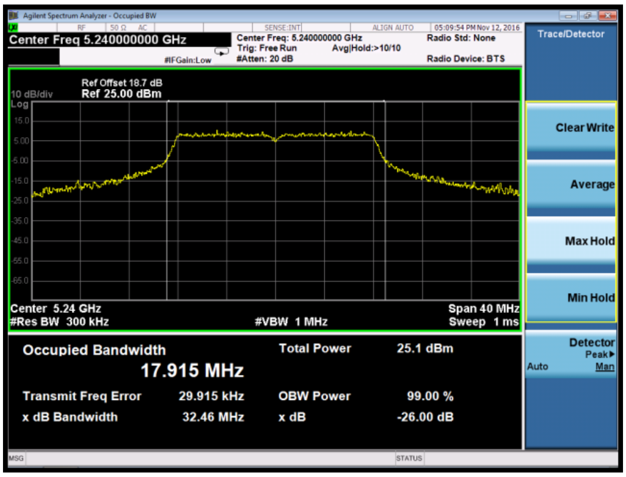
802.11a 26dB Bandwidth & 99% Bandwidth - Ant 1

Channel 36 (5180MHz)



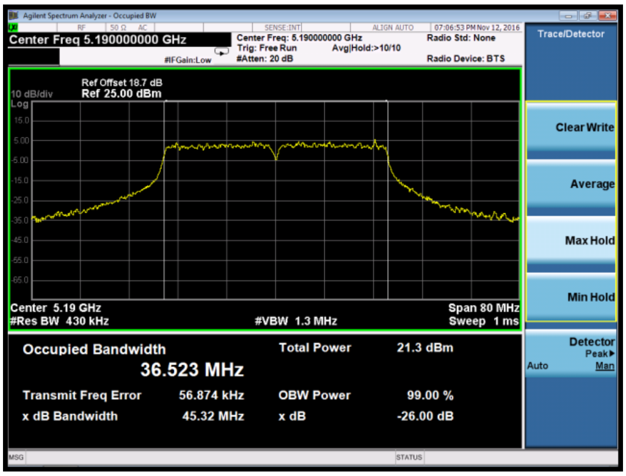
Channel 44 (5220MHz)



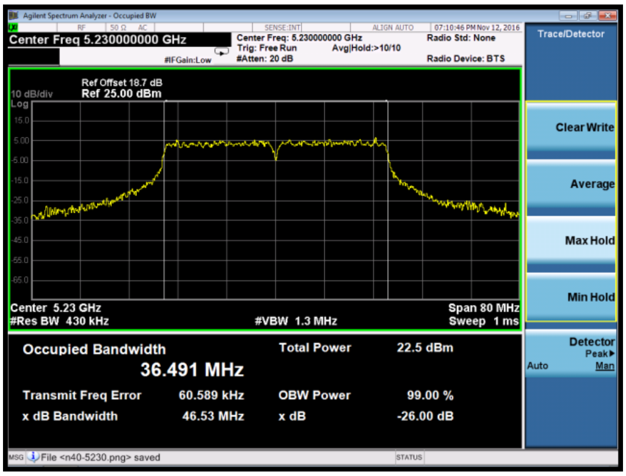
Channel 48 (5240MHz)	
	
802. 11n-HT20 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1	
Channel 36 (5180MHz)	**Channel 44 (5220MHz)**
	
Channel 48 (5240MHz)	
	

802. 11n-HT40 26dB Bandwidth & 99% Bandwidth - Ant 0 / Ant 0 + 1

Channel 38 (5190MHz)



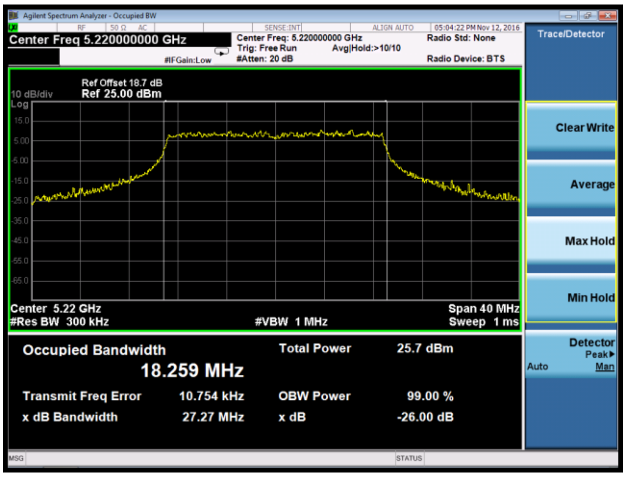
Channel 46 (5230MHz)



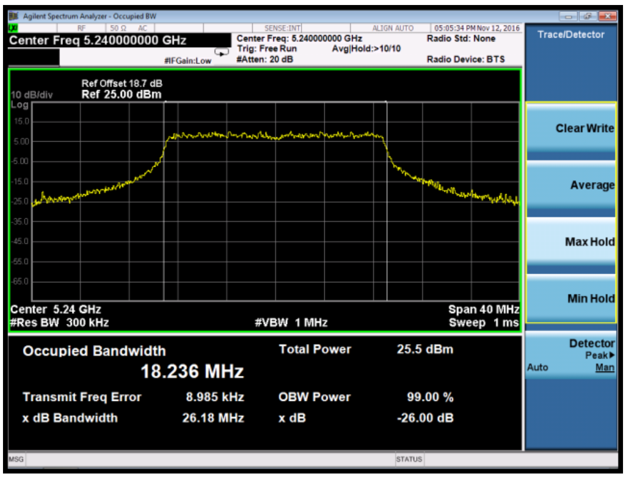
802. 11n-HT20 26dB Bandwidth & 99% Bandwidth - Ant 1 / Ant 0 + 1

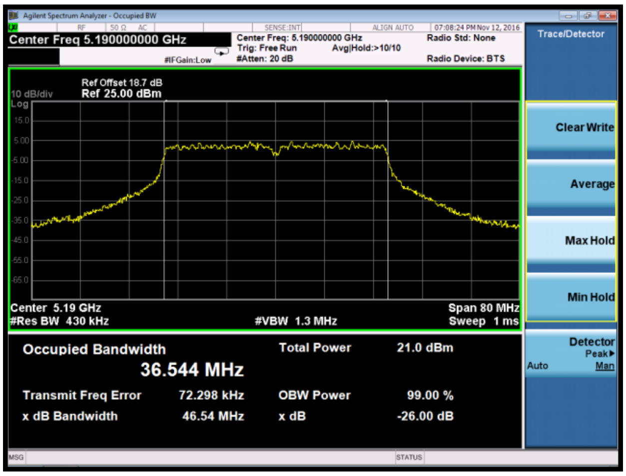
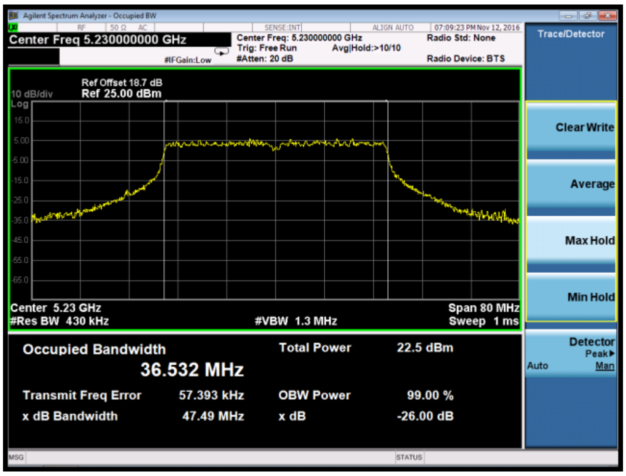
Channel 36 (5180MHz)

Channel 44 (5220MHz)



Channel 48 (5240MHz)



802. 11n-HT40 26dB Bandwidth & 99% Bandwidth - Ant 1 / Ant 0 + 1	
Channel 38 (5190MHz)	Channel 46 (5230MHz)
	

7.3. Output Power Measurement

7.3.1. Test Limit

For the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 250mW (24dBm).

If transmitting antennas of directional gain greater than 6dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

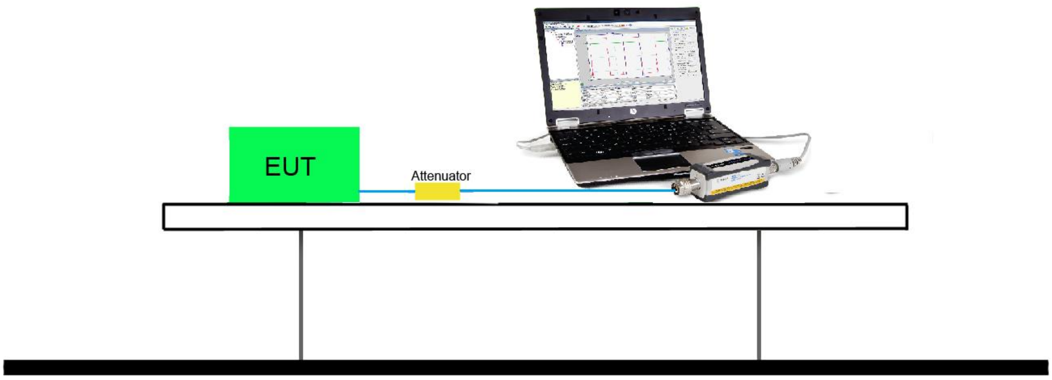
7.3.2. Test Procedure Used

KDB 789033 D02v01r03 - Section E) 3) b) Method PM-G

7.3.3. Test Setting

Average power measurements were perform only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter. The trace was averaged over 100 traces to obtain the final measured average power.

7.3.4. Test Setup



7.3.5. Test Result

Power output test was verified over all data rates of each mode shown as below, and then choose the maximum power output (yellow marker) for final test of each channel.

N_{Tx}	802.11a	MCS Index for 802.11n	Data Rate (Mbps)			
			20MHz Bandwidth		40MHz Bandwidth	
			800ns GI	400ns GI	800ns GI	400ns GI
1	6	0	6.5	7.2	13.5	15.0
1	9	1	13.0	14.4	27.0	30.0
1	12	2	19.5	21.7	40.5	45.0
1	18	3	26.0	28.9	54.0	60.0
1	24	4	39.0	43.3	81.0	90.0
1	36	5	52.0	57.8	108.0	120.0
1	48	6	58.5	65.0	121.5	135.0
1	54	7	65.0	72.2	135.0	150.0

N_{Tx}	MCS Index for 802.11n	Data Rate (Mbps)			
		20MHz Bandwidth		40MHz Bandwidth	
		800ns GI	400ns GI	800ns GI	400ns GI
2	8	13.0	14.4	27.0	30.0
2	9	26.0	28.9	54.0	60.0
2	10	39.0	43.3	81.0	90.0
2	11	52.0	57.8	108.0	120.0
2	12	78.0	86.7	162.0	180.0
2	13	104.0	115.6	216.0	240.0
2	14	117.0	130.0	243.0	270.0
2	15	130.0	144.0	270.0	300.0

Note: Power output test was verified over all data rates of each mode shown as above, and then choose the maximum power output (yellow marker) for final test of each channel.

Output power at various data rates:

Test Mode	Bandwidth	Channel	Frequency (MHz)	Data Rate (Mbps)	Average Power (dBm)
Ant 0					
802.11a	20	36	5180	6	19.65
				24	19.34
				54	19.18
Ant 0 / Ant 0 + 1					
802.11n	20	36	5180	13.0	18.48
				26.0	18.36
				39.0	18.20
				52.0	17.96
				78.0	17.90
				104.0	17.76
				117.0	17.69
				130.0	17.61
802.11n	40	38	5190	27.0	15.48
				54.0	15.35
				81.0	15.07
				108.0	14.97
				162.0	14.84
				216.0	14.78
				243.0	14.72
				270.0	14.68

1T$_X$

Test Mode	Data Rate (Mbps)	Channel No.	Freq. (MHz)	Average Power (dBm)	Average Power Limit (dBm)	Result
Ant 0						
11a	6	36	5180	19.65	≤ 24.00	Pass
11a	6	44	5220	22.08	≤ 24.00	Pass
11a	6	48	5240	21.92	≤ 24.00	Pass
Ant 1						
11a	6	36	5180	21.17	≤ 24.00	Pass
11a	6	44	5220	21.39	≤ 24.00	Pass
11a	6	48	5240	21.12	≤ 24.00	Pass

2T$_X$

Test Mode	Data Rate (Mbps)	Channel No.	Freq. (MHz)	Ant 0 Average Power (dBm)	Ant 1 Average Power (dBm)	Total Average Power (dBm)	Average power Limit (dBm)	Result
11n-HT20	13	36	5180	18.48	18.05	21.28	≤ 24.00	Pass
11n-HT20	13	44	5220	19.36	19.35	22.37	≤ 24.00	Pass
11n-HT20	13	48	5240	19.75	18.96	22.38	≤ 24.00	Pass
11n-HT40	27	38	5190	15.48	15.23	18.37	≤ 24.00	Pass
11n-HT40	27	46	5230	19.49	19.51	22.51	≤ 24.00	Pass

Note: The Total Average Power (dBm) = $10*\log\{10^{(\text{Ant 0 Average Power }/10)} + 10^{(\text{Ant 1 Average Power }/10)}\}$.

7.4. Power Spectral Density Measurement

7.4.1. Test Limit

For the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 11dBm in any 1MHz band.

If transmitting antennas of directional gain greater than 6dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

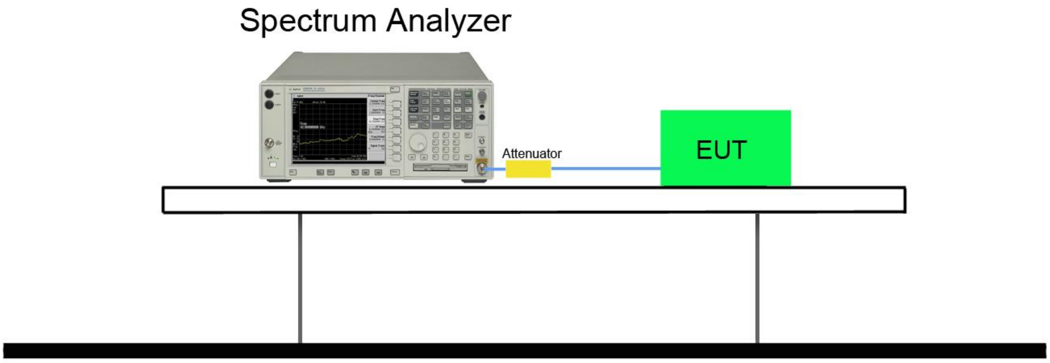
7.4.2. Test Procedure Used

KDB 789033 D02v01r03 - Section F

7.4.3. Test Setting

1. Analyzer was set to the center frequency of the UNII channel under investigation
2. Span was set to encompass the entire 26dB EBW of the signal.
3. RBW = 1MHz
4. VBW = 3MHz
5. Number of sweep points ≥ 2 × (span / RBW)
6. Sweep time = auto
7. Detector = power averaging (rms), if available. Otherwise, use sample detector mode.
8. Do not use sweep triggering. Allow the sweep to “free run.”
9. Trace average at least 100 traces in power averaging (rms) mode; however, the number of traces to be averaged shall be increased above 100 as needed to ensure that the average accurately represents the true average over the on and off periods of the transmitter.
10. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
11. 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 (because the measurement represents an average over both the on and off times of the transmission). For example, add 10 log (1/0.25) = 6 dB if the duty cycle is 25%.

7.4.4. Test Setup



7.4.5. Test Result

1Tx

Test Mode	Data Rate (Mbps)	Channel No.	Freq. (MHz)	PSD (dBm/MHz)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
Ant 0							
11a	6	36	5180	6.452	6.452	≤ 11	Pass
11a	6	44	5220	9.082	9.082	≤ 11	Pass
11a	6	48	5240	8.986	8.986	≤ 11	Pass
Ant 1							
11a	6	36	5180	7.558	7.558	≤ 11	Pass
11a	6	44	5220	8.498	8.498	≤ 11	Pass
11a	6	48	5240	8.001	8.001	≤ 11	Pass

Note: When EUT duty cycle < 98%, Total PSD (dBm/MHz) = PSD (dBm/MHz) + 10*log(1/duty cycle).

2Tx

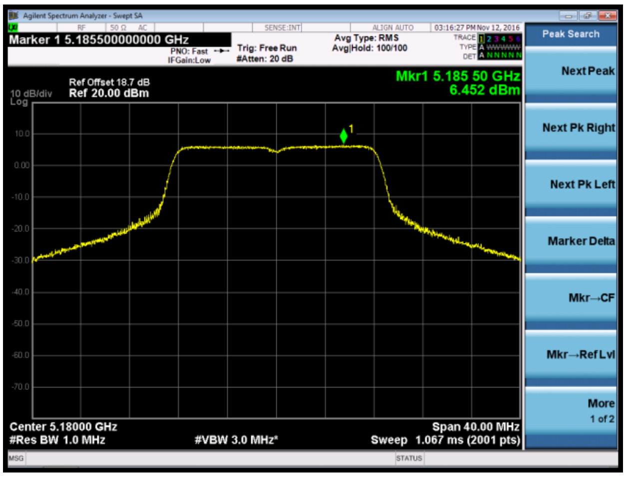
Test Mode	Data Rate (Mbps)	Channel No.	Freq. (MHz)	Ant 0 PSD (dBm/MHz)	Ant 1 PSD (dBm/MHz)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
Ant 0 + 1								
11n-HT20	13	36	5180	5.032	4.413	7.744	≤ 8.99	Pass
11n-HT20	13	44	5220	5.423	5.327	8.386	≤ 8.99	Pass
11n-HT20	13	48	5240	5.400	5.407	8.414	≤ 8.99	Pass
11n-HT40	27	38	5190	-0.904	-1.299	2.021	≤ 8.99	Pass
11n-HT40	27	46	5230	5.062	5.308	8.305	≤ 8.99	Pass

Note 1: When EUT duty cycle < 98%, Total PSD (dBm/MHz) = $10*\log\{10^{(\text{Ant 0 PSD}/10)} + 10^{(\text{Ant 1 PSD}/10)}\}$ + 10*log(1/duty cycle).

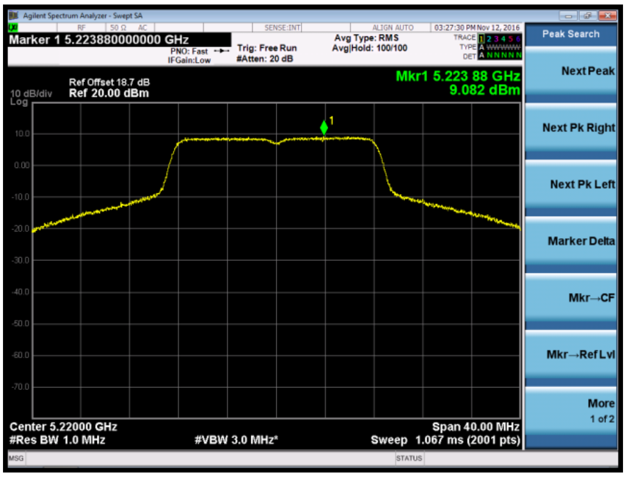
Note 2: Limit = 11dBm/MHz – (8.01dBi – 6dBi) = 8.99dBm/MHz.

802.11a Power Spectral Density - Ant 0

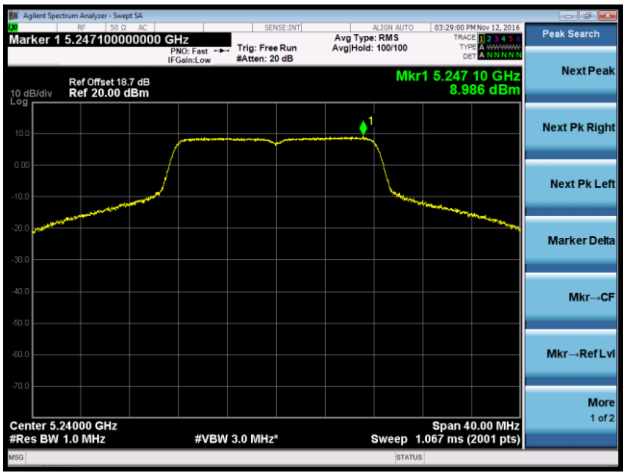
Channel 36 (5180MHz)



Channel 44 (5220MHz)

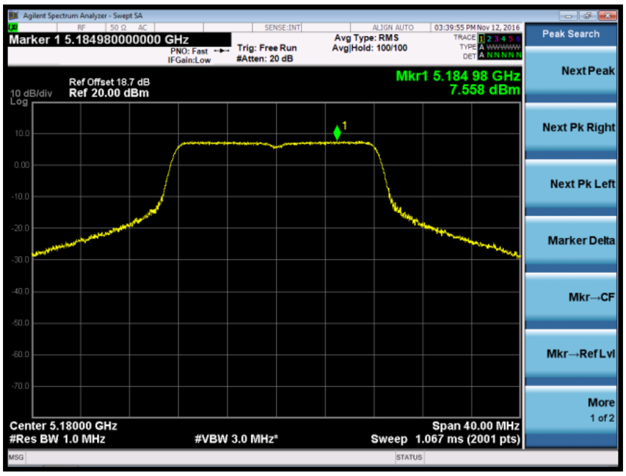


Channel 48 (5240MHz)

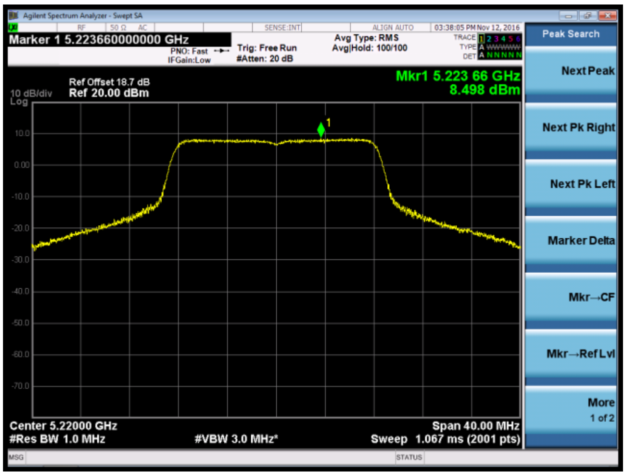


802.11a Power Spectral Density - Ant 1

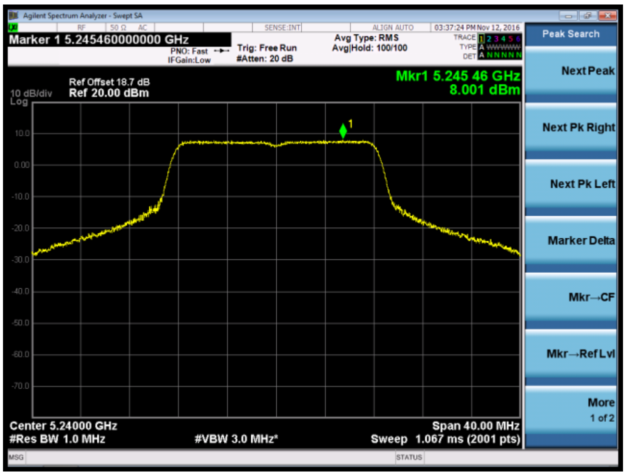
Channel 36 (5180MHz)



Channel 44 (5220MHz)

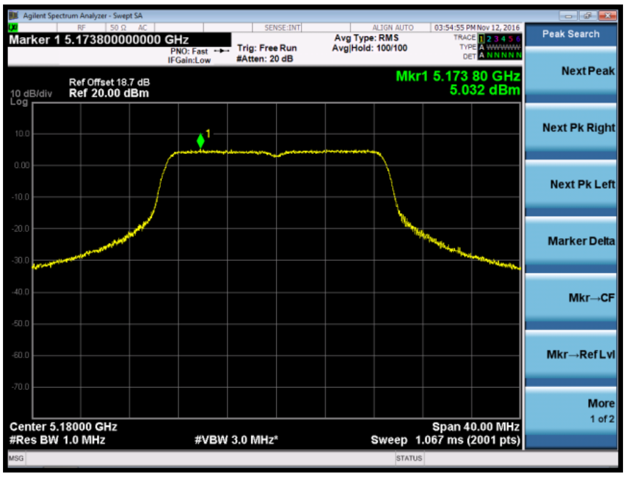


Channel 48 (5240MHz)

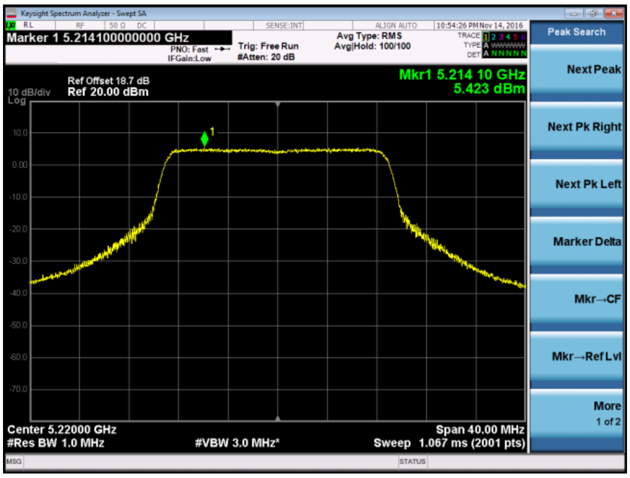


802.11n-HT20 Power Spectral Density - Ant 0 / Ant 0 + 1

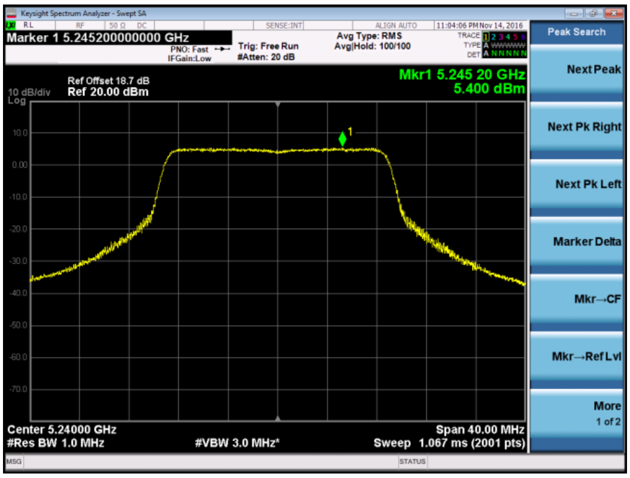
Channel 36 (5180MHz)

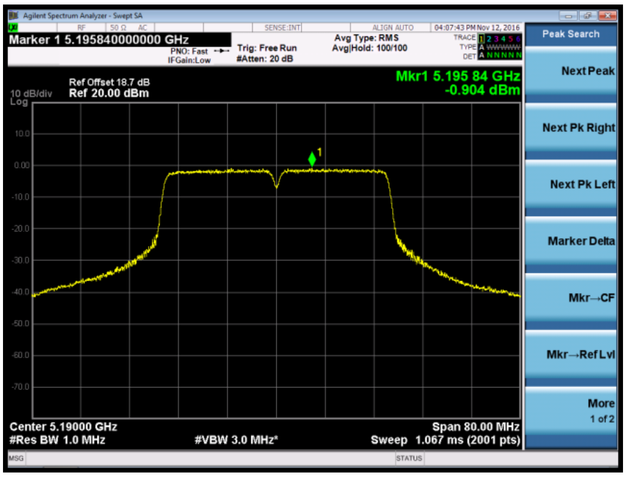
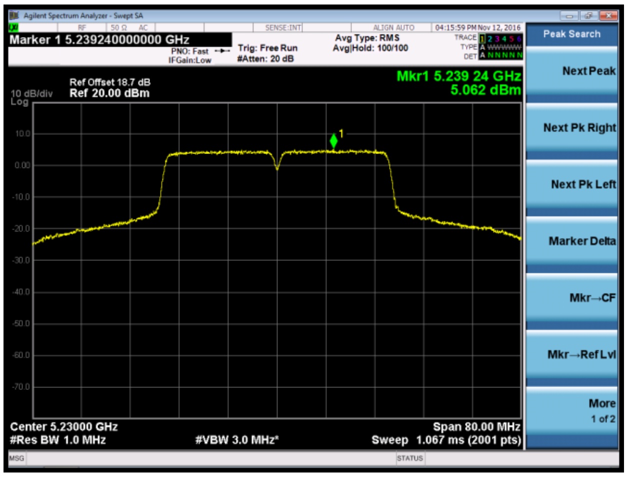


Channel 44 (5220MHz)



Channel 48 (5240MHz)



<table>
<tr><th colspan="2">802.11n-HT40 Power Spectral Density - Ant 0 / Ant 0 + 1</th></tr>
<tr><th>Channel 38 (5190MHz)</th><th>Channel 46 (5230MHz)</th></tr>
<tr><td>
</td><td>
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<tr><th colspan="2">802.11n-HT20 Power Spectral Density - Ant 1 / Ant 0 + 1</th></tr>
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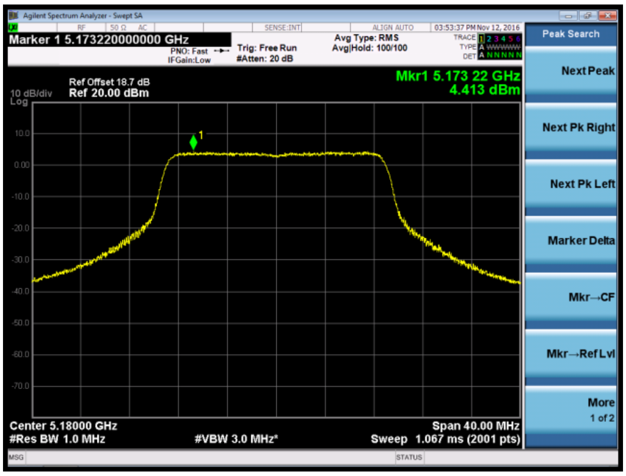
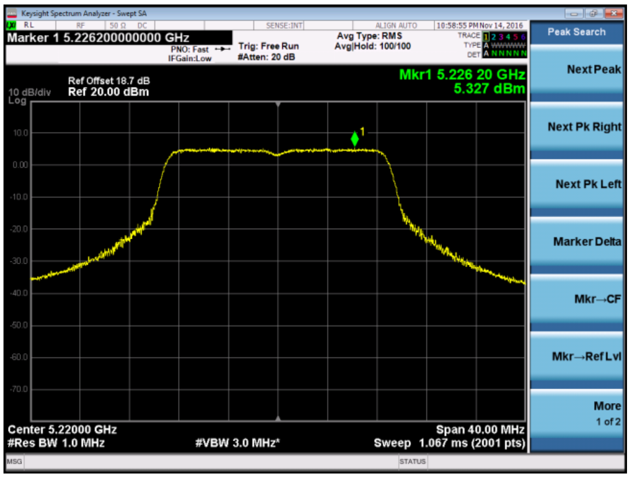
<tr><td>
</td><td>
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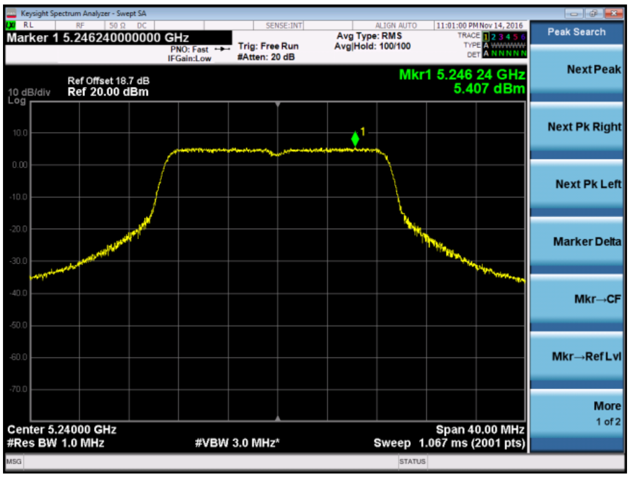
<tr><th>Channel 48 (5240MHz)</th><th></th></tr>
<tr><td>
</td><td></td></tr>
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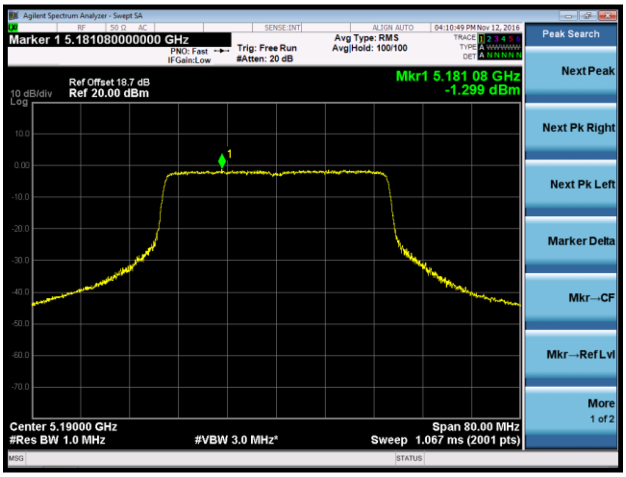
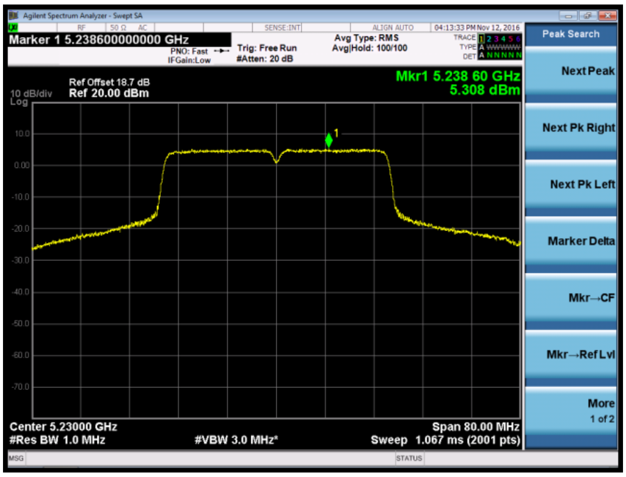
802.11n-HT40 Power Spectral Density - Ant 1 / Ant 0 + 1	
Channel 38 (5190MHz)	**Channel 46 (5230MHz)**
	

7.5. Frequency Stability Measurement

7.5.1. Test Limit

Manufactures of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

7.5.2. Test Procedure Used

Frequency Stability Under Temperature Variations:

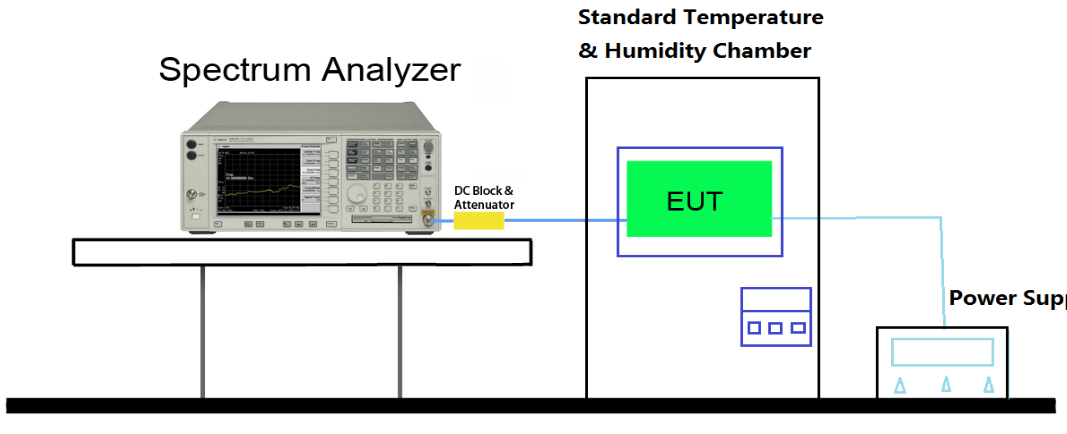
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to highest. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C decreased per stage until the lowest temperature reached.

Frequency Stability Under Voltage Variations:

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation (±15%) and endpoint, record the maximum frequency change.

7.5.3. Test Setup



7.5.4. Test Result

Test Engineer	Amy Zhang	Temperature	-30 ~ 50°C
Test Time	11-12-2016	Relative Humidity	52%RH

Voltage (%)	Power (V_{AC})	Temp (°C)	Frequency Tolerance (ppm)			
			0 minutes	2 minutes	5 minutes	10 minutes
100%	120	- 30	-1.41	-1.09	0.71	-2.40
		- 20	-3.73	-1.78	-4.27	-4.06
		- 10	-5.32	-6.94	-2.64	-1.74
		0	-0.53	-3.63	-0.69	-5.63
		+ 10	-3.51	-2.93	-3.30	-0.03
		+ 20 (Ref)	-4.31	-0.80	0.55	0.10
		+ 30	-3.03	-5.93	-4.96	-0.49
		+ 40	-1.69	-1.00	0.18	-4.31
		+ 50	1.52	1.28	0.19	-4.85
115%	138	+ 20	0.17	-3.51	-2.34	0.09
85%	102	+ 20	-0.81	-2.09	-4.30	-2.01

Note: Frequency Tolerance (ppm) = {[Measured Frequency (Hz) - Declared Frequency (Hz)] / Declared Frequency (Hz)} $*10^6$.

7.6. Radiated Spurious Emission Measurement

7.6.1. Test Limit

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
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

7.6.2. Test Procedure Used

KDB 789033 D02v01r03 – Section G

7.6.3. Test Setting

Peak Measurements above 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Quasi-Peak Measurements below 1GHz

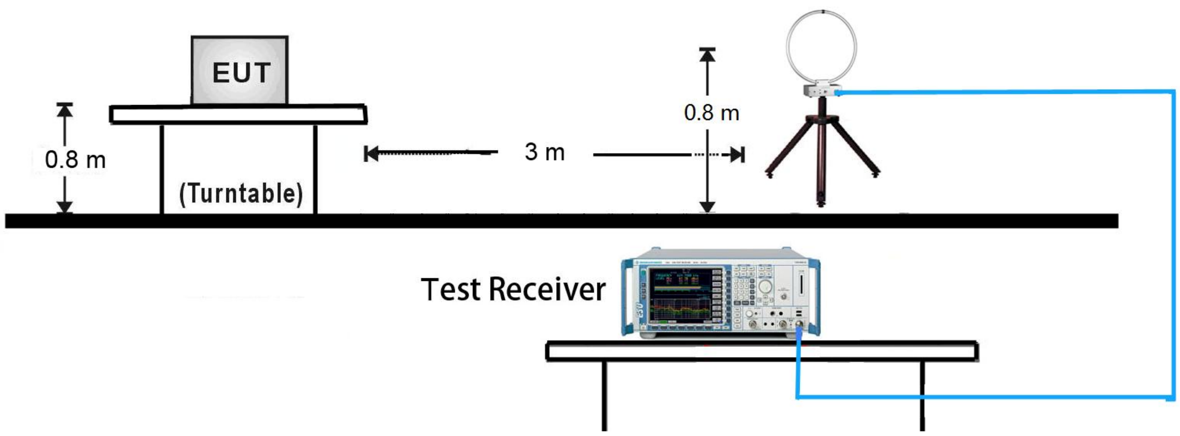
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. Span was set greater than 1MHz
3. RBW = 120 kHz
4. Detector = CISPR quasi-peak
5. Sweep time = auto couple
6. Trace was allowed to stabilize

Average Measurements above 1GHz (Method AD)

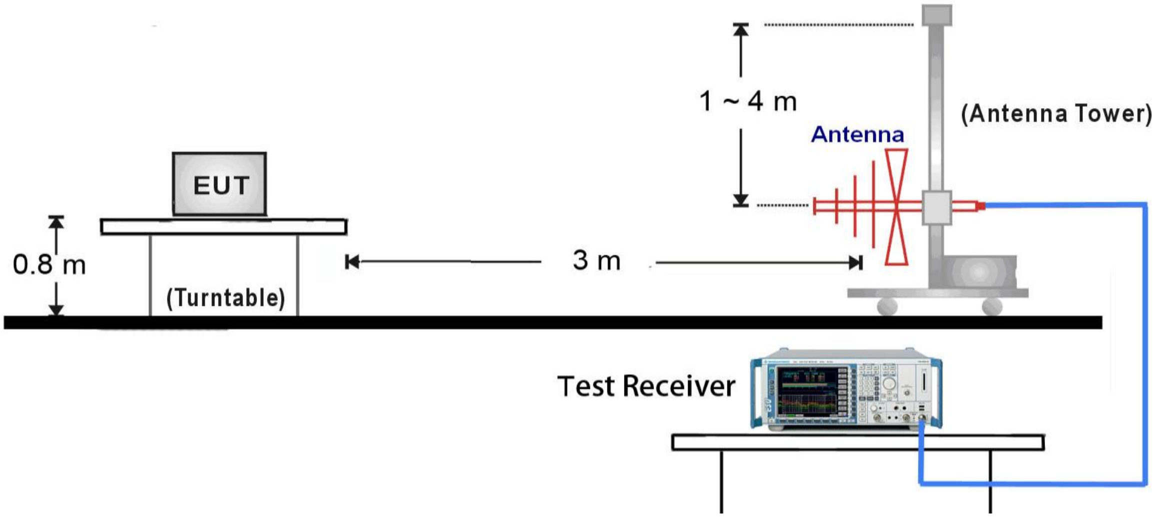
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = power average (Average)
5. Number of measurement points = 1001 (Number of points must be > 2 x span/RBW)
6. Sweep time = auto
7. Trace was averaged over at 100 sweeps

7.6.4. Test Setup

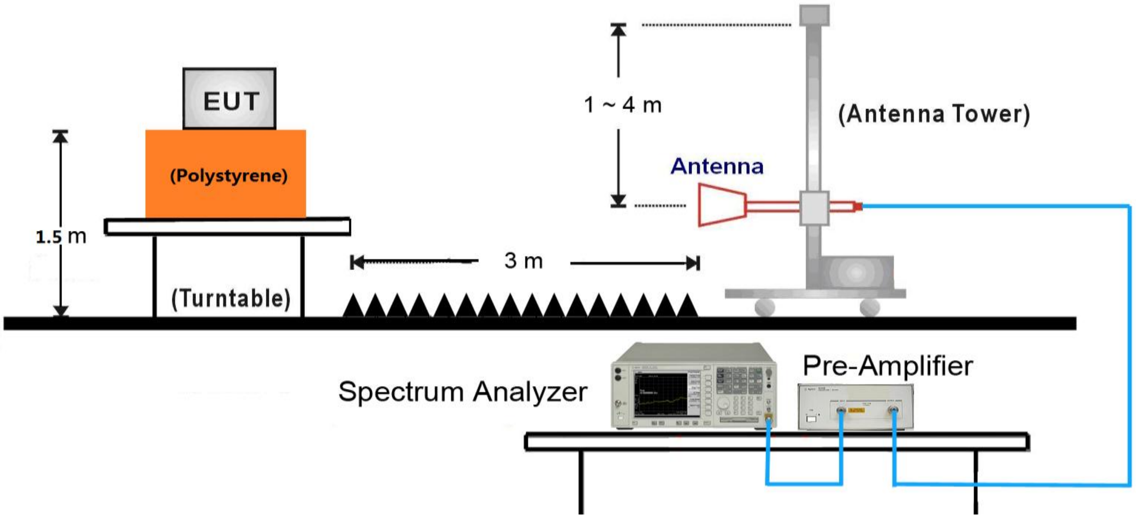
9kHz ~ 30MHz Test Setup:



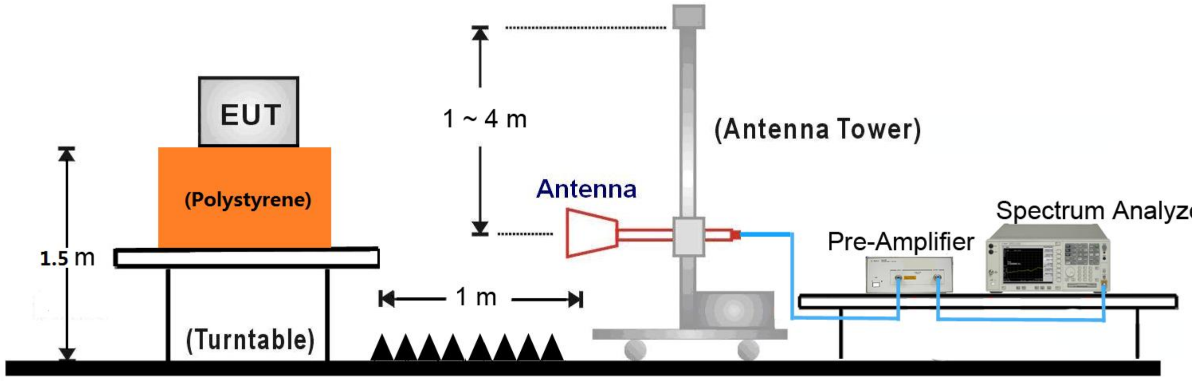
30MHz ~ 1GHz Test Setup:



1GHz ~18GHz Test Setup:



18GHz ~40GHz Test Setup:



7.6.5. Test Result

For Dipole Antenna

Test Mode:	802.11a - Ant 0	Test Site:	AC1
Test Channel:	36	Test Engineer:	Jone Zhang
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBµV)	Factor (dB)	Measure Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Polarization
*	8735.0	36.0	8.9	44.9	68.2	-23.3	Peak	Horizontal
*	9219.5	35.6	10.1	45.7	68.2	-22.5	Peak	Horizontal
	10970.5	35.0	13.1	48.1	74.0	-25.9	Peak	Horizontal
	14479.0	34.6	15.8	50.4	74.0	-23.6	Peak	Horizontal
*	7111.5	36.1	7.5	43.6	68.2	-24.6	Peak	Vertical
*	8633.0	36.7	8.8	45.5	68.2	-22.7	Peak	Vertical
	9245.0	36.3	10.2	46.5	74.0	-27.5	Peak	Vertical
	14468.6	35.7	15.8	51.5	74.0	-22.5	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is -27dBm/MHz. At a distance of 3 meters, the field strength limit in dBµV/m can be determined by adding a “conversion” factor of 95.2dB to the EIRP limit of -27dBm/MHz to obtain the limit for out of band spurious emissions.

Note 2: Measure Level (dBµV/m) = Reading Level (dBµV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Test Mode:	802.11a - Ant 0	Test Site:	AC1
Test Channel:	44	Test Engineer:	Jone Zhang
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
*	7859.5	34.4	8.4	42.8	68.2	-25.4	Peak	Horizontal
*	8650.0	36.7	8.8	45.5	68.2	-22.7	Peak	Horizontal
	11514.5	35.1	12.8	47.9	74.0	-26.1	Peak	Horizontal
	15662.5	43.4	12.0	55.4	74.0	-18.6	Peak	Horizontal
	15662.5	31.6	12.0	43.6	54.0	-10.4	Average	Horizontal
*	8607.5	36.6	8.8	45.4	68.2	-22.8	Peak	Vertical
*	10120.5	34.7	11.6	46.3	68.2	-21.9	Peak	Vertical
	11276.5	35.5	12.4	47.9	74.0	-26.1	Peak	Vertical
	15654.0	40.0	12.0	52.0	74.0	-22.0	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is -27dBm/MHz. At a distance of 3 meters, the field strength limit in dBμV/m can be determined by adding a “conversion” factor of 95.2dB to the EIRP limit of -27dBm/MHz to obtain the limit for out of band spurious emissions.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Test Mode:	802.11a - Ant 0	Test Site:	AC1
Test Channel:	48	Test Engineer:	Jone Zhang
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
*	7145.5	36.0	7.7	43.7	68.2	-24.5	Peak	Horizontal
*	8641.5	36.5	8.8	45.3	68.2	-22.9	Peak	Horizontal
	11302.0	35.9	12.5	48.4	74.0	-25.6	Peak	Horizontal
	15722.0	42.1	11.8	53.9	74.0	-20.1	Peak	Horizontal
*	7910.5	36.6	8.4	45.0	68.2	-23.2	Peak	Vertical
*	8854.0	35.5	9.1	44.6	68.2	-23.6	Peak	Vertical
	10945.0	35.6	13.1	48.7	74.0	-25.3	Peak	Vertical
	15722.0	40.4	11.8	52.2	74.0	-21.8	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is -27dBm/MHz. At a distance of 3 meters, the field strength limit in dBμV/m can be determined by adding a “conversion” factor of 95.2dB to the EIRP limit of -27dBm/MHz to obtain the limit for out of band spurious emissions.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Test Mode:	802.11a - Ant 1	Test Site:	AC1
Test Channel:	36	Test Engineer:	Jone Zhang
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
*	7902.0	36.3	8.3	44.6	68.2	-23.6	Peak	Horizontal
*	8701.0	35.9	9.0	44.9	68.2	-23.3	Peak	Horizontal
	9355.5	35.6	10.5	46.1	74.0	-27.9	Peak	Horizontal
	14469.1	35.1	15.8	50.9	74.0	-23.1	Peak	Horizontal
*	7910.5	35.8	8.4	44.2	68.2	-24.0	Peak	Vertical
*	8658.5	36.4	8.8	45.2	68.2	-23.0	Peak	Vertical
	11013.0	35.0	13.0	48.0	74.0	-26.0	Peak	Vertical
	14478.3	35.0	15.8	50.8	74.0	-23.2	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is -27dBm/MHz or -17dBm/MHz. At a distance of 3 meters, the field strength limit in dBμV/m can be determined by adding a “conversion” factor of 95.2dB to the EIRP limit of -27dBm/MHz to obtain the limit for out of band spurious emissions.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Test Mode:	802.11a - Ant 1	Test Site:	AC1
Test Channel:	44	Test Engineer:	Jone Zhang
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
*	7851.0	35.3	8.4	43.7	68.2	-24.5	Peak	Horizontal
*	10163.0	34.5	11.7	46.2	68.2	-22.0	Peak	Horizontal
	11506.0	35.4	12.8	48.2	74.0	-25.8	Peak	Horizontal
	15662.5	42.3	12.0	54.3	74.0	-19.7	Peak	Horizontal
	15662.5	31.9	12.0	43.9	54.0	-10.1	Average	Horizontal
*	8667.0	37.7	8.9	46.6	68.2	-21.6	Peak	Vertical
*	10171.5	35.6	11.7	47.3	68.2	-20.9	Peak	Vertical
	12364.5	36.7	11.5	48.2	74.0	-25.8	Peak	Vertical
	15671.0	41.6	11.9	53.5	74.0	-20.5	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is -27dBm/MHz or -17dBm/MHz. At a distance of 3 meters, the field strength limit in dBμV/m can be determined by adding a "conversion" factor of 95.2dB to the EIRP limit of -27dBm/MHz to obtain the limit for out of band spurious emissions.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Test Mode:	802.11a - Ant 1	Test Site:	AC1
Test Channel:	48	Test Engineer:	Jone Zhang
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
*	7103.0	35.1	7.5	42.6	68.2	-25.6	Peak	Horizontal
*	8505.5	36.2	8.4	44.6	68.2	-23.6	Peak	Horizontal
	11327.5	35.4	12.5	47.9	74.0	-26.1	Peak	Horizontal
	15705.0	43.0	11.8	54.8	74.0	-19.2	Peak	Horizontal
	15705.0	31.4	11.8	43.2	54.0	-10.8	Average	Horizontal
*	7188.0	36.6	7.8	44.4	68.2	-23.8	Peak	Vertical
*	8590.5	35.5	8.7	44.2	68.2	-24.0	Peak	Vertical
	11642.0	36.8	12.4	49.2	74.0	-24.8	Peak	Vertical
	15722.0	42.0	11.8	53.8	74.0	-20.2	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is -27dBm/MHz or -17dBm/MHz. At a distance of 3 meters, the field strength limit in dBμV/m can be determined by adding a “conversion” factor of 95.2dB to the EIRP limit of -27dBm/MHz to obtain the limit for out of band spurious emissions.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Test Mode:	802.11n-HT20 - Ant 0 + 1	Test Site:	AC1
Test Channel:	36	Test Engineer:	Jone Zhang
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
*	7196.5	36.2	7.8	44.0	68.2	-24.2	Peak	Horizontal
*	8650.0	37.2	8.8	46.0	68.2	-22.2	Peak	Horizontal
	10962.0	35.3	13.1	48.4	74.0	-25.6	Peak	Horizontal
	13367.5	37.0	13.6	50.6	74.0	-23.4	Peak	Horizontal
*	7987.0	35.2	8.7	43.9	68.2	-24.3	Peak	Vertical
*	8726.5	36.0	9.0	45.0	68.2	-23.2	Peak	Vertical
	10953.5	36.1	13.1	49.2	74.0	-24.8	Peak	Vertical
	14200.5	36.7	15.4	52.1	74.0	-21.9	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is -27dBm/MHz or -17dBm/MHz. At a distance of 3 meters, the field strength limit in dBμV/m can be determined by adding a "conversion" factor of 95.2dB to the EIRP limit of -27dBm/MHz to obtain the limit for out of band spurious emissions.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Test Mode:	802.11n-HT20 - Ant 0 + 1	Test Site:	AC1
Test Channel:	44	Test Engineer:	Jone Zhang
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
*	7179.5	35.5	7.8	43.3	68.2	-24.9	Peak	Horizontal
*	8811.5	34.9	9.0	43.9	68.2	-24.3	Peak	Horizontal
	11038.5	36.1	12.9	49.0	74.0	-25.0	Peak	Horizontal
	15654.0	45.6	12.0	57.6	74.0	-16.4	Peak	Horizontal
	15660.5	34.2	12.0	46.2	54.0	-7.8	Average	Horizontal
*	8743.5	37.1	9.0	46.1	68.2	-22.1	Peak	Vertical
*	10443.5	37.7	12.0	49.7	68.2	-18.5	Peak	Vertical
	12517.5	36.5	11.4	47.9	74.0	-26.1	Peak	Vertical
	15654.0	43.9	12.0	55.9	74.0	-18.1	Peak	Vertical
	15654.0	33.1	12.0	45.1	54.0	-8.9	Average	Vertical

Note 1: “*” is not in restricted band, its limit is -27dBm/MHz or -17dBm/MHz. At a distance of 3 meters, the field strength limit in dBμV/m can be determined by adding a “conversion” factor of 95.2dB to the EIRP limit of -27dBm/MHz to obtain the limit for out of band spurious emissions.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Test Mode:	802.11n-HT20 - Ant 0 + 1	Test Site:	AC1
Test Channel:	48	Test Engineer:	Jone Zhang
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
*	7970.0	36.0	8.6	44.6	68.2	-23.6	Peak	Horizontal
*	8718.0	35.7	9.0	44.7	68.2	-23.5	Peak	Horizontal
	10970.5	34.5	13.1	47.6	74.0	-26.4	Peak	Horizontal
	15722.6	34.0	11.8	45.8	54.0	-8.2	Average	Horizontal
	15730.5	45.0	11.8	56.8	74.0	-17.2	Peak	Horizontal
*	7944.5	36.0	8.5	44.5	68.2	-23.7	Peak	Vertical
*	10477.5	36.1	12.2	48.3	68.2	-19.9	Peak	Vertical
	11268.0	35.9	12.4	48.3	74.0	-25.7	Peak	Vertical
	15722.0	43.6	11.8	55.4	74.0	-18.6	Peak	Vertical
	15722.0	32.8	11.8	44.6	54.0	-9.4	Average	Vertical

Note 1: “*” is not in restricted band, its limit is -27dBm/MHz or -17dBm/MHz. At a distance of 3 meters, the field strength limit in dBμV/m can be determined by adding a “conversion” factor of 95.2dB to the EIRP limit of -27dBm/MHz to obtain the limit for out of band spurious emissions.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Test Mode:	802.11n-HT40 - Ant 0 + 1	Test Site:	AC1
Test Channel:	38	Test Engineer:	Jone Zhang
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBµV)	Factor (dB)	Measure Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Polarization
*	7902.0	36.2	8.3	44.5	68.2	-23.7	Peak	Horizontal
*	8820.0	36.1	9.0	45.1	68.2	-23.1	Peak	Horizontal
	11004.5	35.3	13.0	48.3	74.0	-25.7	Peak	Horizontal
	14471.3	35.0	15.8	50.8	74.0	-23.2	Peak	Horizontal
*	7137.0	36.1	7.7	43.8	68.2	-24.4	Peak	Vertical
*	8650.0	36.0	8.8	44.8	68.2	-23.4	Peak	Vertical
	10936.5	34.6	13.0	47.6	74.0	-26.4	Peak	Vertical
	14475.2	35.2	15.8	51.0	74.0	-23.0	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is -27dBm/MHz or -17dBm/MHz. At a distance of 3 meters, the field strength limit in dBµV/m can be determined by adding a “conversion” factor of 95.2dB to the EIRP limit of -27dBm/MHz to obtain the limit for out of band spurious emissions.

Note 2: Measure Level (dBµV/m) = Reading Level (dBµV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Test Mode:	802.11n-HT40 - Ant 0 + 1	Test Site:	AC1
Test Channel:	46	Test Engineer:	Jone Zhang
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	7621.5	36.1	8.0	44.1	74.0	-29.9	Peak	Horizontal
	8038.0	35.8	8.8	44.6	74.0	-29.4	Peak	Horizontal
*	8641.5	36.5	8.8	45.3	68.2	-22.9	Peak	Horizontal
*	10129.0	35.5	11.6	47.1	68.2	-21.1	Peak	Horizontal
	7502.5	36.4	8.3	44.7	74.0	-29.3	Peak	Vertical
	9117.5	36.7	9.5	46.2	74.0	-27.8	Peak	Vertical
*	10520.0	34.9	12.4	47.3	68.2	-20.9	Peak	Vertical
*	14676.5	38.1	15.7	53.8	68.2	-14.4	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is -27dBm/MHz or -17dBm/MHz. At a distance of 3 meters, the field strength limit in dBμV/m can be determined by adding a “conversion” factor of 95.2dB to the EIRP limit of -27dBm/MHz to obtain the limit for out of band spurious emissions.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)