MRT Technology2Suzhou) Co., Ltd
Phone: +86-512-66308358
Fax: +86-512-66308368
Web: www.mrt-cert.com

Report No.: 1607RSU01401
Report Version: V01
Issue Date: 08-04-2016

MEASUREMENT REPORT
FCC PART 15.247 / RSS-247 WLAN 802.11b/g/n

FCC ID:	2ACS5-ST16P
IC:	11554B-ST16P
APPLICANT:	Yuneec Technology Co., Limited
Application Type:	Certification
Product:	Personal Ground Station
FCC Model No.:	ST16***** (The "*" can be 0 to 9, a to z, A to Z, blank or plus, for marketing purpose.)
IC Model No.:	ST16 Pro
Brand Name:	YUNEEC
FCC Classification:	Digital Transmission System (DTS)
FCC Rule Part(s):	Part 15.247
IC Rule(s):	RSS-247 Issue 1, RSS-GEN Issue 4
Test Procedure(s):	ANSI C63.10-2013, KDB 558074 D01v03r05
Test Date:	January 22 ~ July 24, 2016

Reviewed By Manager : Robin Wu
(Robin Wu)

Approved By CEO : Marlin Chen
(Marlin Chen)

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

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 558074 D01v03r05. Test results reported herein relate only to the item(s) tested.

Revision History

Report No.	Version	Description	Issue Date	Note
1607RSU01401	Rev. 01	Initial report	08-04-2016	Valid

Compare the original EUT (FCC ID: 2ACS5-ST16)	
RF Parts	Modification
ZigBee	Add the shielding case and change the antenna
WLAN (2.4GHz)	No change
WLAN (5GHz)	Change the antenna
Note 1: Besides the difference as above, add one new adapter and the others are same as before. Note 2: The report was based on the original MRT report 1601RSU02001 and add conducted emission testing.	

CONTENTS

Description Page

§2.1033 General Information

Applicant:	Yuneec Technology Co., Limited
Applicant Address:	2/F Man Shung Industrial Building, 7 Lai Yip Street, Kwun Tong, Hong Kong
Manufacturer:	Yuneec International (China) Co., Ltd.
Manufacturer Address:	No.388 East Zhengwei Road, Jinxi Town, Kunshan, Jiangsu 215324, China
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
MRT Registration No.:	809388
IC Registration No.:	11384A
FCC Rule Part(s):	Part 15.247
IC Rule:	RSS-247 Issue 1, RSS-GEN Issue 4
FCC ID:	2ACS5-ST16P
IC:	11554B-ST16P
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering
FCC Classification:	Digital Transmission System (DTS)

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.**

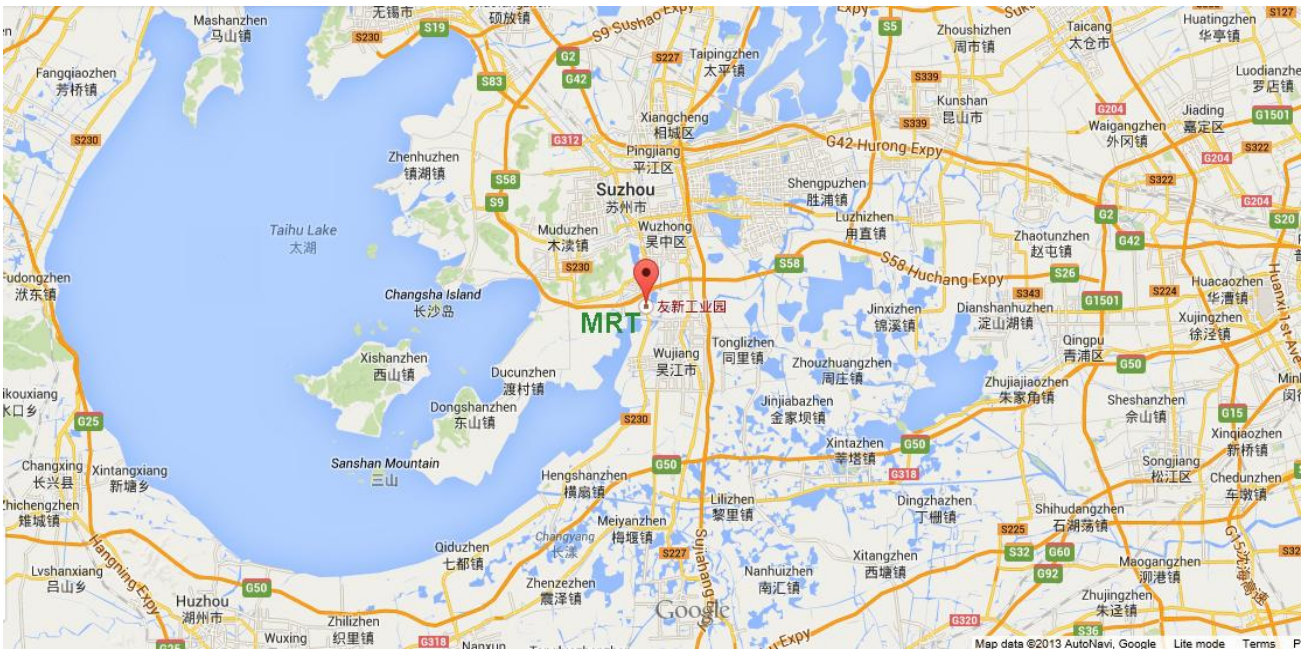
1. INTRODUCTION

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, Youxin Industrial Park, 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	Personal Ground Station
FCC Model No.	ST16***** (The "*" can be 0 to 9, a to z, A to Z, blank or plus, for marketing purpose.)
IC Model No.	ST16 Pro
Brand Name	YUNEEC
WLAN Specification	802.11a/b/g/n
ZigBee Specification	802.15.4
Component	
Adapter	M/N: A31-501000 INPUT: 100-240V ~ 50/60Hz, 0.2A OUTPUT: 5Vdc, 1000mA

2.2. Product Specification Subjective to this Report

Frequency Range	802.11b/g/n-HT20: 2412 ~ 2462 MHz
Maximum Peak Output Power	802.11b: 9.77dBm 802.11g: 15.35dBm 802.11n-HT20: 14.85dBm
Type of Modulation	802.11b: DSSS 802.11g/n: OFDM

Note: For other features of this EUT, test report will be issued separately.

2.3. Operation Frequency / Channel List

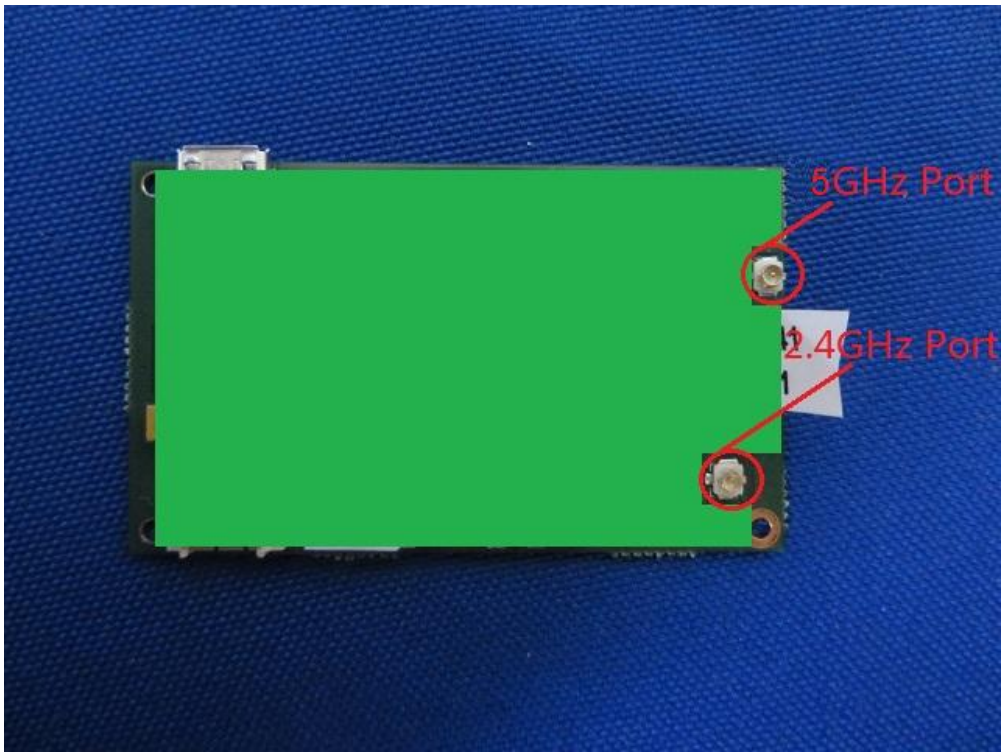
802.11b/g/n-HT20

Channel	Frequency	Channel	Frequency	Channel	Frequency
01	2412 MHz	02	2417 MHz	03	2422 MHz
04	2427 MHz	05	2432 MHz	06	2437 MHz
07	2442 MHz	08	2447 MHz	09	2452 MHz
10	2457 MHz	11	2462 MHz	--	--

2.4. Description of Available Antennas

Antenna Type	Manufacturer	Frequency Band (GHz)	Max Peak Gain (dBi)
Dipole Antenna	Yuneec Technology Co., Limited	2.4	-0.11

2.5. Description of Antenna RF Port

Antenna RF Port


2.6. Test Mode

Test Mode	Mode 1: Transmit by 802.11b
	Mode 2: Transmit by 802.11g
	Mode 3: Transmit by 802.11n-HT20

2.7. Test Software

The test utility software used during testing was “adb.exe”.

2.8. Device Capabilities

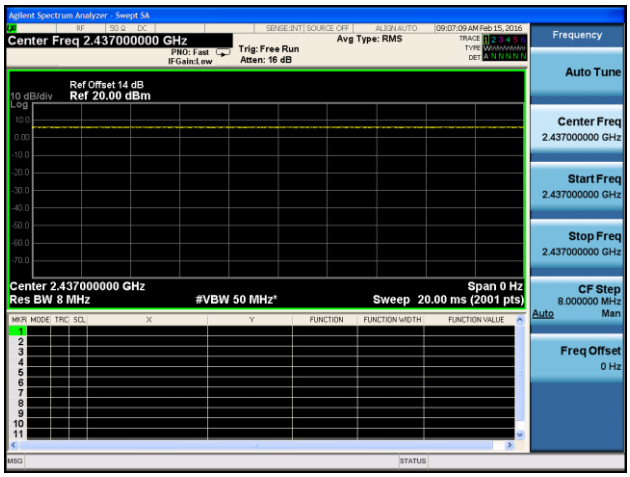
This device contains the following capabilities:

2.4GHz WLAN (DTS) & 2.4GHz ZigBee (DTS) & 5.8GHz WLAN (UNII)

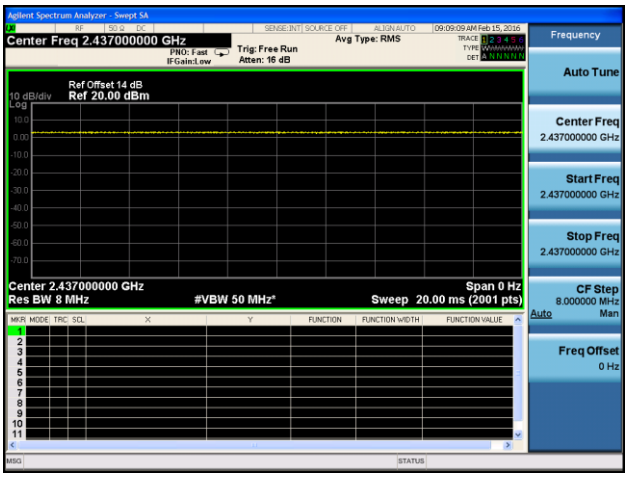
Note: 2.4GHz WLAN (DTS) operation is possible in 20MHz channel bandwidth. The maximum achievable duty cycle was determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Test Mode	Duty Cycle
802.11b	100%
802.11g	100%
802.11n-HT20	100%

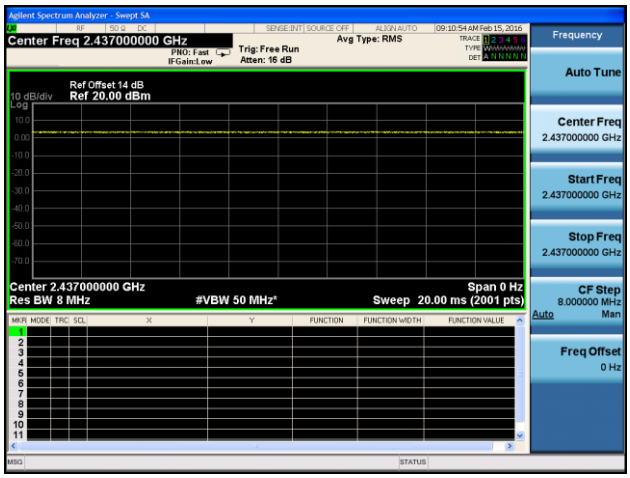
802.11b - Duty Cycle



802.11g - Duty Cycle



802.11n-HT20 - Duty Cycle



2.9. Test Configuration

The **Personal Ground Station FCC ID: 2ACS5-ST16P** was tested per the guidance of KDB 558074 D01v03r05. 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 558074 D01v03r05 were used in the measurement of the **Personal Ground Station FCC ID: 2ACS5-ST16P Mode Number: ST16.**

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 7.8.

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 1-25GHz 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 Personal Ground Station is **permanently attached.**
- There are no provisions for connection to an external antenna.

Conclusion:

The **Personal Ground Station FCC ID: 2ACS5-ST16P** unit complies with the requirement of §15.203.

5. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions - SR2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2016/11/03
Two-Line V-Network	R&S	ENV216	MRTSUE06002	1 year	2016/11/03
Two-Line V-Network	R&S	ENV216	MRTSUE06003	1 year	2016/11/03
Temperature/Humidity Meter	Yuhuaze	HTC-2	MRTSUE06182	1 year	2016/12/20
Shielding Anechoic Chamber	Mikebang	Chamber-SR2	MRTSUE06215	1 year	2017/05/10

Radiated Emission - AC1

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	E4447A	MRTSUE06028	1 year	2016/12/08
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2016/11/03
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2016/04/16
Preamplifier	Agilent	83017A	MRTSUE06076	1 year	2016/03/29
Loop Antenna	Schwarzbeck	FMZB1519	MRTSUE06025	1 year	2016/12/14
TRILOG Antenna	Schwarzbeck	VULB9162	MRTSUE06022	1 year	2016/11/07
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06023	1 year	2016/11/07
Broadband Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06024	1 year	2017/01/04
RF Cable	HUBER+SUHNER	Cable 01	MRTSUE06055-1	1 year	2016/03/29
RF Cable	HUBER+SUHNER	Cable 02	MRTSUE06055-2	1 year	2016/03/29
Temperature/Humidity Meter	Yuhuaze	HTC-2	MRTSUE06182	1 year	2016/12/20
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	1 year	2016/05/10

Conducted Test Equipment - TR3

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2016/05/08
USB Wideband Power Sensor	Boonton	55006	MRTSUE06109	1 year	2016/05/08
RF Cable	HUBER+SUHNER	Cable 03	MRTSUE06055-3	1 year	2016/03/29
Attenuator	Woken	WATT-218FS-15	MRTSUE06220	1 year	2016/03/29
DC Block	Woken	00900A1A2A101A	MRTSUE06221	1 year	2016/03/29
Temperature/Humidity Meter	Yuhuaze	HTC-2	MRTSUE06180	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 ~ 25GHz: 4.76dB
Spurious Emissions, Conducted - TR3
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.78dB
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: **Yuneec Technology Co., Limited**
FCC ID: **2ACS5-ST16P**
IC: **11554B-ST16P**
FCC Classification: **Digital Transmission System (DTS)**
Data Rate(s) Tested: **1Mbps ~ 11Mbps (b); 6Mbps ~ 54Mbps (g); 6.5/7.2Mbps ~ 65.0/72.2Mbps (n-HT20);**

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(2)	RSS-247 [5.2]	6dB Bandwidth	≥ 500kHz	Conducted	Pass	Section 7.2
15.247(b)(3)	RSS-247 [5.4(4)]	Output Power	≤ 1Watt & EIRP ≤ 4Watt		Pass	Section 7.3
15.247(e)	RSS-247 [5.2]	Power Spectral Density	≤ 8dBm / 3kHz Band		Pass	Section 7.4
15.247(d)	RSS-247 [5.5]	Band Edge / Out-of-Band Emissions	≥ 20dBc(Peak)		Pass	Section 7.5
15.205 15.209	RSS-247 [5.5]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209	Radiated	Pass	Section 7.6&7.7
15.207	RSS-Gen [8.8]	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	N/A	Section 7.8

Notes:

1) All modes of operation and data rates were investigated. 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. 6dB Bandwidth Measurement

7.2.1. Test Limit

The minimum 6dB bandwidth shall be at least 500 kHz.

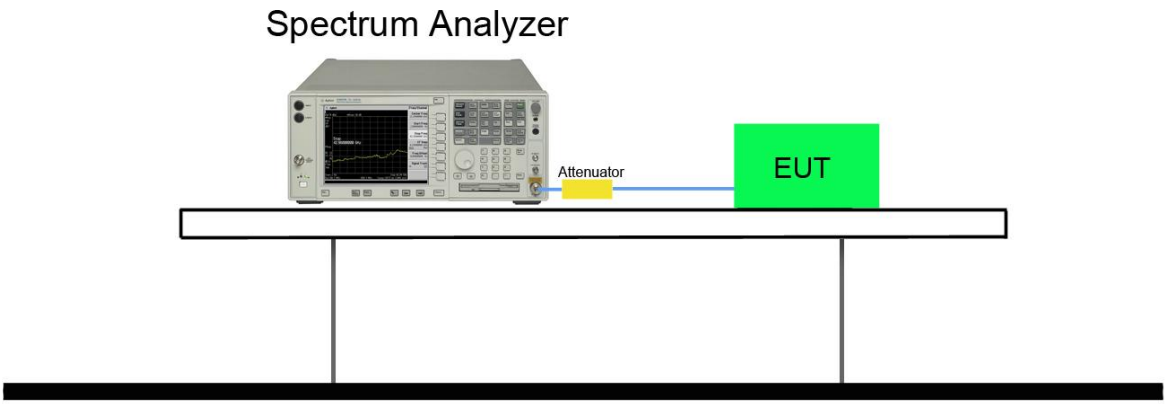
7.2.2. Test Procedure used

KDB 558074 D01v03r05 – Section 8.2 Option 2

7.2.3. Test Setting

1. The Spectrum's automatic bandwidth measurement capability was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 6. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. Set RBW = 100 kHz
3. VBW ≥ 3 × RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. Allow the trace was allowed to stabilize

7.2.4. Test Setup

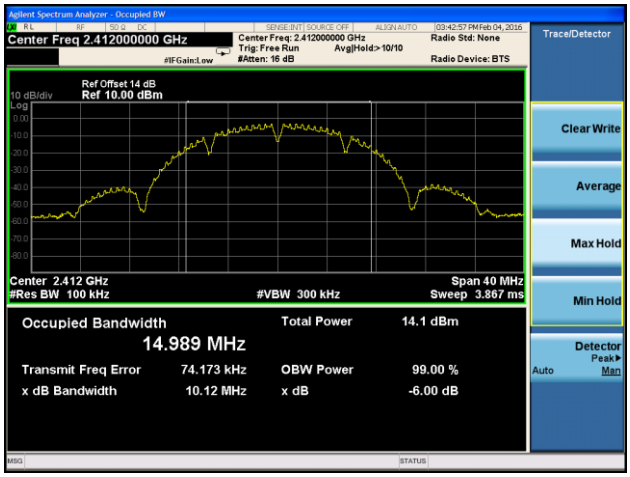


7.2.5. Test Result

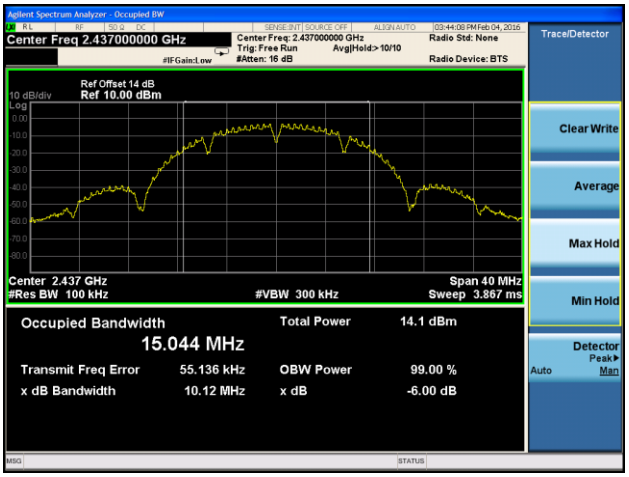
Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
802.11b	1	01	2412	10.12	≥ 0.5	Pass
802.11b	1	06	2437	10.12	≥ 0.5	Pass
802.11b	1	11	2462	10.12	≥ 0.5	Pass
802.11g	6	01	2412	16.56	≥ 0.5	Pass
802.11g	6	06	2437	16.57	≥ 0.5	Pass
802.11g	6	11	2462	16.56	≥ 0.5	Pass
802.11n-HT20	6.5	01	2412	17.83	≥ 0.5	Pass
802.11n-HT20	6.5	06	2437	17.81	≥ 0.5	Pass
802.11n-HT20	6.5	11	2462	17.81	≥ 0.5	Pass

802.11b 6dB Bandwidth

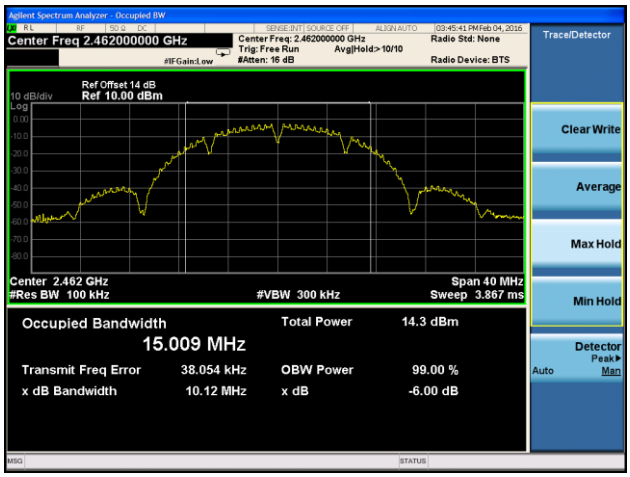
Channel 01 (2412MHz)

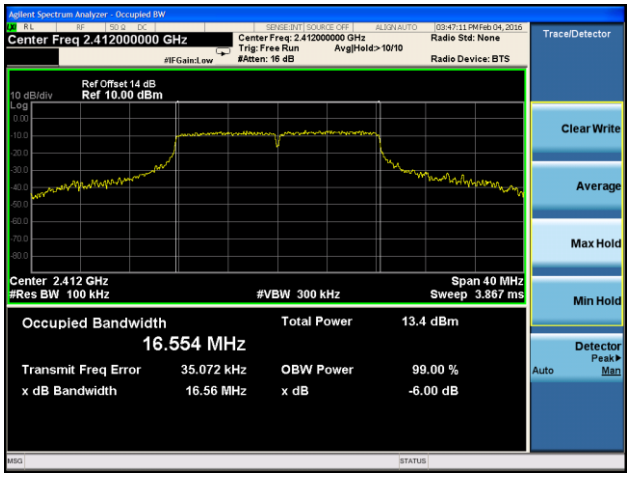
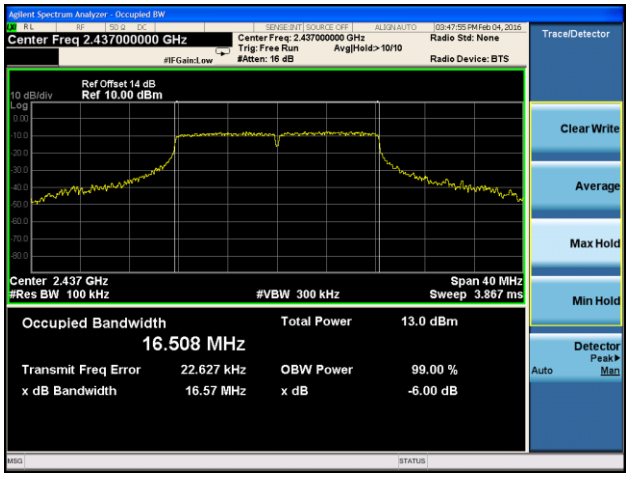
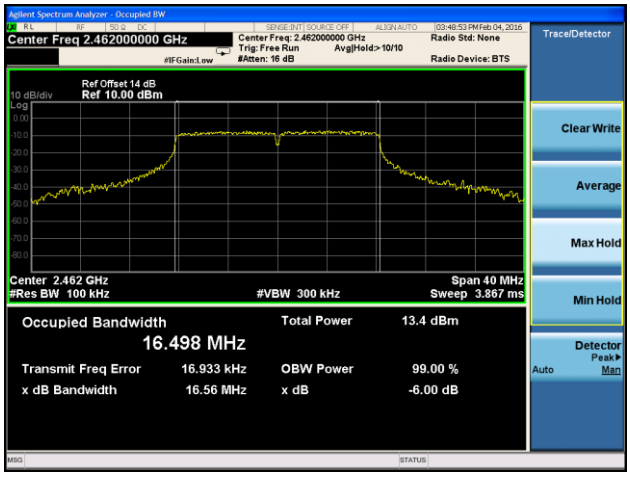


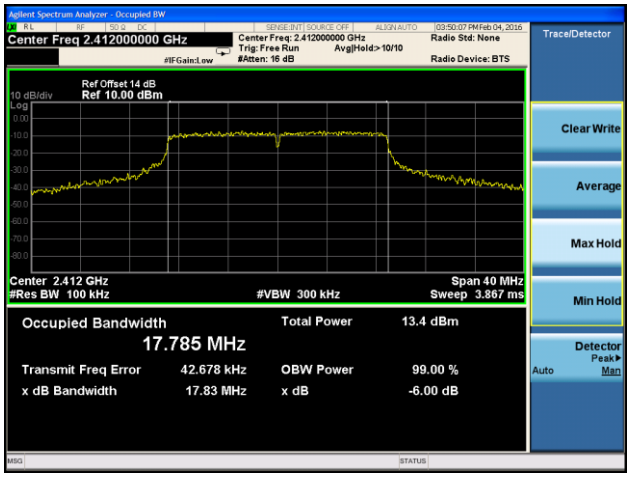
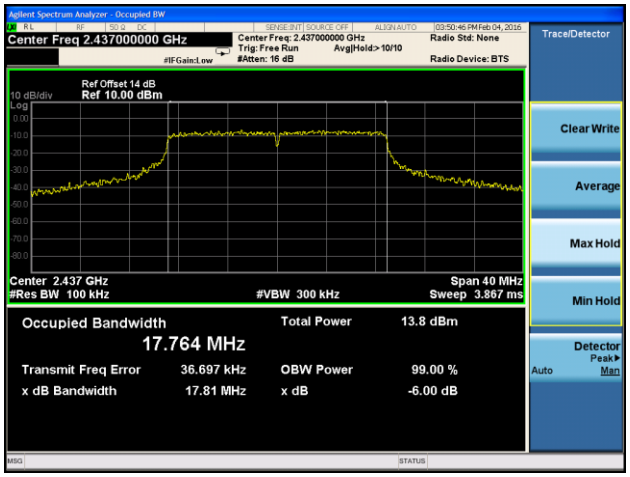
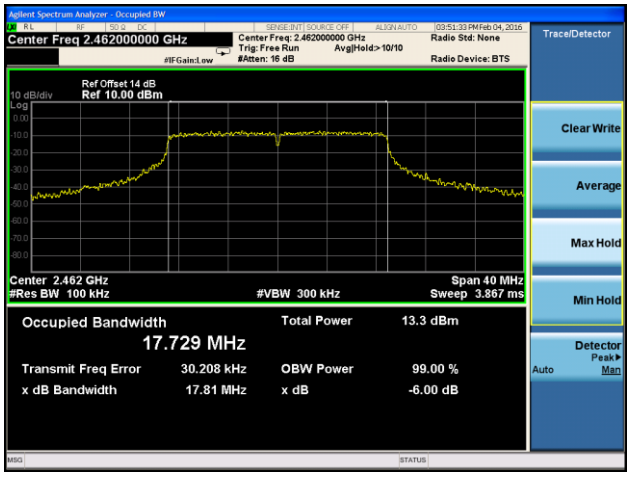
Channel 06 (2437MHz)



Channel 11 (2462MHz)



802.11g 6dB Bandwidth	
Channel 01 (2412MHz)	**Channel 06 (2437MHz)**
	
Channel 11 (2462MHz)	
	

802.11n-HT20 6dB Bandwidth	
Channel 01 (2412MHz)	**Channel 06 (2437MHz)**
	
Channel 11 (2462MHz)	
	

7.3. Output Power Measurement

7.3.1. Test Limit

The maximum output power shall be less 1 Watt (30dBm).

7.3.2. Test Procedure Used

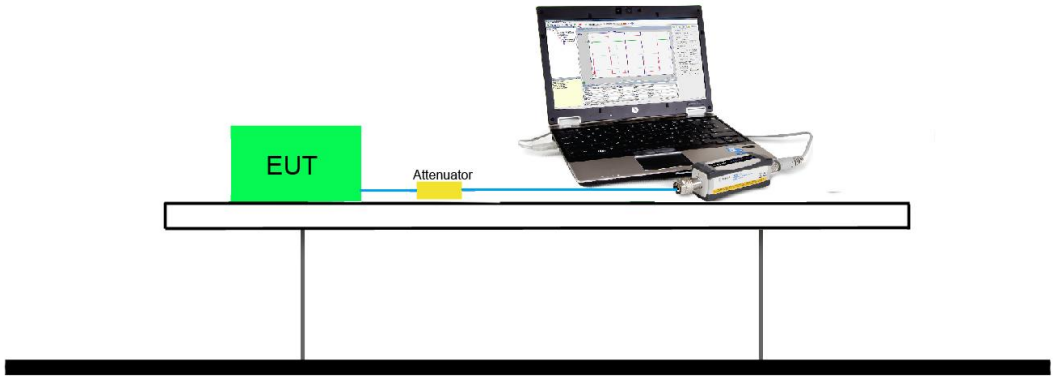
KDB 558074 D01v03r05 - Section 9.1.2 PKPM1 Peak Power Method (for signals with BW ≤ 50MHz)

7.3.3. Test Setting

Method PKPM1 (Peak Power Measurement of Signals with DTS BW ≤ 50MHz)

Peak power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The pulse sensor employs a VBW = 50MHz so this method was only used for signals whose DTS bandwidth was less than or equal to 50MHz.

7.3.4. Test Setup



7.3.5. Test Result of Output Power

Output power at various data rates:

Test Mode	Bandwidth (MHz)	Channel No.	Frequency (MHz)	Data Rate (Mbps)	Peak Power (dBm)
802.11b	20	6	2437	1	9.67
				5.5	9.55
				11	9.15
802.11g	20	6	2437	6	14.71
				24	14.58
				54	14.01
802.11n	20	6	2437	6.5	14.72
				7.2	14.60
				26.0	14.52
				28.9	14.38
				65.0	14.25
				72.2	14.16

Test Result of Peak Output Power

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Peak Output Power (dBm)	Limit (dBm)	E.I.R.P (dBm)	Limit (dBm)	Result
11b	1	1	2412	9.35	≤ 30	9.24	≤ 36	Pass
11b	1	6	2437	9.67	≤ 30	9.56	≤ 36	Pass
11b	1	11	2462	9.77	≤ 30	9.66	≤ 36	Pass
11g	6	1	2412	14.21	≤ 30	14.40	≤ 36	Pass
11g	6	6	2437	14.41	≤ 30	14.60	≤ 36	Pass
11g	6	11	2462	15.25	≤ 30	15.24	≤ 36	Pass
11n-HT20	6.5	1	2412	14.14	≤ 30	14.03	≤ 36	Pass
11n-HT20	6.5	6	2437	14.72	≤ 30	14.61	≤ 36	Pass
11n-HT20	6.5	11	2462	14.45	≤ 30	14.74	≤ 36	Pass

Note: E.I.R.P (dBm) = Peak Output Power (dBm) + Antenna Gain (dBi).

Test Result of Average Output Power for Report Only

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Average Output Power (dBm)	Limit (dBm)	E.I.R.P (dBm)	Limit (dBm)	Result
11b	1	1	2412	7.01	≤ 30	6.90	≤ 36	Pass
11b	1	6	2437	7.36	≤ 30	7.25	≤ 36	Pass
11b	1	11	2462	7.45	≤ 30	7.34	≤ 36	Pass
11g	6	1	2412	7.09	≤ 30	6.98	≤ 36	Pass
11g	6	6	2437	7.03	≤ 30	6.92	≤ 36	Pass
11g	6	11	2462	7.44	≤ 30	7.33	≤ 36	Pass
11n-HT20	6.5	1	2412	7.01	≤ 30	6.90	≤ 36	Pass
11n-HT20	6.5	6	2437	7.78	≤ 30	7.67	≤ 36	Pass
11n-HT20	6.5	11	2462	7.39	≤ 30	7.28	≤ 36	Pass

Note: E.I.R.P (dBm) = Average Output Power (dBm) + Antenna Gain (dBi).

7.4. Power Spectral Density Measurement

7.4.1. Test Limit

The maximum permissible power spectral density is 8dBm in any 3 kHz band.

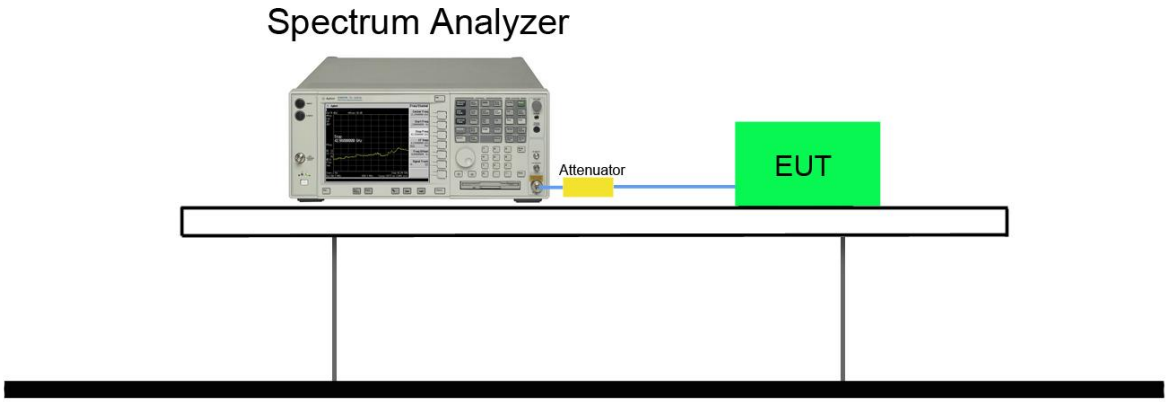
7.4.2. Test Procedure Used

KDB 558074 D01v03r05 - Section 10.2 Method PKPSD

7.4.3. Test Setting

1. Analyzer was set to the center frequency of the DTS channel under investigation
2. Span = 1.5 times the DTS channel bandwidth
3. RBW = 3kHz
4. VBW = 10kHz
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Trace was allowed to stabilize

7.4.4. Test Setup



7.4.5. Test Result

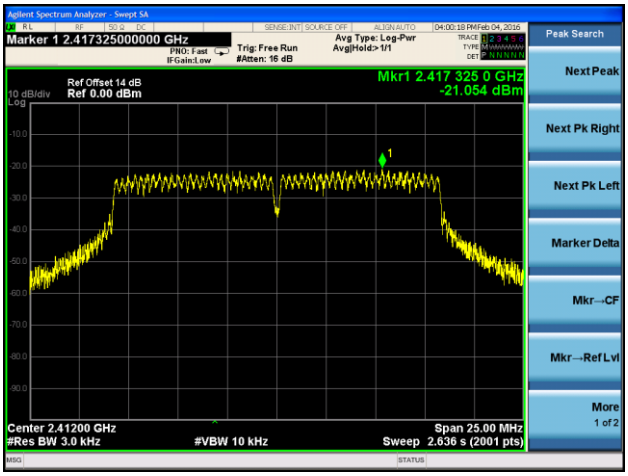
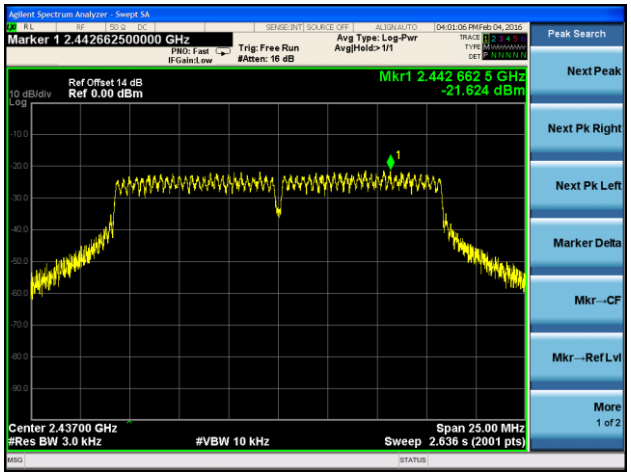
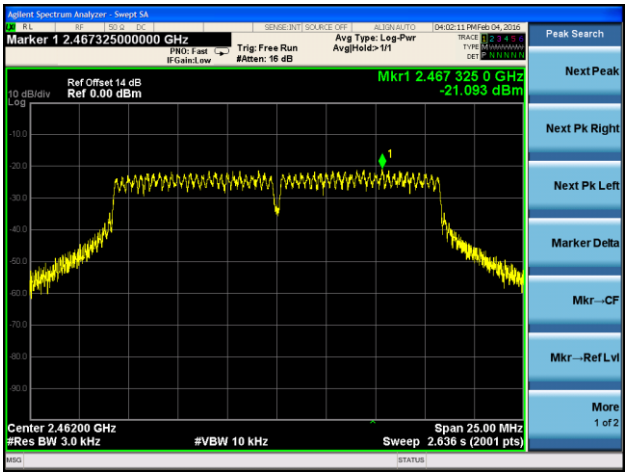
Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Measured PSD (dBm / 3kHz)	Limit (dBm / 3kHz)	Result
802.11b	1	01	2412	-22.805	≤ 8	Pass
802.11b	1	06	2437	-22.609	≤ 8	Pass
802.11b	1	11	2462	-22.626	≤ 8	Pass
802.11g	6	01	2412	-21.054	≤ 8	Pass
802.11g	6	06	2437	-21.624	≤ 8	Pass
802.11g	6	11	2462	-21.093	≤ 8	Pass
802.11n-HT20	6.5	01	2412	-21.290	≤ 8	Pass
802.11n-HT20	6.5	06	2437	-20.445	≤ 8	Pass
802.11n-HT20	6.5	11	2462	-21.174	≤ 8	Pass

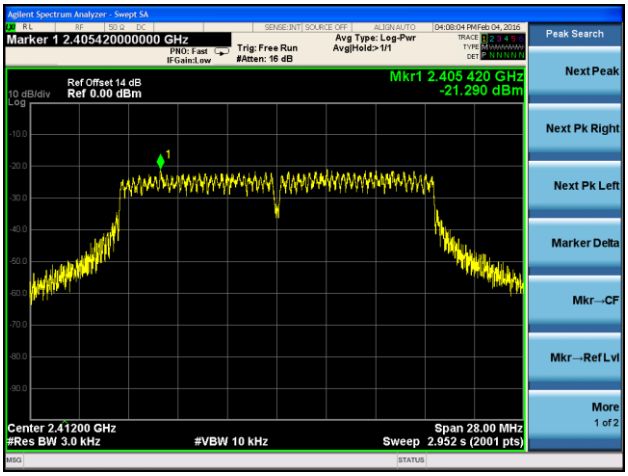
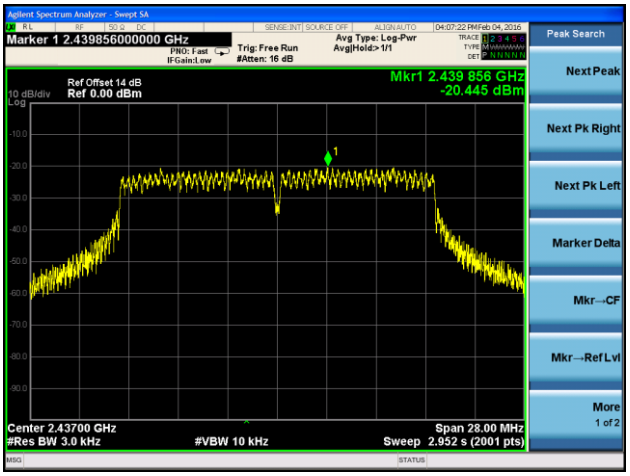
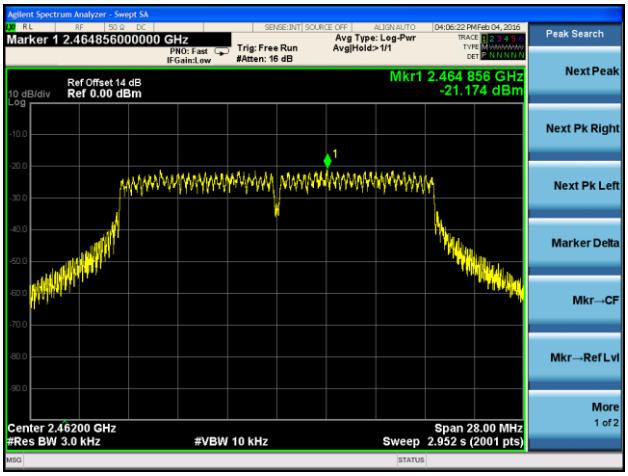
802.11b PSD

Channel 01 (2412MHz)

Channel 06 (2437MHz)

Channel 11 (2462MHz)

802.11g PSD	
Channel 01 (2412MHz)	**Channel 06 (2437MHz)**
	
Channel 11 (2462MHz)	
	

802.11n-HT20 PSD	
Channel 01 (2412MHz)	**Channel 06 (2437MHz)**
	
Channel 11 (2462MHz)	
	

7.5. Conducted Band Edge and Out-of-Band Emissions

7.5.1. Test Limit

The limit for out-of-band spurious emissions at the band edge is 20dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100 kHz bandwidth per the PSD procedure.

7.5.2. Test Procedure Used

KDB 558074 D01v03r05 - Section 11.2 & Section 11.3

7.5.3. Test Settitng

1. Reference level measurement

(a) Set instrument center frequency to DTS channel center frequency

(b) Set the span to ≥ 1.5 times the DTS bandwidth

(c) Set the RBW = 100 kHz

(d) Set the VBW ≥ 3 x RBW

(e) Detector = peak

(f) Sweep time = auto couple

(g) Trace mode = max hold

(h) Allow trace to fully stabilize

2. Emission level measurement

(a) Set the center frequency and span to encompass frequency range to be measured

(b) RBW = 100kHz

(c) VBW = 300kHz

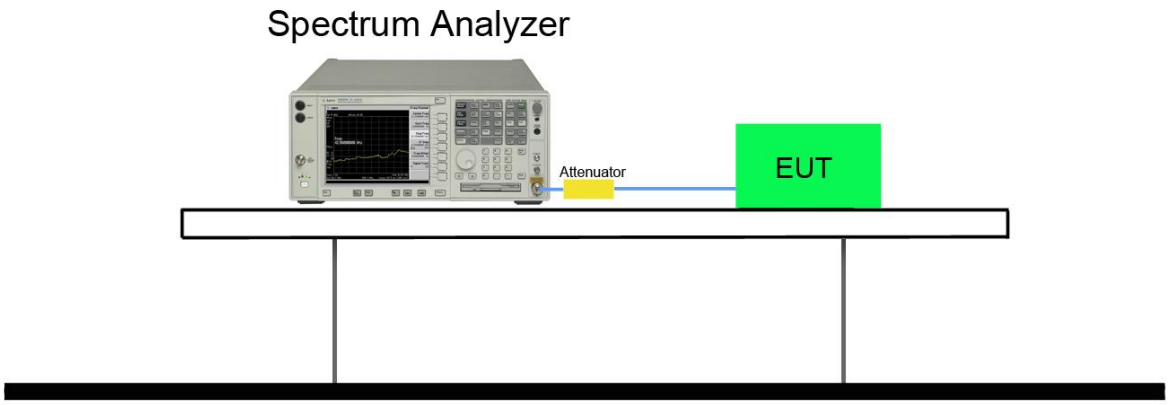
(d) Detector = Peak

(e) Trace mode = max hold

(f) Sweep time = auto couple

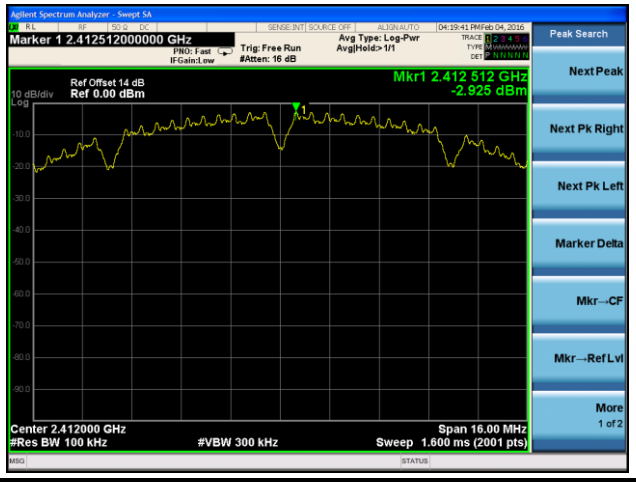
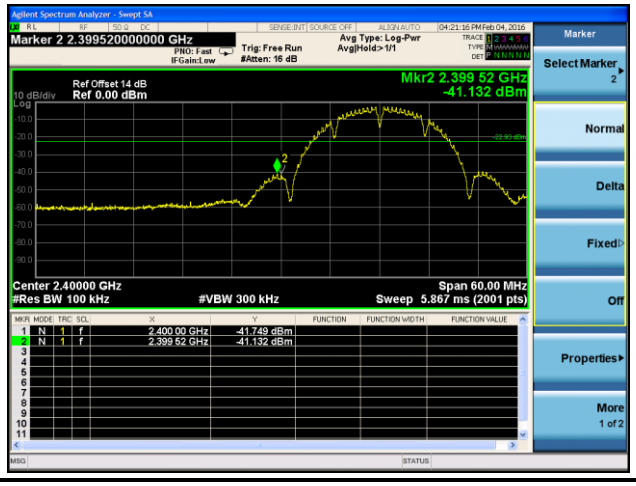
(g) The trace was allowed to stabilize

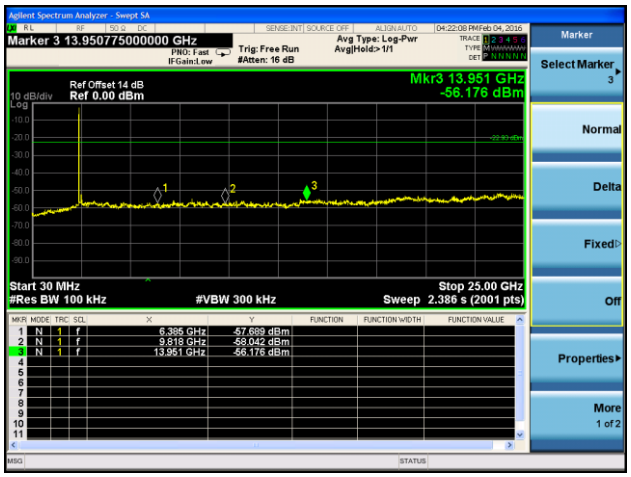
7.5.4. Test Setup

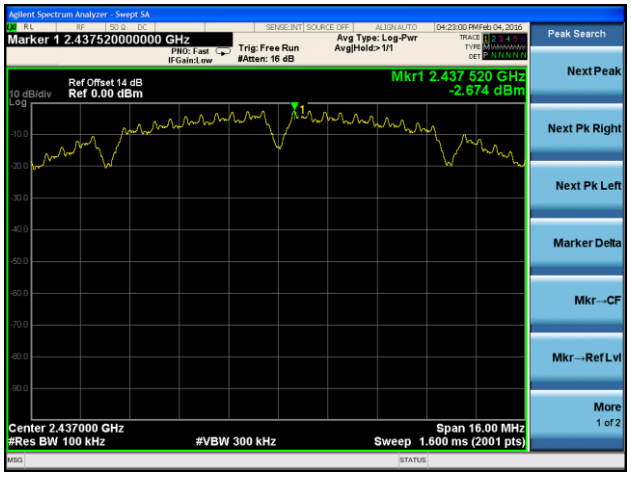
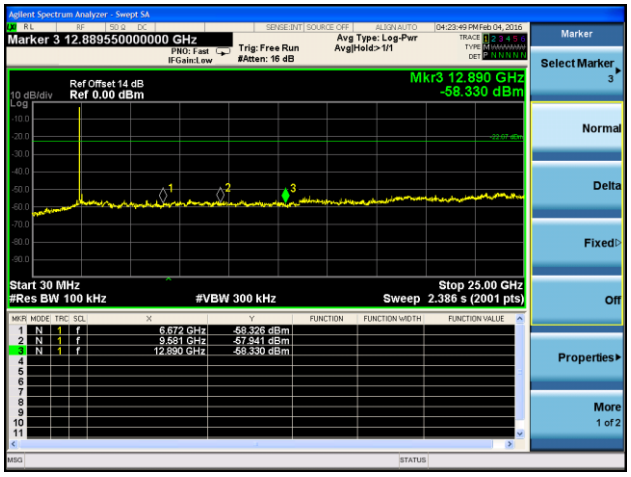


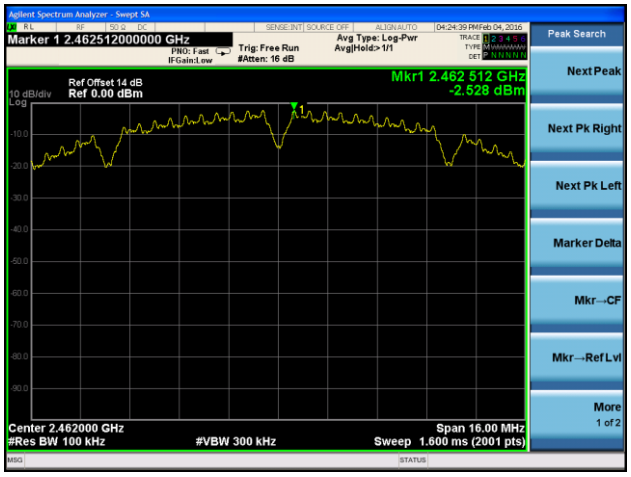
7.5.5. Test Result

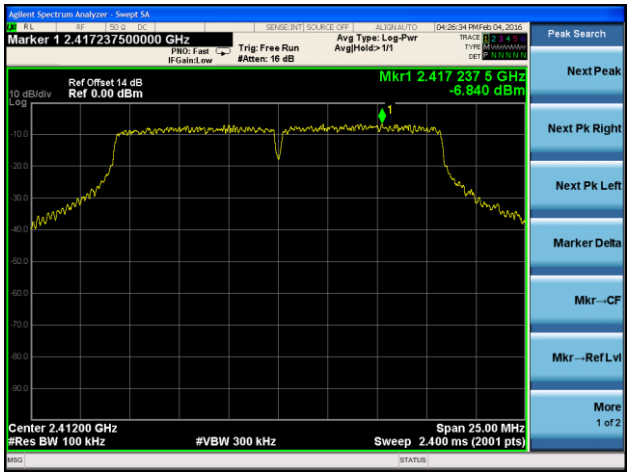
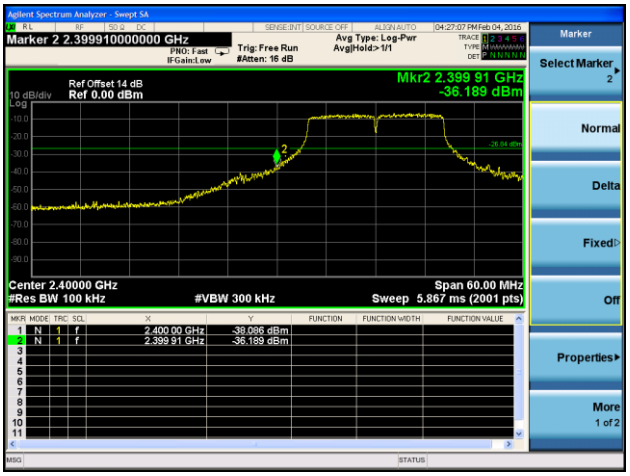
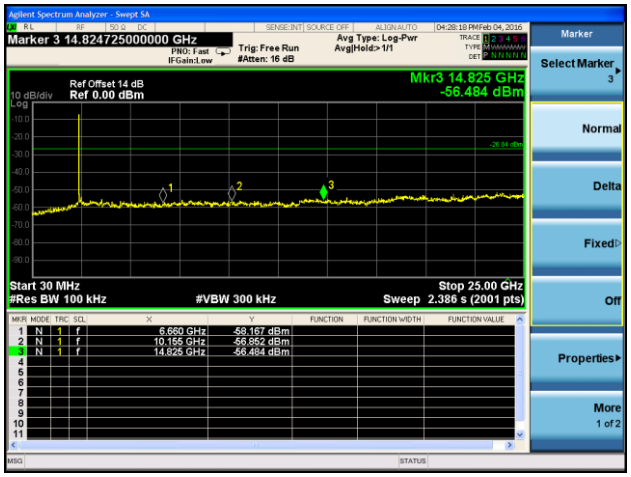
Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Limit	Result
802.11b	1	01	2412	20dBc	Pass
802.11b	1	06	2437	20dBc	Pass
802.11b	1	11	2462	20dBc	Pass
802.11g	6	01	2412	20dBc	Pass
802.11g	6	06	2437	20dBc	Pass
802.11g	6	11	2462	20dBc	Pass
802.11n-HT20	6.5	01	2412	20dBc	Pass
802.11n-HT20	6.5	06	2437	20dBc	Pass
802.11n-HT20	6.5	11	2462	20dBc	Pass

802.11b Out-of-Band Emissions	
Channel 01 (2412MHz)	
100kHz PSD reference Level	Low Band Edge
	

Spurious Emission	
	

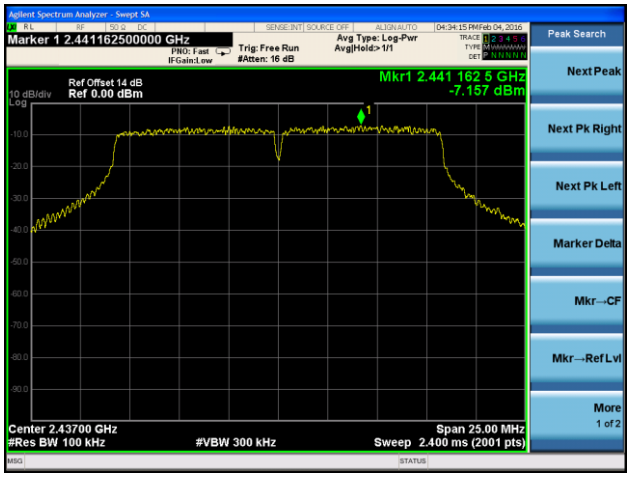
Channel 06 (2437MHz)	
100kHz PSD reference Level	Spurious Emission
	

Channel 11 (2462MHz)	
100kHz PSD reference Level	High Band Edge
	

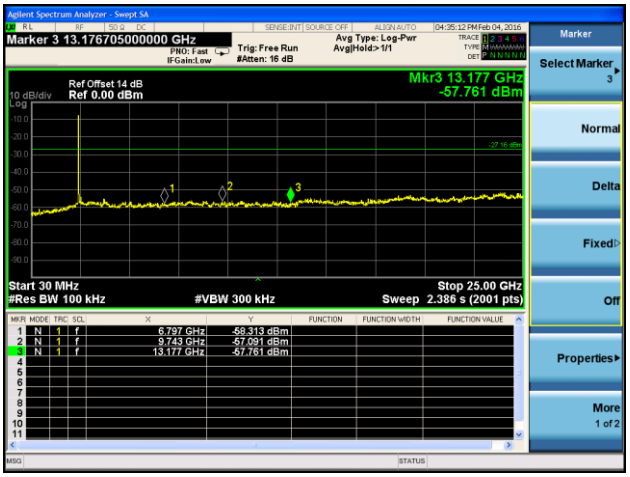
Spurious Emission	
	
802.11g Out-of-Band Emissions	
Channel 01 (2412MHz)	
100kHz PSD reference Level	**Low Band Edge**
	
Spurious Emission	
	

Channel 06 (2437MHz)

100kHz PSD reference Level



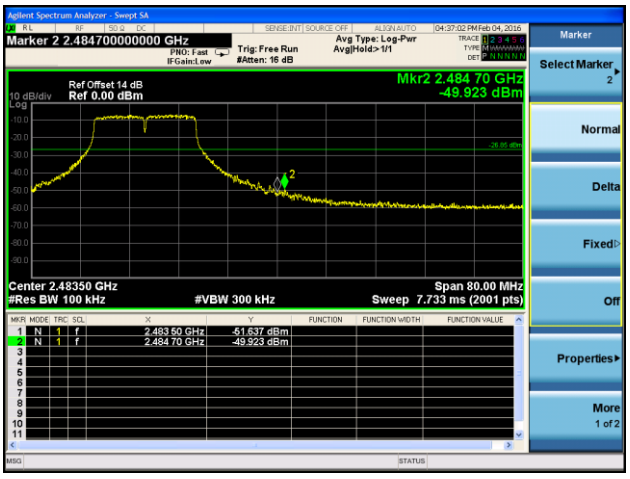
Spurious Emission



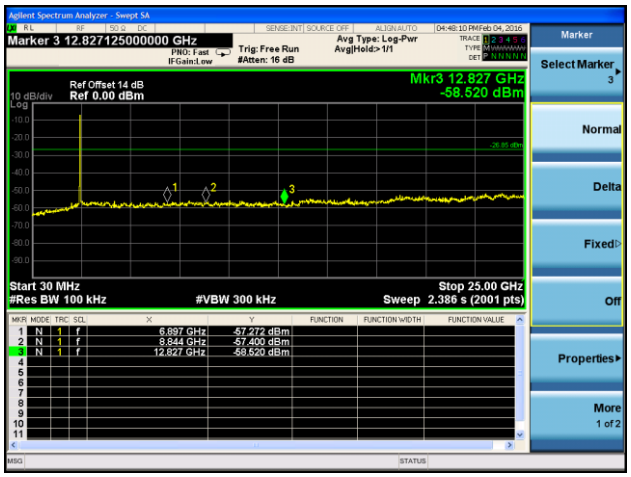
Channel 11 (2462MHz)

100kHz PSD reference Level

High Band Edge



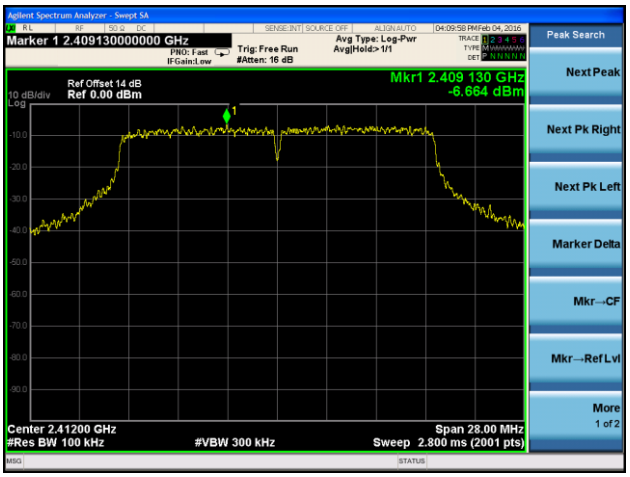
Spurious Emission



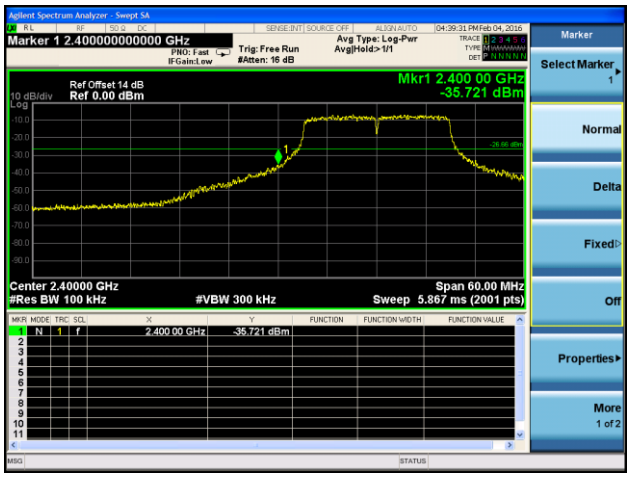
802.11n-HT20 Out-of-Band Emissions

Channel 01 (2412MHz)

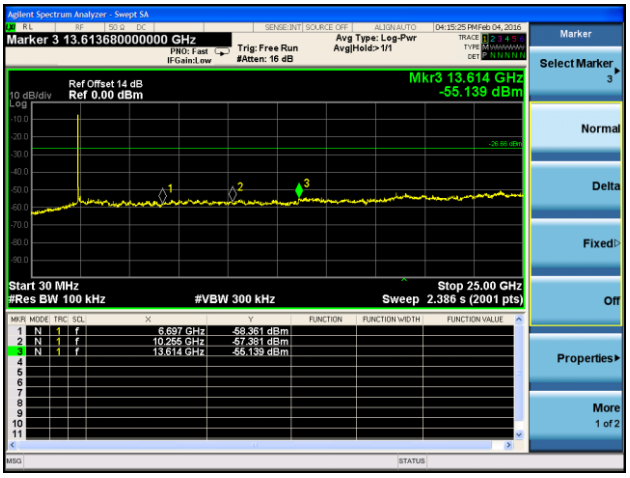
100kHz PSD reference Level



Low Band Edge

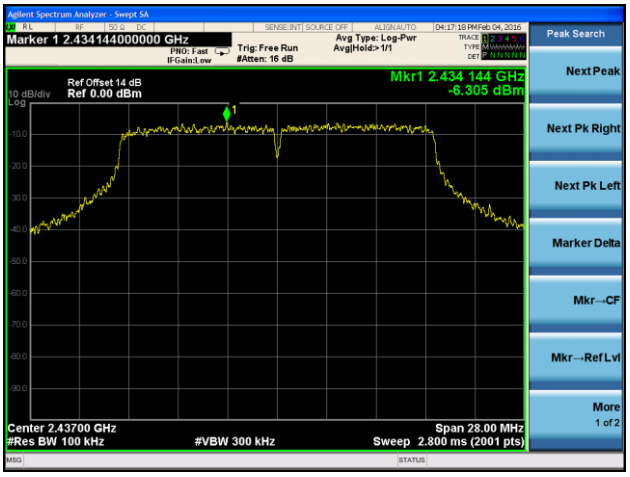


Spurious Emission

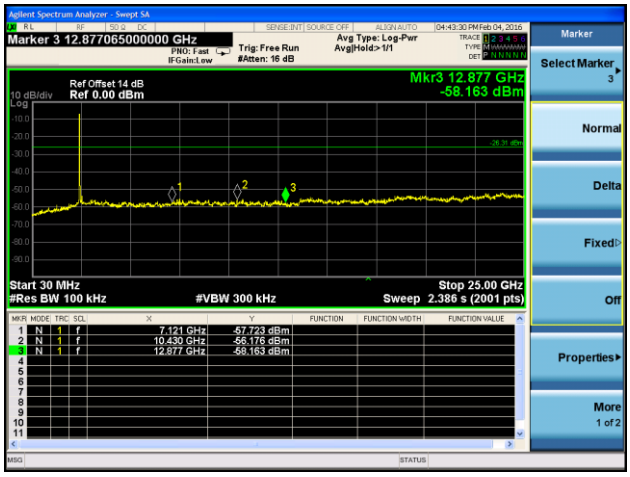


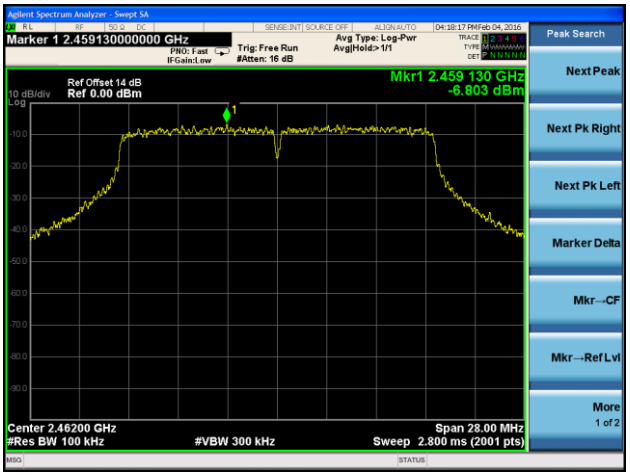
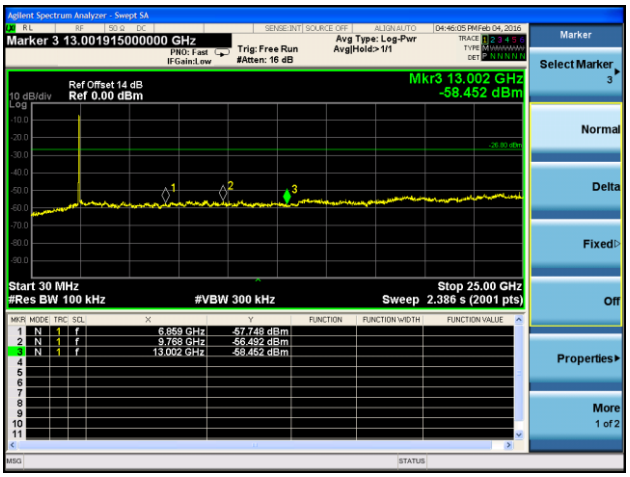
Channel 06 (2437MHz)

100kHz PSD reference Level



Spurious Emission



Channel 11 (2462MHz)	
100kHz PSD reference Level	**High Band Edge**
	
Spurious Emission	
	

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 558074 D01v03r05 – Section 12.2.3 (quasi-peak measurements)

KDB 558074 D01v03r05 – Section 12.2.4 (peak power measurements)

KDB 558074 D01v03r05 – Section 12.2.5 (average power measurements)

7.6.3. Test Setting

Peak Field Strength Measurements per Section 12.2.4 of KDB 558074 D01v03r05

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = as specified in Table 1
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple

6. Trace mode = max hold
7. Trace was allowed to stabilize

Table 1 - RBW as a function of frequency

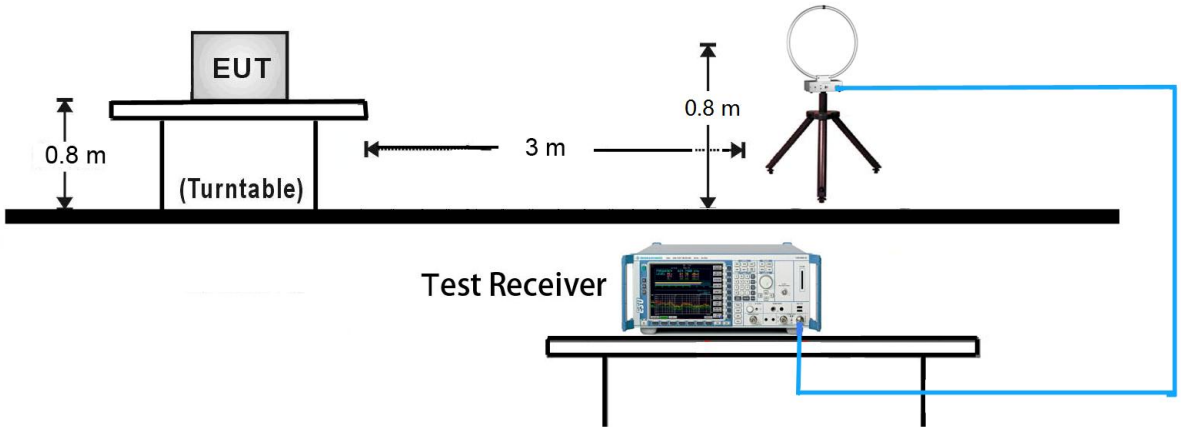
Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz
> 1000 MHz	1 MHz

Average Field Strength Measurements per Section 12.2.5.3 of KDB 558074 D01v03r05

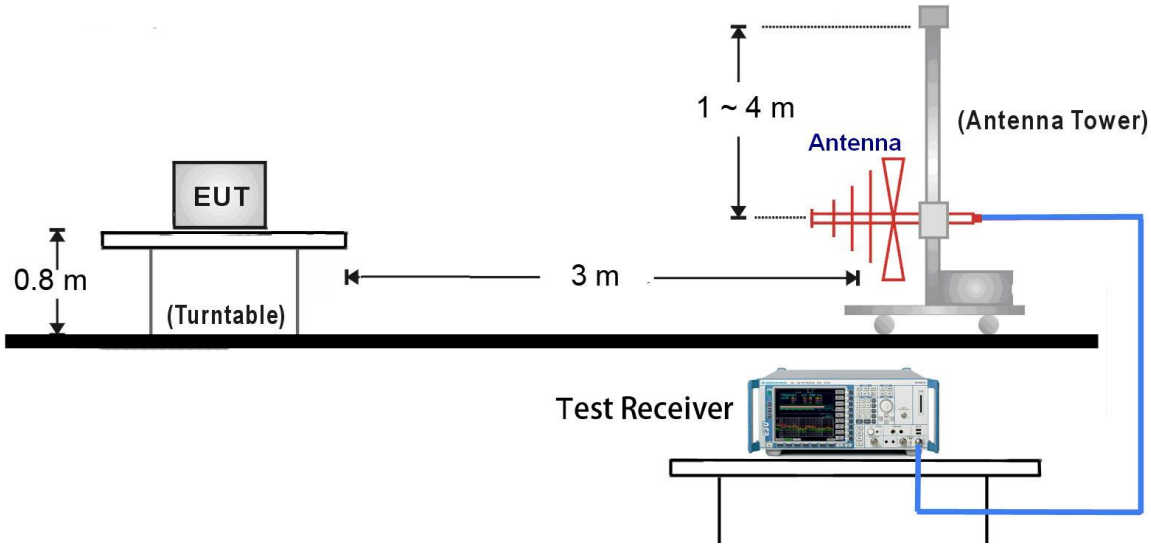
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW ≥ 1/T
4. De As an alternative, the instrument may be set to linear detector mode. Ensure that video filtering is applied in linear voltage domain (rather than in a log or dB domain). Some instruments require linear display mode in order to accomplish this. Others have a setting for Average-VBW Type, which can be set to “Voltage” regardless of the display mode
5. Detector = Peak
6. Sweep time = auto
7. Trace mode = max hold
8. Allow max hold to run for at least 50 times (1/duty cycle) traces

7.6.4. Test Setup

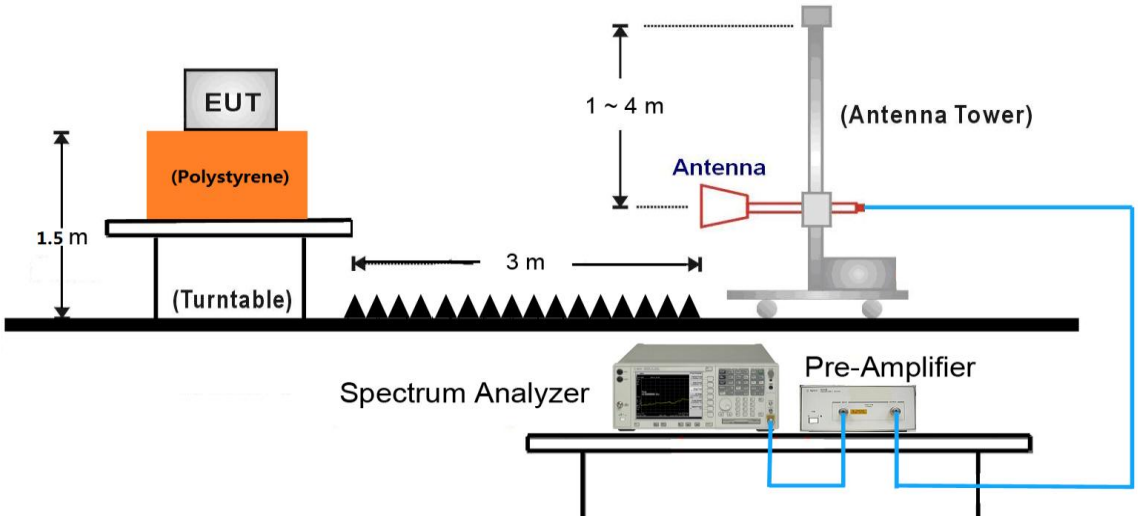
9kHz ~ 30MHz Test Setup:



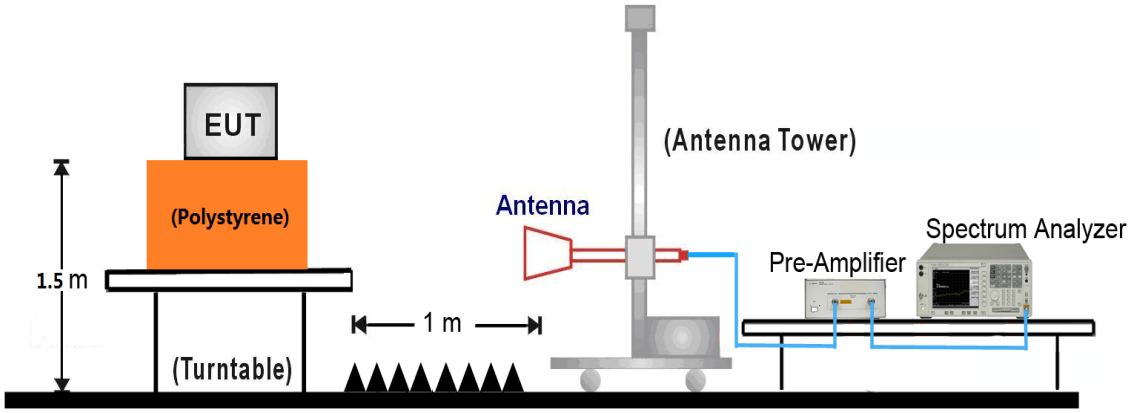
30MHz ~ 1GHz Test Setup:



1GHz ~ 18GHz Test Setup:



18GHz ~25GHz Test Setup:



7.6.5. Test Result

Test Mode:	802.11b	Test Site:	AC2
Test Channel:	1	Test Engineer:	Lewis Huang
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
	4000.5	39.5	-0.8	38.7	74.0	-35.3	Peak	Horizontal
	4825.0	50.1	2.0	52.1	74.0	-21.9	Peak	Horizontal
*	6431.5	41.7	5.7	47.4	74.4	-27.0	Peak	Horizontal
*	7842.5	34.6	9.3	43.9	74.4	-30.5	Peak	Horizontal
	4000.5	46.7	-0.8	45.9	74.0	-28.1	Peak	Vertical
	4825.0	46.7	2.0	48.7	74.0	-25.3	Peak	Vertical
*	6431.5	42.4	5.7	48.1	74.4	-26.3	Peak	Vertical
*	8641.5	33.9	10.1	44.0	74.4	-30.4	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (94.4dBμV/m) or 15.209 which is higher.

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:	802.11b	Test Site:	AC2
Test Channel:	6	Test Engineer:	Lewis Huang
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
	4000.5	42.2	-0.8	41.4	74.0	-32.6	Peak	Horizontal
	4876.0	48.7	1.9	50.6	74.0	-23.4	Peak	Horizontal
*	6499.5	40.6	6.2	46.8	76.3	-29.5	Peak	Horizontal
*	8531.0	34.0	9.7	43.7	76.3	-32.6	Peak	Horizontal
	4000.5	45.1	-0.8	44.3	74.0	-29.7	Peak	Vertical
	4876.0	45.3	1.9	47.2	74.0	-26.8	Peak	Vertical
*	6499.5	41.3	6.2	47.5	76.3	-28.8	Peak	Vertical
*	7859.5	34.8	9.4	44.2	76.3	-32.1	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (96.3dBμV/m) or 15.209 which is higher.

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:	802.11b	Test Site:	AC2
Test Channel:	11	Test Engineer:	Lewis Huang
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
	4000.5	41.0	-0.8	40.2	74.0	-33.8	Peak	Horizontal
	4927.0	48.5	1.9	50.4	74.0	-23.6	Peak	Horizontal
*	6567.5	40.5	6.6	47.1	75.0	-27.9	Peak	Horizontal
*	8573.5	34.1	9.8	43.9	75.0	-31.1	Peak	Horizontal
	4000.5	46.6	-0.8	45.8	74.0	-28.2	Peak	Vertical
	4927.0	45.9	1.9	47.8	74.0	-26.2	Peak	Vertical
*	6567.5	40.7	6.6	47.3	75.0	-27.7	Peak	Vertical
*	7910.5	35.8	9.6	45.4	75.0	-29.6	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (95.0dBμV/m) or 15.209 which is higher.

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:	802.11g	Test Site:	AC2
Test Channel:	1	Test Engineer:	Lewis Huang
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
	4000.5	43.1	-0.8	42.3	74.0	-31.7	Peak	Horizontal
	4825.0	49.7	2.0	51.7	74.0	-22.3	Peak	Horizontal
*	6431.5	41.5	5.7	47.2	75.9	-28.7	Peak	Horizontal
*	8811.5	35.1	10.5	45.6	75.9	-30.3	Peak	Horizontal
	4000.5	48.7	-0.8	47.9	74.0	-26.1	Peak	Vertical
	4825.0	46.3	2.0	48.3	74.0	-25.7	Peak	Vertical
*	6431.5	43.9	5.7	49.6	75.9	-26.3	Peak	Vertical
*	8590.5	34.5	9.9	44.4	75.9	-31.5	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (95.9dBμV/m) or 15.209 which is higher.

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:	802.11g	Test Site:	AC2
Test Channel:	6	Test Engineer:	Lewis Huang
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
	3864.5	39.0	-0.9	38.1	74.0	-35.9	Peak	Horizontal
	4867.5	48.4	1.9	50.3	74.0	-23.7	Peak	Horizontal
*	6499.5	40.1	6.2	46.3	78.4	-32.1	Peak	Horizontal
*	8743.5	34.3	10.5	44.8	78.4	-33.6	Peak	Horizontal
	4000.5	46.4	-0.8	45.6	74.0	-28.4	Peak	Vertical
	4876.0	43.3	1.9	45.2	74.0	-28.8	Peak	Vertical
*	6499.5	42.1	6.2	48.3	78.4	-30.1	Peak	Vertical
*	8599.0	34.0	9.9	43.9	78.4	-34.5	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (98.4dBμV/m) or 15.209 which is higher.

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:	802.11g	Test Site:	AC2
Test Channel:	11	Test Engineer:	Lewis Huang
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
	4000.5	43.0	-0.8	42.2	74.0	-31.8	Peak	Horizontal
	4927.0	46.4	1.9	48.3	74.0	-25.7	Peak	Horizontal
*	6567.5	40.0	6.6	46.6	77.3	-30.7	Peak	Horizontal
*	8582.0	34.5	9.9	44.4	77.3	-32.9	Peak	Horizontal
	4000.5	47.2	-0.8	46.4	74.0	-27.6	Peak	Vertical
	4927.0	44.7	1.9	46.6	74.0	-27.4	Peak	Vertical
*	6567.5	40.7	6.6	47.3	77.3	-30.0	Peak	Vertical
*	8624.5	35.0	10.1	45.1	77.3	-32.2	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (97.3dBμV/m) or 15.209 which is higher.

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	Test Site:	AC2
Test Channel:	1	Test Engineer:	Lewis Huang
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
	4000.5	39.3	-0.8	38.5	74.0	-35.5	Peak	Horizontal
	4825.0	49.8	2.0	51.8	74.0	-22.2	Peak	Horizontal
*	6431.5	41.8	5.7	47.5	75.7	-28.2	Peak	Horizontal
*	8565.0	34.4	9.7	44.1	75.7	-31.6	Peak	Horizontal
	4000.5	44.5	-0.8	43.7	74.0	-30.3	Peak	Vertical
	4816.5	47.1	2.0	49.1	74.0	-24.9	Peak	Vertical
*	6431.5	43.7	5.7	49.4	75.7	-26.3	Peak	Vertical
*	8624.5	35.0	10.1	45.1	75.7	-30.6	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (95.7dBμV/m) or 15.209 which is higher.

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	Test Site:	AC2
Test Channel:	6	Test Engineer:	Lewis Huang
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
	4000.5	39.9	-0.8	39.1	74.0	-34.9	Peak	Horizontal
	4876.0	50.1	1.9	52.0	74.0	-22.0	Peak	Horizontal
*	6499.5	41.2	6.2	47.4	77.2	-29.8	Peak	Horizontal
*	8573.5	35.1	9.8	44.9	77.2	-32.3	Peak	Horizontal
	4000.5	46.8	-0.8	46.0	74.0	-28.0	Peak	Vertical
	4876.0	45.8	1.9	47.7	74.0	-26.3	Peak	Vertical
*	6499.5	42.6	6.2	48.8	77.2	-28.4	Peak	Vertical
*	8607.5	33.8	9.9	43.7	77.2	-33.5	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (97.2dBμV/m) or 15.209 which is higher.

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	Test Site:	AC2
Test Channel:	11	Test Engineer:	Lewis Huang
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
	4000.5	40.3	-0.8	39.5	74.0	-34.5	Peak	Horizontal
	4927.0	49.1	1.9	51.0	74.0	-23.0	Peak	Horizontal
*	6567.5	39.7	6.6	46.3	76.6	-30.3	Peak	Horizontal
*	8709.5	34.0	10.2	44.2	76.6	-32.4	Peak	Horizontal
	4000.5	45.7	-0.8	44.9	74.0	-29.1	Peak	Vertical
	4927.0	46.5	1.9	48.4	74.0	-25.6	Peak	Vertical
*	6567.5	40.7	6.6	47.3	76.6	-29.3	Peak	Vertical
*	8539.5	34.0	9.7	43.7	76.6	-32.9	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (96.6dBμV/m) or 15.209 which is higher.

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

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