MEASUREMENT REPORT

FCC PART 15.407 WLAN 802.11a/n

FCC ID:	X3ZWFMOD1
APPLICANT:	Amp'ed RF Technology, Inc.
Application Type:	Certification
Product:	Wi-Fi & BLE combo module
Model No.:	ART6212
Brand Name:	ART
FCC Classification:	Unlicensed National Information Infrastructure (UNII)
FCC Rule Part(s):	Part15 Subpart E (Section 15.407)
Test Procedure(s):	ANSI C63.10-2013 KDB 789033 D02v01r04,
Test Date:	March 20 ~ June 14, 2017

Reviewed By : (Kevin Guo)

Approved By : (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 measurementreport and was tested in accordance with the measurement procedures specified in KDB 789033 D02v01r04. Test results reported hereinrelate only to the item(s) tested.

Revision History

Report No.	Version	Description	Issue Date	Note
1710WSU01003	Rev. 01	Initial Report	01-11-2018	Invalid
1710WSU01003	Rev. 02	Add antenna description	04-16-2018	Valid

CONTENTS

Description Page

§2.1033General Information

Applicant:	Amp'ed RF Technology, Inc.
Applicant Address:	1879 Lundy Ave, Suite 138, San Jose, CA, 95131
Manufacturer:	Amp'ed RF Technology, Inc.
Manufacturer Address:	1879 Lundy Ave, Suite 138, San Jose, CA, 95131
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.:	893164
FCC Rule Part(s):	Part15 Subpart E (Section 15.407)
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering

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. 893164) 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 (A2LACert. No.3628.01) in EMC, Telecommunications and Radio testingfor FCC, Industry Canada, EU and TELEC Rules.**

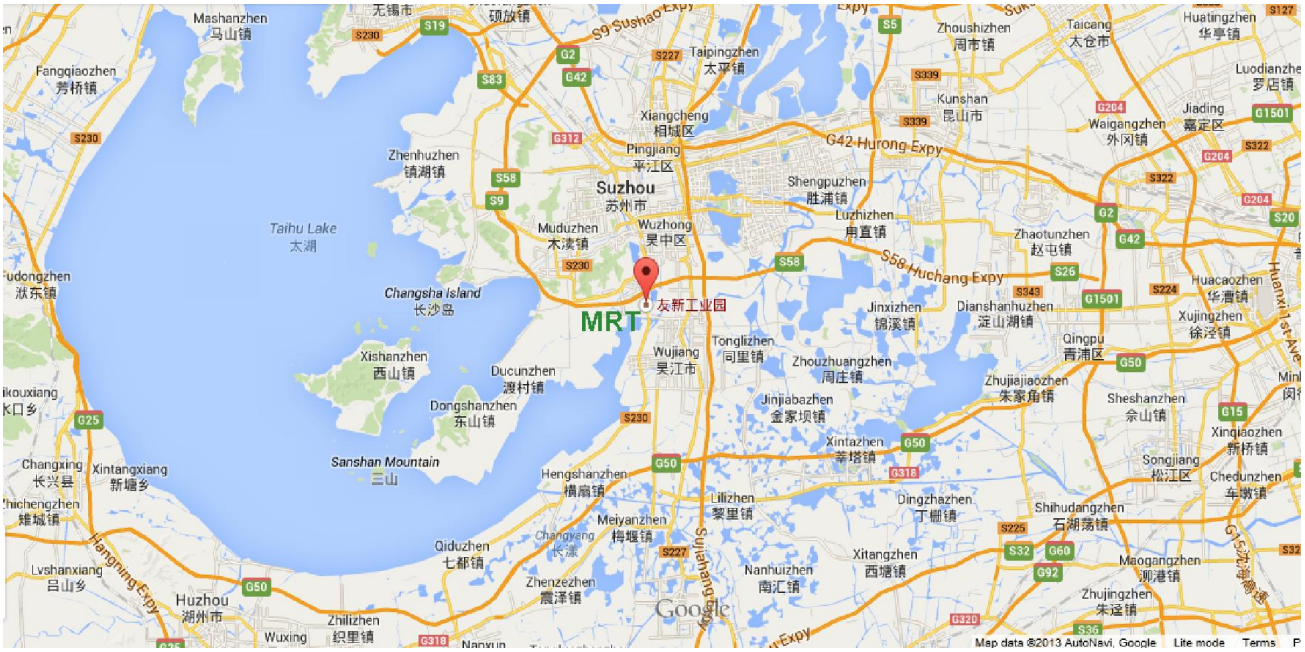
1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices includingintentional and/or unintentional radiators for compliance with the technical rules and regulations of the FederalCommunications 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 measurementfacility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on September30, 2013.



2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name:	Wi-Fi & BLE combo module
Model No.:	ART6212
Brand Name:	ART
Work Voltage	DC 3.6V
Bluetooth Specification	
Frequency Range:	2402 ~ 2480MHz
Bluetooth Version:	V4.1
Modulation Type:	GFSK
Antenna Type:	PCB
Antenna Gain:	3 dBi
Wi-Fi Specification	
Frequency Range	**2.4GHz:** For 802.11b/g/n-HT20: 2412 ~ 2462 MHz **5GHz:** For 802.11a/n-HT20-VHT20: 5180~5240MHz, 5745~5825MHz
Type of Modulation	802.11b: DSSS 802.11a/g/n: OFDM
Antenna Type:	Chip
Antenna Gain:	0.5 dBi for 2.4GHz 2 dBi for 5GHz

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

2.2. Working Frequencies for this report

802.11a/n-HT20 -VHT20

Channel	Frequency	Channel	Frequency	Channel	Frequency
36	5180 MHz	40	5200 MHz	44	5220 MHz
48	5240 MHz	149	5745 MHz	153	5765 MHz
157	5785 MHz	161	5805 MHz	165	5825 MHz

2.3. Description of Avilable Antenna

Antenna Specification				
Model Name	**Type**	**Frequency Band**	**Connector**	**Max. Peak Gain**
AT3216-B2R7HAA	Surface Mount	2.4G WiFi	Solder	0.2 dBi
AT3216-B5R5HAA	Surface Mount	5G WiFi	Solder	2 dBi
479501011	PCB Trace	Bluetooth	U.FL	3 dBi

2.4. Test Mode

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

2.5. Description of Test Software

The test utility software used during testing was “ Wi-Fi Term”, and the version was “v4.11”.

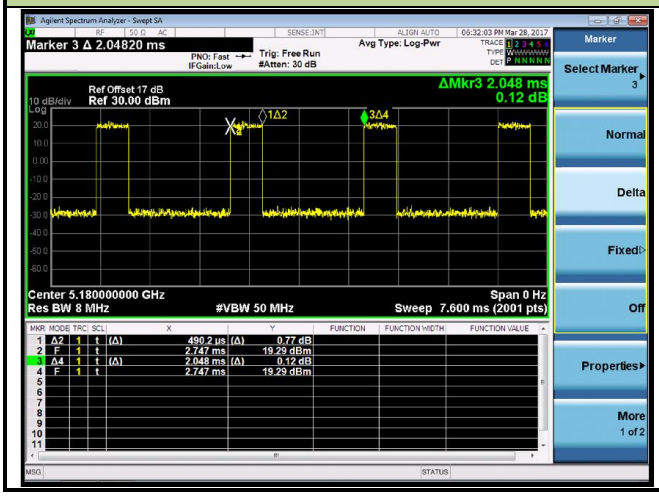
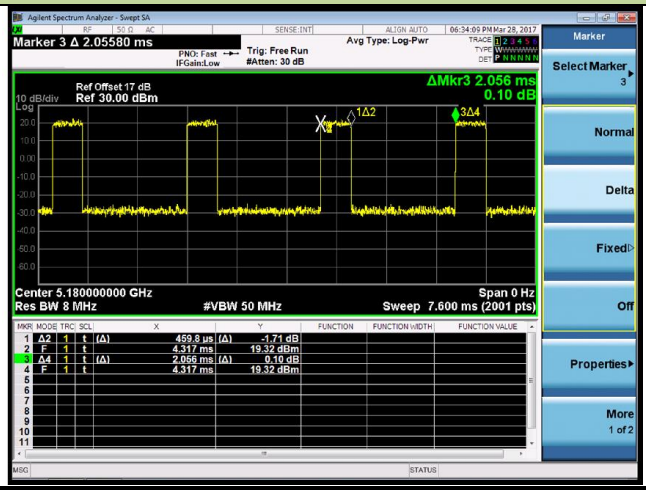
2.6. Device Capabilities

This device contains the following capabilities:

802.11a/b/g/n Wi-Fi and BLE Device.

Note: 5GHz (NII) operation is possible in 20MHz 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 D02v01r04. 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	23.94 %
802.11n-HT20	22.36 %

802.11a	802.11n-HT20
	

2.7. Test Configuration

The **Wi-Fi & BLE combo module**was tested per the guidance of KDB 789033 D02v01r04.ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testingand AC line conducted testing.

2.8. EMI Suppression Device(s)/Modifications

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

2.9. 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 pamphletsupplied to the user and be readily visible to the purchaser at the time of purchase. However, when the deviceis 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 andlabel location.

3. DESCRIPTION OF TEST

3.1. Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed WirelessDevices (ANSI C63.10-2013), and the guidance provided in KDB 789033 D02v01r04 were used in themeasurement of the **Wi-Fi & BLE combo module.**

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

3.2. AC Line Conducted Emissions

The line-conducted facility is located inside an8'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.

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, remotecontrolled, 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. An80cm 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 tomaximize 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 theresponsible party can be used with the device. The use of a permanently attached antenna or of an antennathat uses a unique coupling to the intentional radiator shall be considered sufficient to comply with theprovisions of this section.”

Conclusion:

The **Wi-Fi & BLE combo module** unit complies with the requirement of §15.203.

5. TEST EQUIPMENT CALIBRATION DATE

Conducted Emission - SR2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06185	1 year	2018/04/28
Two-Line V-Network	R&S	ENV216	MRTSUE06002	1 year	2018/06/21
Two-Line V-Network	R&S	ENV216	MRTSUE06003	1 year	2018/06/21
Temperature/Humidity Meter	Yuhuaze	HTC-2	MRTSUE06181	1 year	2017/12/20
Shielding Anechoic Chamber	Mikebang	Chamber-SR2	MRTSUE06214	1 year	2018/05/10

Radiated Spurious Emission and Radiated Restricted Band Edge-AC2

Instrument	Manufacturer	Type No.	AssetNo.	Cali. Interval	Cal. Due Date
MXE EMI Receiver	Agilent	N9038A	MRTSUE06125	1 year	2018/08/18
Broadband Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2017/12/10
Loop Antenna	Schwarzbeck	FMZB1519	MRTSUE06025	1 year	2017/11/21
TRILOG Antenna	Schwarzbeck	VULB9162	MRTSUE06022	1 year	2018/10/22
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06171	1 year	2017/11/19
Broadband Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06024	1 year	2018/01/04
Digitial Thermometer & Hygrometer	Minggao	ETH529	MRTSUE06170	1 year	2017/11/30
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2018/05/10

Conducted Test Equipment - TR3

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2018/04/25
Power Meter	Boonton	55006	MRTSUE06109	1 year	2018/04/25
Temperature/Humidity Meter	Yuhuaze	HTC-2	MRTSUE06184	1 year	2017/12/22

Software	**Version**	**Function**
e3	V 8.3.5	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 - AC2
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz ~ 1GHz: ± 3.86dB 1GHz ~ 25GHz: ± 4.32dB

7. TEST RESULT

7.1. Summary

Product Name: **Wi-Fi & BLE combo module**

FCC ID: **X3ZWFMOD1**

FCC Classification: **Unlicensed National Information Infrastructure (UNII)**

Data Rate / MCS Tested: **6Mbps ~ 54Mbps (a);MCS0 for802.11n-HT20MHz; MCS0 for 802.11n-HT40MHz;MCS0 for802.11ac-VHT20MHz; MCS0 for 802.11ac-VHT40MHz;MCS0 for 802.11ac-VHT80MHz**

FCC Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.407(a)	26dB Bandwidth	N/A	Conducted	Pass	Section7.2
15.407(e)	6dB Bandwidth	≥ 500kHz		Pass	Section 7.3
15.407(a)(1)(ii), (2), (3)	Maximum Conducted Output Power	Refer to Section 7.5		Pass	Section 7.5
15.407(h)(1)	Transmit Power Control	≤ 24 dBm		N/A	Section 7.6
15.407(a)(1)(ii), (2), (3), (5)	Peak Power Spectral Density	Refer to Section 7.7		Pass	Section 7.7
15.407(g)	Frequency Stability	N/A		Pass	Section 7.8
15.407(b)(1), (2), (3), (4)	Undesirable Emissions	≤ -27dBm/MHz EIRP ≤ -17dBm/MHz EIRP	Radiated	Pass	Section 7.9 & 7.10
15.205, 15.209 15.407(b)(5), (6), (7)	General Field Strength Limits(Restricted Bands andRadiated Emission Limits)	Emissions in restrictedbands must meet theradiated limits detailed in15.209		Pass	
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	N/A	Section 7.11

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 ofthe system to connect the EUT to the analyzer at all frequencies of interest.
3) Test Items “26dB Bandwidth”, “99% Bandwidth”, “6dB Bandwidth” & “Operation Frequency Range of 26dB BW”have been assessed,and showed the worst test data in this report.

7.2. 26dB Bandwidth Measurement

7.2.1.Test Limit

N/A

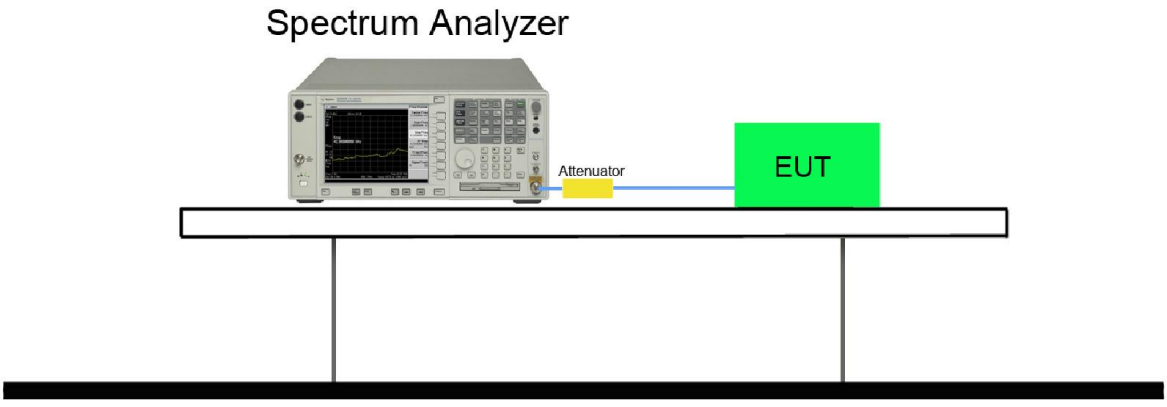
7.2.2.TestProcedure used

KDB 789033 D02v01r04- Section C.1

7.2.3.TestSetting

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



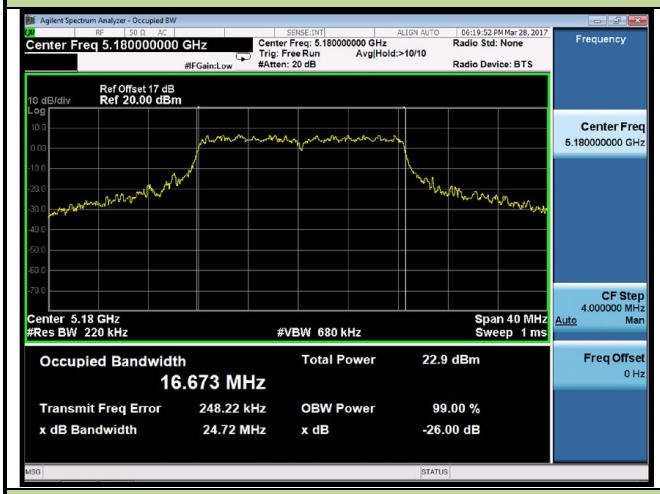
7.2.5.Test Result

Product	Wi-Fi & BLE combo module	Temperature	26°C
Test Engineer	Andy Zhu	Relative Humidity	75%
Test Site	TR3	Test Date	2017/06/26

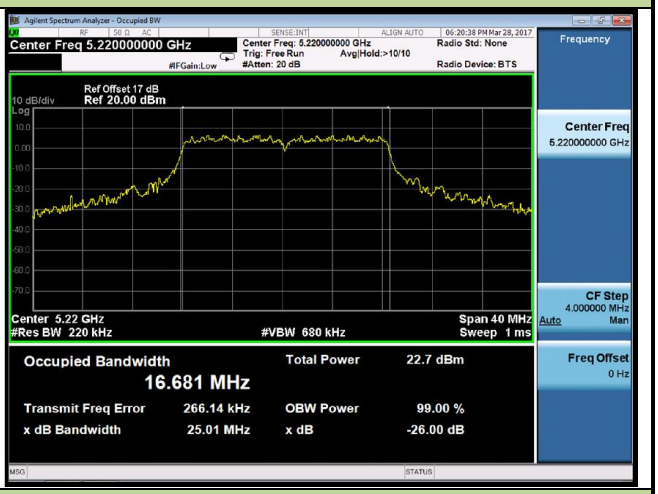
Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11a	6Mbps	36	5180	24.72	16.67
802.11a	6Mbps	44	5220	25.01	16.68
802.11a	6Mbps	48	5240	25.04	16.69
802.11a	6Mbps	149	5745	23.06	16.61
802.11a	6Mbps	157	5785	23.11	16.62
802.11a	6Mbps	165	5825	23.48	16.64
802.11n-HT20	MCS0	36	5180	23.24	17.79
802.11n-HT20	MCS0	44	5220	22.22	17.79
802.11n-HT20	MCS0	48	5240	21.40	17.78
802.11n-HT20	MCS0	149	5745	20.94	17.73
802.11n-HT20	MCS0	157	5785	20.74	17.72
802.11n-HT20	MCS0	165	5825	20.91	17.75

802.11a 26dB Bandwidth & 99% Bandwidth

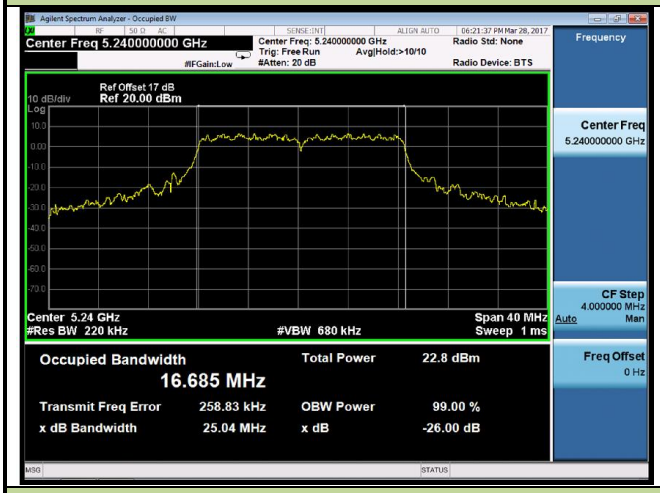
Channel 36 (5180MHz)



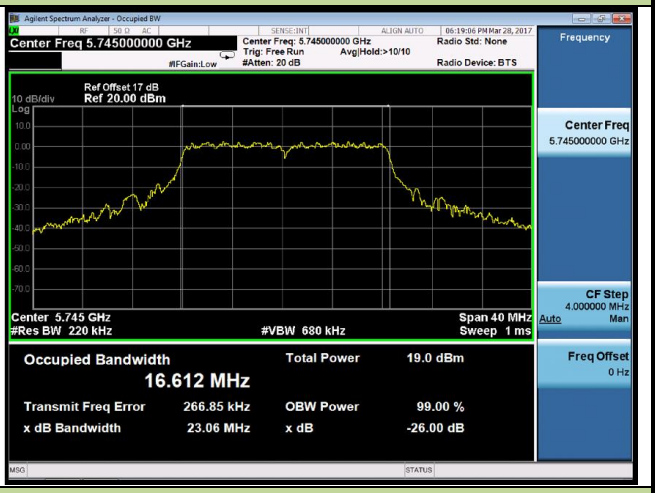
Channel 44 (5220MHz)



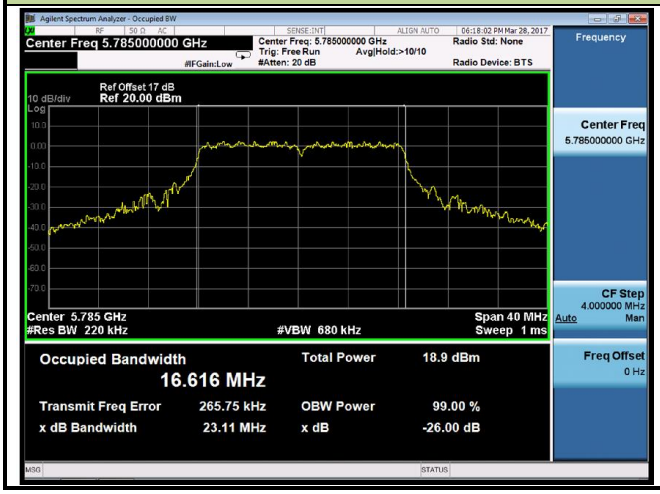
Channel 48 (5240MHz)



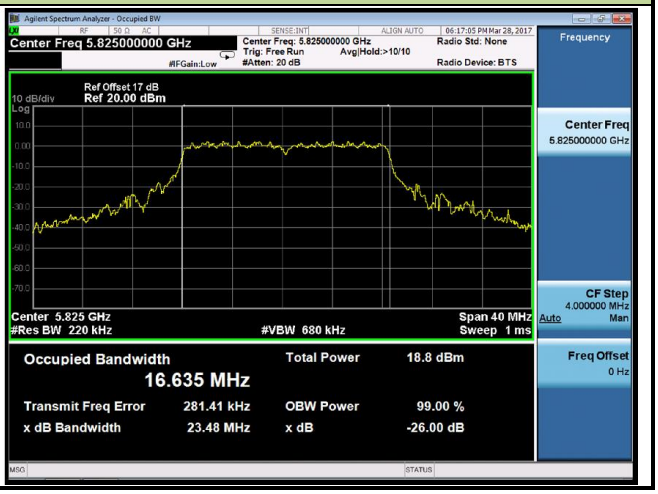
Channel 149 (5745MHz)



Channel 157 (5785MHz)

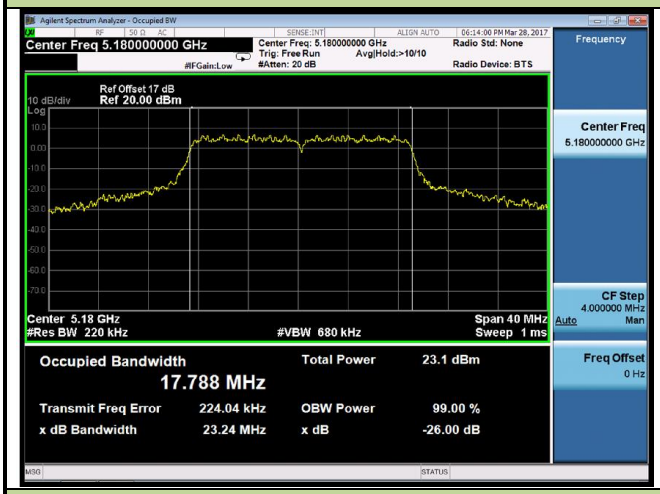


Channel 165 (5825MHz)

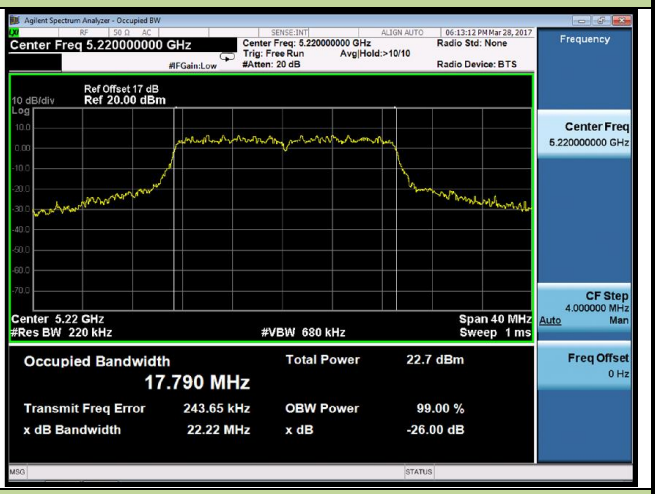


802.11n-HT20 26dB Bandwidth & 99% Bandwidth

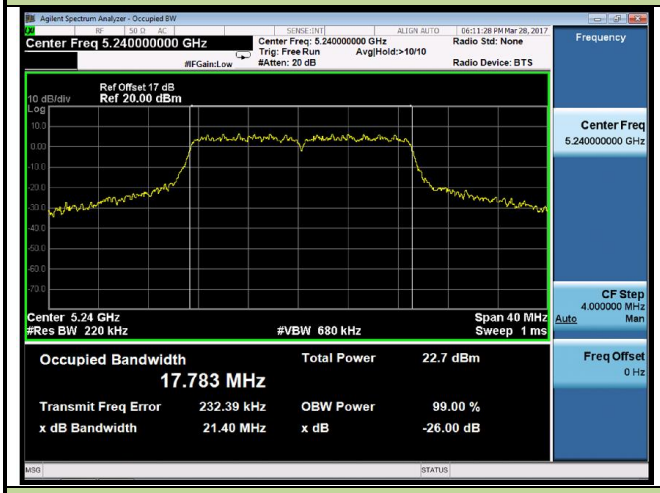
Channel 36 (5180MHz)



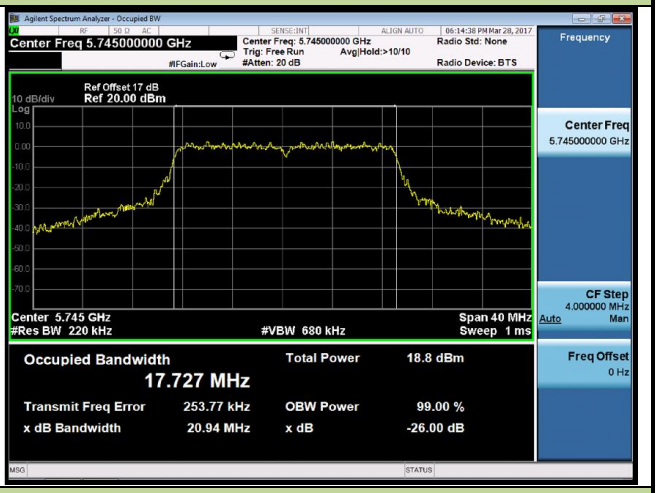
Channel 44 (5220MHz)



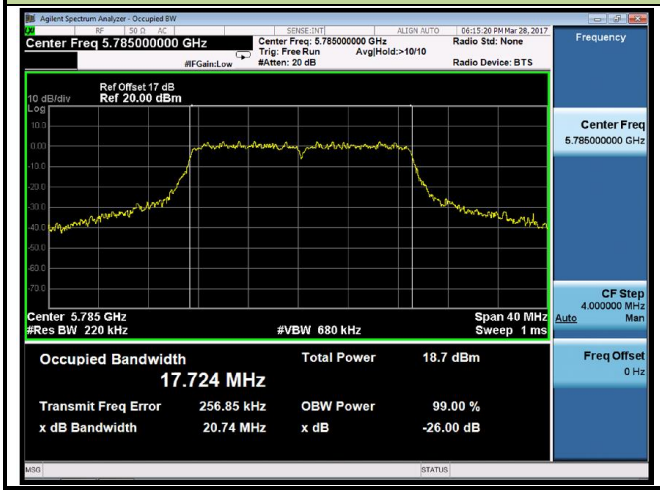
Channel 48 (5240MHz)



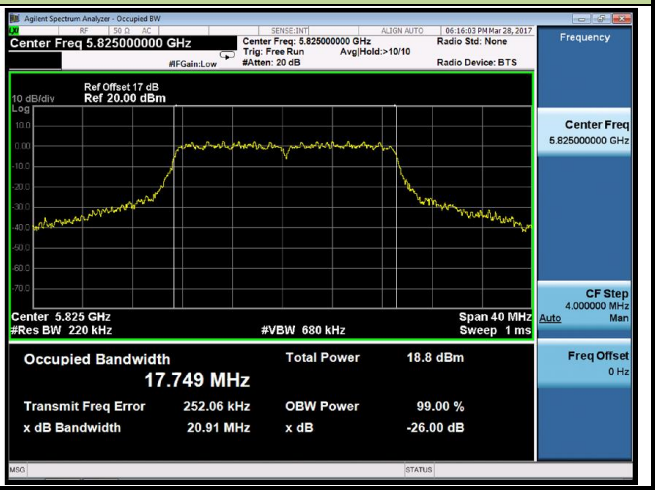
Channel 149 (5745MHz)



Channel 157 (5785MHz)



Channel 165 (5825MHz)



7.3. 6dB Bandwidth Measurement

7.3.1.Test Limit

The minimum 6dBbandwidth shall be at least 500 kHz.

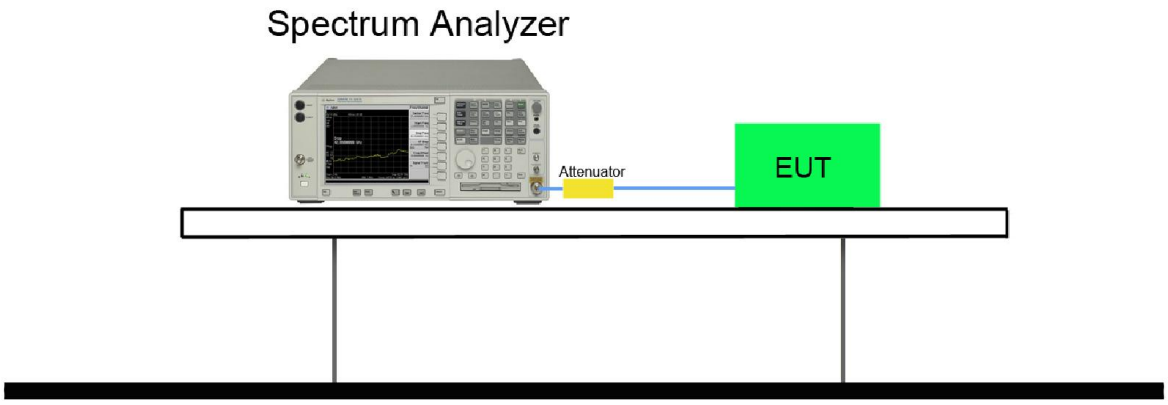
7.3.2.Test Procedure used

KDB 789033 D02v01r04– Section C.2

7.3.3.Test Setting

1. Set center frequency to the nominal EUT channel center frequency.
2. RBW = 100 kHz.
3. VBW≧ 3 × RBW.
4. Detector = Peak.
5. Trace mode = max hold.
6. Sweep = auto couple.
7. Allow the trace to stabilize.
8. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

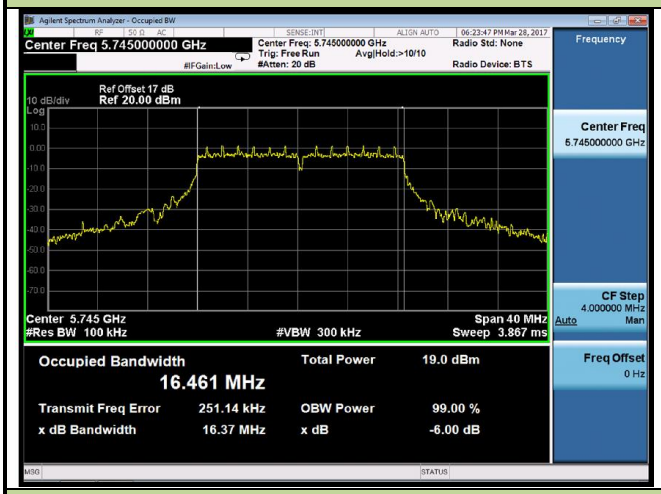
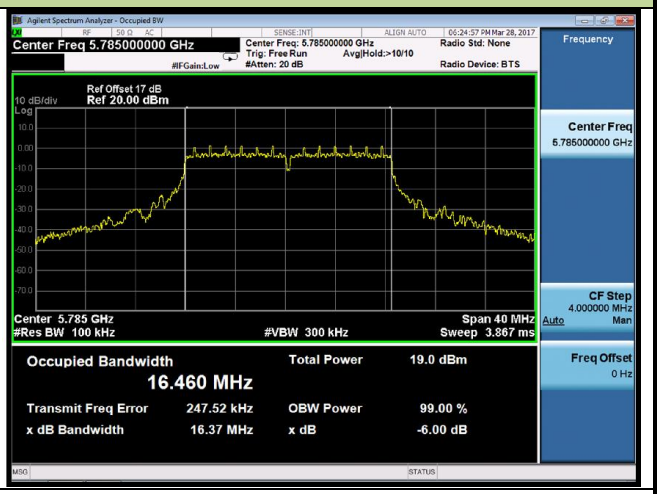
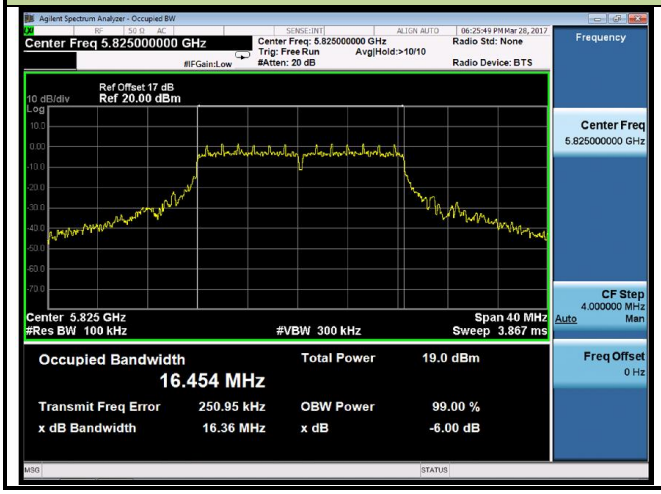
7.3.4.Test Setup

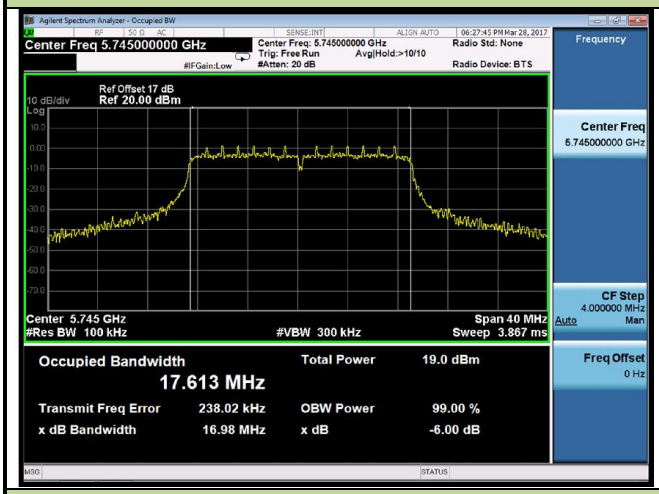
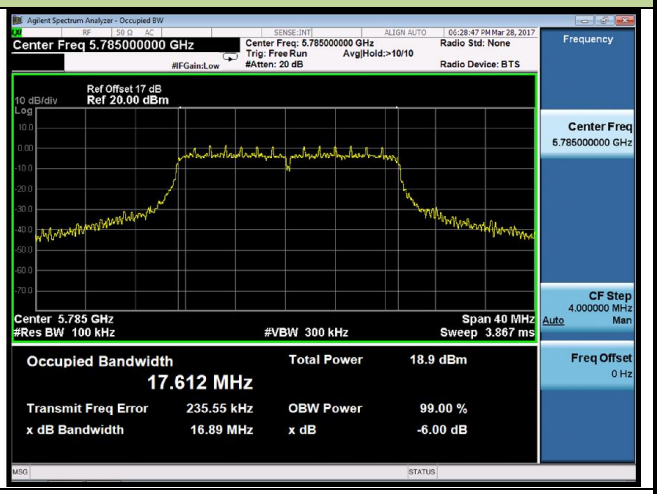
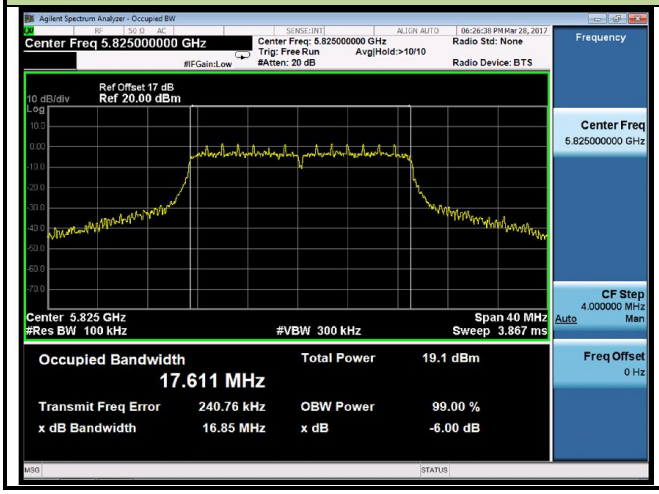


7.3.5.Test Result

Product	Wi-Fi & BLE combo module	Temperature	23°C
Test Engineer	Andy Zhu	Relative Humidity	52%
Test Site	TR3	Test Date	2017/03/28

Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	6dB Bandwidth(MHz)	Limit (MHz)	Result
802.11a	6Mbps	149	5745	16.37	≥0.5	Pass
802.11a	6Mbps	157	5785	16.37	≥0.5	Pass
802.11a	6Mbps	165	5825	16.36	≥0.5	Pass
802.11n-HT20	MCS0	149	5745	16.98	≥0.5	Pass
802.11n-HT20	MCS0	157	5785	16.89	≥0.5	Pass
802.11n-HT20	MCS0	165	5825	16.85	≥0.5	Pass

802.11a 6dB Bandwidth	
Channel 149 (5745MHz)	**Channel 157 (5785MHz)**
	
Channel 165 (5825MHz)	
	

802.11n-HT20 6dB Bandwidth	
Channel 149 (5745MHz)	**Channel 157 (5785MHz)**
	
Channel 165 (5825MHz)	
	

7.4. Output Power Measurement

7.4.1.Test Limit

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm).

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

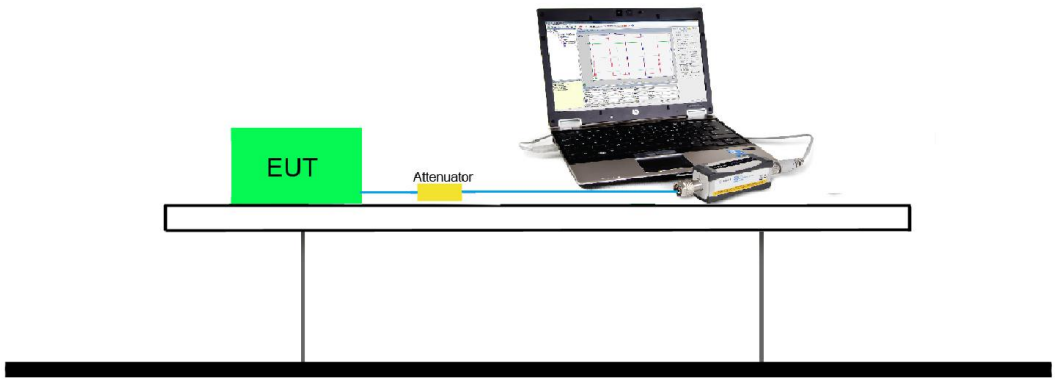
7.4.2.Test Procedure Used

KDB 789033D02v01r04- Section E)3)b) Method PM-G

7.4.3.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.

7.4.4.Test Setup



7.4.5.Test Result

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

Test Mode	Bandwidth	Channel	Frequency (MHz)	Data Rate/ MCS	Average Power (dBm)
802.11a	20	36	5180	6Mbps	18.34
				24Mbps	18.10
				54Mbps	17.95
802.11n	20	36	5180	MCS0	15.81
				MCS3	15.35
				MCS7	15.12

Product	Wi-Fi & BLE combo module	Temperature	22°C
Test Engineer	Andy Zhu	Relative Humidity	54%
Test Site	TR3	Test Date	2017/03/24
Test Item	Output Power		

Test Mode	Data Rate/ MCS	Channel No.	Freq. (MHz)	Average Power (dBm)	Limit (dBm)	Result
11a	6Mbps	36	5180	18.34	≤ 23.98	Pass
11a	6Mbps	44	5220	17.95	≤ 23.98	Pass
11a	6Mbps	48	5240	17.72	≤ 23.98	Pass
11a	6Mbps	149	5745	9.70	≤ 23.98	Pass
11a	6Mbps	157	5785	9.64	≤ 23.98	Pass
11a	6Mbps	165	5825	9.58	≤ 23.98	Pass
11n-HT20	MCS0	36	5180	15.81	≤ 30.00	Pass
11n-HT20	MCS0	44	5220	15.29	≤ 30.00	Pass
11n-HT20	MCS0	48	5240	15.03	≤ 30.00	Pass
11n-HT20	MCS0	149	5745	9.52	≤ 30.00	Pass
11n-HT20	MCS0	157	5785	9.67	≤ 30.00	Pass
11n-HT20	MCS0	165	5825	9.64	≤ 30.00	Pass

7.5. Transmit Power Control

7.5.1.Test Limit

The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm.

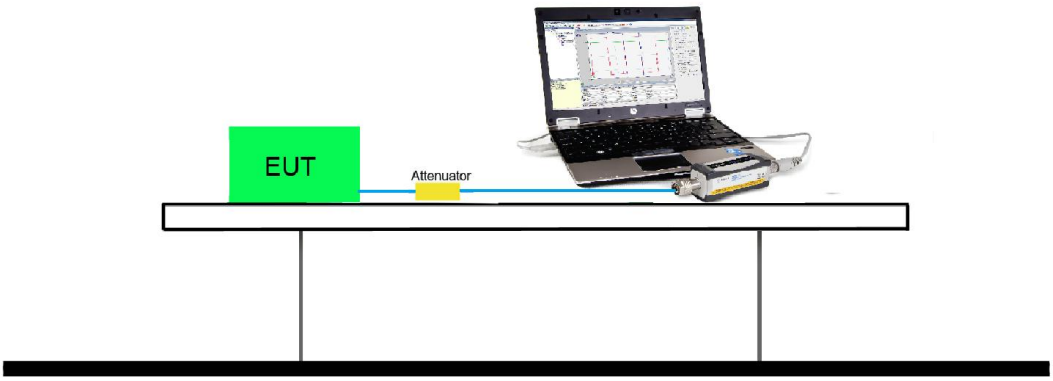
7.5.2.Test Procedure Used

KDB 789033 D02v01- Section E)3)b) Method PM-G

7.5.3.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.

7.5.4.Test Setup



7.5.5.TestResult

Not Applicant.

7.6. Power Spectral Density Measurement

7.6.1.TestLimit

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

For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz 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 theantenna exceeds 6dBi.

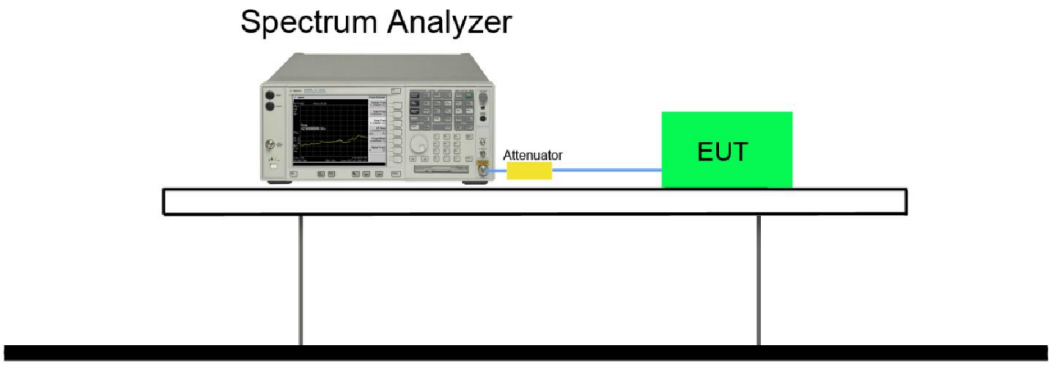
7.6.2.Test Procedure Used

KDB 789033 D02v01r04 - SectionF

7.6.3.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, if measurement bandwidth of Maximum PSD is specified in 500 kHz, RBW = 100 kHz
4. VBW = 3MHz
5. Number of sweep points ≥ 2 × (span / RBW)
6. Detector = power averaging (Average)
7. Sweep time = auto
8. Trigger = free run
9. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
10. 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 percent.
11. When the measurement bandwidth of Maximum PSD is specified in 500 kHz, add a constant factor 10*log(500kHz/100kHz) = 6.99 dB to the measured result.

7.6.4.Test Setup



7.6.5.Test Result

Product	Wi-Fi & BLE combo module	Temperature	22°C
Test Engineer	Andy Zhu	Relative Humidity	54%
Test Site	TR3	Test Date	2017/03/28
Test Item	Power Spectral Density (UNII-Band 1)		

Test Mode	Data Rate/ MCS	Channel No.	Freq. (MHz)	PSD (dBm/ MHz)	Duty Cycle (%)	Final PSD(dBm/ MHz)	PSD Limit (dBm/ MHz)	Result
11a	6Mbps	36	5180	0.22	23.94	6.43	≤ 11.00	Pass
11a	6Mbps	44	5220	0.51	23.94	6.72	≤ 11.00	Pass
11a	6Mbps	48	5240	-1.21	23.94	5.00	≤ 11.00	Pass
11n-HT20	MCS0	36	5180	-0.47	22.36	6.04	≤ 11.00	Pass
11n-HT20	MCS0	44	5220	-0.21	22.36	6.30	≤ 11.00	Pass
11n-HT20	MCS0	48	5240	-0.78	22.36	5.73	≤ 11.00	Pass

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

Product	Wi-Fi & BLE combo module	Temperature	22°C
Test Engineer	Andy Zhu	Relative Humidity	54%
Test Site	TR3	Test Date	2017/06/27
Test Item	Power Spectral Density (UNII-Band 3)		

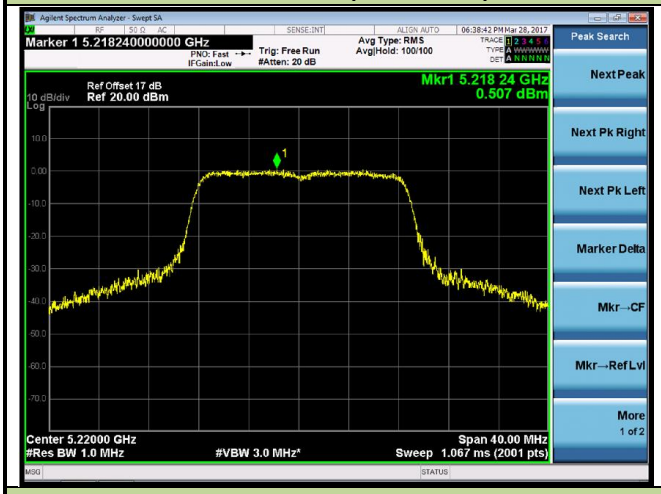
Test Mode	Data Rate/ MCS	Channel No.	Freq. (MHz)	PSD (dBm/ 100KHz)	Duty Cycle (%)	Constant Factor	Final PSD (dBm/ MHz)	PSD Limit (dBm/ MHz)	Result
11a	6Mbps	149	5745	-13.25	23.94	6.99	-0.05	≤ 30.00	Pass
11a	6Mbps	157	5785	-13.05	23.94	6.99	0.15	≤ 30.00	Pass
11a	6Mbps	165	5825	-13.02	23.94	6.99	0.18	≤ 30.00	Pass
11n-HT20	MCS0	149	5745	-12.91	22.36	6.99	0.59	≤ 30.00	Pass
11n-HT20	MCS0	157	5785	-12.89	22.36	6.99	0.61	≤ 30.00	Pass
11n-HT20	MCS0	165	5825	-13.25	22.36	6.99	0.25	≤ 30.00	Pass

Note 1: When EUT duty cycle ≥ 98%, the Final PSD (dBm/MHz) = PSD (dBm/100kHz) + Constant Factor.

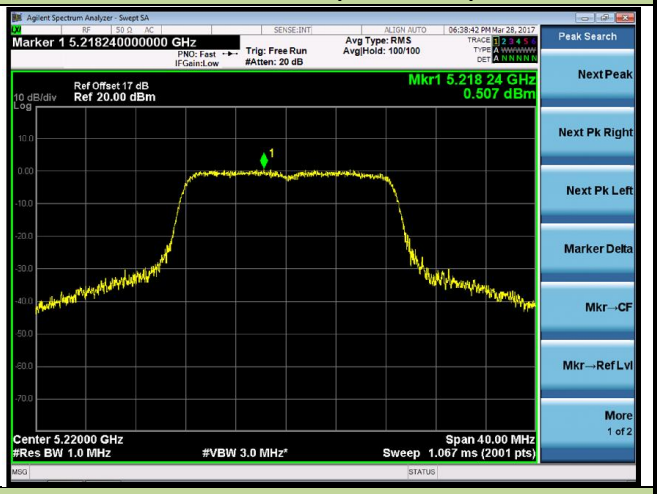
Note 2: When EUT duty cycle < 98%, the Final PSD (dBm/MHz) = PSD (dBm/100k Hz) + 10*log(1/Duty Cycle) + Constant Factor.

802.11a Power Spectral Density

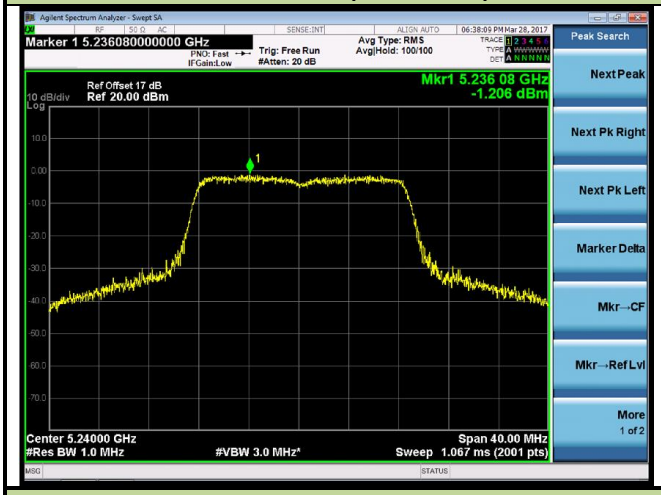
Channel 36 (5180MHz)



Channel 44 (5220MHz)

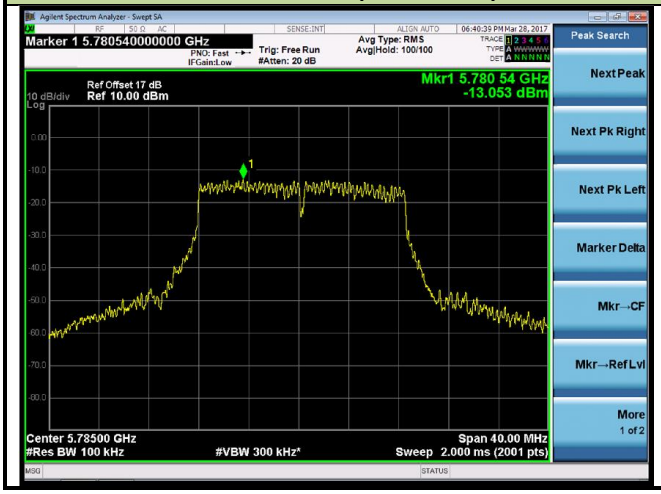


Channel 48 (5240MHz)



Channel 149 (5745MHz)

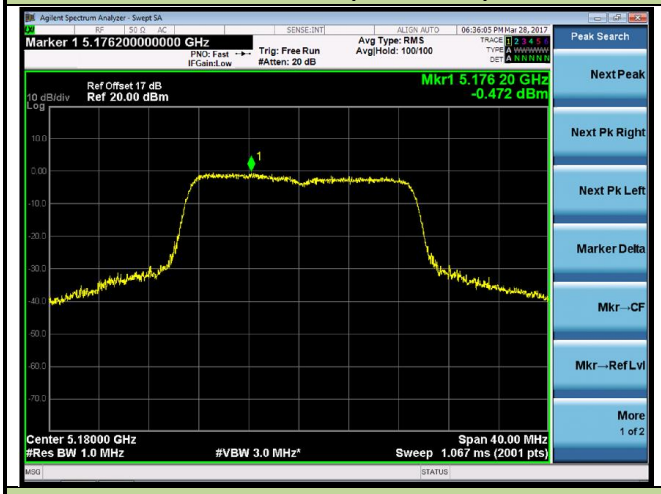
Channel 157 (5785MHz)



Channel 165 (5825MHz)

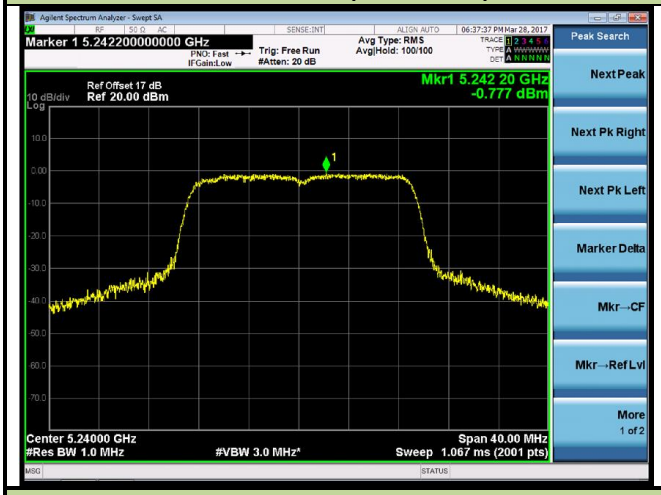
802.11n-HT20 Power Spectral Density

Channel 36 (5180MHz)



Channel 44 (5220MHz)

Channel 48 (5240MHz)



Channel 149 (5745MHz)

Channel 157 (5785MHz)

Channel 165 (5825MHz)

7.7. Frequency Stability Measurement

7.7.1.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.

The transmitter center frequency tolerance shall be ±20 ppm maximum for the 5GHz band (IEEE 802.11 specification).

7.7.2.Test Procedure Used

Frequency Stability Under Temperature Variations:

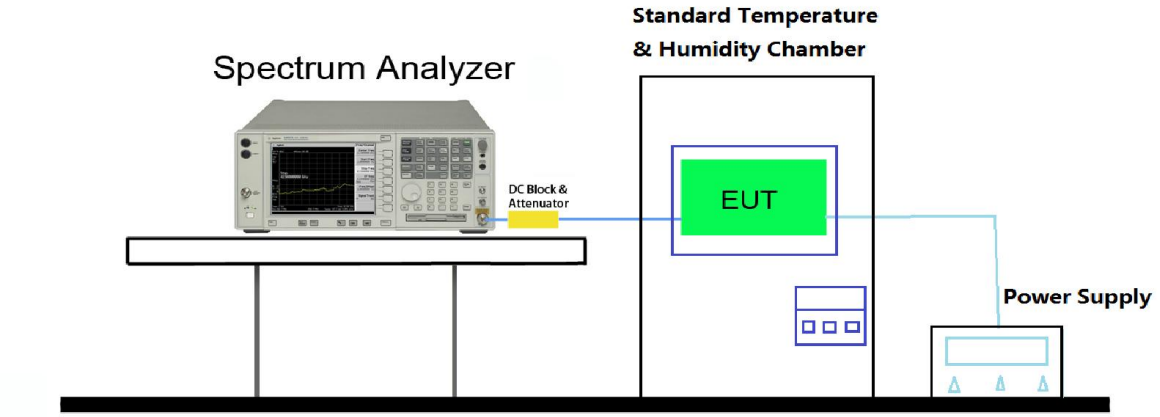
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain 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, recordthe maximum frequency change.

7.7.3.Test Setup



7.7.4.Test Result

Test Engineer	Andy Zhu	Temperature	-30 ~ 50°C
Test Time	2017/03/28	Relative Humidity	48 ~ 55%RH
Test Mode	5180MHz (Carrier Mode)	Test Site	TR3

Voltage (%)	Power (VAC)	Temp (°C)	Frequency Tolerance (ppm)			
			0 minutes	2 minutes	5 minutes	10 minutes
100%	3.6	- 30	-2.92	-3.06	-3.31	-3.52
		- 20	-2.60	-2.91	-2.39	-2.50
		- 10	-1.79	-2.76	-2.91	-1.85
		0	-1.76	-2.04	-1.78	-1.42
		+ 10	-0.54	-0.95	-0.74	0.18
		+ 20 (Ref)	-0.62	-1.00	-0.96	-0.20
		+ 30	-1.91	-2.60	-1.73	-1.81
		+ 40	-2.40	-2.26	-2.05	-1.82
		+ 50	-1.60	-2.30	-3.00	-2.52
115%	4.8	+ 20	-2.49	-2.44	-2.87	-2.32
85%	2.3	+ 20	-2.34	-1.88	-1.65	-1.40

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

7.8. Radiated Spurious Emission Measurement

7.8.1.Test Limit

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47CFR 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

7.8.2.Test Procedure Used

KDB 789033 D02v01r04 – Section G

7.8.3.Test Setting

Quasi-Peak& Average Measurements below30MHz

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 = 200Hz for 9kHz to 150kHz frequency; RBW = 9kHz for 0.15MHz to 30MHz frequency
4. Detector = CISPR quasi-peak or power average (Average)
5. Sweep time = auto couple
6. 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

Peak Measurements above 1GHz

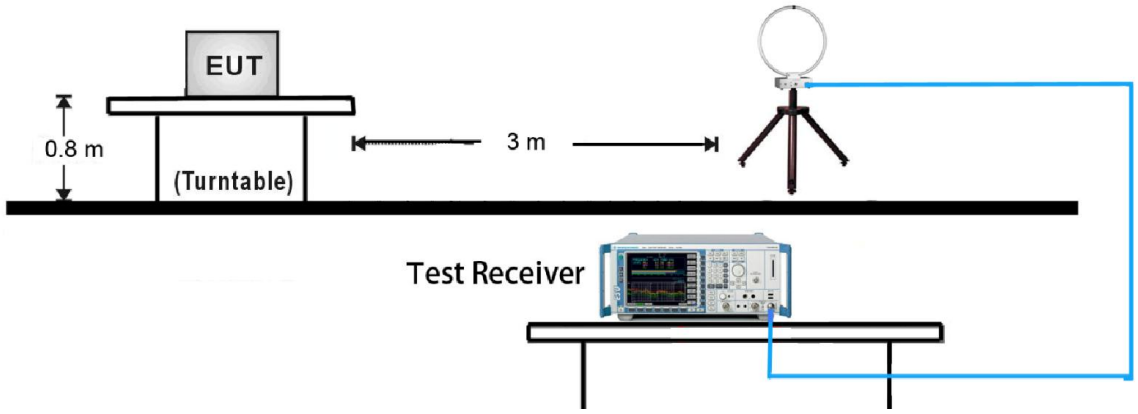
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Average Measurements above 1GHz (Method AD)

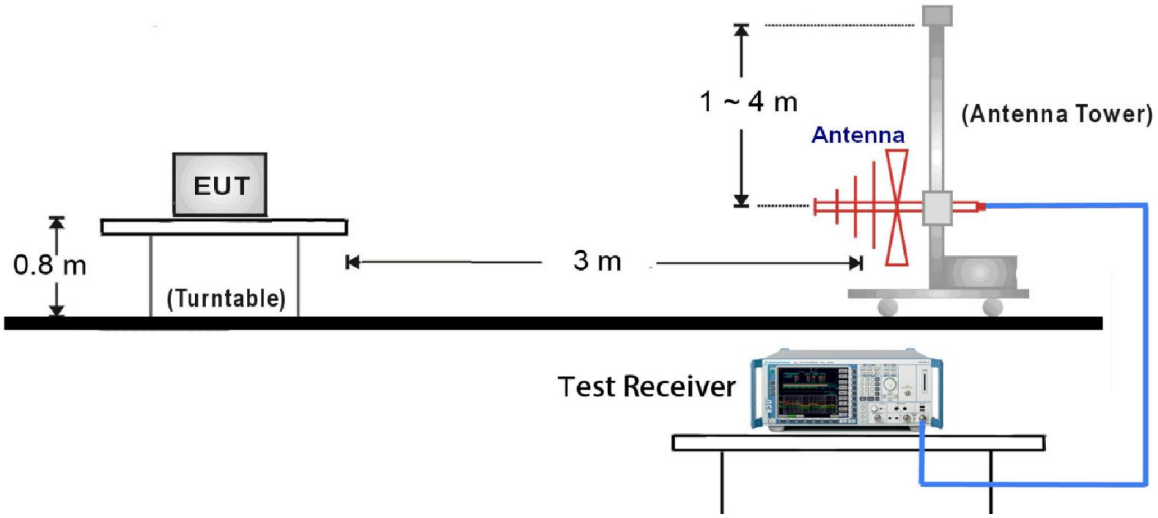
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = power average (Average)
5. Number of measurement points = 1001 (Number of points must be > 2 x span/RBW)
6. Sweep time = auto
7. Trace was averaged over at 100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

7.8.4.Test Setup

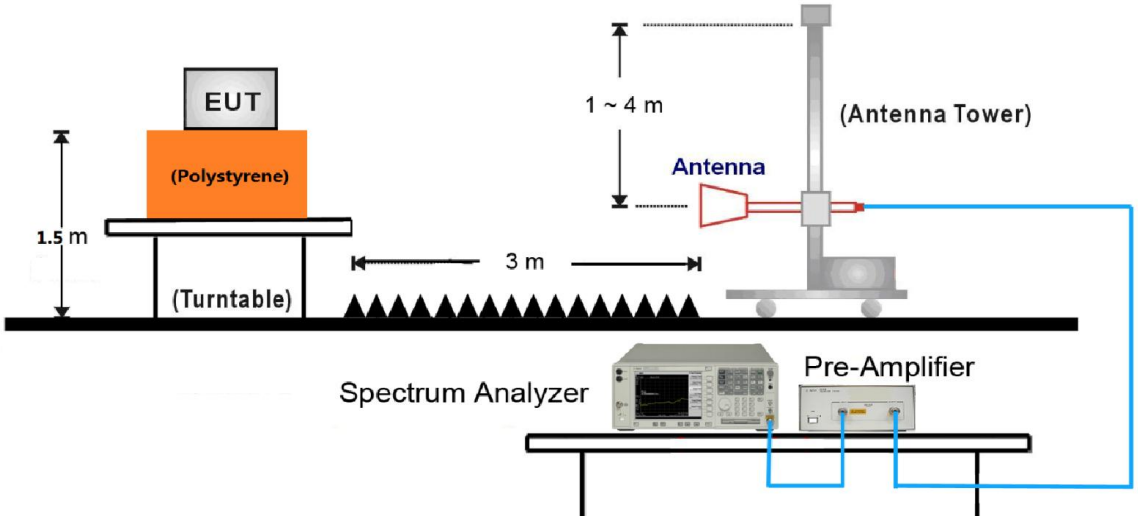
9kHz ~30MHz Test Setup:



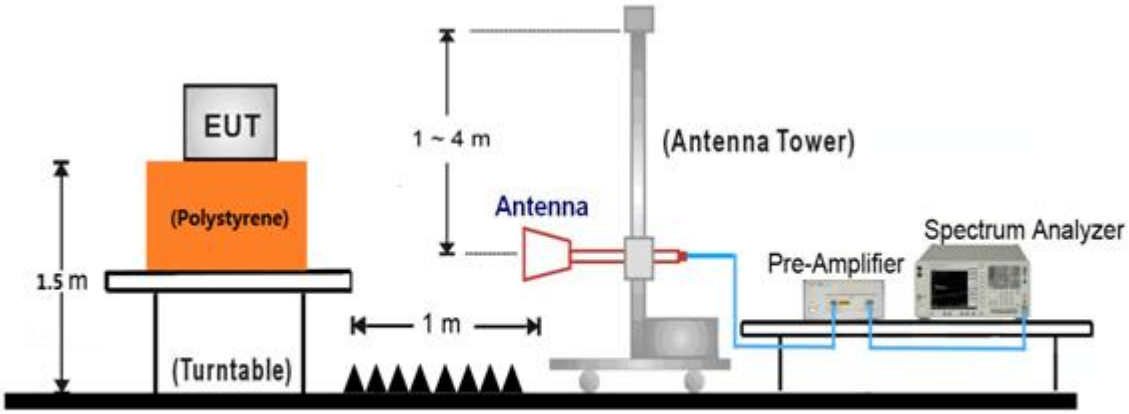
30MHz ~ 1GHz Test Setup:



1GHz ~18GHz Test Setup:



18GHz ~40GHz Test Setup:



7.8.5.Test Result

Product	Wi-Fi & BLE combo module	Temperature	25°C
Test Engineer	Snake Ni	Relative Humidity	50 %
Test Site	AC2	Test Date	2017/06/27
Test Mode:	802.11a	Test Channel:	36
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
*	8012.5	6.0	37.3	43.3	68.2	-24.9	Peak	Horizontal
*	10358.5	53.1	14.9	68.0	68.2	-0.2	Peak	Horizontal
	12118.0	10.0	39.3	49.3	74	-24.7	Peak	Horizontal
	15535.0	38.4	17.4	55.8	74	-18.2	Peak	Horizontal
	15538.5	27.6	17.4	45.0	54	-9.0	Average	Horizontal
*	7783.0	7.3	36.7	44.0	68.2	-24.2	Peak	Vertical
*	10358.5	46.3	14.9	61.2	68.2	-7.0	Peak	Vertical
	11557.0	8.8	40.2	49.0	74	-25.0	Peak	Vertical
	15543.5	12.9	38.3	51.2	74	-22.8	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)

Product	Wi-Fi & BLE combo module	Temperature	25°C
Test Engineer	Snake Ni	Relative Humidity	50 %
Test Site	AC2	Test Date	2017/06/27
Test Mode:	802.11a	Test Channel:	44
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
*	7774.5	6.7	36.7	43.4	68.2	-24.8	Peak	Horizontal
*	10443.5	52.3	14.6	66.9	68.2	-1.3	Peak	Horizontal
	11540.0	8.4	40.2	48.6	74	-25.4	Peak	Horizontal
	15654.0	13.5	38.0	51.5	74	-22.5	Peak	Horizontal
*	7927.5	6.8	37.1	43.9	68.2	-24.3	Peak	Vertical
*	10443.5	44.7	14.6	59.3	68.2	-8.9	Peak	Vertical
	11557.0	8.4	40.2	48.6	74	-25.4	Peak	Vertical
	15577.5	11.8	38.2	50.0	74	-24.0	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)

Product	Wi-Fi & BLE combo module	Temperature	25°C
Test Engineer	Snake Ni	Relative Humidity	50 %
Test Site	AC2	Test Date	2017/06/27
Test Mode:	802.11a	Test Channel:	48
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
*	8004.0	6.1	37.2	43.3	68.2	-24.9	Peak	Horizontal
*	10477.5	51.4	14.8	66.2	68.2	-2.0	Peak	Horizontal
	11557.0	9.1	40.2	49.3	74	-24.7	Peak	Horizontal
	15722.0	35.2	16.5	51.7	74	-22.3	Peak	Horizontal
*	7961.5	6.3	37.2	43.5	68.2	-24.7	Peak	Vertical
*	10477.5	42.9	14.8	57.7	68.2	-10.5	Peak	Vertical
	11506.0	8.1	40.3	48.4	74	-25.6	Peak	Vertical
	15365.0	11.2	39.0	50.2	74	-23.8	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)

Product	Wi-Fi & BLE combo module	Temperature	25°C
Test Engineer	Snake Ni	Relative Humidity	50 %
Test Site	AC2	Test Date	2017/06/27
Test Mode:	802.11a	Test Channel:	149
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
*	7944.5	5.9	37.1	43.0	68.2	-25.2	Peak	Horizontal
*	10528.5	7.7	39.6	47.3	68.2	-20.9	Peak	Horizontal
	11497.5	33.4	17.3	50.7	74	-23.3	Peak	Horizontal
	15705.0	13.3	37.9	51.2	74	-22.8	Peak	Horizontal
*	7766.0	6.9	36.6	43.5	68.2	-24.7	Peak	Vertical
*	10146.0	9.8	38.8	48.6	68.2	-19.6	Peak	Vertical
	11497.5	35.5	17.3	52.8	74	-21.2	Peak	Vertical
	15892.0	12.5	37.7	50.2	74	-23.8	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)

Product	Wi-Fi & BLE combo module	Temperature	25°C
Test Engineer	Snake Ni	Relative Humidity	50 %
Test Site	AC2	Test Date	2017/06/27
Test Mode:	802.11a	Test Channel:	157
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
*	7893.5	6.6	37.0	43.6	68.2	-24.6	Peak	Horizontal
*	10528.5	7.8	39.6	47.4	68.2	-20.8	Peak	Horizontal
	11574.0	8.2	40.1	48.3	74	-25.7	Peak	Horizontal
	15645.5	11.8	38.0	49.8	74	-24.2	Peak	Horizontal
*	7766.0	6.8	36.6	43.4	68.2	-24.8	Peak	Vertical
*	10520.0	8.1	39.6	47.7	68.2	-20.5	Peak	Vertical
	11573.0	25.1	17.4	42.5	54	-11.5	Average	Vertical
	11574.0	37.5	17.4	54.9	74	-19.1	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)

Product	Wi-Fi & BLE combo module	Temperature	25°C
Test Engineer	Snake Ni	Relative Humidity	50 %
Test Site	AC2	Test Date	2017/06/27
Test Mode:	802.11a	Test Channel:	165
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
*	7817.0	6.7	36.8	43.5	68.2	-24.7	Peak	Horizontal
*	10460.5	8.3	39.2	47.5	68.2	-20.7	Peak	Horizontal
	11531.5	8.4	40.2	48.6	74	-25.4	Peak	Horizontal
	15900.5	12.1	37.7	49.8	74	-24.2	Peak	Horizontal
*	7757.5	7.2	36.6	43.8	68.2	-24.4	Peak	Vertical
*	10494.5	8.5	39.5	48.0	68.2	-20.2	Peak	Vertical
	11659.0	35.4	17.5	52.9	74	-21.1	Peak	Vertical
	15424.5	11.8	38.8	50.6	74	-23.4	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)

Product	Wi-Fi & BLE combo module	Temperature	25.2°C
Test Engineer	Snake Ni	Relative Humidity	53 %
Test Site	AC2	Test Date	2017/06/28
Test Mode:	802.11n-HT20	Test Channel:	36
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
*	7936.0	6.5	37.1	43.6	68.2	-24.6	Peak	Horizontal
*	10358.5	51.7	14.9	66.6	68.2	-1.6	Peak	Horizontal
	11650.5	9.6	39.9	49.5	74	-24.5	Peak	Horizontal
	15535.0	38.2	17.4	55.6	74	-18.4	Peak	Horizontal
	15538.3	26.2	17.4	43.6	54	-10.4	Average	Horizontal
*	7791.5	6.9	36.7	43.6	68.2	-24.6	Peak	Vertical
*	10367.0	49.7	14.9	64.6	68.2	-3.6	Peak	Vertical
	12152.0	10.2	39.3	49.5	74	-24.5	Peak	Vertical
	15552.0	12.0	38.3	50.3	74	-23.7	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)

Product	Wi-Fi & BLE combo module	Temperature	25.2°C
Test Engineer	Snake Ni	Relative Humidity	53 %
Test Site	AC2	Test Date	2017/06/28
Test Mode:	802.11n-HT20	Test Channel:	44
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
*	7825.5	7.3	36.8	44.1	68.2	-24.1	Peak	Horizontal
*	10443.5	50.8	14.6	65.4	68.2	-2.8	Peak	Horizontal
	11616.5	8.5	40.0	48.5	74	-25.5	Peak	Horizontal
	15662.5	35.0	17.0	52.0	74	-22.0	Peak	Horizontal
*	7868.0	6.7	36.9	43.6	68.2	-24.6	Peak	Vertical
*	10435.0	46.2	14.6	60.8	68.2	-7.4	Peak	Vertical
	11574.0	9.6	40.1	49.7	74	-24.3	Peak	Vertical
	15654.0	12.7	38.0	50.7	74	-23.3	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)

Product	Wi-Fi & BLE combo module	Temperature	25.2°C
Test Engineer	Snake Ni	Relative Humidity	53 %
Test Site	AC2	Test Date	2017/06/28
Test Mode:	802.11n-HT20	Test Channel:	48
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
*	7757.5	7.0	36.6	43.6	68.2	-24.6	Peak	Horizontal
*	10477.5	50.5	14.8	65.3	68.2	-2.9	Peak	Horizontal
	12126.5	9.5	39.3	48.8	74	-25.2	Peak	Horizontal
	15722.0	35.0	16.5	51.5	74	-22.5	Peak	Horizontal
*	7859.5	6.6	36.9	43.5	68.2	-24.7	Peak	Vertical
*	10477.5	45.5	14.8	60.3	68.2	-7.9	Peak	Vertical
	11557.0	9.2	40.2	49.4	74	-24.6	Peak	Vertical
	15892.0	12.2	37.7	49.9	74	-24.1	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)

Product	Wi-Fi & BLE combo module	Temperature	25.2°C
Test Engineer	Snake Ni	Relative Humidity	53 %
Test Site	AC2	Test Date	2017/06/28
Test Mode:	802.11n-HT20	Test Channel:	149
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
*	7876.5	6.5	36.9	43.4	68.2	-24.8	Peak	Horizontal
*	10120.5	8.3	38.7	47.0	68.2	-21.2	Peak	Horizontal
	11548.5	8.6	40.2	48.8	74	-25.2	Peak	Horizontal
	15960.0	12.2	37.6	49.8	74	-24.2	Peak	Horizontal
*	7868.0	6.7	36.9	43.6	68.2	-24.6	Peak	Vertical
*	10528.5	8.0	39.6	47.6	68.2	-20.6	Peak	Vertical
	11486.6	24.8	17.1	41.9	54	-12.1	Average	Vertical
	11489.0	38.1	17.1	55.2	74	-18.8	Peak	Vertical
	15305.5	11.5	39.3	50.8	74	-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)

Product	Wi-Fi & BLE combo module	Temperature	25.2°C
Test Engineer	Snake Ni	Relative Humidity	53 %
Test Site	AC2	Test Date	2017/06/28
Test Mode:	802.11n-HT20	Test Channel:	157
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
*	7910.5	6.4	37.0	43.4	68.2	-24.8	Peak	Horizontal
*	10180.0	7.8	38.8	46.6	68.2	-21.6	Peak	Horizontal
	11565.5	9.4	40.2	49.6	74	-24.4	Peak	Horizontal
	15654.0	12.1	38.0	50.1	74	-23.9	Peak	Horizontal
*	7825.5	7.3	36.8	44.1	68.2	-24.1	Peak	Vertical
*	10112.0	9.1	38.7	47.8	68.2	-20.4	Peak	Vertical
	11565.5	37.0	17.6	54.6	74	-19.4	Peak	Vertical
	11572.0	25.5	17.4	42.9	54	-11.1	Average	Vertical
	15705.0	12.0	37.9	49.9	74	-24.1	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)

Product	Wi-Fi & BLE combo module	Temperature	25.2°C
Test Engineer	Snake Ni	Relative Humidity	53 %
Test Site	AC2	Test Date	2017/06/28
Test Mode:	802.11n-HT20	Test Channel:	165
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
*	7774.5	6.5	36.7	43.2	74	-30.8	Peak	Horizontal
*	10494.5	7.8	39.5	47.3	74	-26.7	Peak	Horizontal
	11557.0	9.5	40.2	49.7	74	-24.3	Peak	Horizontal
	15892.0	12.6	37.7	50.3	74	-23.7	Peak	Horizontal
*	7944.5	6.4	37.1	43.5	74	-30.5	Peak	Vertical
*	10494.5	9.1	39.5	48.6	74	-25.4	Peak	Vertical
	11650.5	36.2	17.4	53.6	74	-20.4	Peak	Vertical
	15552.0	12.3	38.3	50.6	74	-23.4	Peak	Vertical

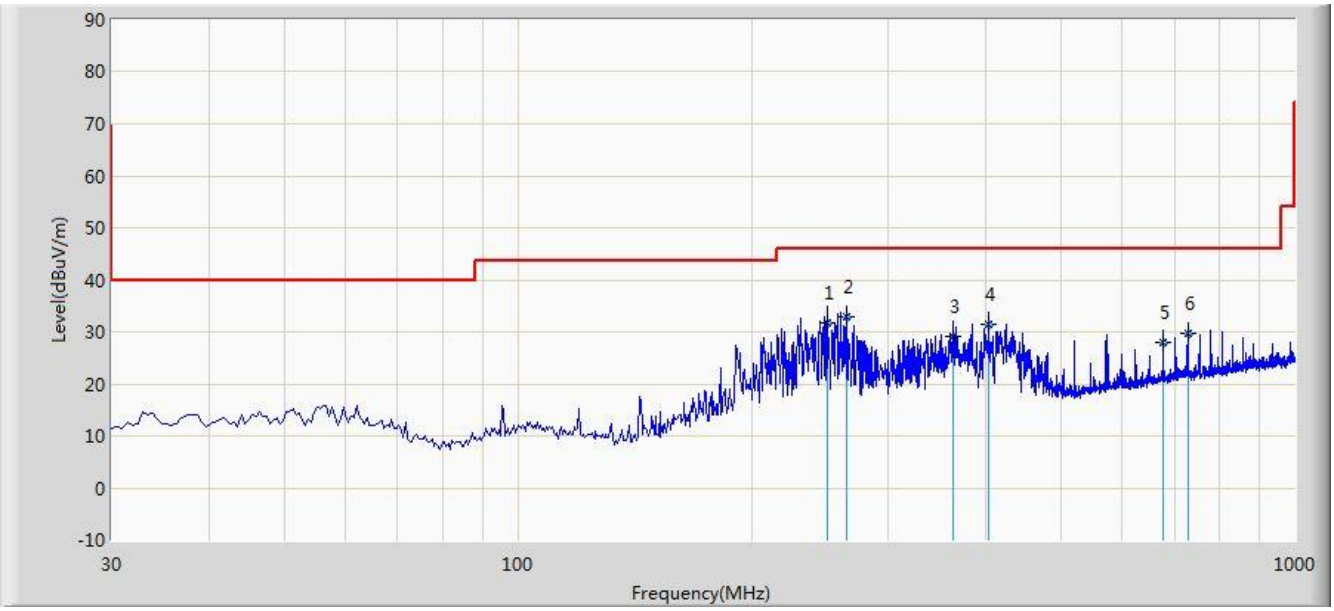
Note 1: "*" is not in restricted band, its limit is -27dBm/MHz or -17dBm/MHz. At a distance of 3 meters, the field strength limit in dBμV/m can be determined by adding a "conversion" factor of 95.2dB to the EIRP limit of -27dBm/MHz to obtain the limit for out of band spurious emissions.

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

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

The worst case of Radiated Emission below 1GHz:

Site: AC2	Time: 2017/04/05 - 10:59
Limit: FCC_Part15.209_RE(3m)	Engineer: Snake Ni
Probe: VULB9162_0.03-8GHz	Polarity: Horizontal
EUT: Wi-Fi & BLE combo module	Power: DC 3.6V
Note: There is the worst case within frequency range 30MHz~1GHz.	



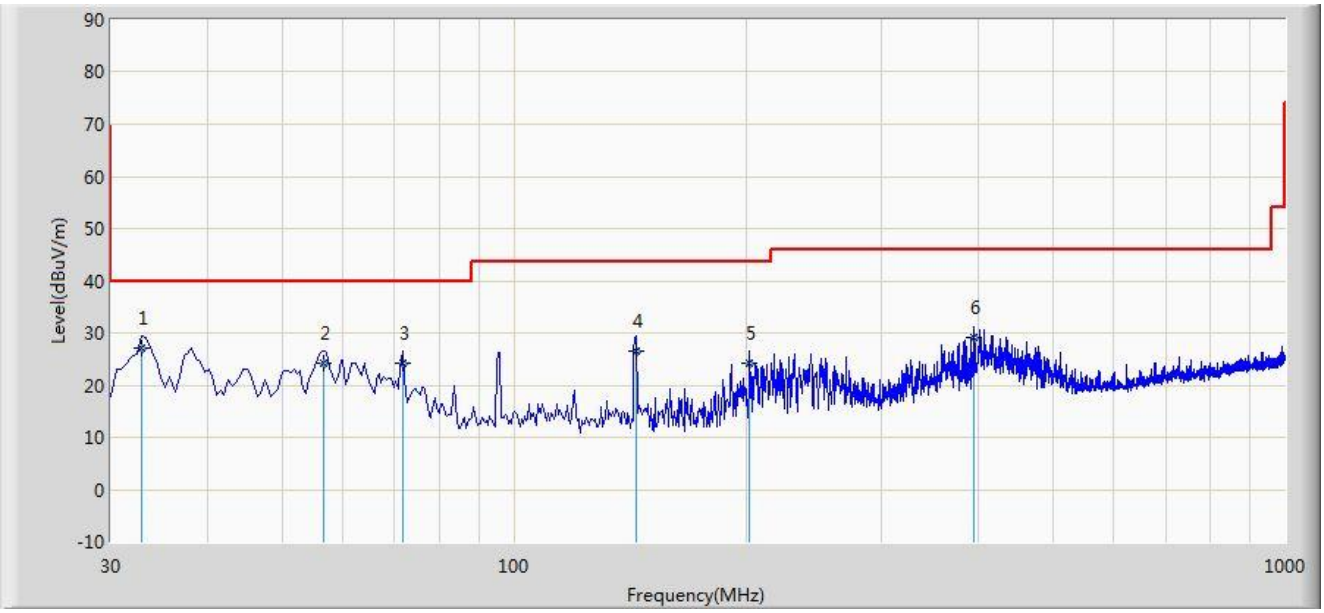
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			250.190	31.676	19.365	-14.324	46.000	12.311	QP
2		*	265.225	32.904	20.341	-13.096	46.000	12.563	QP
3			362.710	29.080	14.699	-16.920	46.000	14.381	QP
4			403.450	31.398	16.371	-14.602	46.000	15.027	QP
5			676.020	27.985	9.121	-18.015	46.000	18.864	QP
6			727.915	29.596	10.007	-16.404	46.000	19.589	QP

Note 1: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

Site: AC2	Time: 2017/04/05 - 11:01
Limit: FCC_Part15.209_RE(3m)	Engineer: Snake Ni
Probe: VULB9162_0.03-8GHz	Polarity: Vertical
EUT: Wi-Fi & BLE combo module	Power: DC 3.6V
Note: There is the worst case within frequency range 30MHz~1GHz.	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	32.910	27.195	15.131	-12.805	40.000	12.064	QP
2			56.675	24.103	10.340	-15.897	40.000	13.763	QP
3			71.710	24.085	14.319	-15.915	40.000	9.766	QP
4			143.975	26.507	18.098	-16.993	43.500	8.409	QP
5			202.175	24.059	12.982	-19.441	43.500	11.077	QP
6			395.205	29.021	14.127	-16.979	46.000	14.894	QP

Note 1: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

7.9. Radiated RestrictedBand Edge Measurement

7.9.1.Test Limit

For 15.205 requirement:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a).

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 - 0.110	16.42-16.423	399.9 - 410	4.5-5.15
[1] 0.495 - 0.505	16.69475-16.69525	608 - 614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960 - 1240	7.25-7.75
4.125-4.128	25.5 -25.67	1300 - 1427	8.25 - 8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660 - 1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123 - 138	2200 - 2300	14.47-14.5
8.291-8.294	149.9-150.05	2310–2390	15.35-16.2
8.362-8.366	156.52475-156.525	2483.5 - 2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690 - 2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260 - 3267	23.6-24.0
12.29-12.293	167.72-173.2	3332 - 3339	31.2-31.8
12.51975-12.52025	240 - 285	3345.8 - 3358	36.43-36.5
12.57675-12.57725	322-335.4	3600 - 4400	([2])
13.36-13.41	--	--	--

For 15.407(b) requirement:

For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.

Refer to KDB 789033 D02v01r04 G)2)c), as specified in § 15.407(b), emissions above 1000 MHz that are outside of the restricted bands are subject to a maximum emission limit of -27 dBm/MHz (or -17 dBm/MHz as specified in § 15.407(b)(4)). However, an out-of-band emission that complies with

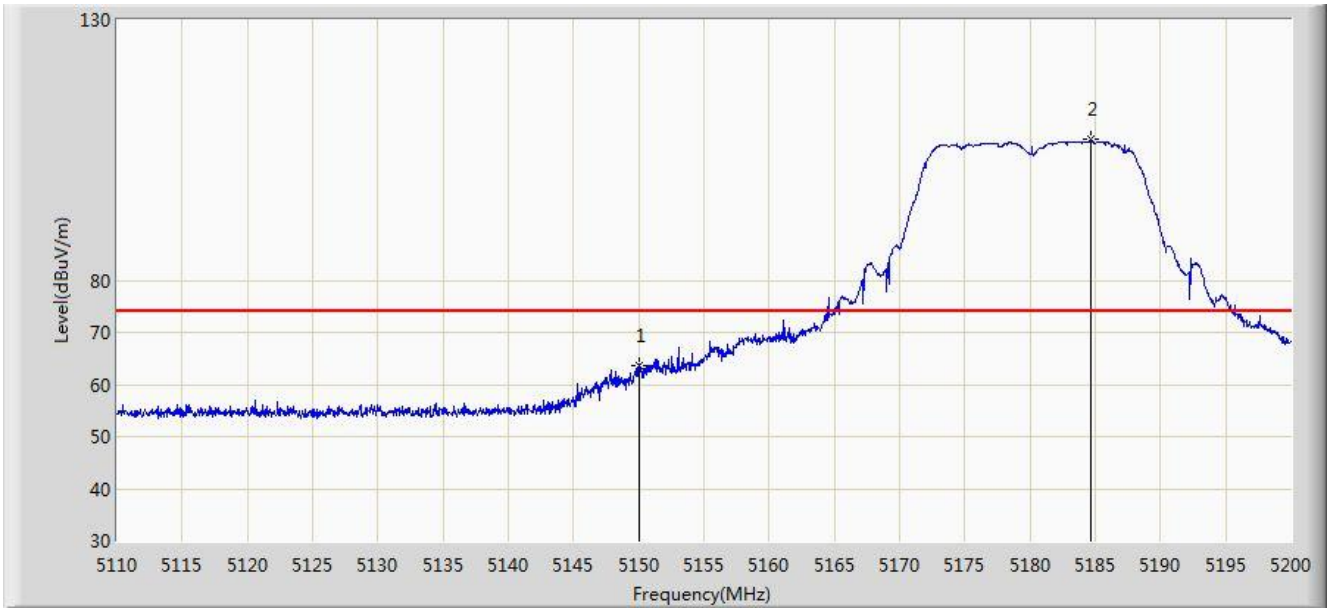
both the peak and average limits of § 15.209 is not required to satisfy the -27 dBm/MHz or -17 dBm/MHz maximum emission limit.

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47CFR 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

7.9.2.Test Result

Site: AC2	Time: 2017/03/24 - 02:42
Limit: FCC_Part15.209_RE(3m)	Engineer: Snake Ni
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Wi-Fi & BLE combo module	Power: DC 3.6V
Note: Transmit by 802.11a at channel 5180MHz	

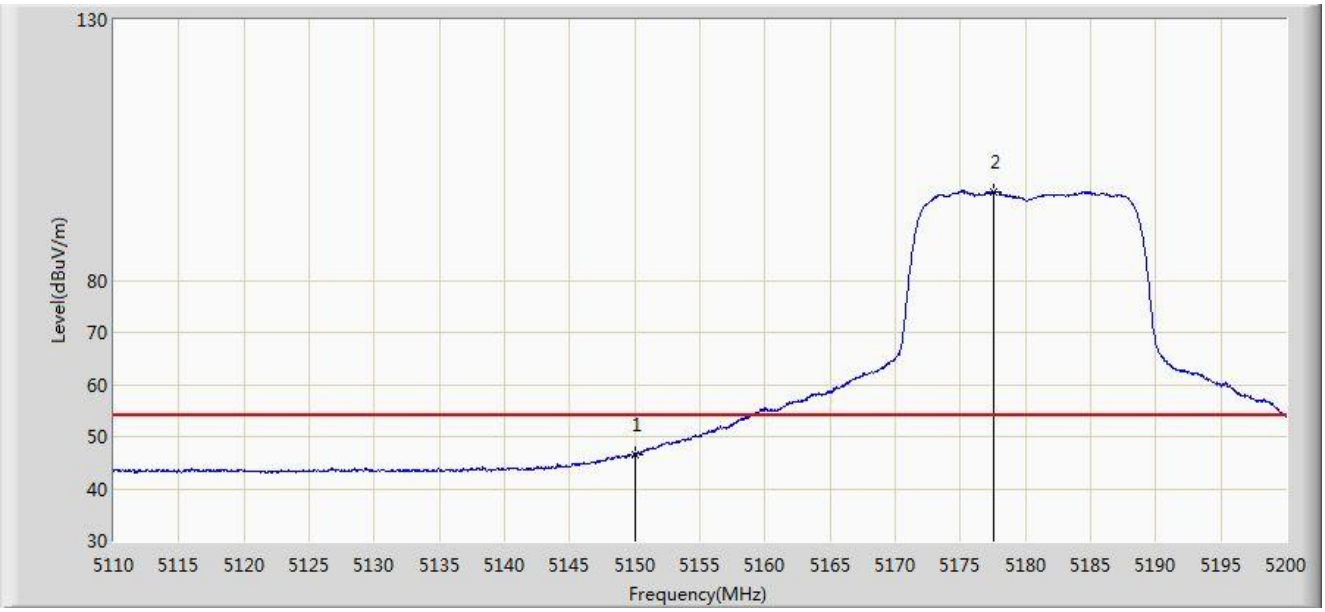


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			5150.000	63.757	60.687	-10.243	74.000	3.069	PK
2		*	5184.610	106.991	103.973	N/A	N/A	3.018	PK

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2017/03/24 - 02:50
Limit: FCC_Part15.209_RE(3m)	Engineer: Snake Ni
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Wi-Fi & BLE combo module	Power: DC 3.6V
Note: Transmit by 802.11a at channel 5180MHz	

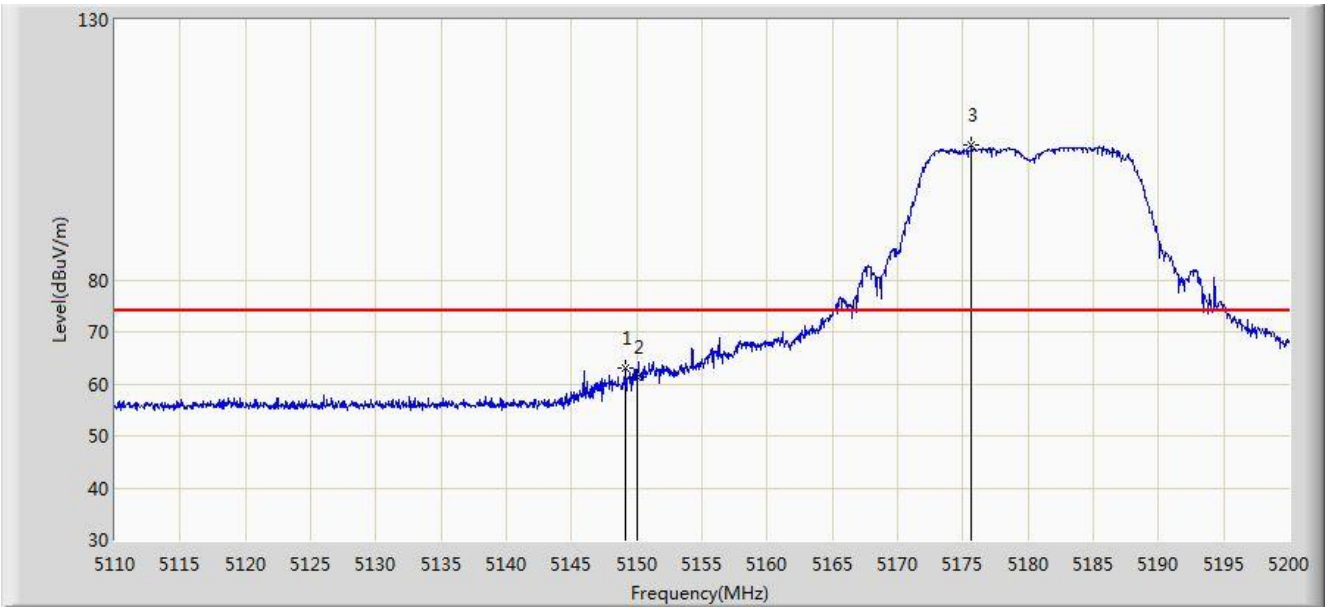


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			5150.000	46.549	43.479	-7.451	54.000	3.069	AV
2		*	5177.545	96.934	93.901	N/A	N/A	3.033	AV

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2017/03/24 - 03:00
Limit: FCC_Part15.209_RE(3m)	Engineer: Snake Ni
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Wi-Fi & BLE combo module	Power: DC 3.6V
Note: Transmit by 802.11a at channel 5180MHz	

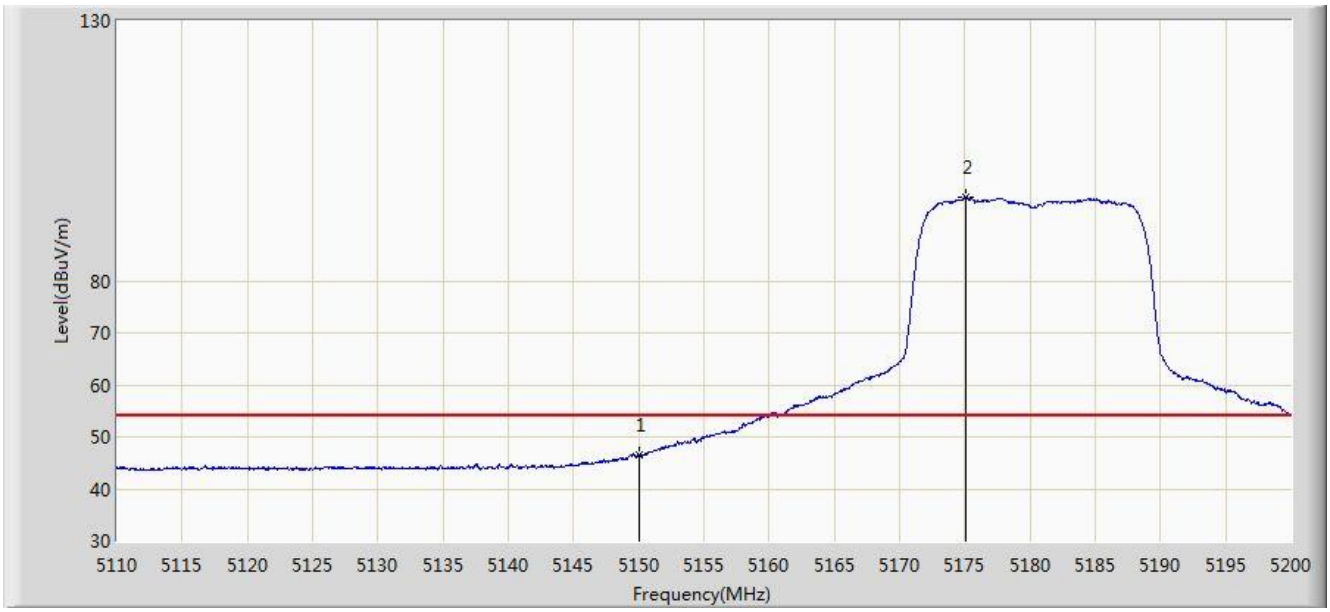


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			5149.105	63.070	59.998	-10.930	74.000	3.072	PK
2			5150.000	61.167	58.097	-12.833	74.000	3.069	PK
3		*	5175.655	106.011	102.985	N/A	N/A	3.026	PK

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2017/03/24 - 03:03
Limit: FCC_Part15.209_RE(3m)	Engineer: Snake Ni
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Wi-Fi & BLE combo module	Power: DC 3.6V
Note: Transmit by 802.11a at channel 5180MHz	

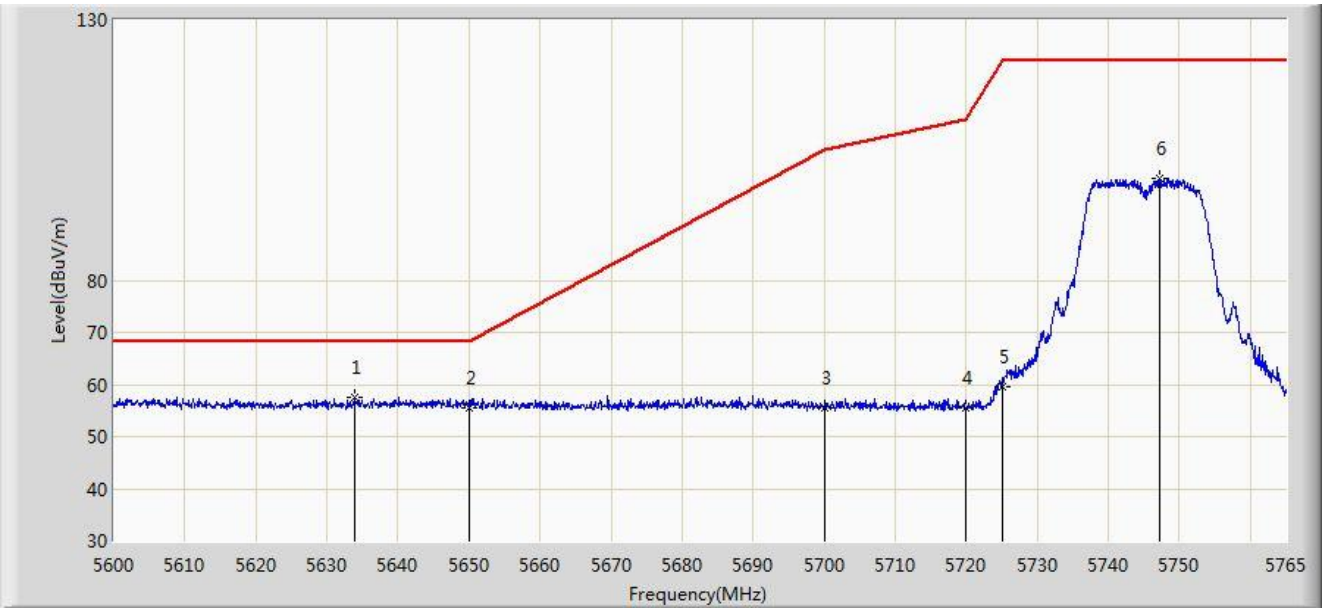


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			5150.000	46.641	43.571	-7.359	54.000	3.069	AV
2		*	5175.025	96.000	92.976	N/A	N/A	3.024	AV

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2017/06/21 - 22:07
Limit: FCC_Part15.407_RE(3m)	Engineer: Snake Ni
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Wi-Fi & BLE combo module	Power: DC 3.6V
Test Mode: Transmit by 802.11a at channel 5745MHz	

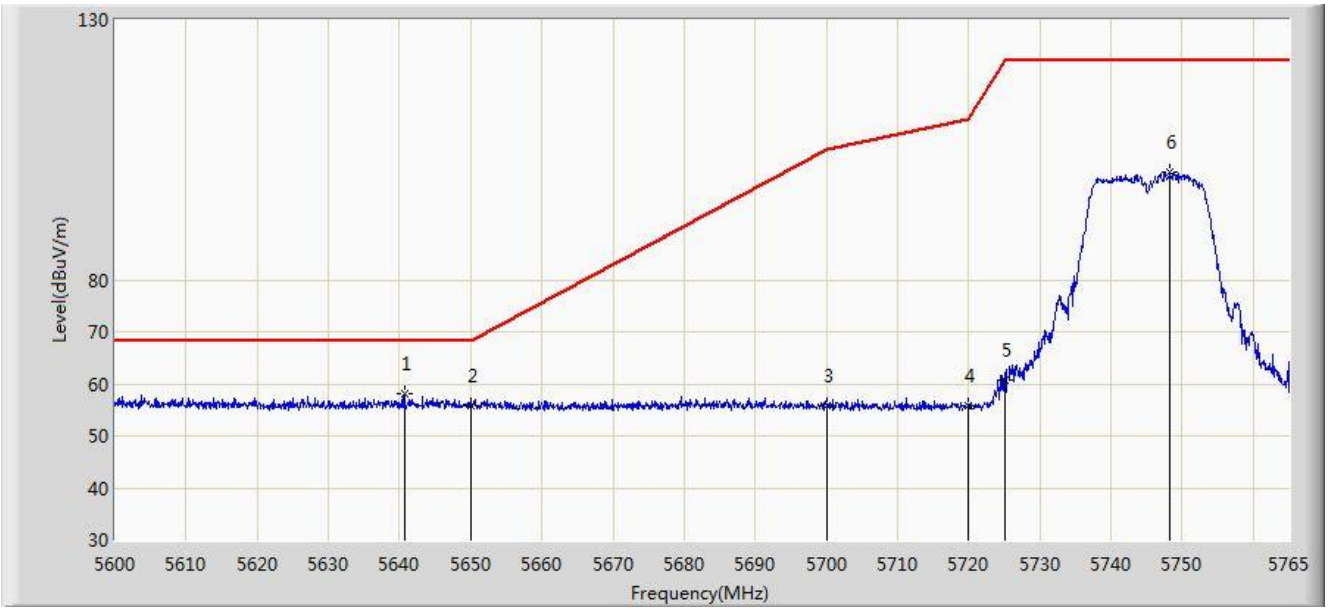


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	5633.825	57.668	53.973	-10.532	68.200	3.695	PK
2			5650.000	55.529	51.726	-12.671	68.200	3.803	PK
3			5700.000	55.453	51.513	-49.747	105.200	3.940	PK
4			5720.000	55.406	51.424	-55.394	110.800	3.982	PK
5			5725.000	59.549	55.443	-62.651	122.200	4.105	PK
6			5747.180	99.437	95.169	N/A	N/A	4.268	PK

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2017/06/21 - 22:07
Limit: FCC_Part15.407_RE(3m)	Engineer: Snake Ni
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Wi-Fi & BLE combo module	Power: DC 3.6V
Test Mode: Transmit by 802.11a at channel 5745MHz	

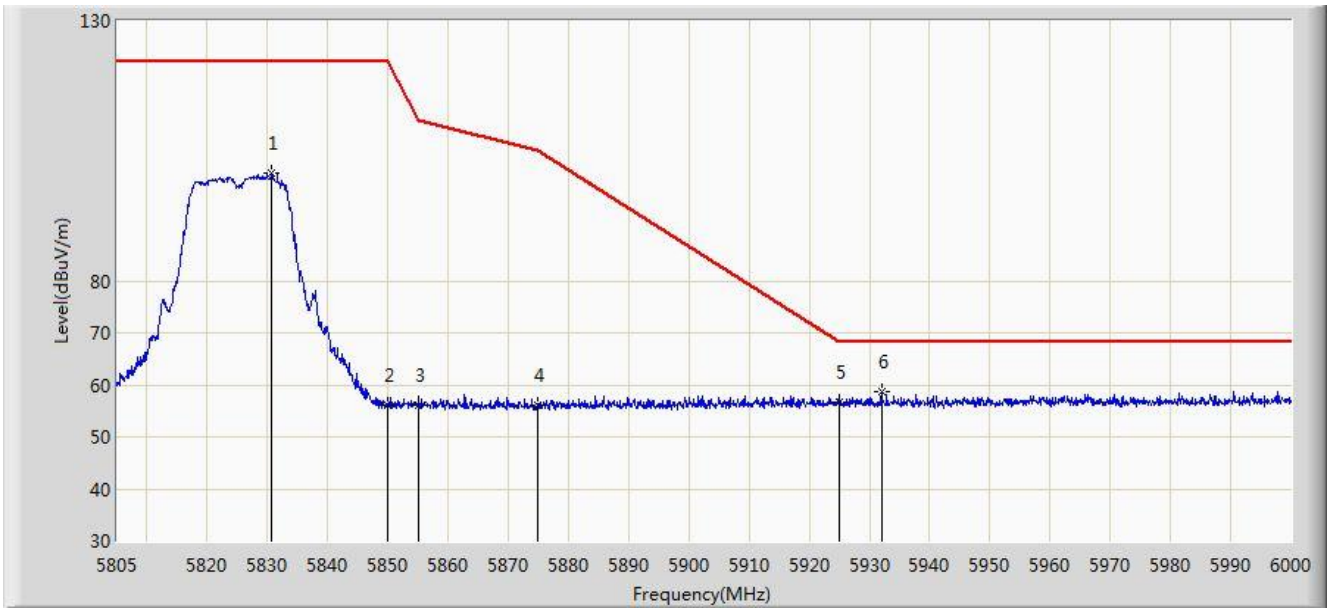


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	5640.672	58.248	54.407	-9.952	68.200	3.841	PK
2			5650.000	55.922	52.119	-12.278	68.200	3.803	PK
3			5700.000	55.814	51.874	-49.386	105.200	3.940	PK
4			5720.000	55.724	51.742	-55.076	110.800	3.982	PK
5			5725.000	60.696	56.590	-61.504	122.200	4.105	PK
6			5748.335	100.631	96.364	N/A	N/A	4.268	PK

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2017/06/21 - 22:07
Limit: FCC_Part15.407_RE(3m)	Engineer: Snake Ni
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Wi-Fi & BLE combo module	Power: DC 3.6V
Test Mode: Transmit by 802.11a at channel 5825MHz	

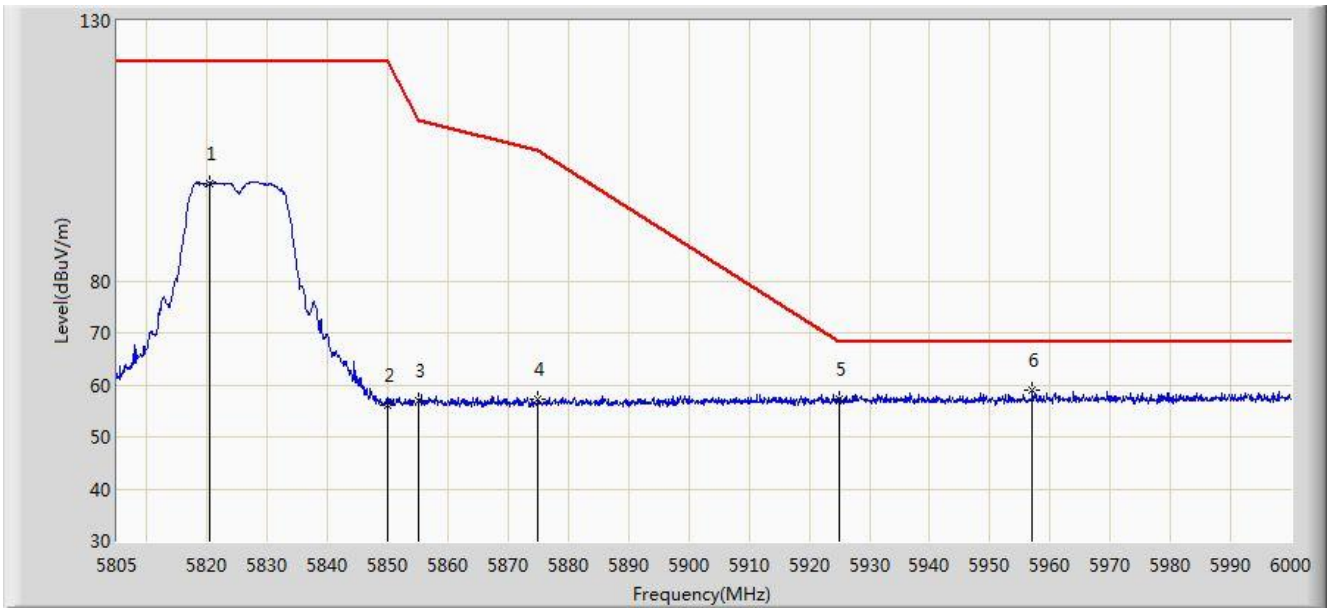


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			5830.740	100.839	96.006	N/A	N/A	4.832	PK
2			5850.000	55.992	50.997	-66.208	122.200	4.995	PK
3			5855.000	56.010	51.022	-54.790	110.800	4.987	PK
4			5875.000	55.990	50.983	-49.210	105.200	5.008	PK
5			5925.000	56.681	51.529	-11.519	68.200	5.152	PK
6		*	5932.042	58.826	53.635	-9.374	68.200	5.191	PK

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2017/06/21 - 22:07
Limit: FCC_Part15.407_RE(3m)	Engineer: Snake Ni
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Wi-Fi & BLE combo module	Power: DC 3.6V
Test Mode: Transmit by 802.11a at channel 5825MHz	

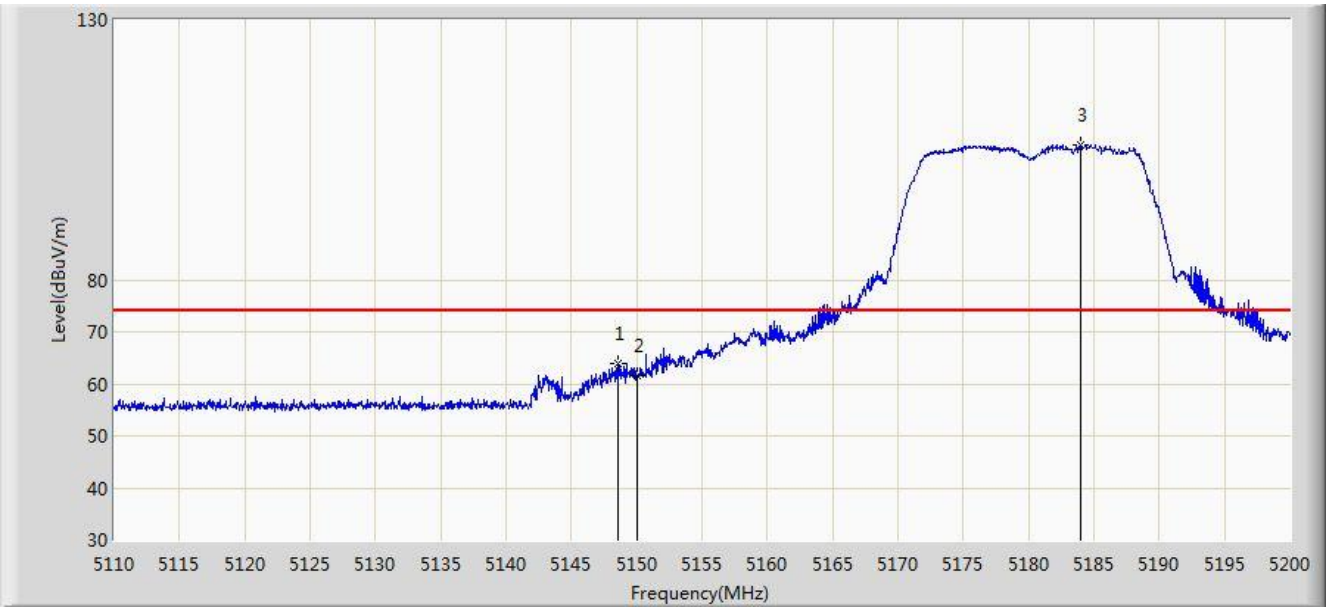


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			5820.405	98.807	94.138	N/A	N/A	4.669	PK
2			5850.000	56.196	51.201	-66.004	122.200	4.995	PK
3			5855.000	56.857	51.869	-53.943	110.800	4.987	PK
4			5875.000	57.155	52.148	-48.045	105.200	5.008	PK
5			5925.000	57.312	52.160	-10.888	68.200	5.152	PK
6		*	5957.100	58.889	53.561	-9.311	68.200	5.328	PK

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2017/03/24 - 03:13
Limit: FCC_Part15.209_RE(3m)	Engineer: Snake Ni
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Wi-Fi & BLE combo module	Power: DC 3.6V
Note: Transmit by 802.11n-HT20 at channel 5180MHz	

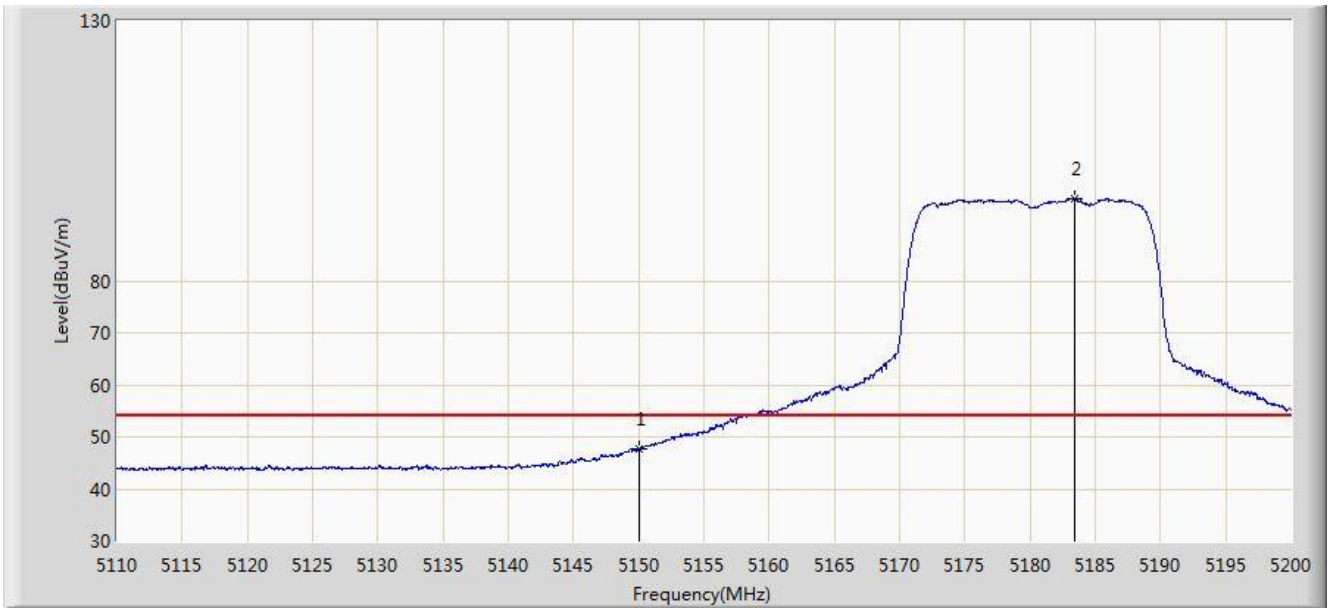


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			5148.520	63.969	60.896	-10.031	74.000	3.073	PK
2			5150.000	61.668	58.598	-12.332	74.000	3.069	PK
3		*	5183.980	106.063	103.037	N/A	N/A	3.026	PK

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2017/03/24 - 03:15
Limit: FCC_Part15.209_RE(3m)	Engineer: Snake Ni
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Wi-Fi & BLE combo module	Power: DC 3.6V
Note: Transmit by 802.11n-HT20 at channel 5180MHz	

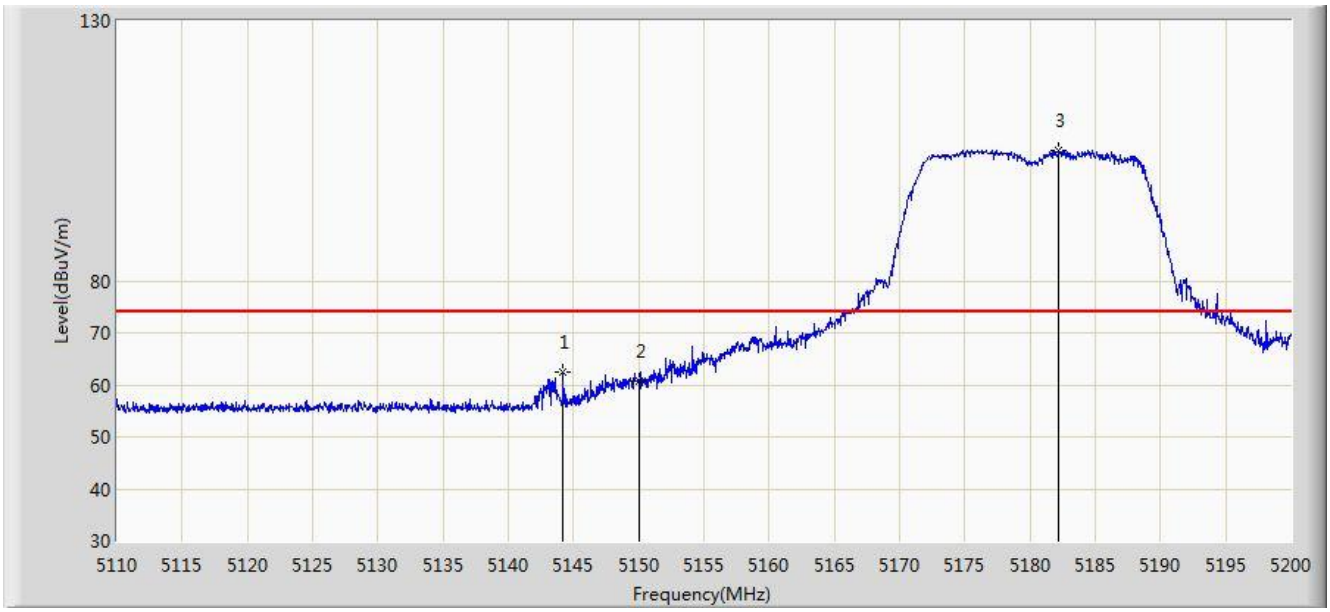


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			5150.000	47.655	44.585	-6.345	54.000	3.069	AV
2		*	5183.395	95.810	92.777	N/A	N/A	3.033	AV

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2017/03/24 - 03:15
Limit: FCC_Part15.209_RE(3m)	Engineer: Snake Ni
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Wi-Fi & BLE combo module	Power: DC 3.6V
Note: Transmit by 802.11n-HT20 at channel 5180MHz	

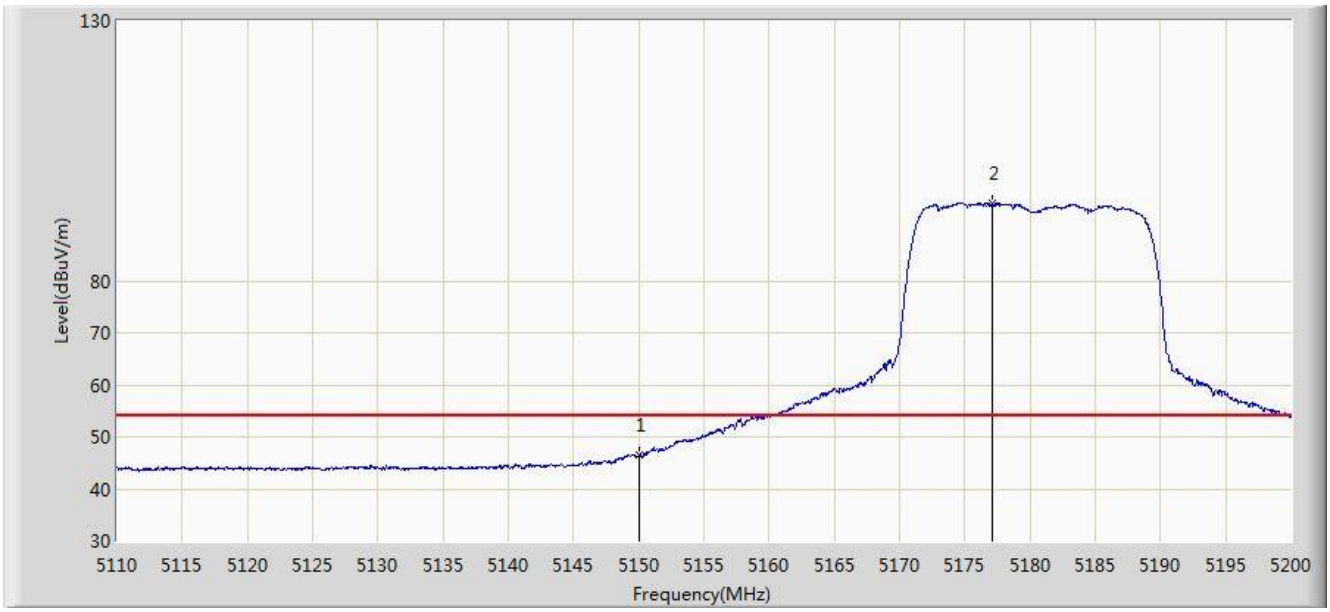


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			5144.200	62.521	59.437	-11.479	74.000	3.084	PK
2			5150.000	60.776	57.706	-13.224	74.000	3.069	PK
3		*	5182.225	105.079	102.031	N/A	N/A	3.047	PK

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2017/03/24 - 03:16
Limit: FCC_Part15.209_RE(3m)	Engineer: Snake Ni
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Wi-Fi & BLE combo module	Power: DC 3.6V
Note: Transmit by 802.11n-HT20 at channel 5180MHz	

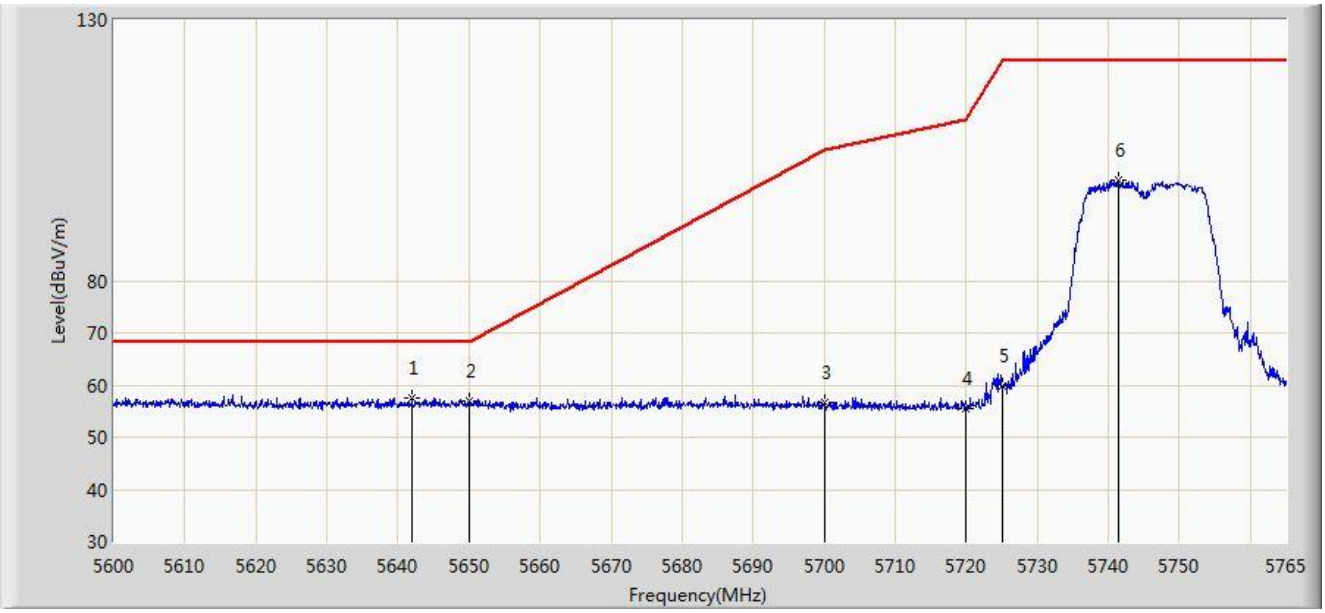


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			5150.000	46.386	43.316	-7.614	54.000	3.069	AV
2		*	5177.050	94.810	91.779	N/A	N/A	3.031	AV

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2017/06/21 - 22:07
Limit: FCC_Part15.407_RE(3m)	Engineer: Snake Ni
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Wi-Fi & BLE combo module	Power: DC 3.6V
Test Mode: Transmit by 802.11n-HT20 at channel 5745MHz	

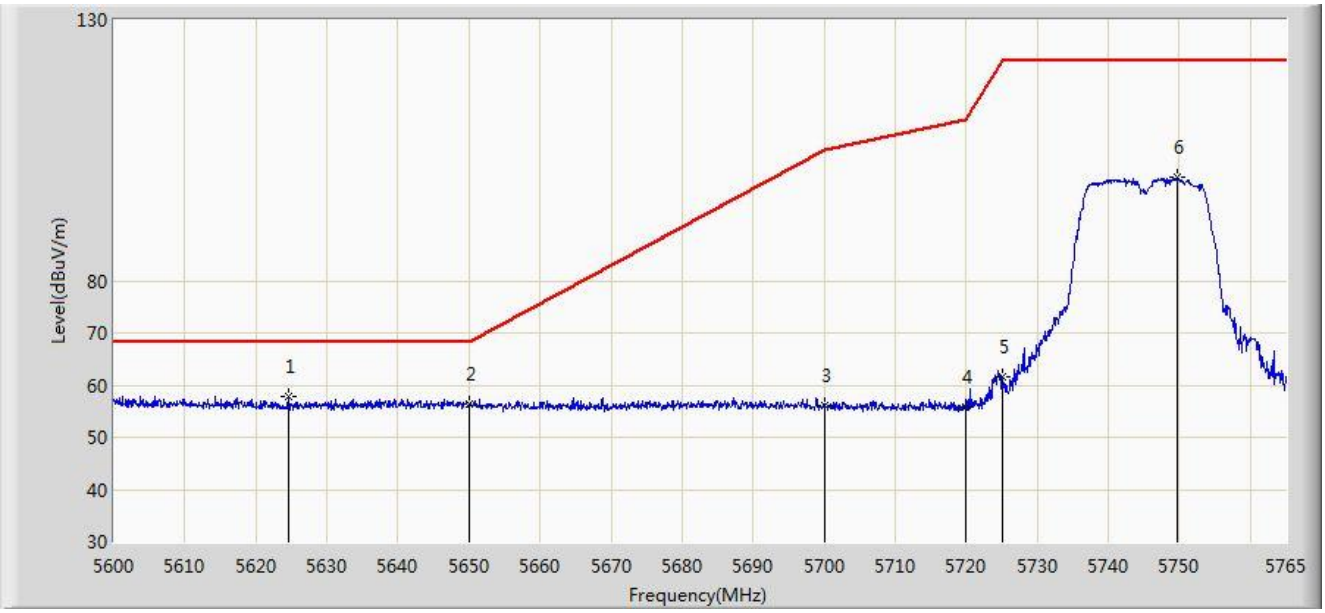


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	5641.993	57.666	53.801	-10.534	68.200	3.865	PK
2			5650.000	56.965	53.162	-11.235	68.200	3.803	PK
3			5700.000	56.674	52.734	-48.526	105.200	3.940	PK
4			5720.000	55.542	51.560	-55.258	110.800	3.982	PK
5			5725.000	59.898	55.792	-62.302	122.200	4.105	PK
6			5741.405	99.231	94.957	N/A	N/A	4.274	PK

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2017/06/21 - 22:07
Limit: FCC_Part15.407_RE(3m)	Engineer: Snake Ni
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Wi-Fi & BLE combo module	Power: DC 3.6V
Test Mode: Transmit by 802.11n-HT20 at channel 5745MHz	

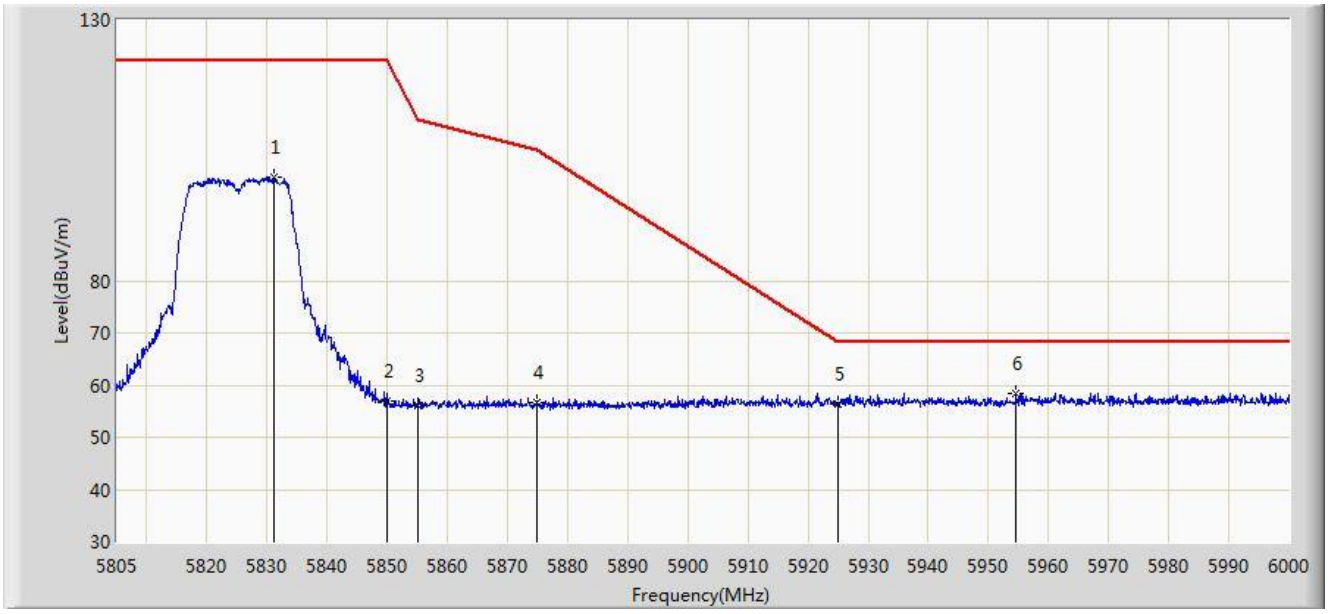


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	5624.502	57.701	54.129	-10.499	68.200	3.572	PK
2			5650.000	56.246	52.443	-11.954	68.200	3.803	PK
3			5700.000	56.086	52.146	-49.114	105.200	3.940	PK
4			5720.000	55.876	51.894	-54.924	110.800	3.982	PK
5			5725.000	61.711	57.605	-60.489	122.200	4.105	PK
6			5749.737	99.757	95.491	N/A	N/A	4.266	PK

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2017/06/21 - 22:07
Limit: FCC_Part15.407_RE(3m)	Engineer: Snake Ni
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Wi-Fi & BLE combo module	Power: DC 3.6V
Test Mode: Transmit by 802.11n-HT20 at channel 5825MHz	

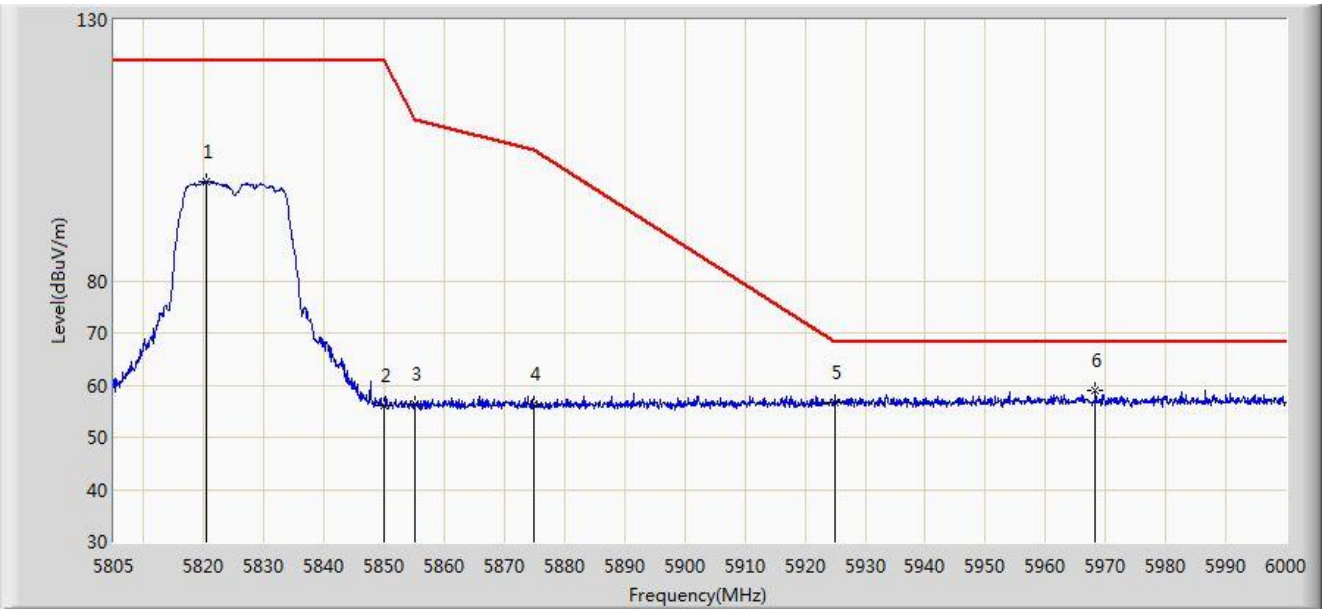


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			5831.130	99.743	94.903	N/A	N/A	4.840	PK
2			5850.000	56.975	51.980	-65.225	122.200	4.995	PK
3			5855.000	56.060	51.072	-54.740	110.800	4.987	PK
4			5875.000	56.789	51.782	-48.411	105.200	5.008	PK
5			5925.000	56.279	51.127	-11.921	68.200	5.152	PK
6		*	5954.663	58.487	53.198	-9.713	68.200	5.289	PK

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2017/06/21 - 22:07
Limit: FCC_Part15.407_RE(3m)	Engineer: Snake Ni
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Wi-Fi & BLE combo module	Power: DC 3.6V
Test Mode: Transmit by 802.11n-HT20 at channel 5825MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			5820.502	98.985	94.314	N/A	N/A	4.671	PK
2			5850.000	56.010	51.015	-66.190	122.200	4.995	PK
3			5855.000	56.505	51.517	-54.295	110.800	4.987	PK
4			5875.000	56.480	51.473	-48.720	105.200	5.008	PK
5			5925.000	56.749	51.597	-11.451	68.200	5.152	PK
6		*	5968.312	59.104	53.843	-9.096	68.200	5.262	PK

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

7.10. AC Conducted Emissions Measurement

7.10.1. TestLimit

FCC Part 15.207 Limits		
Frequency (MHz)	QP (dBμV)	AV (dBμV)
0.15 - 0.50	66 - 56	56 – 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

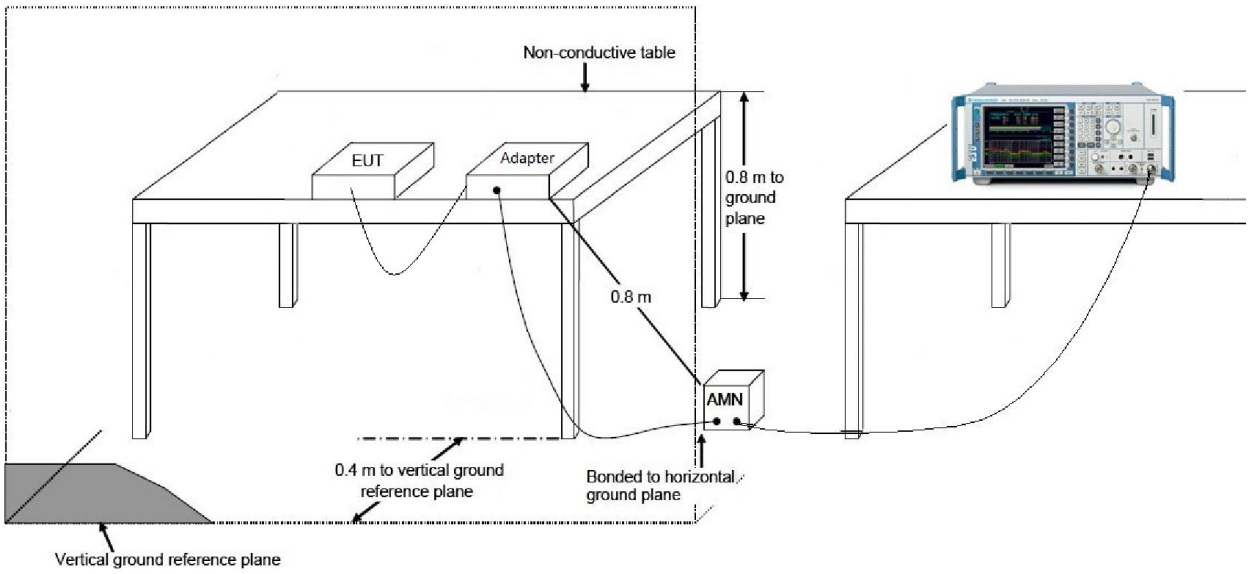
7.10.2. Test Procedure

The EUT was setup according to ANSI C63.4, 2009 and tested according to KDB 789033 for compliance to FCC 47CFR 15.247 requirements.The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.

The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

7.10.3. Test Setup



7.10.4.Test Result

This test was not performed since the EUT is a build-in module which will be powerd by the host equipment.

8. CONCLUSION

The data collected relate only the item(s) tested and show that the **Wi-Fi & BLE combo module**is in compliance with Part 15E of the FCC Rules.

The End