MEASUREMENT REPORT

FCC PART 15.247 Bluetooth-LE

FCC ID:	2ALJ3AP31X
Applicant:	HAN Networks Co., Ltd.
Application Type:	Certification
Product:	HAN Access Point
Model No.:	AP311
Brand Name:	HAN NETWORKS; HANNETWORKS
FCC Classification:	Digital Transmission System (DTS)
FCC Rule Part(s):	Part 15 Subpart C (Section 15.247)
Test Procedure(s):	ANSI C63.10-2013
Test Date:	September 27 ~ October 13, 2020

Reviewed By: Paddy Chen (Paddy Chen)

Approved By: Chenz Ker (Chenz Ker)

Testing Laboratory 3261

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 ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.

Revision History

Report No.	Version	Description	Issue Date	Note
2010TW0002-U3	Rev. 01	Initial Report	11-09-2020	Valid

CONTENTS

Description Page

General Information

Applicant:	HAN Networks Co., Ltd.
Applicant Address:	101-A16, 1st Floor, Building 3, No.9 compound, Yongfeng Road, Haidian District, Beijing, P.R. China
Manufacturer:	HAN Networks Co., Ltd.
Manufacturer Address:	101-A16, 1st Floor, Building 3, No.9 compound, Yongfeng Road, Haidian District, Beijing, P.R. China
Test Site:	MRT Technology (Taiwan) Co., Ltd
Test Site Address:	No. 38, Fuxing Second Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C)

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Fuxing Rd., Taoyuan, Taiwan (R.O.C)

- **MRT facility is an FCC registered (Reg. No. 291082 and 153292) test facility with the site description report on file and is designated by the FCC as an Accredited Test Film.**
- **MRT facility is an IC registered (MRT Reg. No. 21723-1) test laboratory with the site description on file at Industry Canada.**
- **MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (TAF) under the American Association for Laboratory Accreditation Program (TAF Cert. No. 3261) in EMC, Telecommunications and Radio testing for FCC, Industry Canada, Taiwan, EU and TELEC Rules.**

TAF certificate here

Testing Laboratory
3261

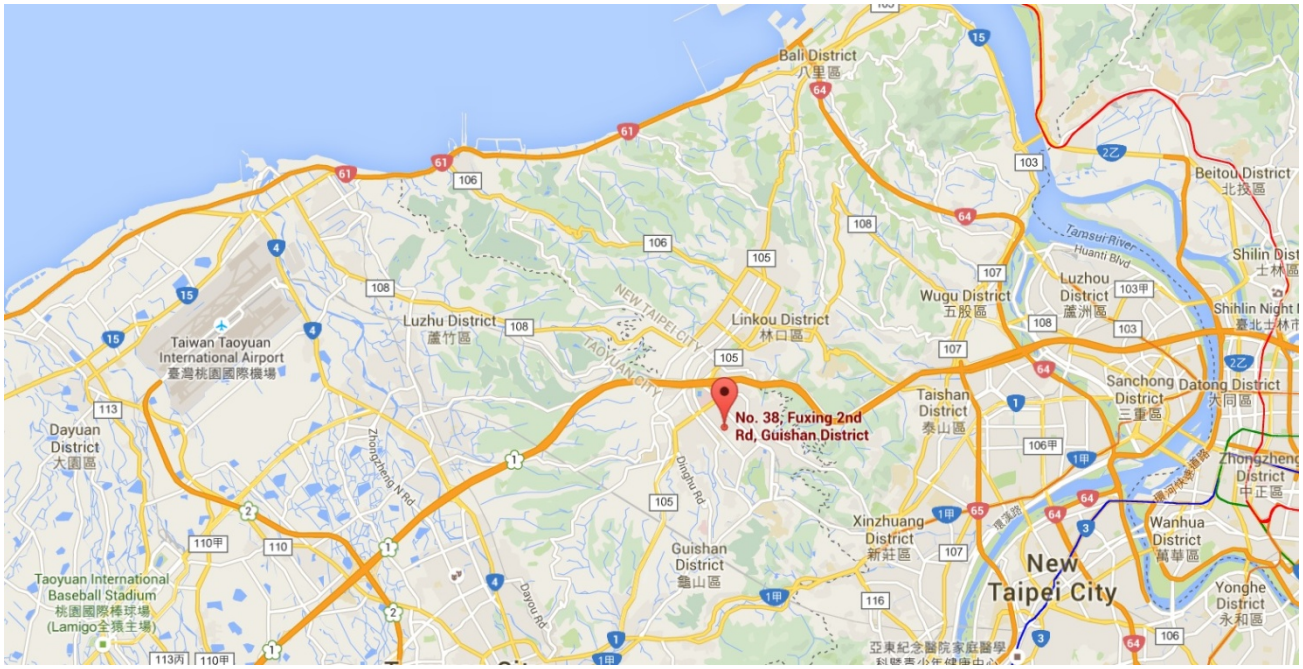
1. INTRODUCTION

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 Innovation, Science and Economic Development Canada and Certification and Engineering Bureau.

1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taoyuan City. These measurement tests were conducted at the MRT Technology (Taiwan) Co., Ltd. Facility located at No.38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 33377, Taiwan (R.O.C).



2. PRODUCT INFORMATION

2.1. Feature of Equipment under Test

Product Name:	HAN Access Point
Model No.:	AP311
Brand Name:	HAN NETWORKS; HANNETWORKS
Wi-Fi Specification:	802.11a/b/g/n/ac/ax
Bluetooth Specification:	V5.1 BLE only
Operating Temperature:	0 ~ 50 °C
Power Type:	PoE input or AC adapter input
Operating Environment:	Indoor Use
EUT Identification No.:	20200824Sample#01(Conducted) 20200824Sample#02(Radiated & AC conducted emission)

2.2. Product Specification Subjective to this Report

Frequency Range:	2400MHz ~ 2483.5MHz
Number of Channels:	40
Data Rate:	1MHz & 2MHz
Type of Modulation:	GFSK

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

2.3. Working Frequencies for this report

Channel	Frequency	Channel	Frequency	Channel	Frequency
00	2402 MHz	01	2404 MHz	02	2406 MHz
03	2408 MHz	04	2410 MHz	05	2412 MHz
06	2414 MHz	07	2416 MHz	08	2418 MHz
09	2420 MHz	10	2422 MHz	11	2424 MHz
12	2426 MHz	13	2428 MHz	14	2430 MHz
15	2432 MHz	16	2434 MHz	17	2436 MHz
18	2438 MHz	19	2440 MHz	20	2442 MHz
21	2444 MHz	22	2446 MHz	23	2448 MHz
24	2450 MHz	25	2452 MHz	26	2454 MHz
27	2456 MHz	28	2458 MHz	29	2460 MHz
30	2462 MHz	31	2464 MHz	32	2466 MHz
33	2468 MHz	34	2470 MHz	35	2472 MHz
36	2474 MHz	37	2476 MHz	38	2478 MHz
39	2480 MHz	--	--	--	--

2.4. Description of Available Antennas

Model No.: AP311

Antenna Type	Frequency Band (GHz)	T_X Paths	Bandwidth (MHz)	Max Peak Gain (dBi)		Directional Gain (dBi)		Beamforming Directional Gain (dBi)
				Ant 0	Ant 1	Power	PSD	
Wi-Fi Internal Antenna List (2.4GHz 2*2 MIMO, 5GHz 2*2 MIMO)								
PIFA Antenna	2412 ~ 2462	2	20, 40	3.20	3.30	3.30	6.31	6.26
	5150 ~ 5850	2	20, 40, 80	3.10	3.30	3.30	6.31	6.21

Bluetooth Internal Antenna		
Antenna Type	Frequency Band (GHz)	Max Peak Gain (dBi)
PIFA Antenna	2400 ~ 2483.5	3.20

Scan Antenna ((1 Tx)		
Antenna Type	Frequency Band (GHz)	Max Peak Gain (dBi)
PIFA Antenna	2412 ~ 2462	3.20
	5150 ~ 5250	3.30
	5725~5850	3.30

Note 1: The EUT supports Cyclic Delay Diversity (CDD) technology for 802.11a/b/g/n/ac/ax and Beam Forming technology for 802.11n/ac/ax.

Note 2: When the EUT supports Cyclic Delay Diversity (CDD) and it is correlated.

If all antennas have the same gain, G_{ANT}, Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows.

- For power spectral density (PSD) measurements on all devices,

Array Gain = 10 log (N_{ANT}/ N_{SS}) dB = 3.01;

- For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB for $N_{ANT} \leq 4$;

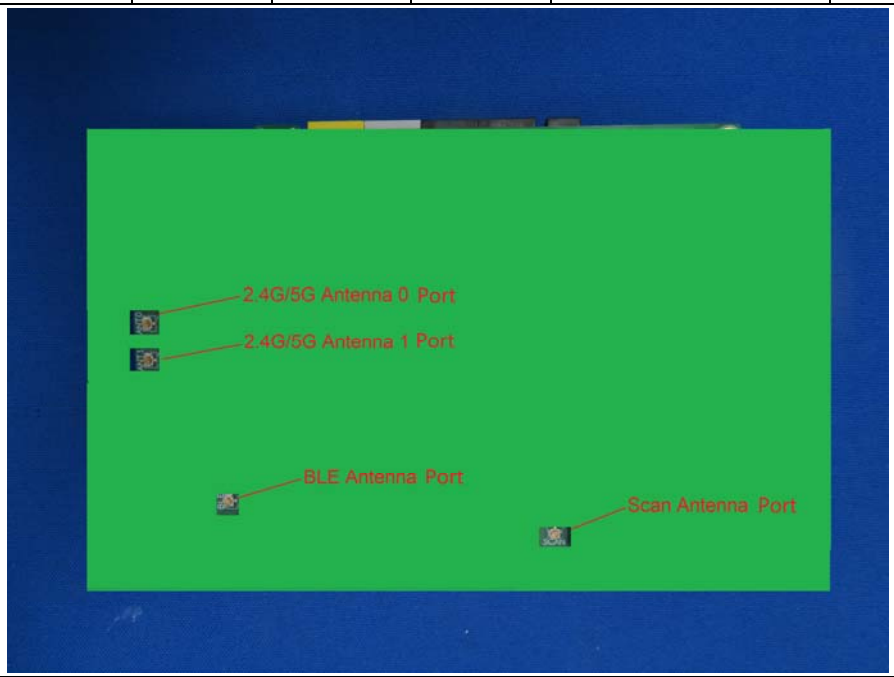
If antenna gains are not equal, Directional gain may be calculated by using the formulas applicable to equal gain antennas with G_{ANT} set equal to the gain of the antenna having the highest gain.

Note 2: The EUT also supports Beam Forming mode, and the Beam Forming support 802.11n/ac/ax, not include 802.11a/b/g. The directional gain = $10*\log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2/NANT]$ dBi.

Note 3: All the antenna gains are declared by manufacture.

2.5. Description of Antenna RF Port

Antenna RF Port						
Software Control Port	2.4G RF Port		5G RF Port		Scan RF Port	BLE RF Port
	Ant 0	Ant 1	Ant 0	Ant 1	Ant 0	Ant 0



2.6. Duty Cycle

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
BLE - 1Mbps	85.2%
BLE - 2Mbps	55.8%

Duty Cycle (T = Transmission Duration)	
BLE - 1Mbps (T = 2.130ms)	BLE- 2Mbps (T = 1.047ms)
	

2.7. EMI Suppression Device(s)/Modifications

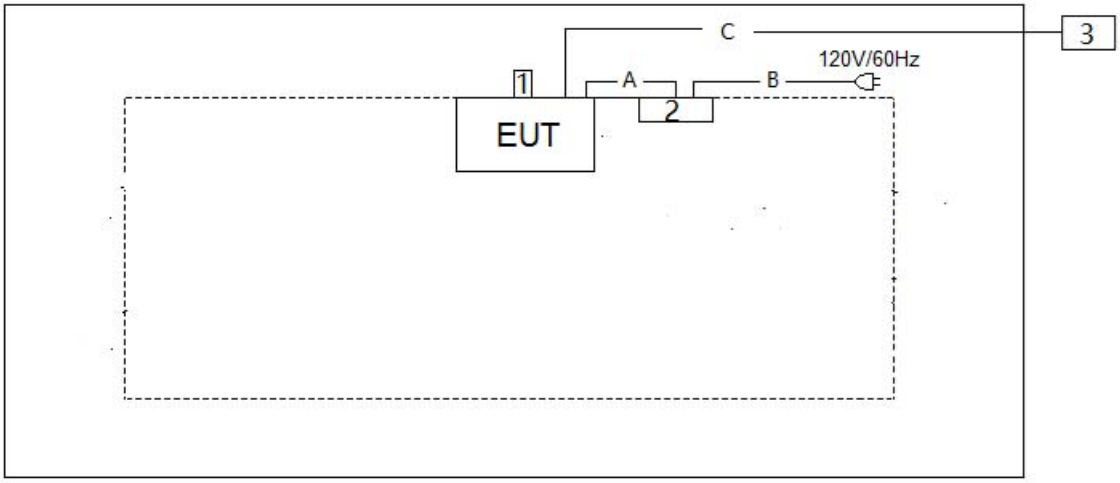
No EMI suppression device(s) were added and/or no modifications were made during testing.

2.8. Test Software

The test utility software used during testing was “Console”.

2.9. Configuration of Tested System

This device was tested per the guidance ANSI C63.10:2013 was used to reference the appropriate EUT setup for radiated emissions testing and AC line conducted testing.

Connection Diagram


Cable Type		cable Description
A	Power Cable	Non-Shielding, 1.5m
B	Power Cable	Non-Shielding, 1.5m
C	LAN Cable	Non-Shielding, ＞10m

2.10. Test System Details

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	USB Dongle	SanDisk	BL161025264V	N/A	N/A
2	AC Adapter	DELTA	ADP-30HR B	1WMD05S00T5	Non-Shielded, 1.8m
3	Notebook	ASUS	PRO45V	N/A	Non-Shielded, 1.8m

3. 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 device is **permanently attached.**
- There are no provisions for connection to an external antenna.

Conclusion:

The unit complies with the requirement of §15.203.

4. TEST EQUIPMENT CALIBRATION DATE

Radiated Disturbance：

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Broadband TRILOG Antenna	SCHWARZBECK	VULB 9162	MRTTWA00001	1 year	2021/10/5
Acitve Loop Antenna	SCHWARZBECK	FMZB 1519B	MRTTWA00002	1 year	2021/4/27
Broadband Hornantenna	SCHWARZBECK	BBHA 9120D	MRTTWA00003	1 year	2021/4/24
Breitband Hornantenna	SCHWARZBECK	BBHA 9170	MRTTWA00004	1 year	2021/4/24
Broadband Preamplifier	SCHWARZBECK	BBV 9718	MRTTWA00005	1 year	2021/4/24
Broadband Amplifier	SCHWARZBECK	BBV 9721	MRTTWA00006	1 year	2021/4/24
Signal Analyzer	R&S	FSV40	MRTTWA00007	1 year	2021/3/24
EMI Test Receiver	R&S	ESR3	MRTTWA00009	1 year	2021/3/25
EXA Signal Analyzer	KEYSIGHT	N9010A	MRTTWA00012	1 year	2021/10/14
EXA Signal Analyzer	KEYSIGHT	N9010B	MRTTWA00074	1 year	2021/7/14
Antenna Cable	HUBERSUHNER	SF106	MRTTWE00010	1 year	2021/6/16
Temperature/Humidity Meter	TFA	35.1078.10.IT	MRTTWA00032	1 year	2021/5/29
Cable	Rosnol	K1K50-UP0264-K1 K50-4M	MRTTWE00012	1 year	2021/6/21

Conducted Emissions：

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Two-Line V-Network	R&S	ENV216	MRTTWA00019	1 year	2021/3/26
Two-Line V-Network	R&S	ENV216	MRTTWA00020	1 year	2021/4/24
8-Wire ISN (T8-Cat6)	R&S	ENY81 CA6	MRTTWA00017	1 year	2021/5/25
8-Wire ISN (T8)	R&S	ENY81	MRTTWA00018	1 year	2021/5/25
8-Wire ISN	TESEQ	CDN ST08AS	MRTTWA00083	1 year	2021/9/2
EMI Test Receiver	R&S	ESR3	MRTTWA00045	1 year	2021/5/26
Conducted Cable	Rosnol	N1C50-RG400-B1C 50-500CM	MRTTWE00013	1 year	2021/6/21
Temperature/Humidity Meter	TFA	35.1078.10.IT	MRTTWA00033	1 year	2021/5/28

Conducted Test Equipment:

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
X-Series USB Peak and Average Power Sensor	KEYSIGHT	U2021XA	MRTTWA00014	1 year	2021/4/24
X-Series USB Peak and Average Power Sensor	KEYSIGHT	U2021XA	MRTTWA00015	1 year	2021/3/26
Wideband Radio Communication Taster	R&S	CMW 500	MRTTWA00041	1 year	2021/1/7
EXA Signal Analyzer	KEYSIGHT	N9010A	MRTTWA00012	1 year	2021/10/14
EXA Signal Analyzer	KEYSIGHT	N9010B	MRTTWA00074	1 year	2021/7/14
Signal Analyzer	R&S	FSV40	MRTTWA00007	1 year	2021/3/24
Temperature & Humidity Chamber	TEN BILLION	TTH-B3UP	MRTTWA00036	1 year	2021/6/9
Temperature/Humidity Meter	TFA	35.1078.10.IT	MRTTWA00033	1 year	2021/5/28

Software	**Version**	**Function**
e3	9.160520a	EMI Test Software

5. 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
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 150kHz~30MHz: 2.53dB
Radiated Emission Measurement
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz ~ 1GHz: 4.25dB 1GHz ~ 40GHz: 4.45dB
Conducted Power
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): ± 0.84dB
Conducted Spurious Emission
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): ± 2.65 dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 3.3%
Temp. / Humidity
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): ±0.82°C/ ±3%
Frequency Error
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): ±78.4Hz

6. TEST RESULT

6.1. Summary

FCC Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(2)	6dB Bandwidth	≥ 500kHz	Conducted	Pass	Section 6.2
15.247(b)(3)	Output Power	≤ 30dBm		Pass	Section 6.3
15.247(e)	Power Spectral Density	≤ 8dBm/3kHz		Pass	Section 6.4
15.247(d)	Band Edge / Out-of-Band Emissions	≤ 30dBc (Average)		Pass	Section 6.5
15.205 15.209	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 6.6 & 6.7
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	Pass	Section 6.8

Notes:

1) 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.
2) 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.

6.2. 6dB Bandwidth Measurement

6.2.1.Test Limit

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

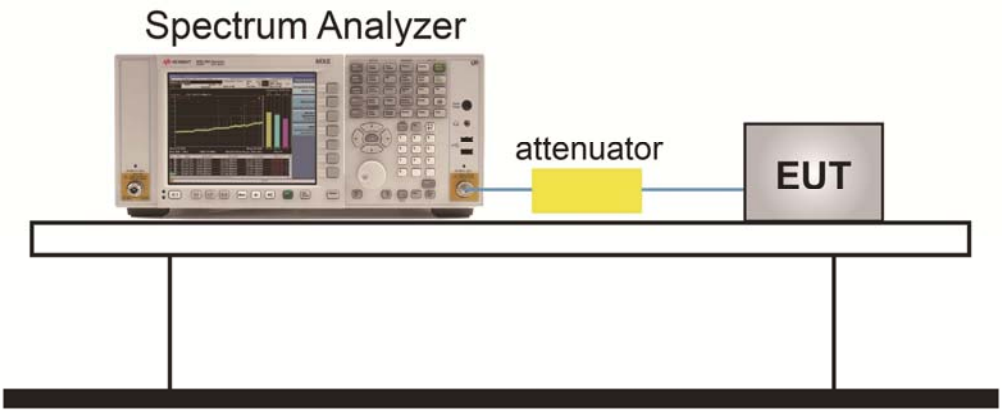
6.2.2.Test Procedure used

ANSI C63.10-2013 - Section 11.8.

6.2.3.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

6.2.4.Test Setup



6.2.5.Test Result

Product	HAN Access Point, AP311	Temperature	26°C
Test Engineer	Kevin Ker	Relative Humidity	61%
Test Site	SR1	Test Date	2020/10/12
Test Mode	BLE		

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
BLE	1	00	2402	0.663	≥ 0.5	Pass
		19	2440	0.665	≥ 0.5	Pass
		39	2480	0.660	≥ 0.5	Pass
	2	00	2402	1.170	≥ 0.5	Pass
		19	2440	1.182	≥ 0.5	Pass
		39	2480	1.180	≥ 0.5	Pass

BLE - 1Mbps 6dB Bandwidth

Channel 00 (2402MHz)

Channel 19 (2440MHz)

Channel 39 (2480MHz)	
	

BLE - 2Mbps 6dB Bandwidth	
Channel 00 (2402MHz)	Channel 19 (2440MHz)
	
Channel 39 (2480MHz)	
	

6.3. Output Power Measurement

6.3.1.Test Limit

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

6.3.2.Test Procedure Used

ANSI C63.10-2013 - Section 11.9.1.3

ANSI C63.10-2013 - Section 11.9.2.3.2

6.3.3.Test Setting

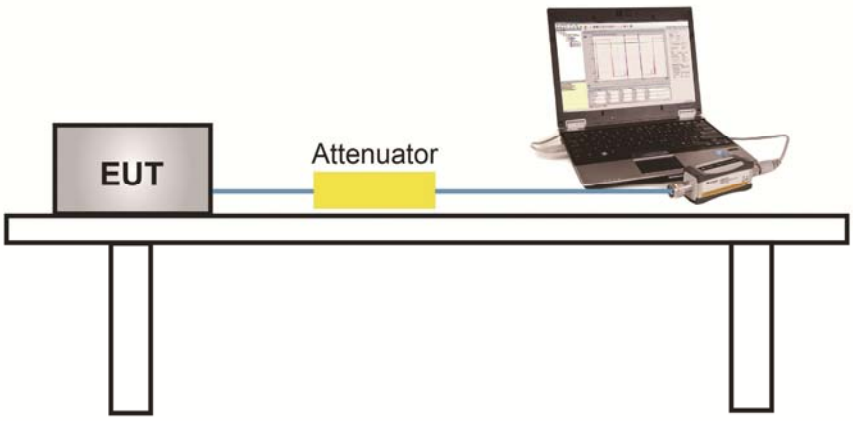
Method PKPM1 (Peak Power Measurement of Signals with DTS BW ≤ 50MHz)

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.

Method AVGPM-G (Measurement using a gated RF average-reading power meter)

Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since this measurement is made only during the ON time of the transmitter, no duty cycle correction is required.

6.3.4.Test Setup



6.3.5.Test Result of Output Power

Product	HAN Access Point, AP311	Temperature	26°C
Test Engineer	Kevin Ker	Relative Humidity	61%
Test Site	SR1	Test Date	2020/09/27
Test Mode	BLE		

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Average Power (dBm)	Limit (dBm)	Result
BLE	1	00	2402	17.39	≤ 30.00	Pass
		19	2440	17.32	≤ 30.00	Pass
		39	2480	17.16	≤ 30.00	Pass
	2	00	2402	17.41	≤ 30.00	Pass
		19	2440	17.35	≤ 30.00	Pass
		39	2480	17.17	≤ 30.00	Pass

6.4. Power Spectral Density Measurement

6.4.1.Test Limit

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

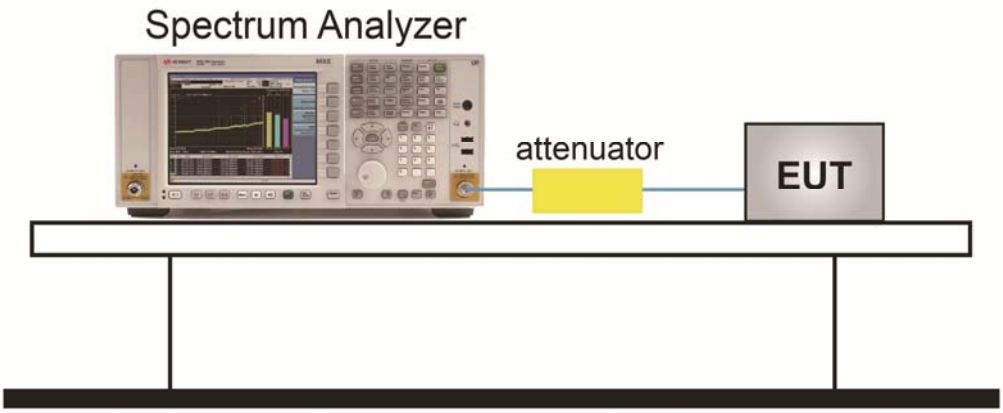
6.4.2.Test Procedure Used

ANSI C63.10 Section 11.10.2

6.4.3.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

6.4.4.Test Setup



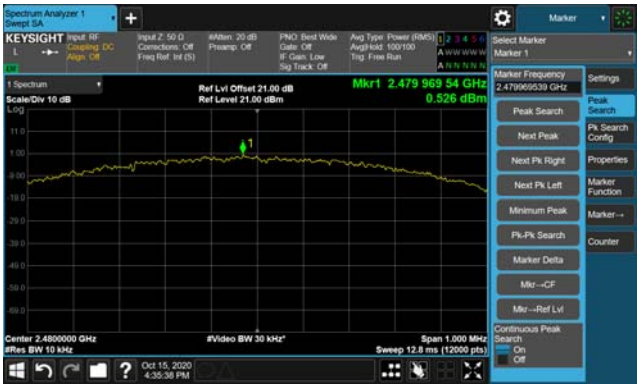
6.4.5.Test Result

Product	HAN Access Point, AP311	Temperature	26°C
Test Engineer	Kevin Ker	Relative Humidity	61%
Test Site	SR1	Test Date	2020/10/15
Test Mode	BLE		

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	PSD Result (dBm / 10kHz)	Duty Cycle (%)	Final PSD Result (dBm / 10kHz)	Limit (dBm / 3kHz)	Result
BLE	1	00	2402	0.20	85.2	0.90	≤ 8.00	Pass
		19	2440	-0.10	85.2	0.60	≤ 8.00	Pass
		39	2480	0.53	85.2	1.23	≤ 8.00	Pass
	2	00	2402	-2.43	55.8	0.10	≤ 8.00	Pass
		19	2440	-2.82	55.8	-0.29	≤ 8.00	Pass
		39	2480	-3.41	55.8	-0.88	≤ 8.00	Pass

Note:

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

BLE - 1Mbps PSD	
Channel 00 (2402MHz)	Channel 19 (2440MHz)
	
Channel 39 (2480MHz)	
	

BLE - 2Mbps PSD	
Channel 00 (2402MHz)	Channel 19 (2440MHz)
	
Channel 39 (2480MHz)	
	

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

6.5.1.Test Limit

The limit for out-of-band spurious emissions at the band edge is 30dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100kHz bandwidth per the PSD procedure.

6.5.2.Test Procedure Used

ANSI C63.10 Section 11.11

6.5.3.Test Settitng

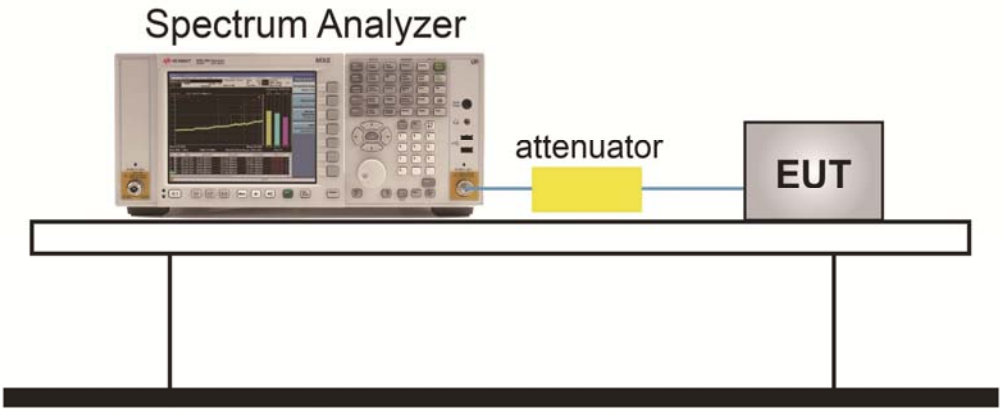
Reference level measurement

1. Set instrument center frequency to DTS channel center frequency
2. Set the span to ≥ 1.5 times the DTS bandwidth
3. Set the RBW = 100 kHz
4. Set the VBW ≥ 3 x RBW
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Allow trace to fully stabilize

Emission level measurement

1. Set the center frequency and span to encompass frequency range to be measured
2. RBW = 100kHz
3. VBW = 300kHz
4. Detector = Peak
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

6.5.4.Test Setup

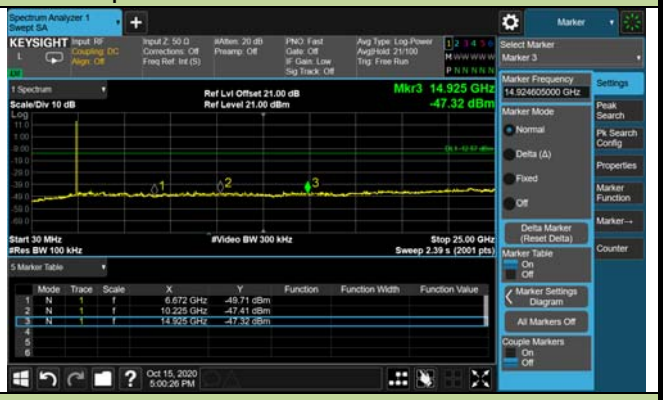


6.5.5.Test Result

Product	HAN Access Point, AP311	Temperature	26°C
Test Engineer	Kevin Ker	Relative Humidity	61%
Test Site	SR1	Test Date	2020/10/12
Test Mode	BLE		

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Limit	Result
BLE	1	00	2402	30dBc	Pass
		19	2440	30dBc	Pass
		39	2480	30dBc	Pass
	2	00	2402	30dBc	Pass
		19	2440	30dBc	Pass
		39	2480	30dBc	Pass

BLE - 1Mbps Out-of-Band Emissions	
Channel 00 (2402MHz)	
100kHz PSD reference Level	Low Band Edge
	
Spurious Emission 30MHz ~ 25GHz	
	

Channel 19 (2440MHz)	
100kHz PSD reference Level	Spurious Emission 30MHz ~ 25GHz
	
Channel 39 (2480MHz)	
100kHz PSD reference Level	High Band Edge
	
Spurious Emission 30MHz ~ 25GHz	
	

BLE - 2Mbps Out-of-Band Emissions	
Channel 00 (2402MHz)	
100kHz PSD reference Level	Low Band Edge
	
Spurious Emission 30MHz ~ 25GHz	
	

Channel 19 (2440MHz)	
100kHz PSD reference Level	Spurious Emission 30MHz ~ 25GHz
	
Channel 39 (2480MHz)	
100kHz PSD reference Level	High Band Edge
	
Spurious Emission 30MHz ~ 25GHz	
	

6.6. Radiated Spurious Emission Measurement

6.6.1.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

6.6.2.Test Procedure Used

ANSI C63.10 Section 6.3 (General Requirements)

ANSI C63.10 Section 6.4 (Standard test method below 30MHz)

ANSI C63.10 Section 6.5 (Standard test method above 30MHz to 1GHz)

ANSI C63.10 Section 6.6 (Standard test method above 1GHz)

6.6.3.Test Setting

Peak Field Strength Measurements

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

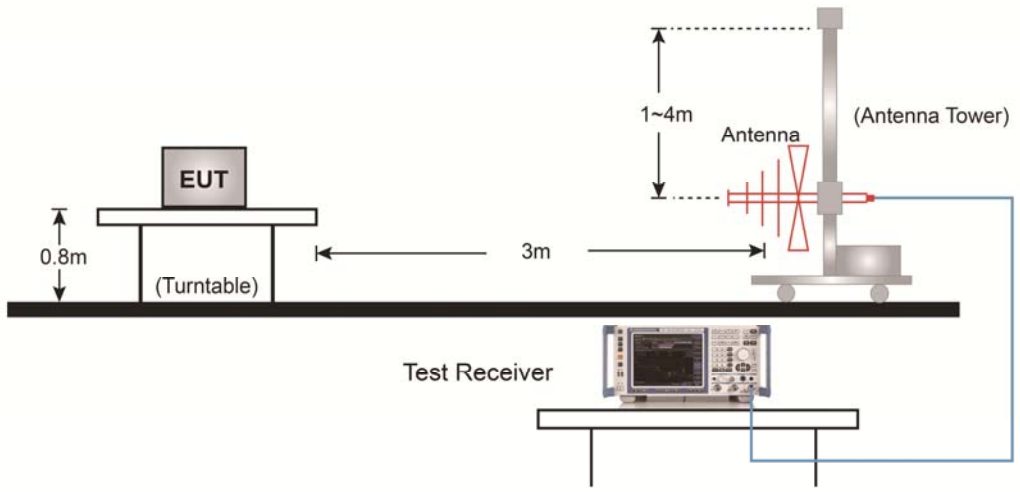
Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz
> 1000 MHz	1 MHz

Average Field Strength Measurements

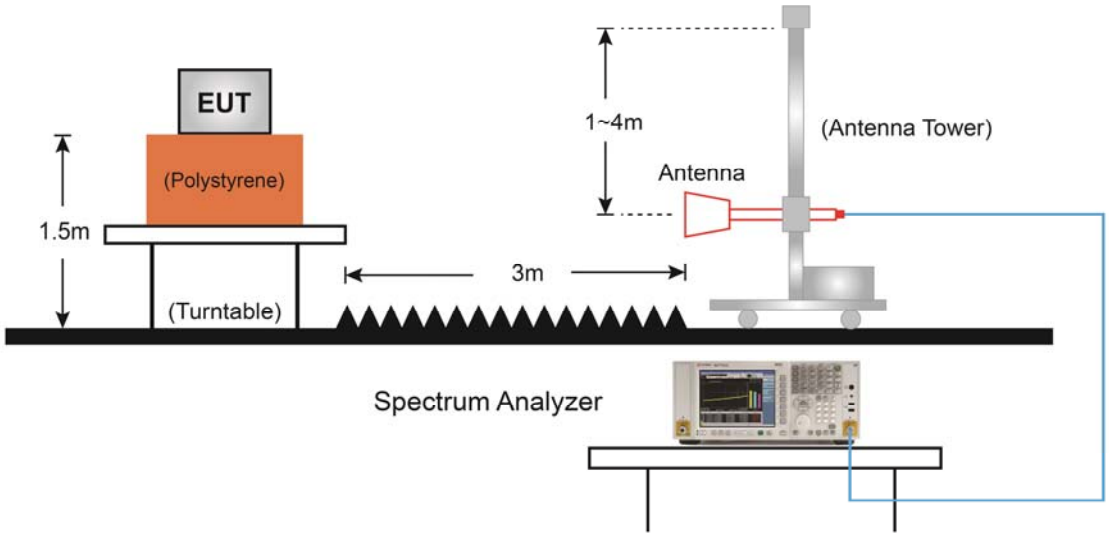
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW ≥ 1/T
4. De As an alternative, the instrument may be set to linear detector mode. Ensure that video filtering is applied in linear voltage domain (rather than in a log or dB domain). 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

6.6.4.Test Setup

Below 1GHz Test Setup:

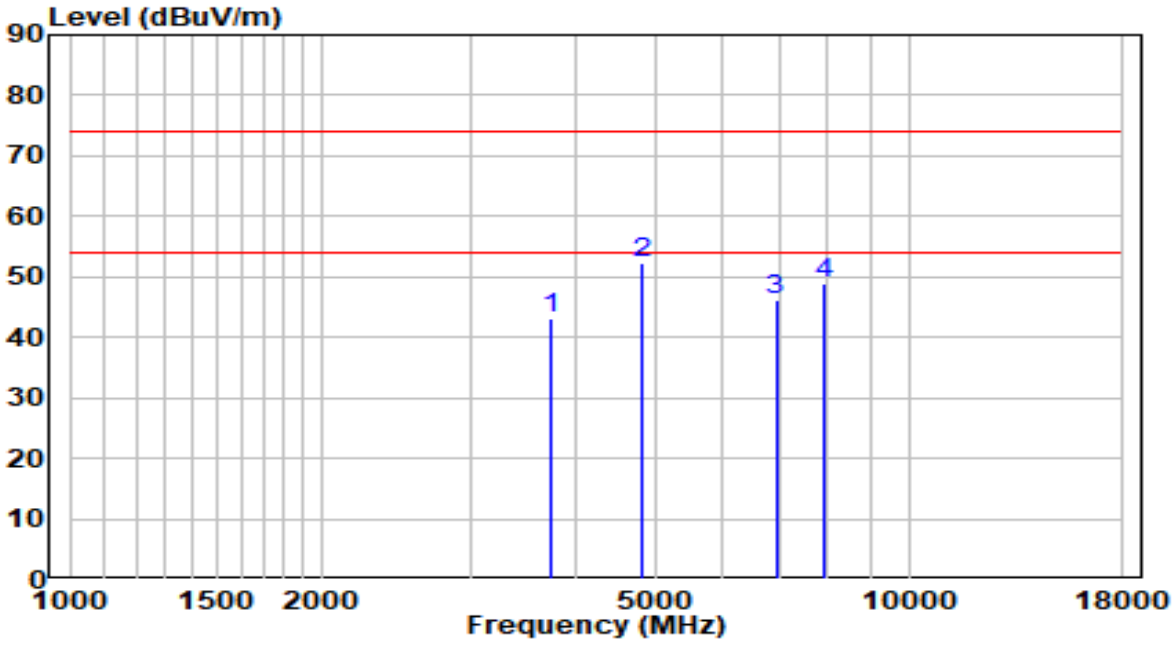


Above 1GHz Test Setup:



6.6.5.Test Result

EUT	AP311	Date of Test	2020-10-12
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	25.8°C/48.0%
Polarity	Horizontal	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 1M at Channel 2402MHz	Test Voltage	120V/60Hz

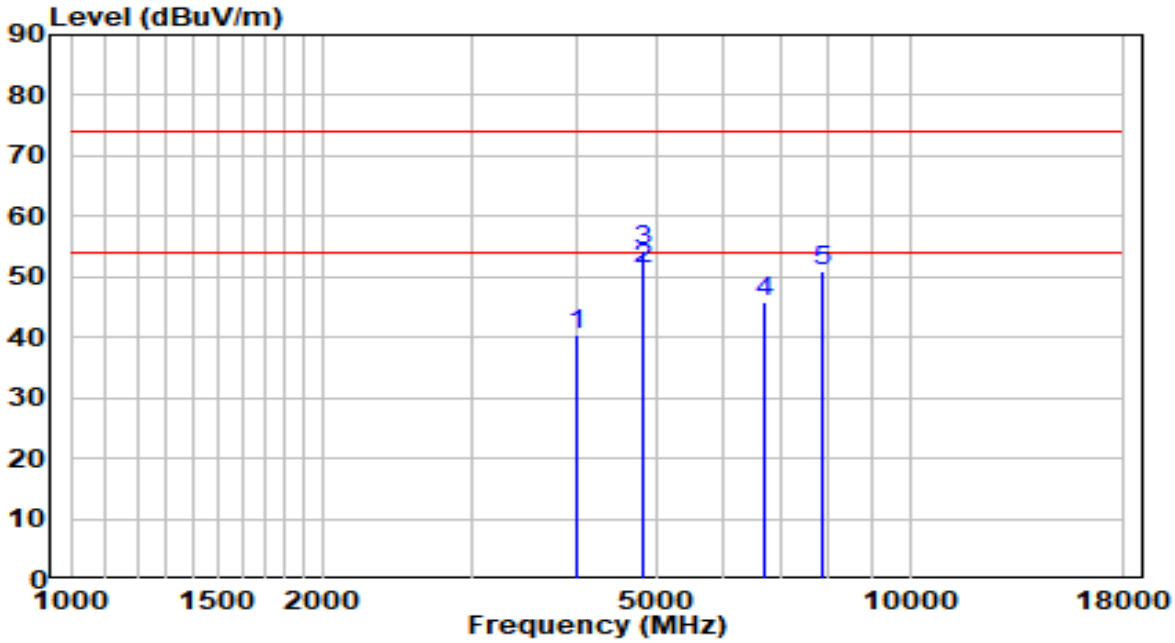


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1		3745.500	43.04	0.00	43.05	-30.95	74.00	Peak
2	*	4808.000	48.97	3.29	52.26	-21.74	74.00	Peak
3		6941.500	36.30	10.04	46.35	-27.65	74.00	Peak
4		7953.000	36.55	12.45	49.00	-25.00	74.00	Peak

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB)– Preamplifier(dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4.The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-10-12
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	25.8°C/48.0%
Polarity	Vertical	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 1M at Channel 2402MHz	Test Voltage	120V/60Hz

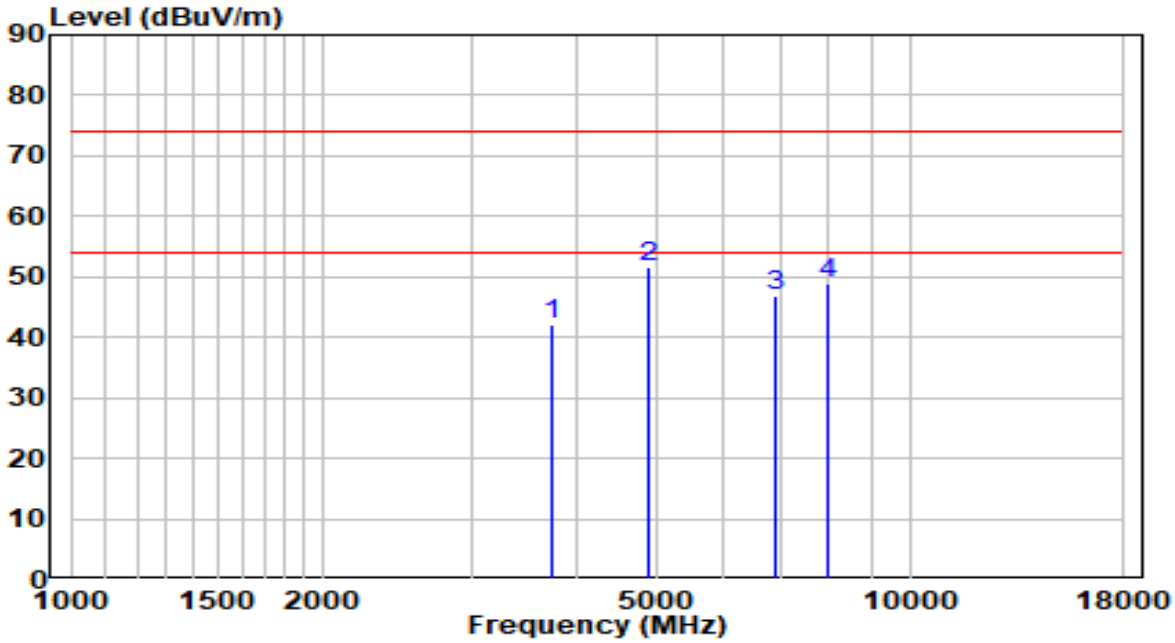


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1		4000.500	39.57	0.88	40.45	-33.55	74.00	Peak
2	*	4808.000	51.16	3.29	54.45	-19.55	74.00	Peak
3		4804.000	47.93	3.29	51.22	-2.78	54.00	Average
4		6703.500	36.91	8.99	45.90	-28.10	74.00	Peak
5		7876.500	38.47	12.33	50.79	-23.21	74.00	Peak

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB)– Preamplifier(dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4.The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-10-12
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	25.8°C/48.0%
Polarity	Horizontal	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 1M at Channel 2440MHz	Test Voltage	120V/60Hz

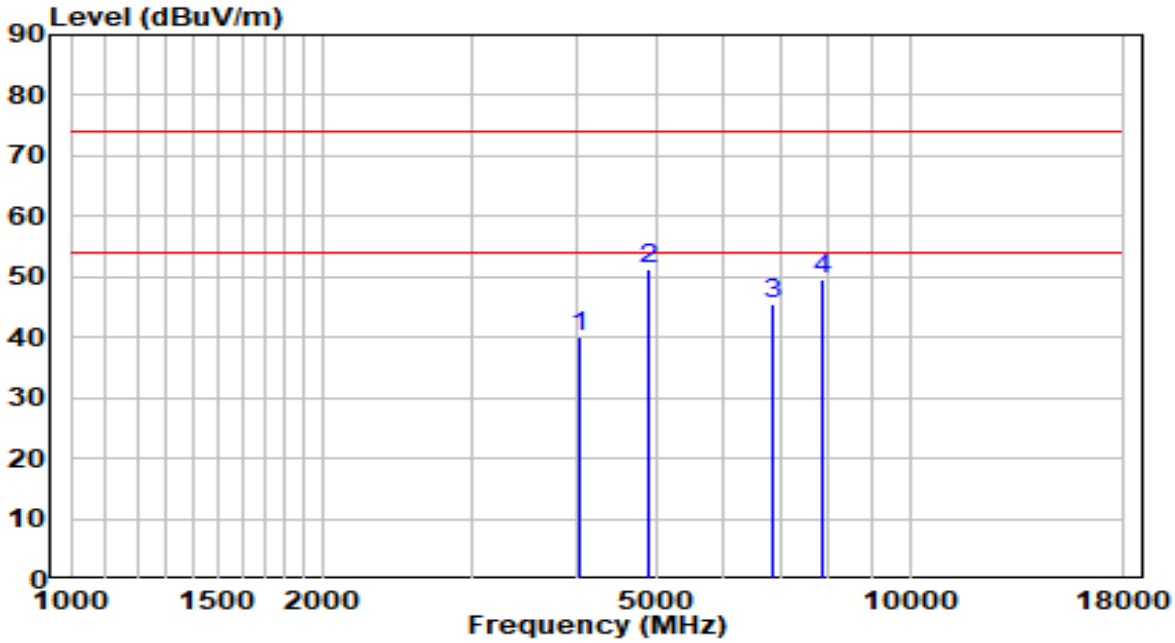


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1		3737.000	42.24	-0.02	42.22	-31.78	74.00	Peak
2	*	4884.500	48.02	3.47	51.50	-22.50	74.00	Peak
3		6916.000	36.99	9.93	46.92	-27.08	74.00	Peak
4		7961.500	36.31	12.47	48.78	-25.22	74.00	Peak

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB)– Preamplifier(dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-10-12
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	25.8°C/48.0%
Polarity	Vertical	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 1M at Channel 2440MHz	Test Voltage	120V/60Hz

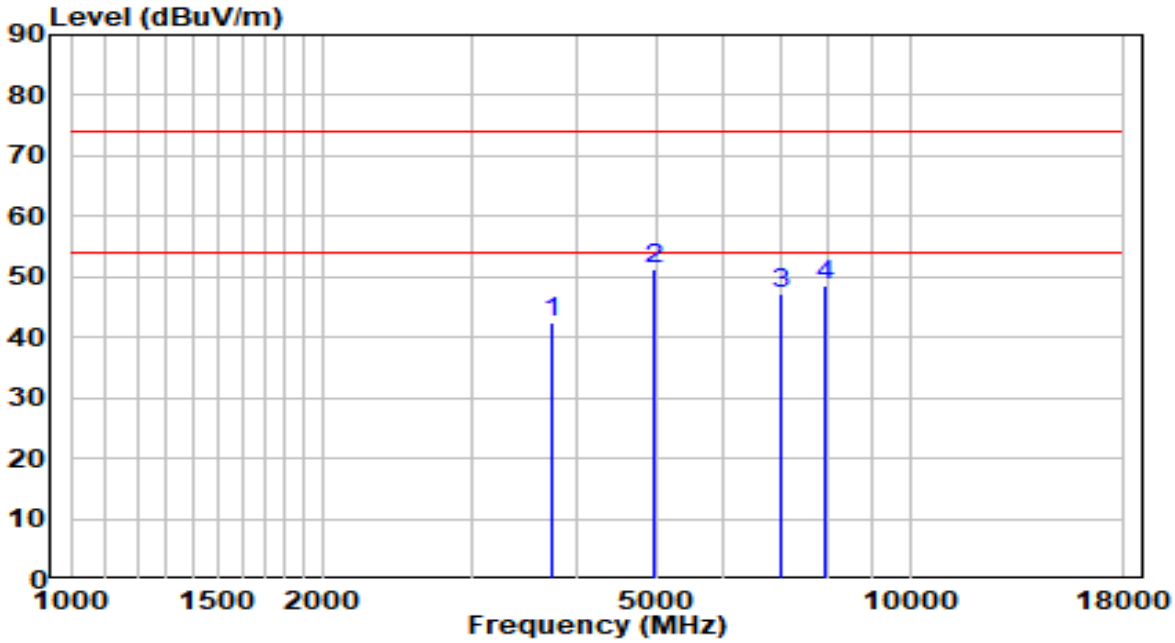


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1		4034.500	39.21	1.00	40.21	-33.79	74.00	Peak
2	*	4884.500	47.67	3.47	51.14	-22.86	74.00	Peak
3		6865.000	35.95	9.70	45.65	-28.35	74.00	Peak
4		7859.500	37.22	12.30	49.52	-24.48	74.00	Peak

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB)– Preamplifier(dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-10-12
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	25.8°C/48.0%
Polarity	Horizontal	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 1M at Channel 2480MHz	Test Voltage	120V/60Hz

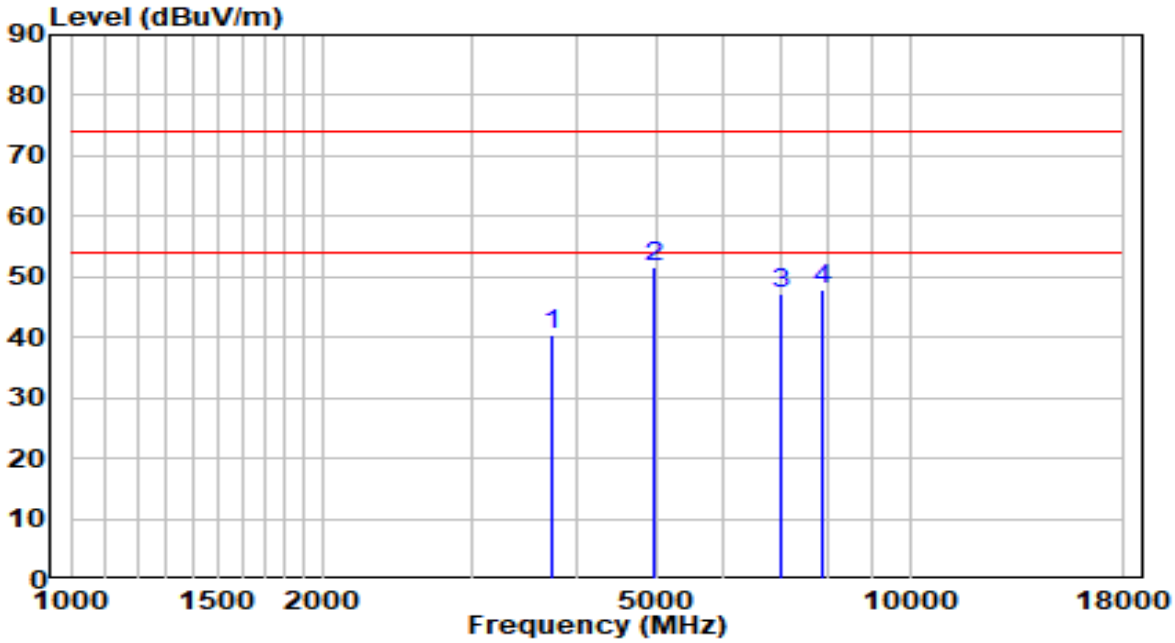


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1		3754.000	42.26	0.03	42.29	-31.71	74.00	Peak
2	*	4961.000	47.63	3.66	51.29	-22.71	74.00	Peak
3		7009.500	36.81	10.33	47.14	-26.86	74.00	Peak
4		7944.500	36.17	12.44	48.61	-25.39	74.00	Peak

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB)– Preamplifier(dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-10-12
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	25.8°C/48.0%
Polarity	Vertical	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 1M at Channel 2480MHz	Test Voltage	120V/60Hz

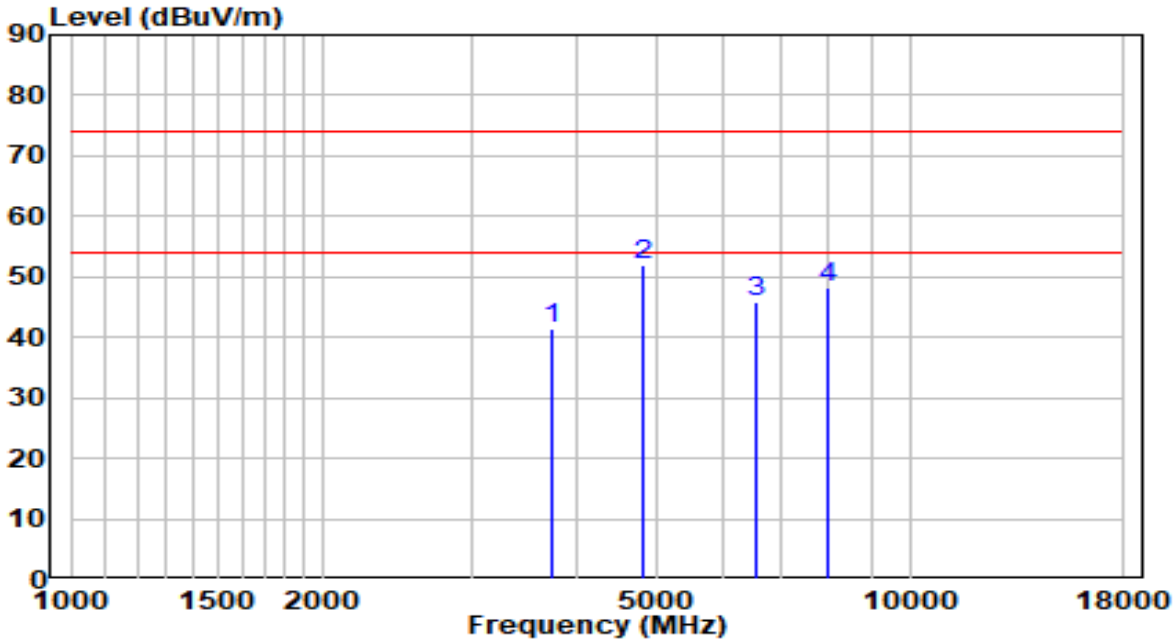


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1		3754.000	40.41	0.03	40.45	-33.55	74.00	Peak
2	*	4961.000	47.92	3.66	51.58	-22.42	74.00	Peak
3		7026.500	36.68	10.37	47.06	-26.94	74.00	Peak
4		7876.500	35.49	12.33	47.82	-26.18	74.00	Peak

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB)– Preamplifier(dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-10-12
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	25.8°C/48.0%
Polarity	Horizontal	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 2M at Channel 2402MHz	Test Voltage	120V/60Hz

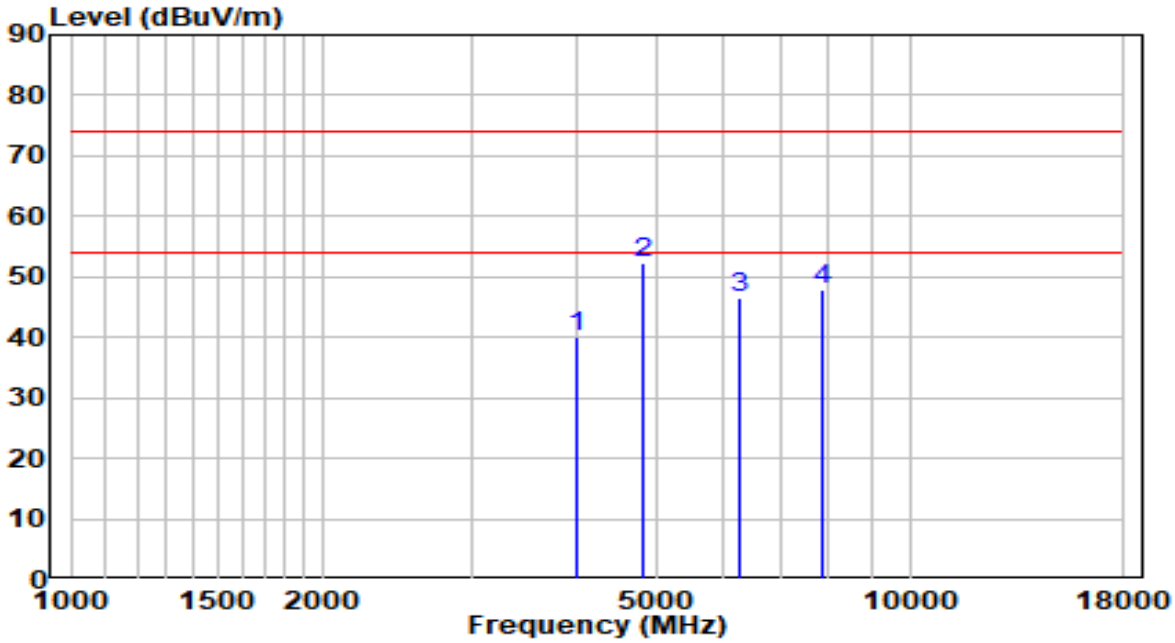


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1		3754.000	41.42	0.03	41.45	-32.55	74.00	Peak
2	*	4799.500	48.67	3.27	51.94	-22.06	74.00	Peak
3		6542.000	37.65	8.28	45.93	-28.07	74.00	Peak
4		7961.500	35.69	12.47	48.16	-25.84	74.00	Peak

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB)– Preamplifier(dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-10-12
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	25.8°C/48.0%
Polarity	Vertical	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 2M at Channel 2402MHz	Test Voltage	120V/60Hz

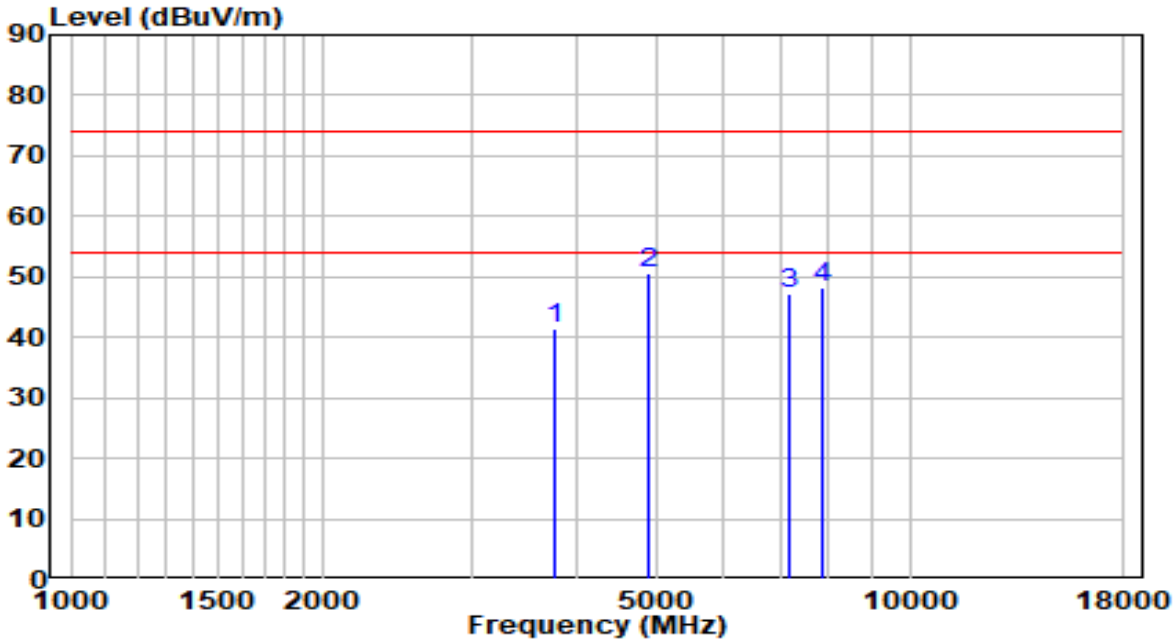


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1		4017.500	39.31	0.94	40.24	-33.76	74.00	Peak
2	*	4799.500	49.05	3.27	52.32	-21.68	74.00	Peak
3		6253.000	39.69	7.01	46.69	-27.31	74.00	Peak
4		7868.000	35.66	12.31	47.97	-26.03	74.00	Peak

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB)– Preamplifier(dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-10-12
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	25.8°C/48.0%
Polarity	Horizontal	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 2M at Channel 2440MHz	Test Voltage	120V/60Hz

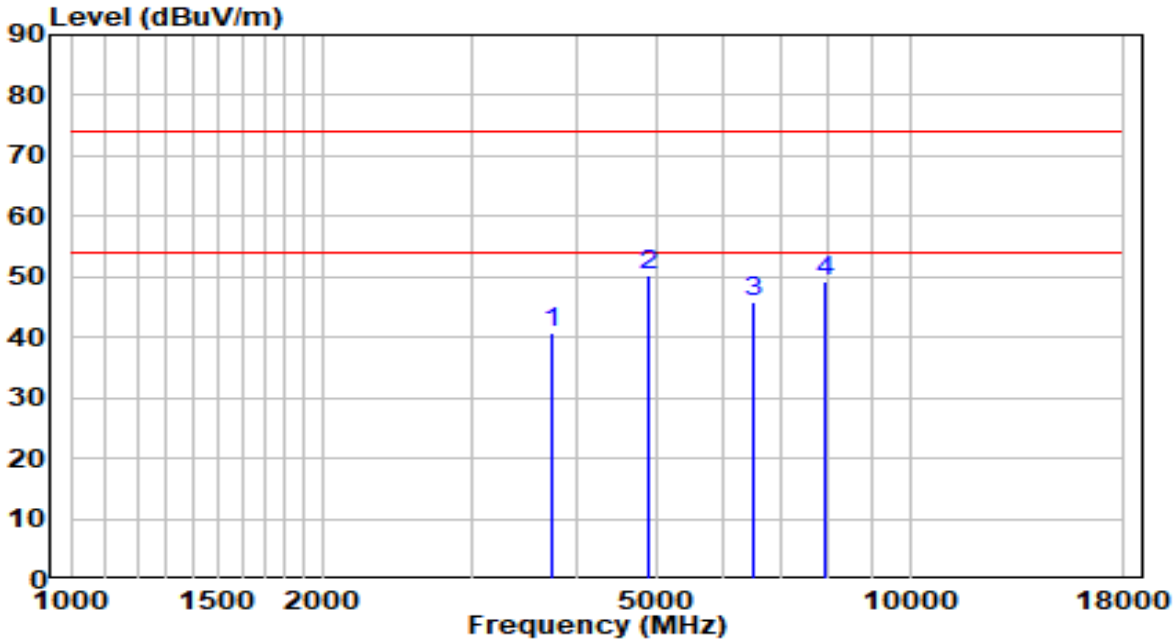


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1		3762.500	41.47	0.06	41.53	-32.47	74.00	Peak
2	*	4884.500	47.23	3.47	50.71	-23.29	74.00	Peak
3		7188.000	36.23	10.83	47.06	-26.94	74.00	Peak
4		7893.500	35.70	12.36	48.06	-25.94	74.00	Peak

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB)– Preamplifier(dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-10-12
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	25.8°C/48.0%
Polarity	Vertical	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 2M at Channel 2440MHz	Test Voltage	120V/60Hz

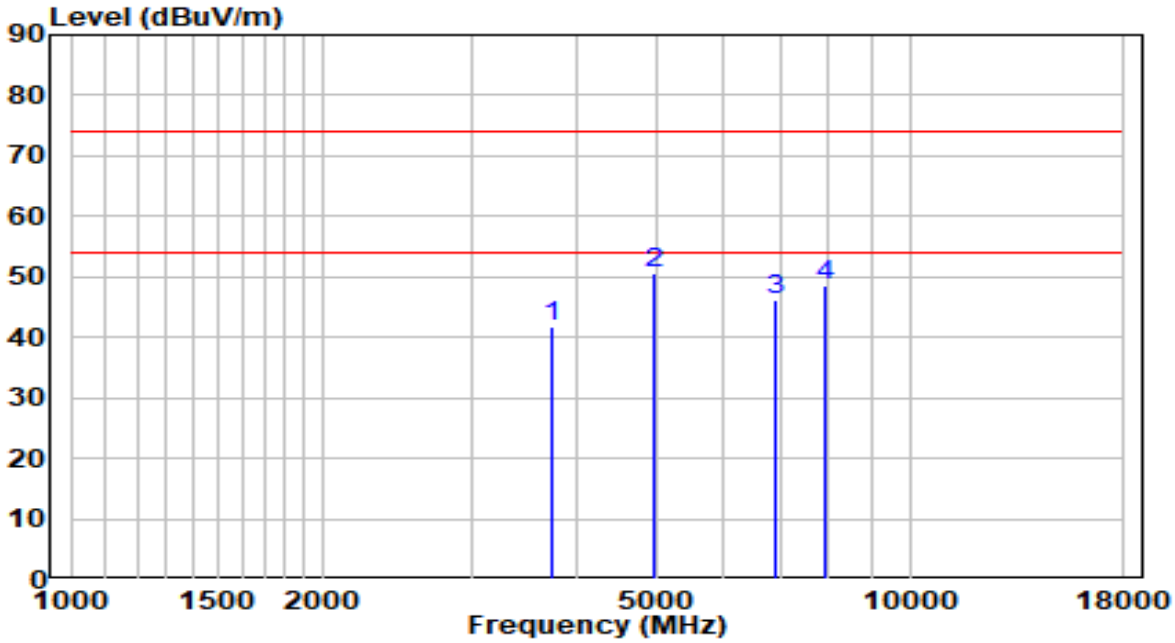


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1		3754.000	40.66	0.03	40.69	-33.31	74.00	Peak
2	*	4884.500	46.91	3.47	50.38	-23.62	74.00	Peak
3		6525.000	37.51	8.21	45.72	-28.28	74.00	Peak
4		7927.500	36.79	12.41	49.21	-24.79	74.00	Peak

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB)– Preamplifier(dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-10-12
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	25.8°C/48.0%
Polarity	Horizontal	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 2M at Channel 2480MHz	Test Voltage	120V/60Hz

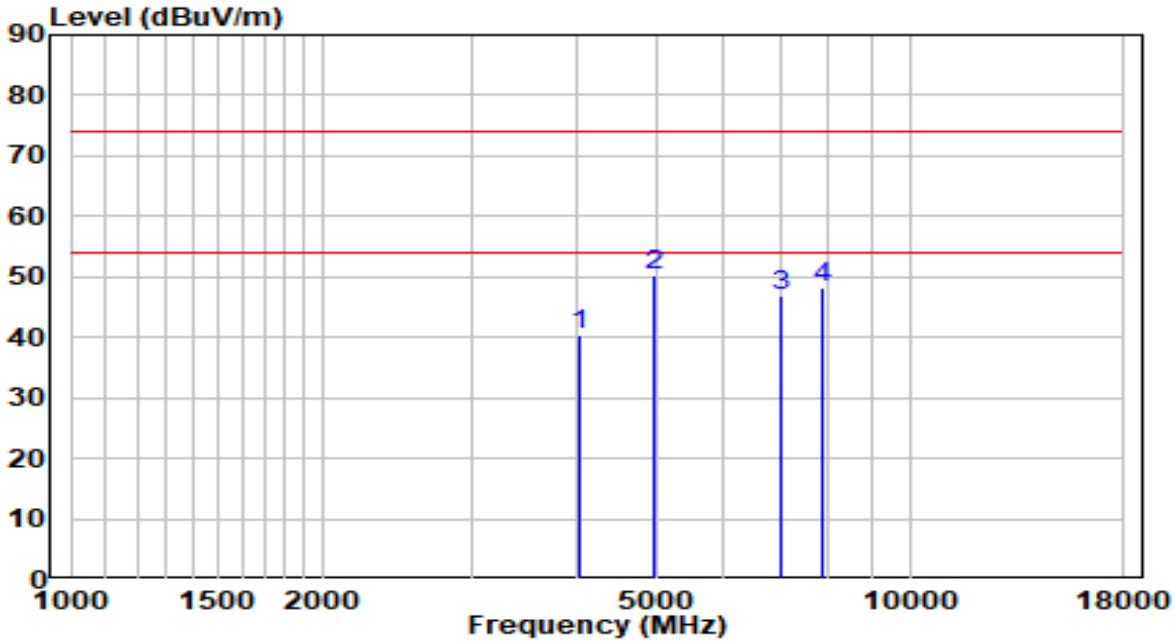


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1		3745.500	41.69	0.00	41.69	-32.31	74.00	Peak
2	*	4961.000	46.85	3.66	50.51	-23.49	74.00	Peak
3		6916.000	36.09	9.93	46.02	-27.98	74.00	Peak
4		7953.000	36.01	12.45	48.46	-25.54	74.00	Peak

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB)– Preamplifier(dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-10-12
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	25.8°C/48.0%
Polarity	Vertical	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 2M at Channel 2480MHz	Test Voltage	120V/60Hz



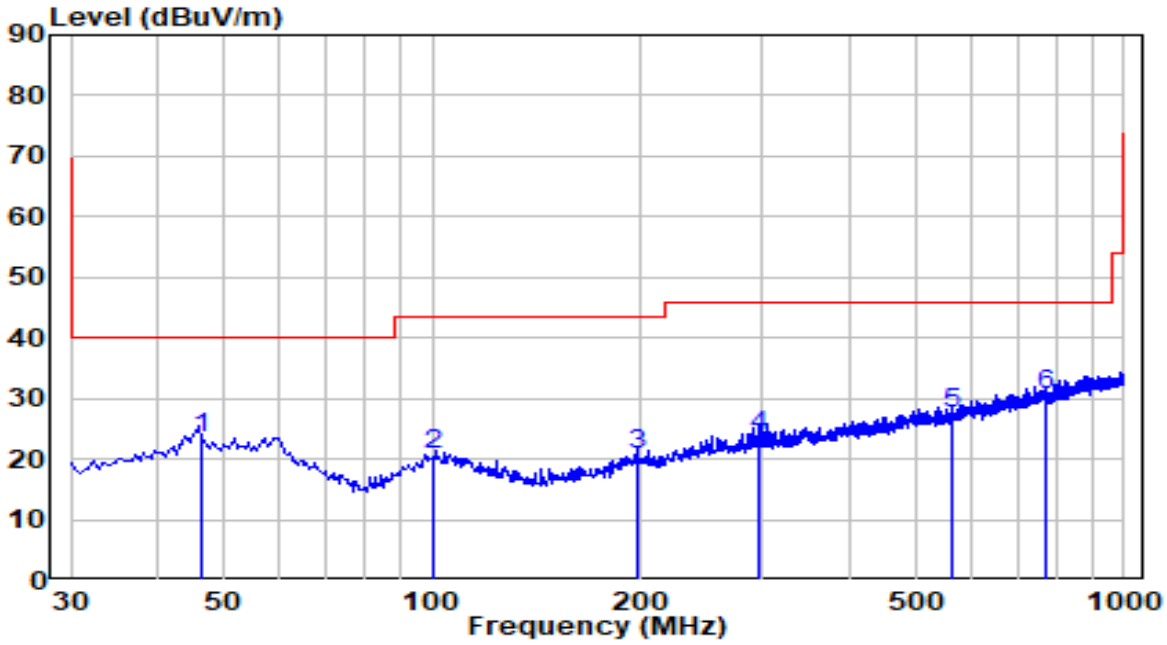
No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1		4034.500	39.49	1.00	40.49	-33.51	74.00	Peak
2	*	4961.000	46.69	3.66	50.35	-23.65	74.00	Peak
3		7026.500	36.41	10.37	46.78	-27.22	74.00	Peak
4		7868.000	36.04	12.31	48.35	-25.65	74.00	Peak

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB)– Preamplifier(dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

The worst case of Radiated Emission below 1GHz:

EUT	AP311	Date of Test	2020-10-13
Factor	AC1_VULB 9168 _20-2000MHz	Temp. / Humidity	25°C /54%
Polarity	Horizontal	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE at channel 2402MHz Bandwidth=2M	Test Voltage	120V/60Hz

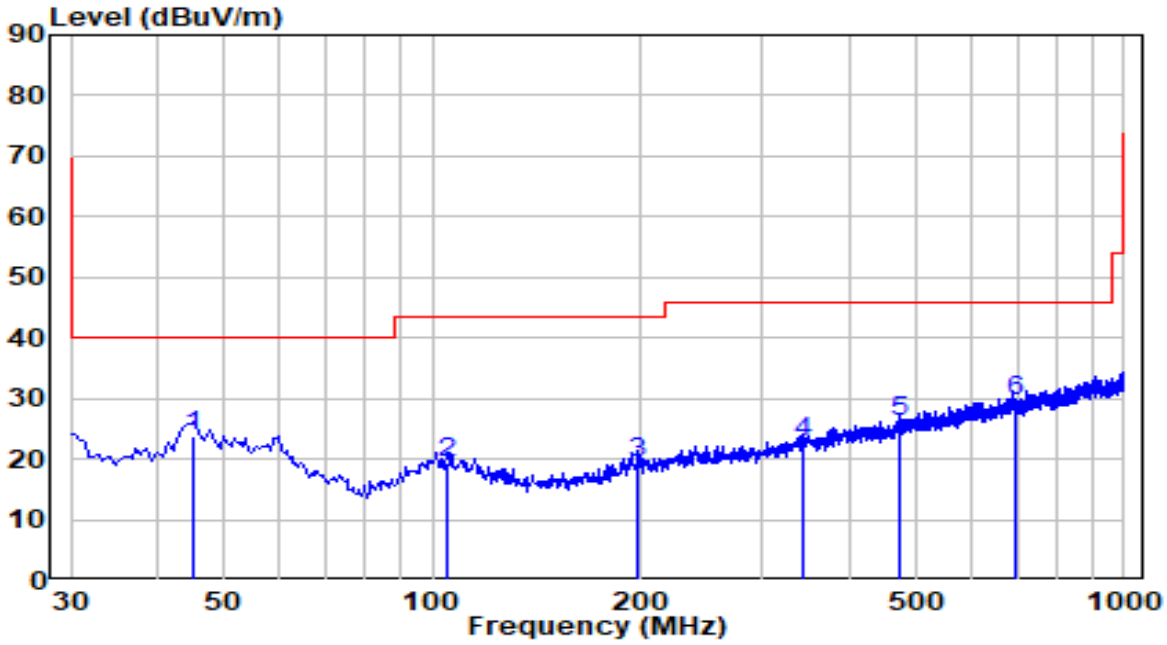


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1		46.520	2.03	21.48	23.51	-16.49	40.00	QP
2		100.210	0.94	19.66	20.60	-22.90	43.50	QP
3		197.360	1.73	18.89	20.62	-22.88	43.50	QP
4		297.650	2.44	21.37	23.81	-22.19	46.00	QP
5		563.210	0.69	26.85	27.54	-18.46	46.00	QP
6	*	769.500	0.40	30.00	30.40	-15.60	46.00	QP

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. The amplitude of Radiated emissions (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), is that proximity to ambient noise, which also are attenuated more than 20 dB below the permissible value. Therefore, the data is not presented in the report.

EUT	AP311	Date of Test	2020-10-13
Factor	AC1_VULB 9168 _20-2000MHz	Temp. / Humidity	25°C /54%
Polarity	Vertical	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE at channel 2402MHz Bandwidth=2M	Test Voltage	120V/60Hz



No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1	*	45.210	2.48	21.42	23.90	-16.10	40.00	QP
2		105.210	0.33	19.17	19.50	-24.00	43.50	QP
3		198.650	0.52	18.92	19.44	-24.06	43.50	QP
4		344.210	-0.29	23.19	22.90	-23.10	46.00	QP
5		475.630	0.69	25.37	26.06	-19.94	46.00	QP
6		695.200	0.35	29.13	29.48	-16.52	46.00	QP

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. The amplitude of Radiated emissions (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), is that proximity to ambient noise, which also are attenuated more than 20 dB below the permissible value. Therefore, the data is not presented in the report.

6.7. Radiated Restricted Band Edge Measurement

6.7.1.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	8.025 - 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	--	--	--

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

6.7.2.Test Procedure Used

ANSI C63.10 Section 6.3 (General Requirements)

ANSI C63.10 Section 6.6 (Standard test method above 1GHz)

6.7.3.Test Setting

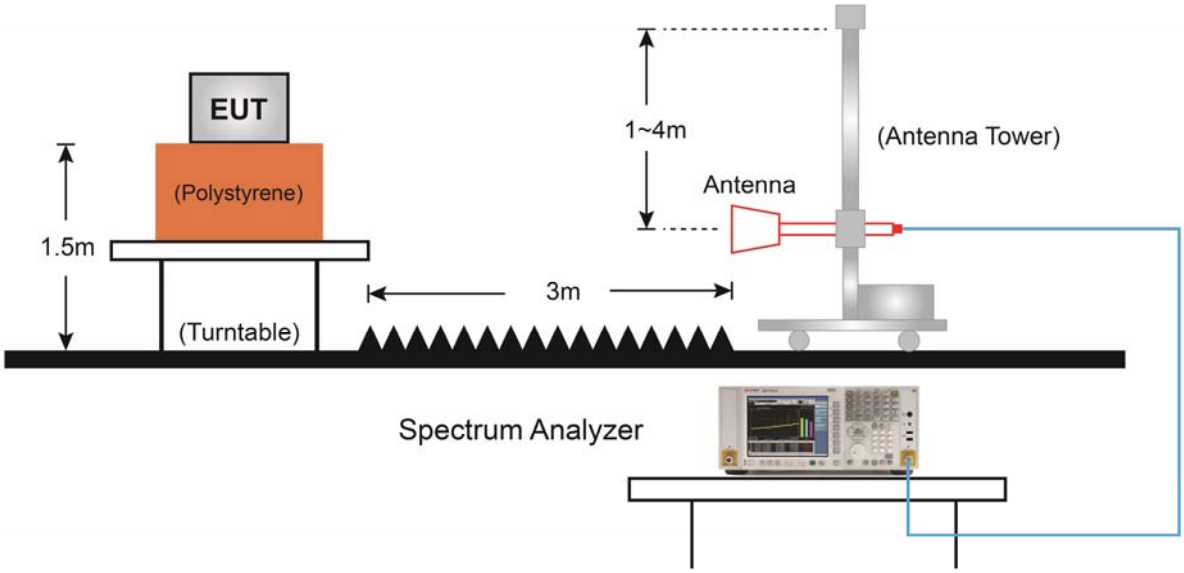
Peak Field Strength Measurements

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 Field Strength Measurements

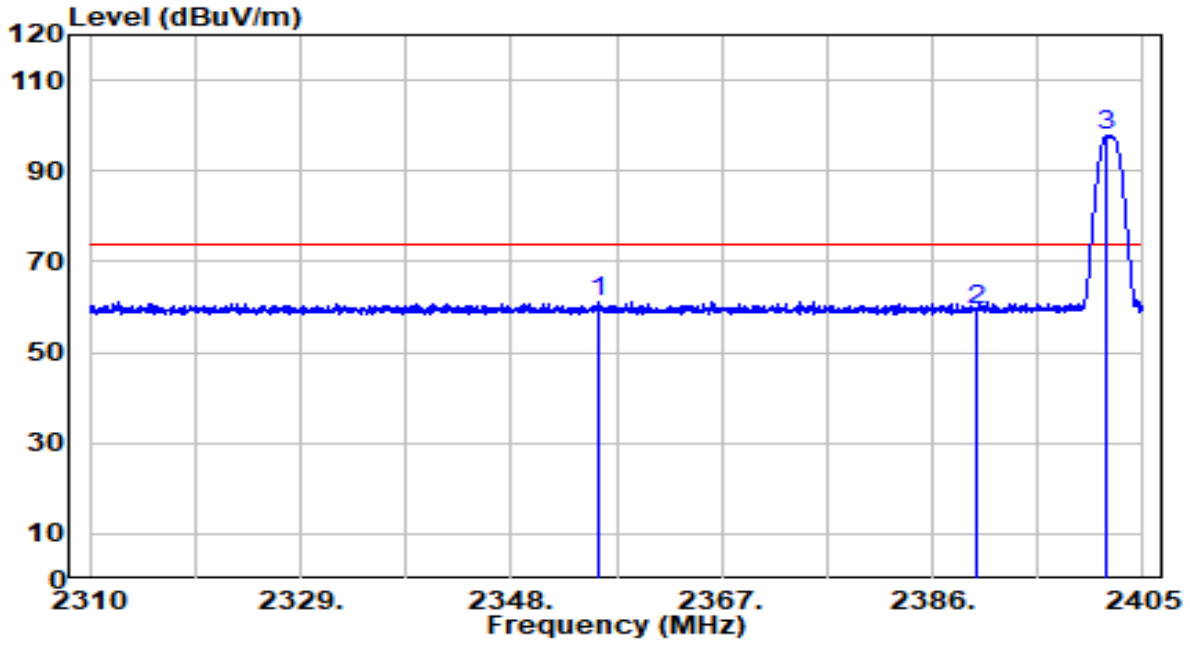
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW ≥ 1/T
4. De As an alternative, the instrument may be set to linear detector mode. Ensure that video filtering is applied in linear voltage domain (rather than in a log or dB domain). 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

6.7.4.Test Setup



6.7.5.Test Result

EUT	AP311	Date of Test	2020-09-27
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	26.3°C/49.5%
Polarity	Horizontal	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 1M at Channel 2402MHz	Test Voltage	120V/60Hz

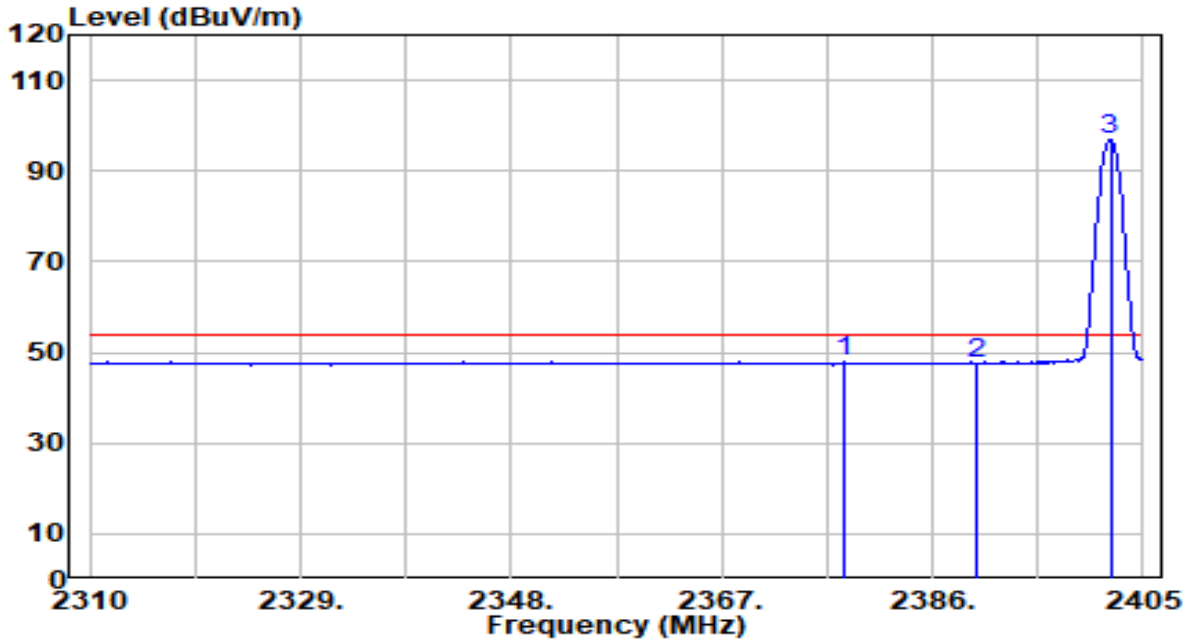


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1		2355.837	29.00	32.15	61.15	-12.85	74.00	Peak
2		2390.000	26.99	32.30	59.29	-14.71	74.00	Peak
3	*	2401.770	65.33	32.35	N/A	N/A	74.00	Peak

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4.The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-09-27
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	26.3°C/49.5%
Polarity	Horizontal	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 1M at Channel 2402MHz	Test Voltage	120V/60Hz

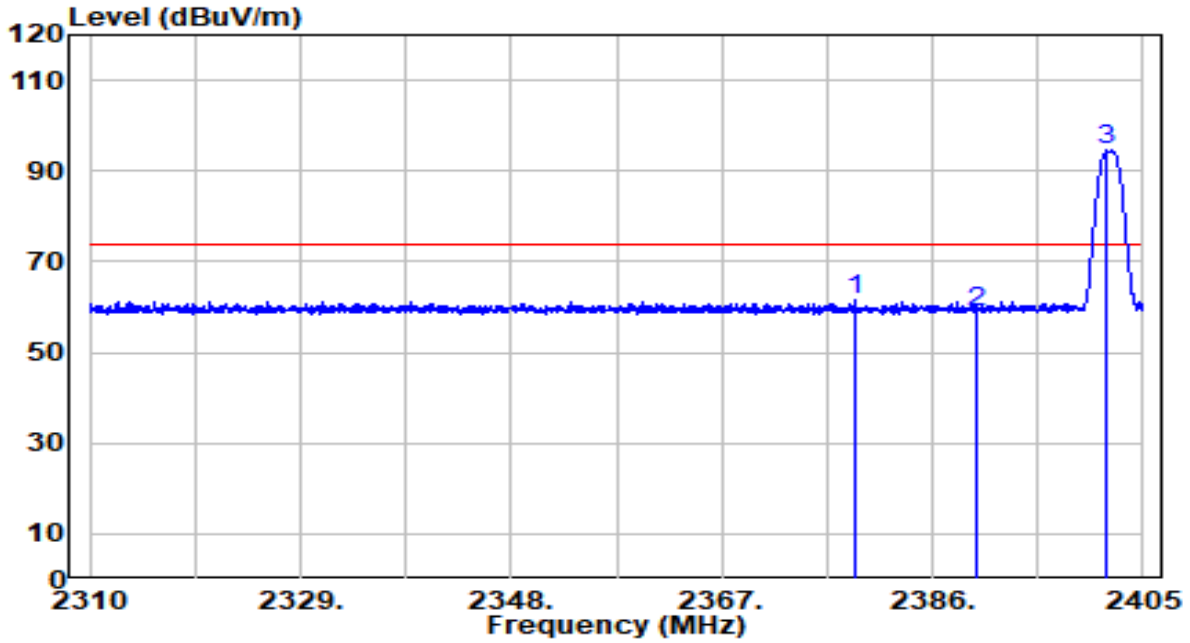


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1		2377.925	15.57	32.24	47.81	-6.19	54.00	Average
2		2390.000	15.27	32.30	47.57	-6.43	54.00	Average
3	*	2402.055	64.43	32.35	N/A	N/A	54.00	Average

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4.The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-09-27
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	26.3°C/49.5%
Polarity	Vertical	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 1M at Channel 2402MHz	Test Voltage	120V/60Hz

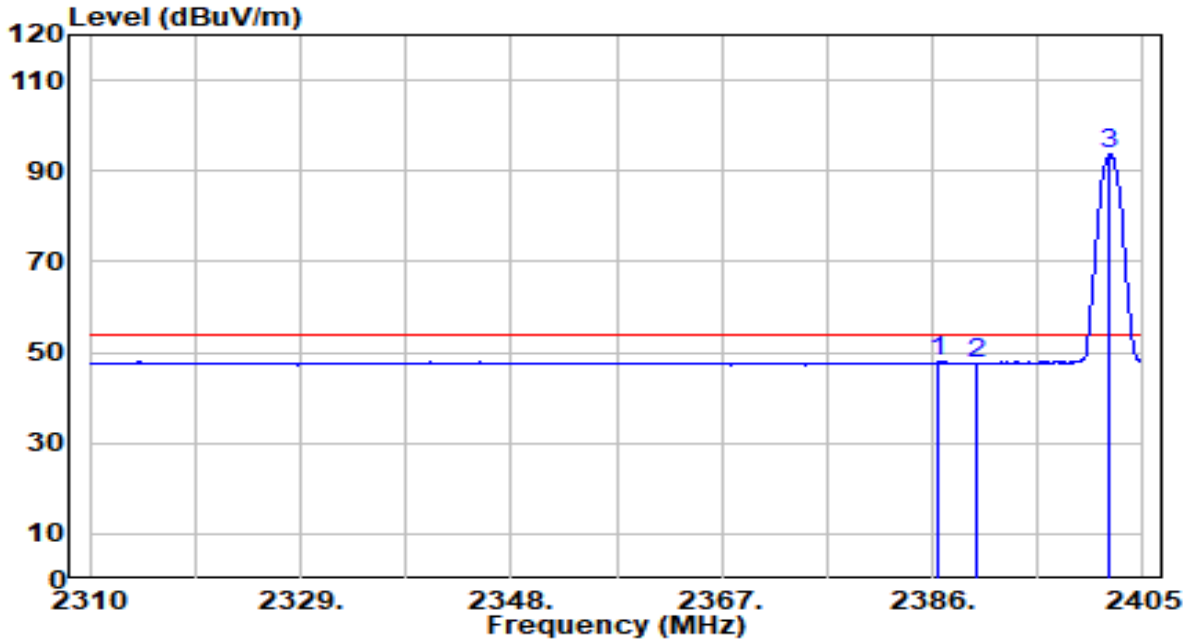


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1		2378.923	29.27	32.25	61.52	-12.48	74.00	Peak
2		2390.000	26.77	32.30	59.06	-14.94	74.00	Peak
3	*	2401.770	62.07	32.35	N/A	N/A	74.00	Peak

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4.The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-09-27
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	26.3°C/49.5%
Polarity	Vertical	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 1M at Channel 2402MHz	Test Voltage	120V/60Hz

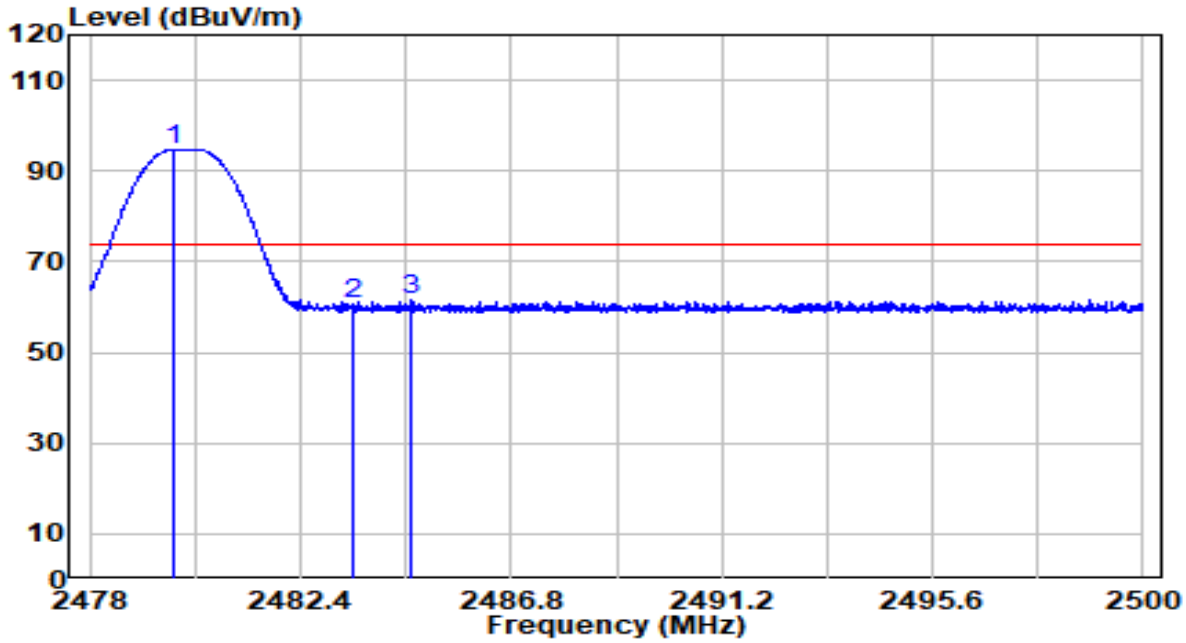


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1		2386.475	15.68	32.28	47.96	-6.04	54.00	Average
2		2390.000	15.29	32.30	47.59	-6.41	54.00	Average
3	*	2402.008	61.33	32.35	N/A	N/A	54.00	Average

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4.The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-09-27
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	26.3°C/49.5%
Polarity	Horizontal	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 1M at Channel 2480MHz	Test Voltage	120V/60Hz

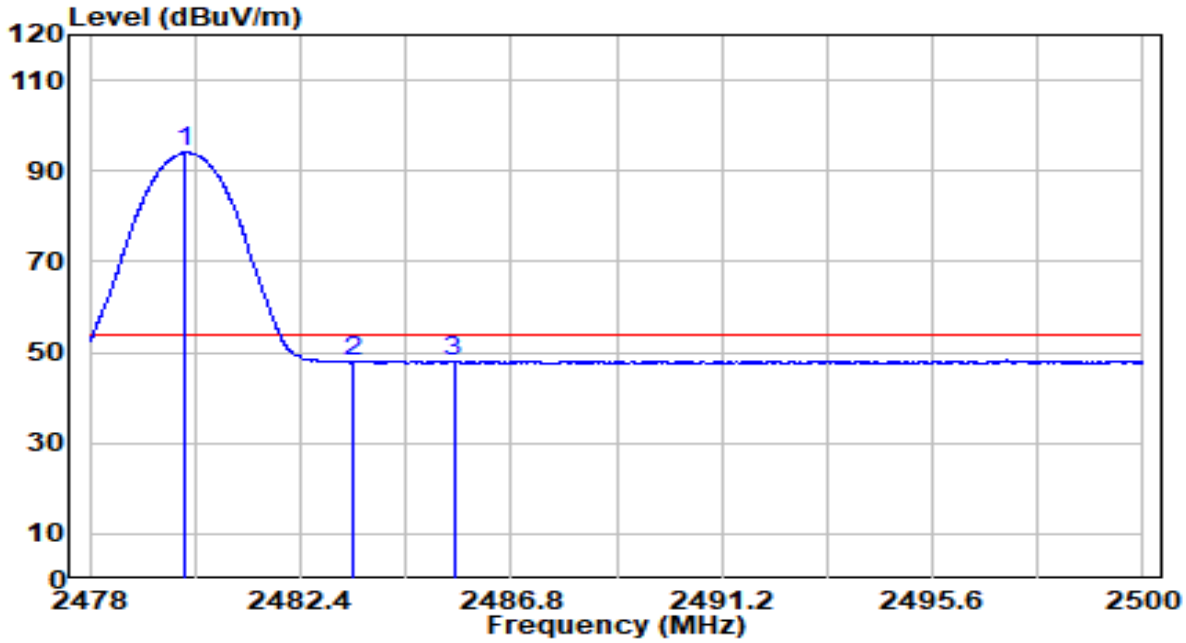


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1	*	2479.760	62.10	32.69	N/A	N/A	74.00	Peak
2		2483.500	28.15	32.71	60.85	-13.15	74.00	Peak
3		2484.721	28.76	32.71	61.48	-12.52	74.00	Peak

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4.The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-09-27
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	26.3°C/49.5%
Polarity	Horizontal	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 1M at Channel 2480MHz	Test Voltage	120V/60Hz

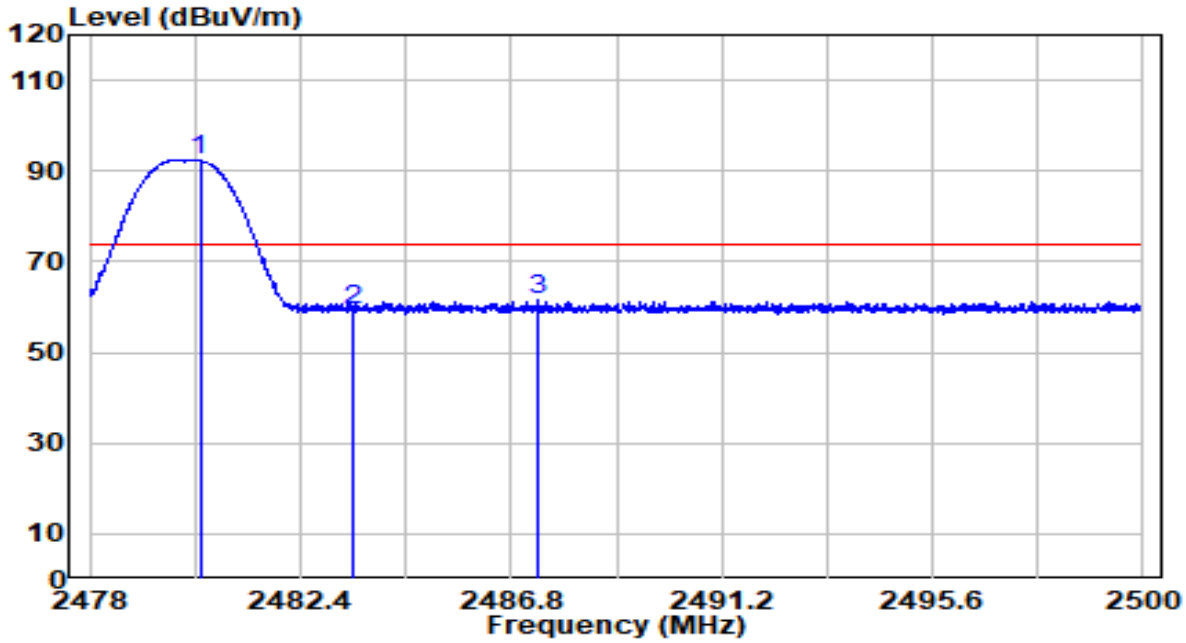


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1	*	2480.002	61.38	32.69	N/A	N/A	54.00	Average
2		2483.500	15.17	32.71	47.87	-6.13	54.00	Average
3		2485.601	15.38	32.72	48.10	-5.90	54.00	Average

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4.The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-09-27
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	26.3°C/49.5%
Polarity	Vertical	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 1M at Channel 2480MHz	Test Voltage	120V/60Hz

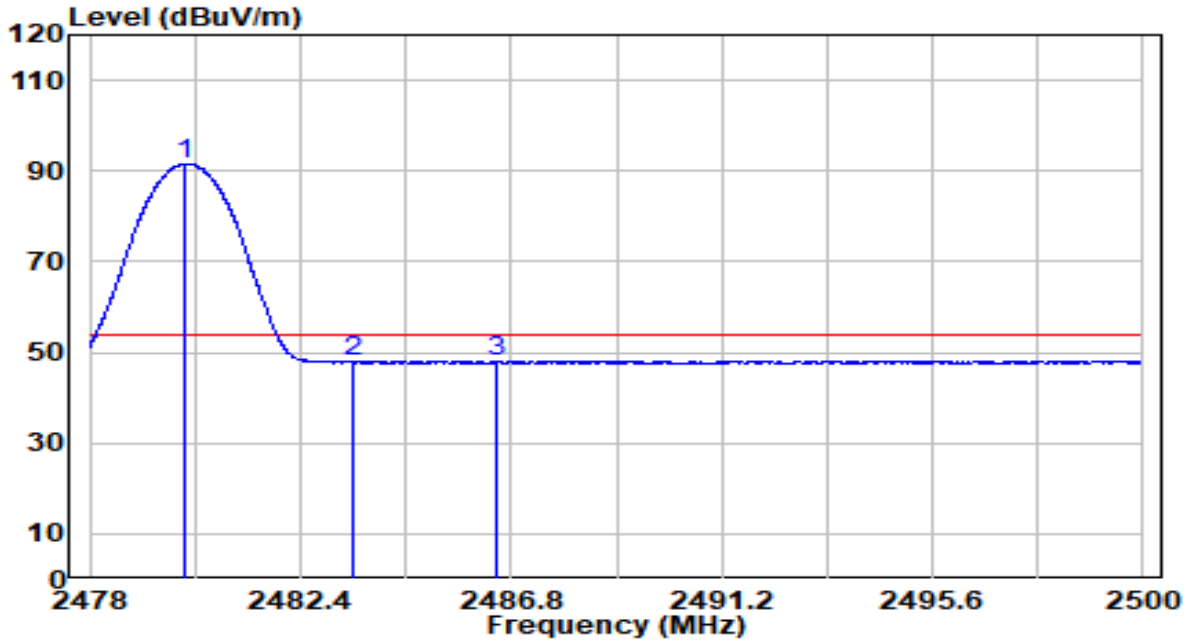


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1	*	2480.299	59.64	32.69	N/A	N/A	74.00	Peak
2		2483.500	26.79	32.71	59.49	-14.51	74.00	Peak
3		2487.361	28.77	32.72	61.49	-12.51	74.00	Peak

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4.The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-09-27
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	26.3°C/49.5%
Polarity	Vertical	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 1M at Channel 2480MHz	Test Voltage	120V/60Hz

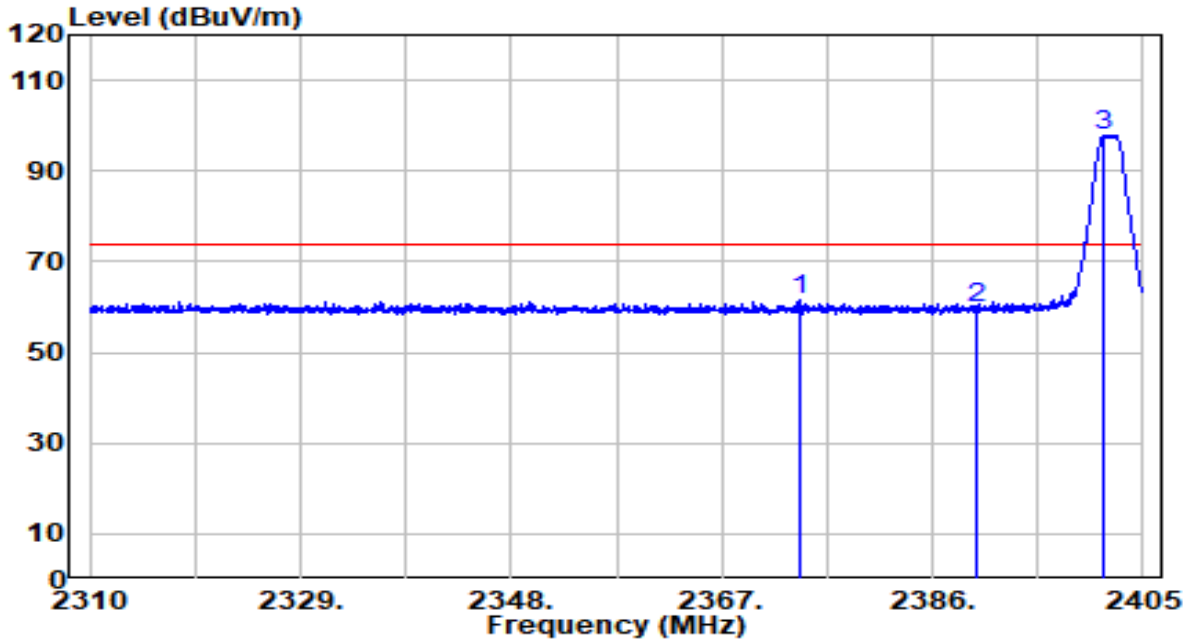


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1	*	2480.002	58.98	32.69	N/A	N/A	54.00	Average
2		2483.500	15.18	32.71	47.89	-6.11	54.00	Average
3		2486.492	15.24	32.72	47.96	-6.04	54.00	Average

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4.The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-09-27
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	26.3°C/49.5%
Polarity	Horizontal	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 2M at Channel 2402MHz	Test Voltage	120V/60Hz

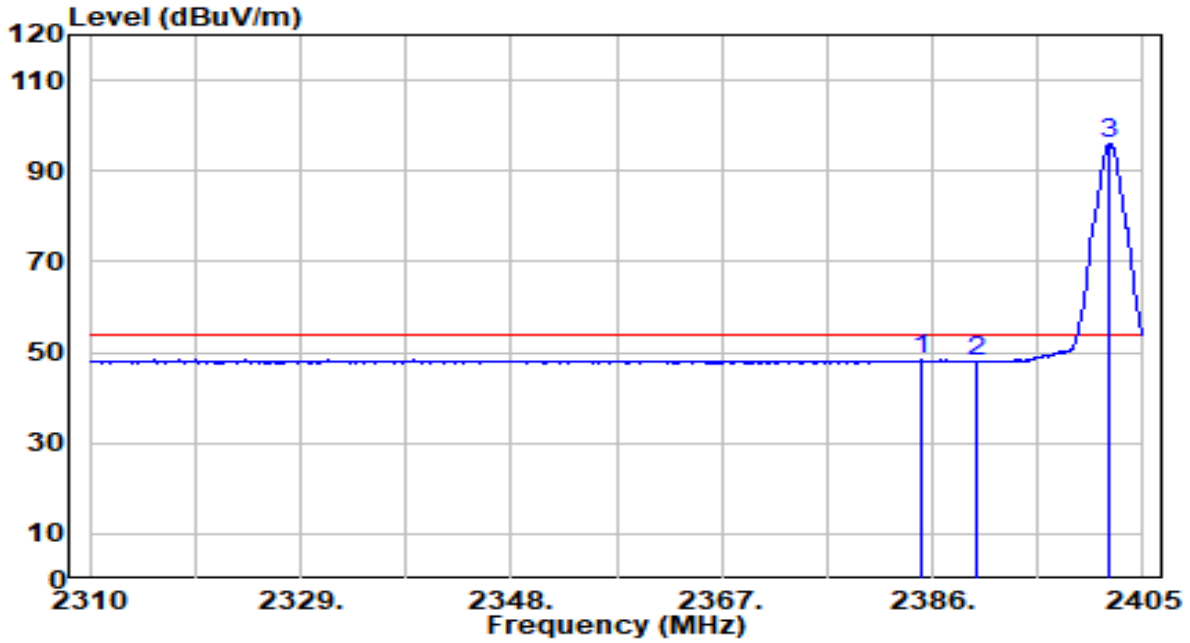


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1		2374.030	29.50	32.23	61.72	-12.28	74.00	Peak
2		2390.000	27.32	32.30	59.61	-14.39	74.00	Peak
3	*	2401.485	65.49	32.35	N/A	N/A	74.00	Peak

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4.The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-09-27
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	26.3°C/49.5%
Polarity	Horizontal	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 2M at Channel 2402MHz	Test Voltage	120V/60Hz

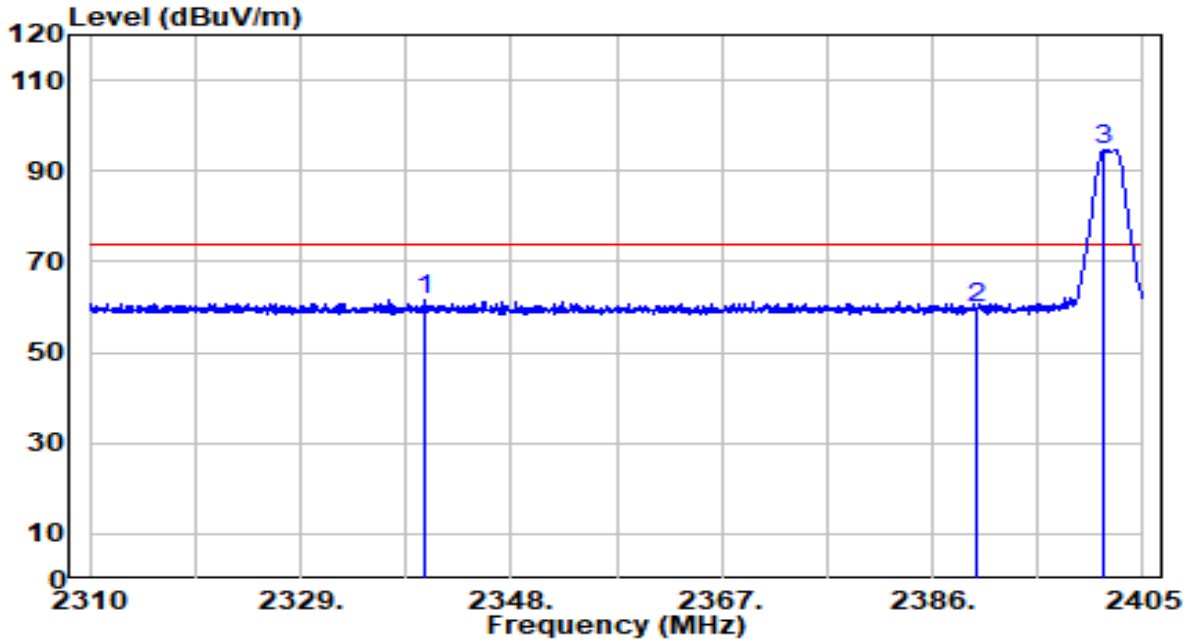


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1		2385.050	16.03	32.27	48.31	-5.69	54.00	Average
2		2390.000	15.71	32.30	48.01	-5.99	54.00	Average
3	*	2402.008	63.48	32.35	N/A	N/A	54.00	Average

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4.The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-09-27
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	26.3°C/49.5%
Polarity	Vertical	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 2M at Channel 2402MHz	Test Voltage	120V/60Hz

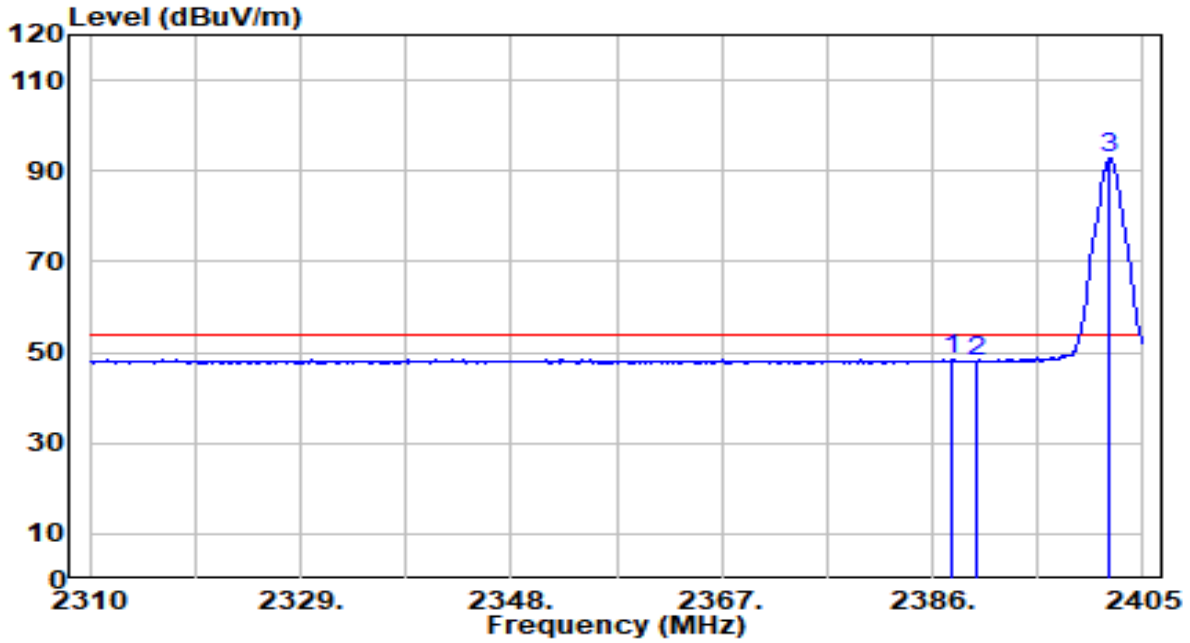


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1		2340.115	29.50	32.08	61.57	-12.43	74.00	Peak
2		2390.000	27.52	32.30	59.82	-14.18	74.00	Peak
3	*	2401.485	62.27	32.35	N/A	N/A	74.00	Peak

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4.The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-09-27
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	26.3°C/49.5%
Polarity	Vertical	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 2M at Channel 2402MHz	Test Voltage	120V/60Hz

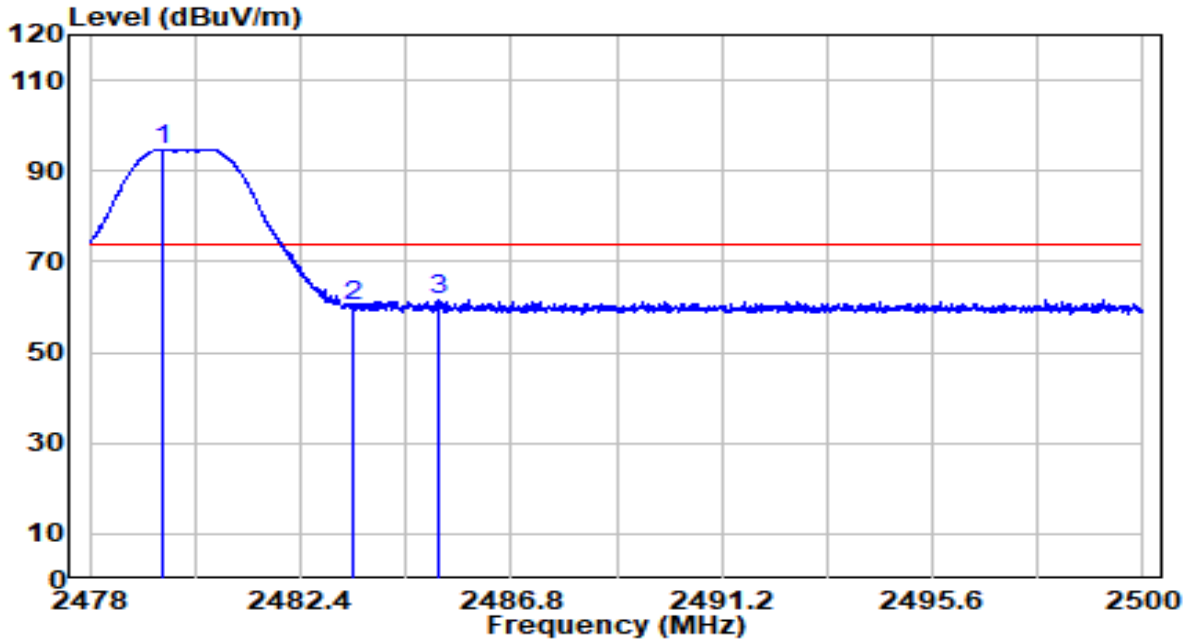


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1		2387.853	16.08	32.29	48.36	-5.64	54.00	Average
2		2390.000	15.49	32.30	47.79	-6.21	54.00	Average
3	*	2401.960	60.39	32.35	N/A	N/A	54.00	Average

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4.The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-09-27
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	26.3°C/49.5%
Polarity	Horizontal	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 2M at Channel 2480MHz	Test Voltage	120V/60Hz

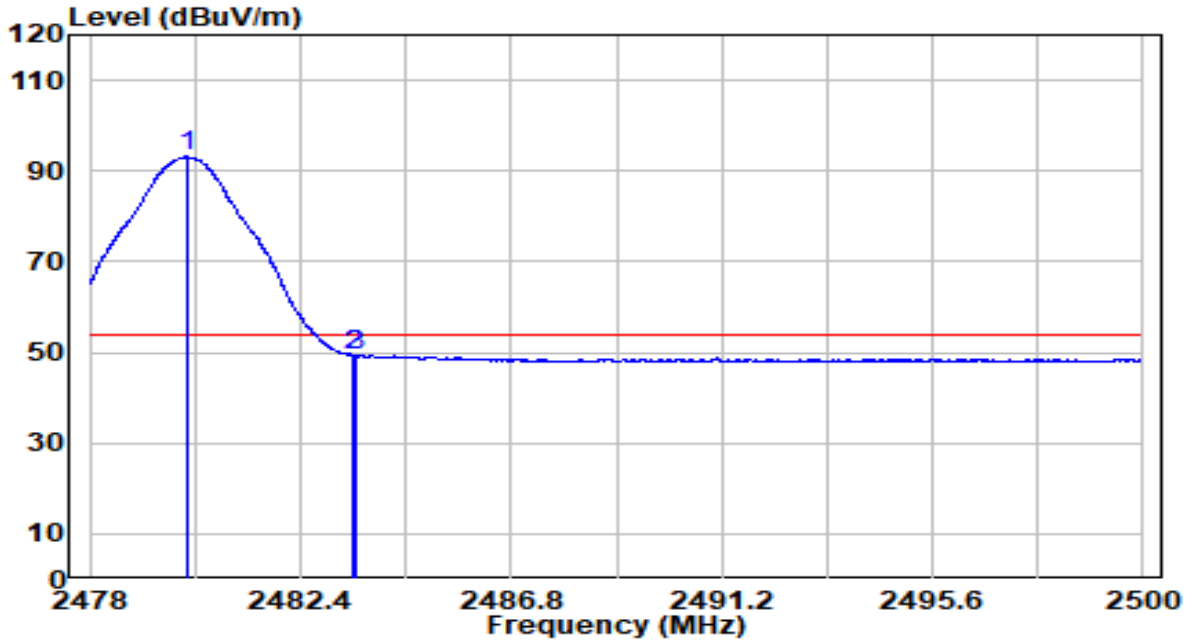


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1	*	2479.540	62.17	32.69	N/A	N/A	74.00	Peak
2		2483.500	27.56	32.71	60.27	-13.73	74.00	Peak
3		2485.260	28.82	32.72	61.54	-12.46	74.00	Peak

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4.The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-09-27
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	26.3°C/49.5%
Polarity	Horizontal	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 2M at Channel 2480MHz	Test Voltage	120V/60Hz

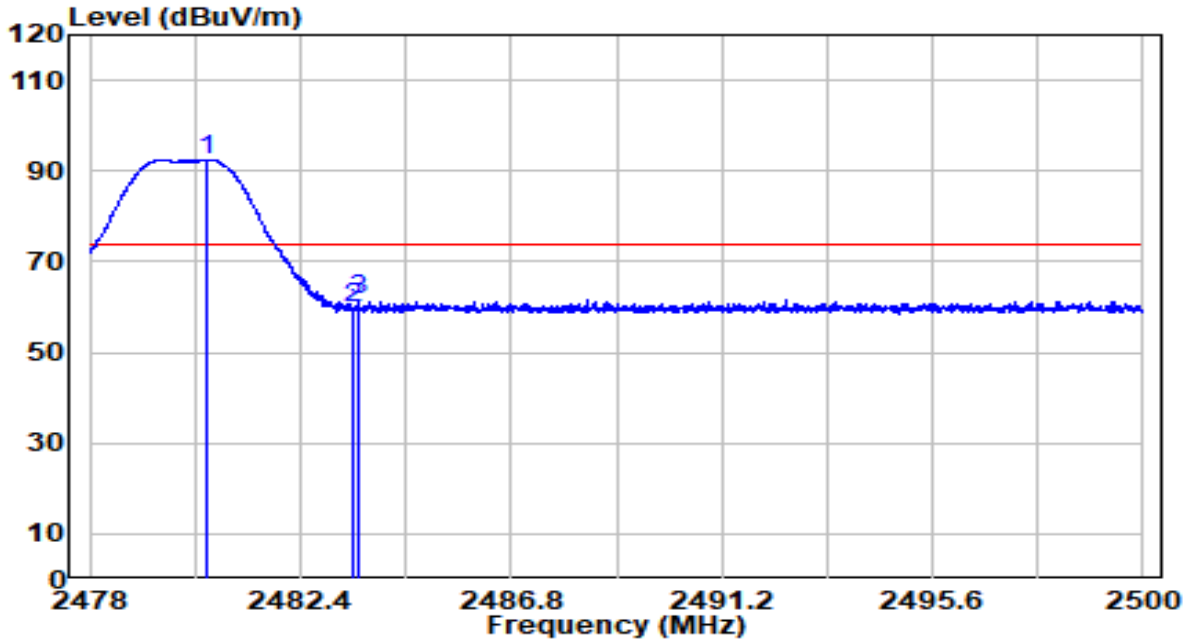


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1	*	2480.046	60.47	32.69	N/A	N/A	54.00	Average
2		2483.500	16.71	32.71	49.42	-4.58	54.00	Average
3		2483.566	16.76	32.71	49.47	-4.53	54.00	Average

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4.The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-09-27
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	26.3°C/49.5%
Polarity	Vertical	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 2M at Channel 2480MHz	Test Voltage	120V/60Hz

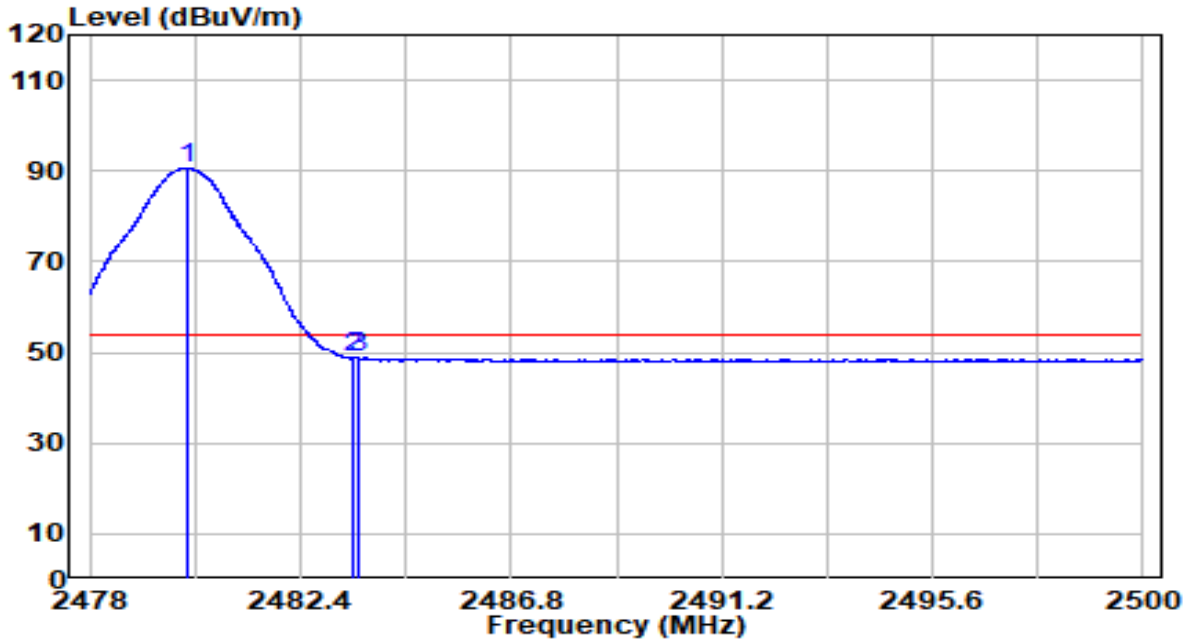


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1	*	2480.442	59.83	32.69	N/A	N/A	74.00	Peak
2		2483.500	26.88	32.71	59.59	-14.41	74.00	Peak
3		2483.588	28.84	32.71	61.55	-12.45	74.00	Peak

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4.The emission levels of other frequencies are very lower than the limit and not show in test report.

EUT	AP311	Date of Test	2020-09-27
Factor	BBHA 9120D (1GHz~18GHz)_2020	Temp. / Humidity	26.3°C/49.5%
Polarity	Vertical	Site / Test Engineer	AC1 / Kevin Ker
Test Mode	Transmit by BLE 2M at Channel 2480MHz	Test Voltage	120V/60Hz



No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1	*	2480.035	58.01	32.69	N/A	N/A	54.00	Average
2		2483.500	16.11	32.71	48.82	-5.18	54.00	Average
3		2483.599	16.14	32.71	48.84	-5.16	54.00	Average

Note:

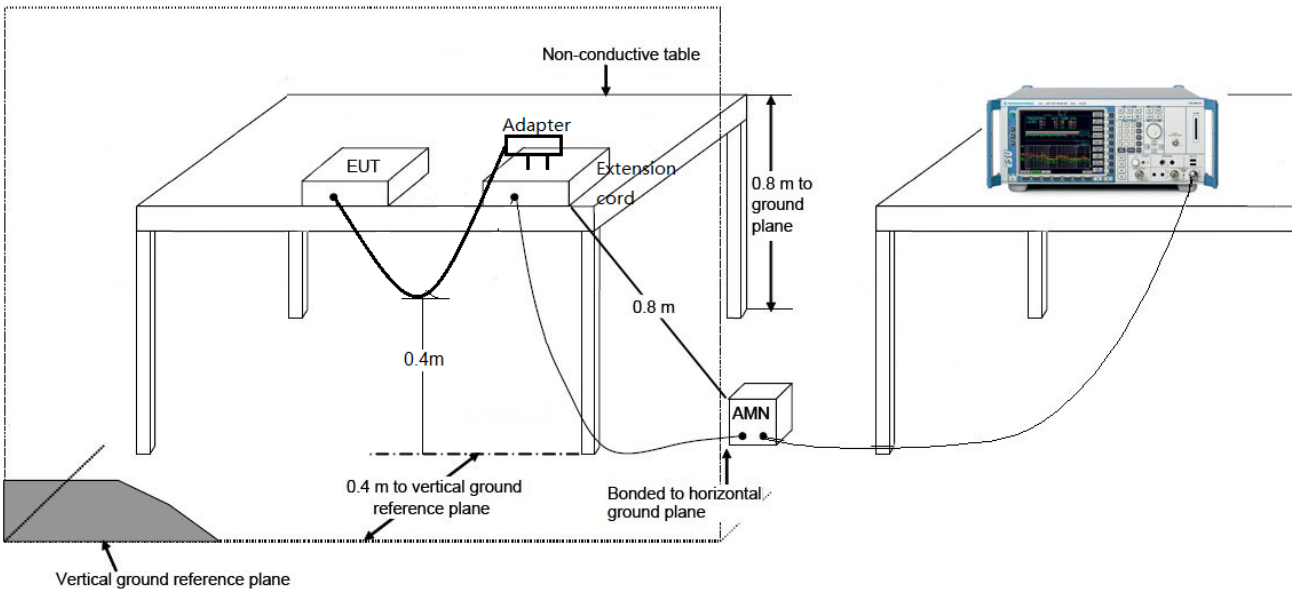
1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).
4.The emission levels of other frequencies are very lower than the limit and not show in test report.

6.8. AC Conducted Emissions Measurement

6.8.1.Test Limit

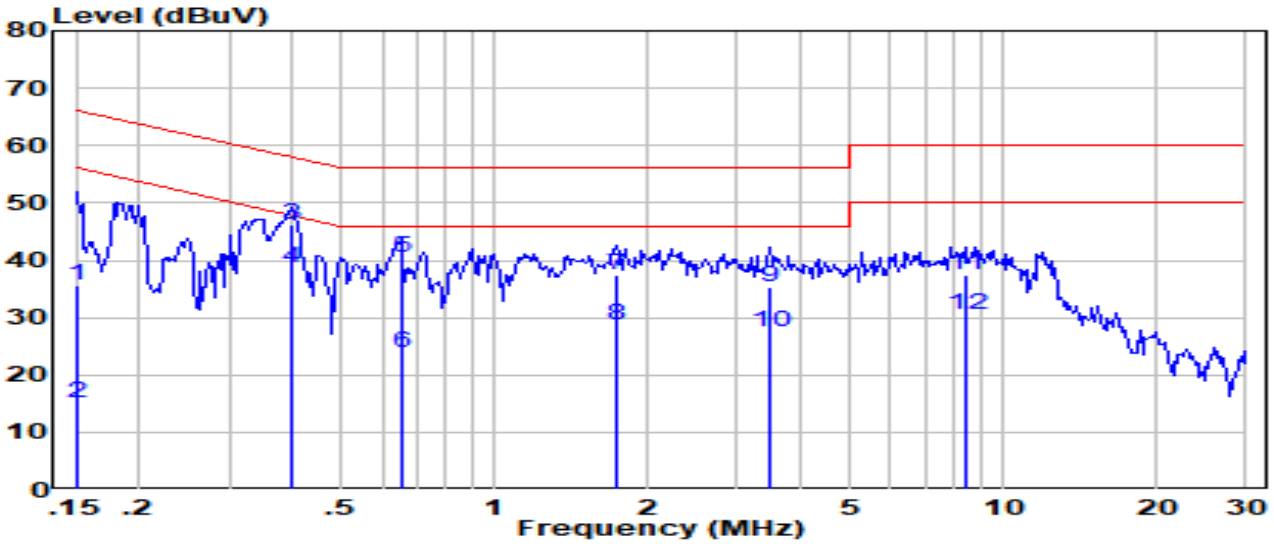
FCC Part 15 Subpart C Paragraph 15.207 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50
Note 1: The lower limit shall apply at the transition frequencies. Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.		

6.8.2.Test Setup



6.8.3.Test Result

EUT	AP311	Date of Test	2020-10-12
Factor	CE_ENV216-L1 (Filter ON)_2020	Temp. / Humidity	23.2°C /51.6%
Polarity	Line1	Site / Test Engineer	SR2 / Kevin Ker
Test Mode	Transmit by BLE at channel 2402MHz Bandwidth=2M	Test Voltage	120V/60Hz

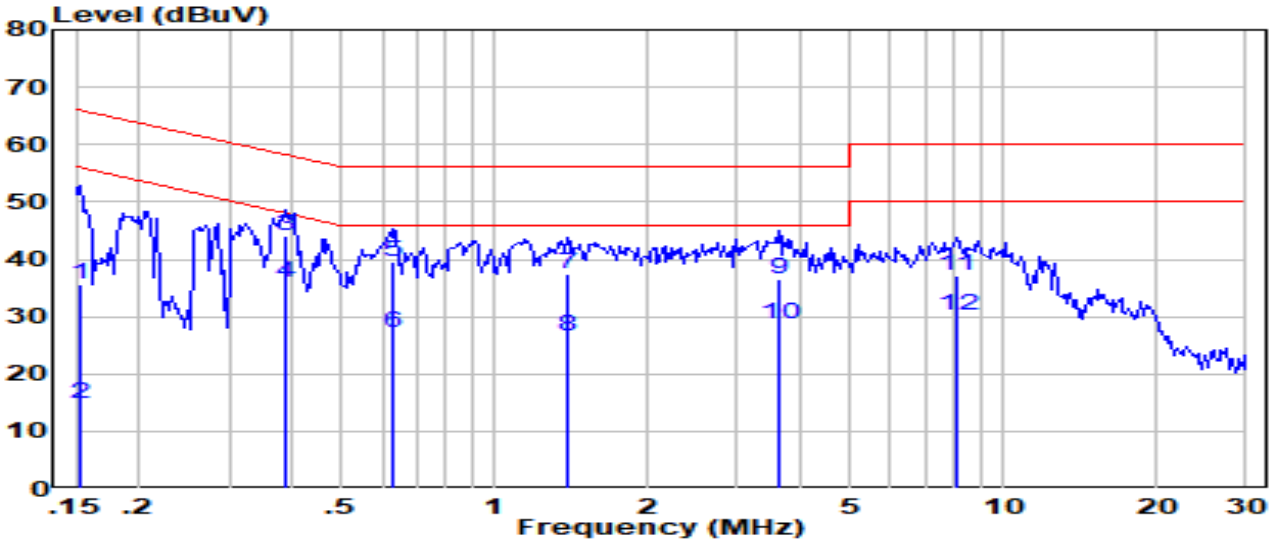


No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1		0.150	25.98	9.61	35.56	-30.44	66.00	QP
2		0.150	5.48	9.61	15.06	-40.94	56.00	AV
3		0.397	36.56	9.62	46.14	-11.77	57.92	QP
4	*	0.397	29.16	9.62	38.74	-9.17	47.92	AV
5		0.653	30.81	9.64	40.39	-15.61	56.00	QP
6		0.653	14.31	9.64	23.89	-22.11	46.00	AV
7		1.730	27.94	9.68	37.54	-18.46	56.00	QP
8		1.730	18.94	9.68	28.54	-17.46	46.00	AV
9		3.470	25.84	9.71	35.45	-20.55	56.00	QP
10		3.470	17.74	9.71	27.35	-18.65	46.00	AV
11		8.400	27.83	9.84	37.49	-22.51	60.00	QP
12		8.400	20.73	9.84	30.39	-19.61	50.00	AV

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).

EUT	AP311	Date of Test	2020-10-12
Factor	CE_ENV216-N (Filter ON)_2020	Temp. / Humidity	23.2°C /51.6%
Polarity	Neutral	Site / Test Engineer	SR2 / Kevin Ker
Test Mode	Transmit by BLE at channel 2402MHz Bandwidth=2M	Test Voltage	120V/60Hz



No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Remark (QP/PK/AV)
1		0.153	26.04	9.62	35.63	-30.20	65.84	QP
2		0.153	5.24	9.62	14.83	-41.00	55.84	AV
3		0.385	34.47	9.63	44.06	-14.11	58.17	QP
4	*	0.385	26.47	9.63	36.06	-12.11	48.17	AV
5		0.627	30.07	9.65	39.67	-16.33	56.00	QP
6		0.627	17.57	9.65	27.17	-18.83	46.00	AV
7		1.390	27.84	9.68	37.44	-18.56	56.00	QP
8		1.390	17.04	9.68	26.64	-19.36	46.00	AV
9		3.610	26.89	9.72	36.51	-19.49	56.00	QP
10		3.610	19.19	9.72	28.81	-17.19	46.00	AV
11		8.080	27.50	9.84	37.16	-22.84	60.00	QP
12		8.080	20.60	9.84	30.26	-19.74	50.00	AV

Note:

1. " *", means this data is the worst emission level.
2. C.F (Correction Factor) = Antenna Factor (dB)+ Cable Loss (dB).
3. Measurement(dBuV/m) = Reading(dBuV) + C.F (Correction Factor).

7. CONCLUSION

The data collected relate only the item(s) tested and show that the unit is compliance with Part 15C of the FCC rules.

The End

Appendix A - Test Setup Photograph

Refer to “2010TW0002-UT” file.

Appendix B - EUT Photograph

Refer to “2010TW0002-UE” file.