MEASUREMENT REPORT

FCC PART 15 Subpart C ZigBee 802.15.4

FCC ID:	Q9DAPIN0504505
APPLICANT:	Hewlett Packard Enterprise Company
Application Type:	Certification
Product:	ACCESS POINT
Model No.:	APIN0504, APIN0505
Brand Name:	aruba a Hewlett Packard Enterprise company , Hewlett Packard Enterprise
FCC Classification:	Digital Transmission System (DTS)
FCC Rule Part(s):	Part15 Subpart C (Section 15.247)
Test Procedure(s):	ANSI C63.10-2013, KDB 558074 D01v05r02
Test Date:	June 03 ~ July 14, 2019

Reviewed By: (Paddy Chen)

Approved By: (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
1906TW0102-U2	Rev. 01	Initial report	07-15-2019	Invalid
1906TW0102-U2	Rev. 02	Update antenna port plot	10-01-2019	Invalid
1906TW0102-U2	Rev. 03	Update PSD test setting	10-03-2019	Valid

CONTENTS

§2.1033 General Information

Applicant:	Hewlett Packard Enterprise Company
Applicant Address:	3333 Scott Blvd, Santa Clara, CA 94089, USA
Manufacturer:	Hewlett Packard Enterprise Company
Manufacturer Address:	3333 Scott Blvd, Santa Clara, CA 94089, USA
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 Device Serial No.:	APIN0504 S/N: DB19590006
	APIN0505 S/N: DB19590053

Test Facility / Accreditations

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

- **MRT facility is a 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 Taiwan, EU and TELEC Rules.**

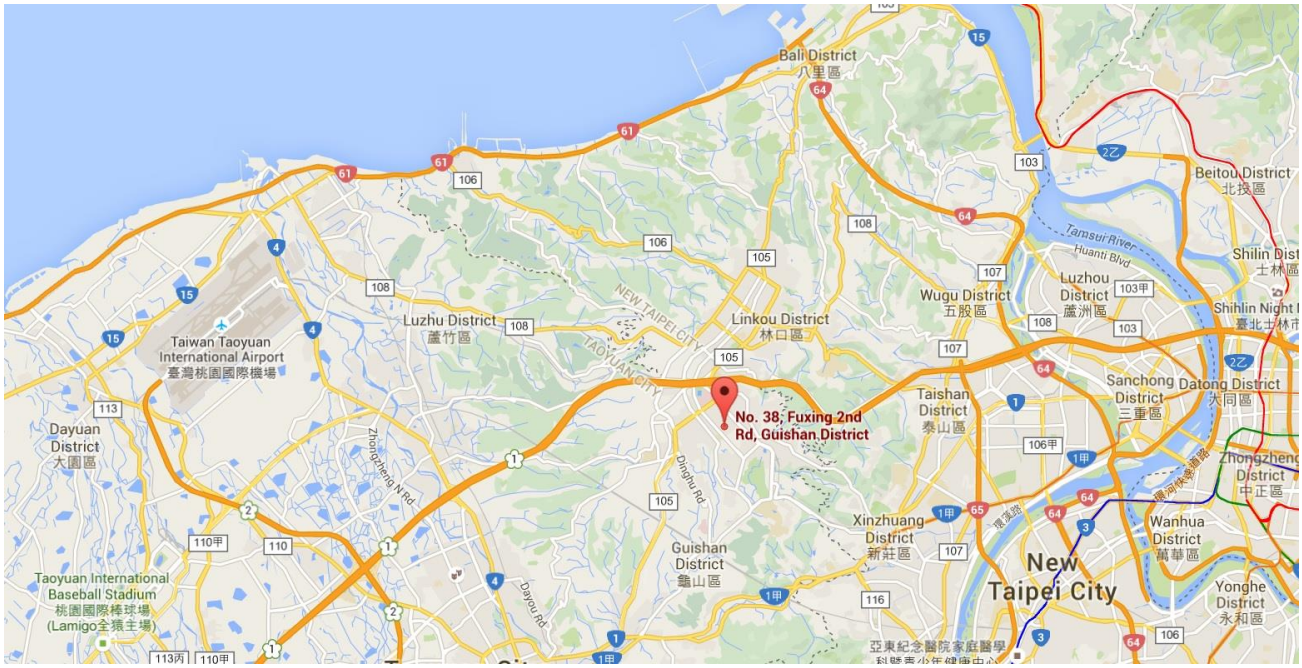
1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the 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:	ACCESS POINT
Model No.:	APIN0504, APIN0505
Brand Name:	aruba a Hewlett Packard Enterprise company , Hewlett Packard Enterprise
Wi-Fi Specification:	802.11a/b/g/n/ac/ax
Bluetooth Specification:	v4.2 single mode
Zigbee Specification:	802.15.4
Software Version:	F.1.00
Operating Temperature:	0 ~ 50 °C
Power Type:	AC Adapter or POE input
Operating Environment:	Indoor Use

Note: The difference between models is that EUT use different antenna and appearance, APIN0504 use some external antennas, but APIN0505 use internal antenna, other hardware and software are the same. Besides, each model has its own power parameter value.

2.2. Product Specification Subjective to this Report

Frequency Range:	2405 ~ 2480 MHz
Channel Number:	16
Type of Modulation:	O-QPSK

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
11	2405 MHz	12	2410 MHz	13	2415 MHz
14	2420 MHz	15	2425 MHz	16	2430 MHz
17	2435 MHz	18	2440 MHz	19	2445 MHz
20	2450 MHz	21	2455 MHz	22	2460 MHz
23	2465 MHz	24	2470 MHz	25	2475 MHz
26	2480 MHz	--	--	--	--

2.4. Description of Available Antennas

APIN0504

Antenna No.	Directionality	Frequency Band (GHz)	Model No.	Max Peak Gain (dBi)	BF Dir Gain (dBi)	CDD Dir Gain (dBi)	
						For Power	For PSD
Wi-Fi External Antenna List (2.4GHz 2*2 MIMO, 5GHz 2*2 MIMO)							
1	Omni	2.4	AP-ANT-1W	3.8	6.81	3.8	6.81
		5		5.8	8.81	5.8	8.81
2	Omni	2.4	AP-ANT-13B	2.3	5.31	2.3	5.31
		5		4.0	7.01	4.0	7.01
3	Omni	2.4	AP-ANT-19	3.0	6.01	3.0	6.01
		5		**6.0**	9.01	6.0	9.01
4	Omni	2.4	AP-ANT-20W	**2.0**	5.01	2.0	5.01
		5		**2.0**	5.01	2.0	5.01
5	Omni	2.4	AP-ANT-40	**4.0**	7.01	4.0	7.01
		5		5.0	8.01	5.0	8.01
6 (Note 3)	Directional	2.4	AP-ANT-25A	5.0	5.0	5.0	8.01
		5		5.0	5.0	5.0	8.01
7 (Note 3)	Directional	2.4	AP-ANT-28	**7.5**	7.5	7.5	10.51
		5		**7.5**	7.5	7.5	10.51
Bluetooth & ZigBee Internal Antenna							
PCB		2.4		3.3			

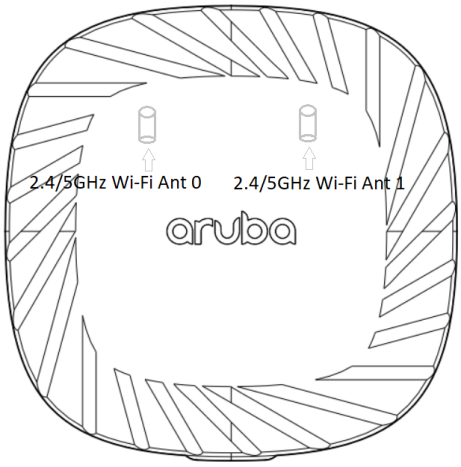
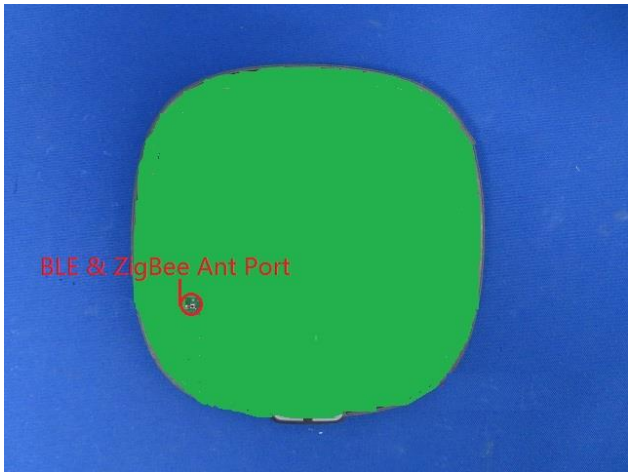
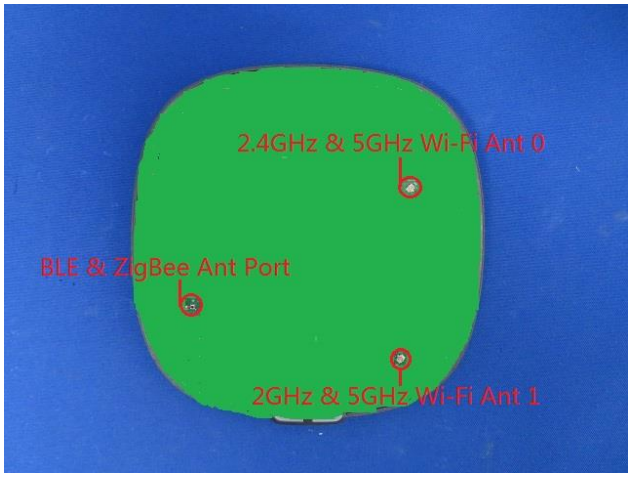
APIN0505

Directionality	Frequency Band (GHz)	Max Peak Gain (dBi)	BF Dir Gain (dBi)	CDD Dir Gain (dBi)	
				For Power	For PSD
Wi-Fi Internal Antenna List (2.4GHz 2*2 MIMO, 5GHz 4*4 MIMO)					
Omni	2.4	4.29	7.08	4.29	7.08
Omni	5	5.63	8.64	5.63	8.64
Bluetooth & ZigBee Internal Antenna					
PCB	2.4	3.3			

Note:

1. The EUT supports Cyclic Delay Diversity (CDD) mode, and CDD signals are correlated.
   For CDD transmissions, directional gain is calculated as follows, N_{ANT} = 2, N_{SS} = 1.
   If all antennas have the same gain, G_{ANT}, Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows.
   - For power spectral density (PSD) measurements on all devices,
     Array Gain = 10 log (N_{ANT}/ N_{SS}) dB = 3.01;
   - For power measurements on IEEE 802.11 devices,
     Array Gain = 0 dB for $N_{ANT} \leq 4$;
2. The EUT also supports Beam Forming mode, and the Beam Forming support 802.11n/ac/ax, not include 802.11a/b/g. Directional gain = G_{ANT} + Array Gain, BF Gain was declared by the applicant.
3. Two type antennas are cross polarized, the detail refer to antenna specification.
4. For APIN0504, low gain antenna AP-ANT-20W was selected to perform all RF testing that can got maximum power setting. High gain Omni antenna AP-ANT-19 & AP-ANT-40 and directional antenna AP-ANT-28 were selected to perform radiated spurious emission and band edge testing. High gain antenna power setting will be reduced according to difference value of antenna gain declared by applicant.
5. For APIN0505, its directional gain was declared by the applicant, the detail refers to antenna specification.

2.5. Description of Antenna RF Port

Antenna RF Port				
--	2.4GHz RF Port		5GHz RF Port	
Software Control Port	Ant 0	Ant 1	Ant 0	Ant 1
APIN0504				
				
APIN0505				
				

2.6. Test Mode

Test Mode	Mode 1: Transmit by ZigBee

2.7. Description of Test Software

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

Detail power setting refer to operation description.

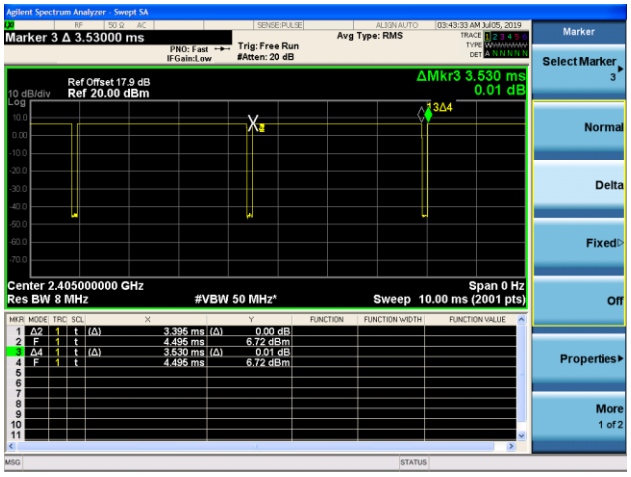
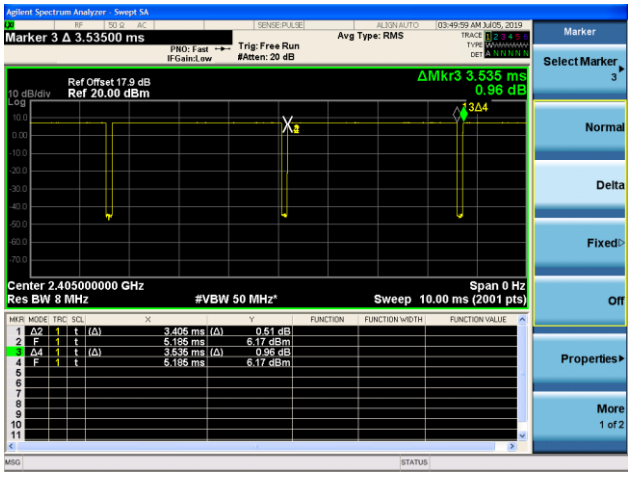
2.8. Device Capabilities

This device contains the following capabilities:

802.11a/b/g/n/ac/ax Wi-Fi, Bluetooth v4.2 single mode and Zigbee devices.

Note: 2.4GHz Zigbee (DTS) operation is possible in 5MHz 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. 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:

Model No.	Test Mode	Duty Cycle
APIN0504	ZigBee	96.18%
APIN0505	ZigBee	96.32%

Duty Cycle (T = Transmission Duration)	
APIN0504	APIN0505
802.15.4 (T = 3.395ms)	802.15.4 (T = 3.405ms)
	

Note 1: This duty cycle was only suitable for continuous transmission of signals via commands.

Note 2: The manufacturer, declared that the ZigBee operation, when implemented, will be limited to a duty cycle of 10% or less in any 100ms period. So -20dB correction factor was used during peak and average band edge testing.

2.9. EMI Suppression Device(s)/Modifications

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

2.10. Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

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

3. DESCRIPTION of TEST

3.1. Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013), and the guidance provided in KDB 558074 D01v05r02 were used in the measurement.

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

3.2. AC Line Conducted Emissions

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

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

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

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

3.3. Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. A MF Model 210SS turntable is used for radiated measurement. It is a continuously rotatable, remote controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm high PVC support structure is placed on top of the turntable.
For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up for frequencies below 1GHz was placed on top of the 0.8 meter high, 1 x 1.5 meter table; and test set-up for frequencies 1-40GHz was placed on top of the 1.5 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.
Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions. According to 3dB Beam-Width of horn antenna, the horn antenna should be always directed to the EUT when rising height.

4. ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

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

For APIN0505

- The antenna of the unit is permanently attached.
- There are no provisions for connection to an external antenna.

For APIN0504

- The antenna of the unit uses a reversed SMA connector.

Conclusion:

The unit complies with the requirement of §15.203.

5. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Two-Line V-Network	R&S	ENV 216	MRTTWA00019	1 year	2020/03/25
Two-Line V-Network	R&S	ENV 216	MRTTWA00020	1 year	2020/04/25
8-Wire ISN (T8)	R&S	ENY81	MRTTWA00018	1 year	2020/04/23
EMI Test Receiver	R&S	ESR3	MRTTWA00045	1 year	2020/05/29
Temperature/Humidity Meter	TFA	35.1078.10.IT	MRTTWA00033	1 year	2020/05/30

Radiated Emissions

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Acitve Loop Antenna	SCHWARZBECK	FMZB 1519B	MRTTWA00002	1 year	2020/04/29
Broadband TRILOG Antenna	SCHWARZBECK	VULB 9162	MRTTWA00001	1 year	2020/06/04
Broadband Horn antenna	SCHWARZBECK	BBHA 9120D	MRTTWA00003	1 year	2020/04/22
Breitband Horn antenna	SCHWARZBECK	BBHA 9170	MRTTWA00004	1 year	2020/04/23
Broadband Preamplifier	SCHWARZBECK	BBV 9718	MRTTWA00005	1 year	2020/04/24
Broadband Amplifier	SCHWARZBECK	BBV 9721	MRTTWA00006	1 year	2020/04/24
Signal Analyzer	R&S	FSV40	MRTTWA00007	1 year	2020/03/26
EMI Test Receiver	R&S	ESR3	MRTTWA00009	1 year	2020/03/25
EXA Signal Analyzer	KEYSIGHT	N9010A	MRTTWA00012	1 year	2019/10/30
Antenna Cable	HUBERSUHNER	SF106	MRTTWE00010	1 year	2020/04/22
Temperature/Humidity Meter	TFA	35.1078.10.IT	MRTTWA00032	1 year	2020/05/30

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	2020/04/22
Wideband Radio Communication Taster	R&S	CMW 500	MRTTWA00041	1 year	2020/01/28
EXA Signal Analyzer	KEYSIGHT	N9010A	MRTTWA00012	1 year	2019/10/30
EXA Signal Analyzer	KEYSIGHT	N9010B	MRTTWA00074	1 year	2020/07/11
Signal Analyzer	R&S	FSV40	MRTTWA00007	1 year	2020/03/26
Temperature/Humidity Meter	TFA	35.1078.10.IT	MRTTWA00033	1 year	2020/05/30

Software	Version	Function
e3	9.160520a	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
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

7. TEST RESULT

7.1. Summary

FCC Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(2)	6dB Bandwidth	≥ 500kHz	Conducted	Pass	Section 7.2
15.247(b)(3)	Output Power	≤ 30dBm		Pass	Section 7.3
15.247(e)	Power Spectral Density	≤ 8dBm/3kHz		Pass	Section 7.4
15.247(d)	Band Edge / Out-of-Band Emissions	≥ 20dBc (Peak)		Pass	Section 7.5
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 7.6 & 7.7
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	Pass	Section 7.8

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 ofthe 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.

7.2. 6dB Bandwidth Measurement

7.2.1.Test Limit

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

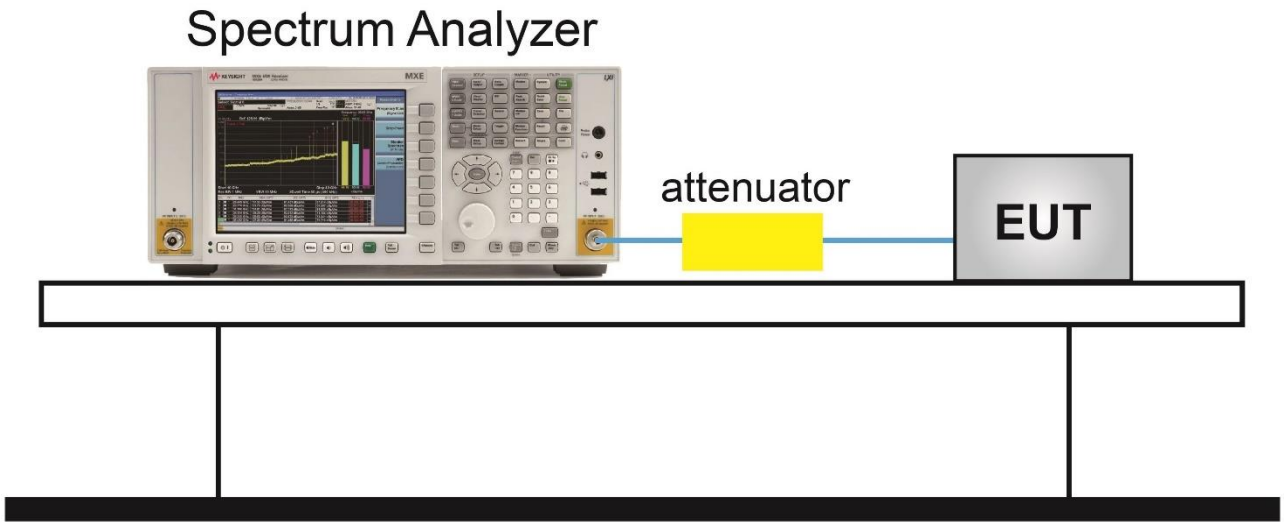
7.2.2.Test Procedure used

ANSI C63.10-2013 Section 11.8

7.2.3.Test Setting

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

7.2.4.Test Setup



7.2.5.Test Result

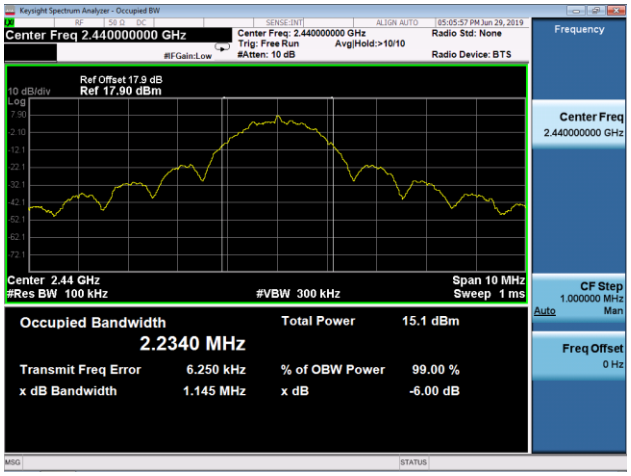
Product	ACCESS POINT	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	54%
Test Site	SR2	Test Date	2019/06/29
Model No.	APIN0504	Test Item	6dB Bandwidth

Test Mode	Modulation Mode	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
802.15.4	O-QPSK	11	2405	1.15	≥ 0.5	Pass
802.15.4	O-QPSK	18	2440	1.15	≥ 0.5	Pass
802.15.4	O-QPSK	26	2480	1.15	≥ 0.5	Pass

802.15.4 6dB Bandwidth

Channel 11 (2405MHz)

Channel 18 (2440MHz)



Channel 26 (2480MHz)

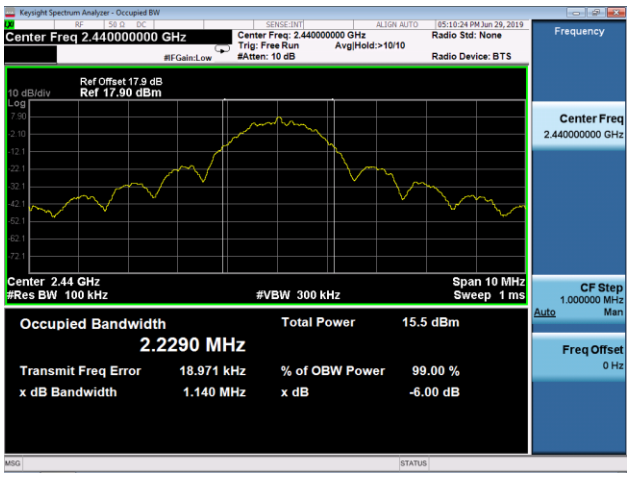
Product	ACCESS POINT	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	54%
Test Site	SR2	Test Date	2019/06/29
Model No.	APIN0505	Test Item	6dB Bandwidth

Test Mode	Modulation Mode	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
802.15.4	O-QPSK	11	2405	1.15	≥ 0.5	Pass
802.15.4	O-QPSK	18	2440	1.14	≥ 0.5	Pass
802.15.4	O-QPSK	26	2480	1.15	≥ 0.5	Pass

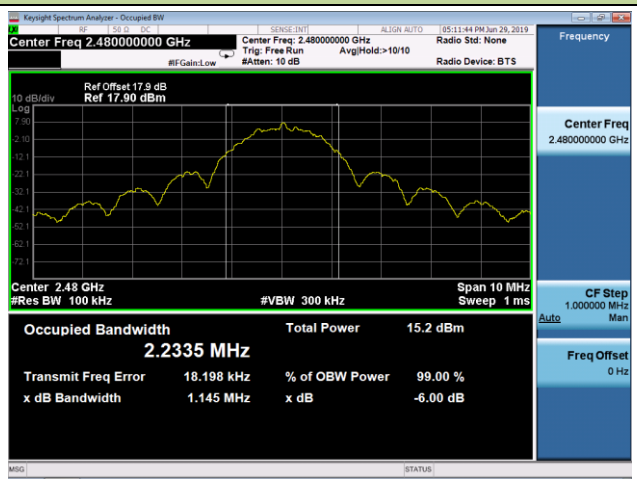
802.15.4 6dB Bandwidth

Channel 11 (2405MHz)

Channel 18 (2440MHz)



Channel 26 (2480MHz)



7.3. Output Power Measurement

7.3.1.Test Limit

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

The conducted output power limit specified in paragraph FCC Part 15.247(b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs FCC Part 15.247(b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

7.3.2.Test Procedure Used

ANSI C63.10 Section 11.9.1.3

ANSI C63.10 Section 11.9.2.3

7.3.3.Test Setting

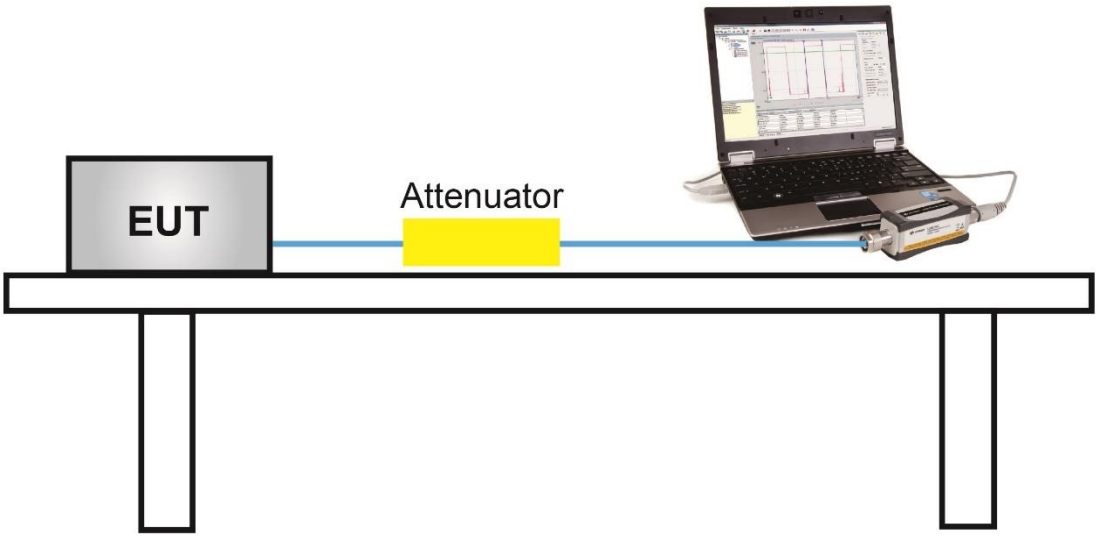
Method PKPM1 (Peak Power Measurement)

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.

Average Power Measurement

Average 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 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.

7.3.4.Test Setup



7.3.5.Test Result of Output Power

Product	ACCESS POINT	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	54%
Test Site	SR2	Test Date	2019/06/29
Model No.	APIN0504	Test Item	Output Power

Test Result of Peak Output Power

Test Mode	Modulation Mode	Channel No.	Freq. (MHz)	Peak Power (dBm)	Limit (dBm)	Result
802.15.4	O-QPSK	11	2405	7.83	≤ 30.00	Pass
802.15.4	O-QPSK	18	2440	7.68	≤ 30.00	Pass
802.15.4	O-QPSK	26	2480	7.21	≤ 30.00	Pass

Note: E.I.R.P (dBm) = Max Peak Power (dBm) + Antenna Gain (dBi) = 7.83 dBm + 3.30 dBi = 11.13 dBm.

Test Result of Average Output Power (Reporting Only)

Test Mode	Modulation Mode	Channel No.	Freq. (MHz)	Average Power (dBm)	Limit (dBm)	Result
802.15.4	O-QPSK	11	2405	7.56	≤ 30.00	Pass
802.15.4	O-QPSK	18	2440	7.47	≤ 30.00	Pass
802.15.4	O-QPSK	26	2480	6.97	≤ 30.00	Pass

Note: E.I.R.P (dBm) = Max Average Power (dBm) + Antenna Gain (dBi) = 7.56 dBm + 3.30 dBi = 10.86 dBm.

Product	ACCESS POINT	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	54%
Test Site	SR2	Test Date	2019/06/29
Model No.	APIN0505	Test Item	Output Power

Test Result of Peak Output Power

Test Mode	Modulation Mode	Channel No.	Freq. (MHz)	Peak Power (dBm)	Limit (dBm)	Result
802.15.4	O-QPSK	11	2405	8.07	≤ 30.00	Pass
802.15.4	O-QPSK	18	2440	8.03	≤ 30.00	Pass
802.15.4	O-QPSK	26	2480	7.77	≤ 30.00	Pass

Note: E.I.R.P (dBm) = Max Peak Power (dBm) + Antenna Gain (dBi) = 8.07 dBm + 3.30 dBi = 11.37 dBm.

Test Result of Average Output Power (Reporting Only)

Test Mode	Modulation Mode	Channel No.	Freq. (MHz)	Average Power (dBm)	Limit (dBm)	Result
802.15.4	O-QPSK	11	2405	7.88	≤ 30.00	Pass
802.15.4	O-QPSK	18	2440	7.81	≤ 30.00	Pass
802.15.4	O-QPSK	26	2480	7.54	≤ 30.00	Pass

Note: E.I.R.P (dBm) = Max Average Power (dBm) + Antenna Gain (dBi) = 7.88 dBm + 3.30 dBi = 11.18 dBm.

7.4. Power Spectral Density Measurement

7.4.1.Test Limit

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

The same method of determining the conducted output power shall be used to determine the power spectral density.

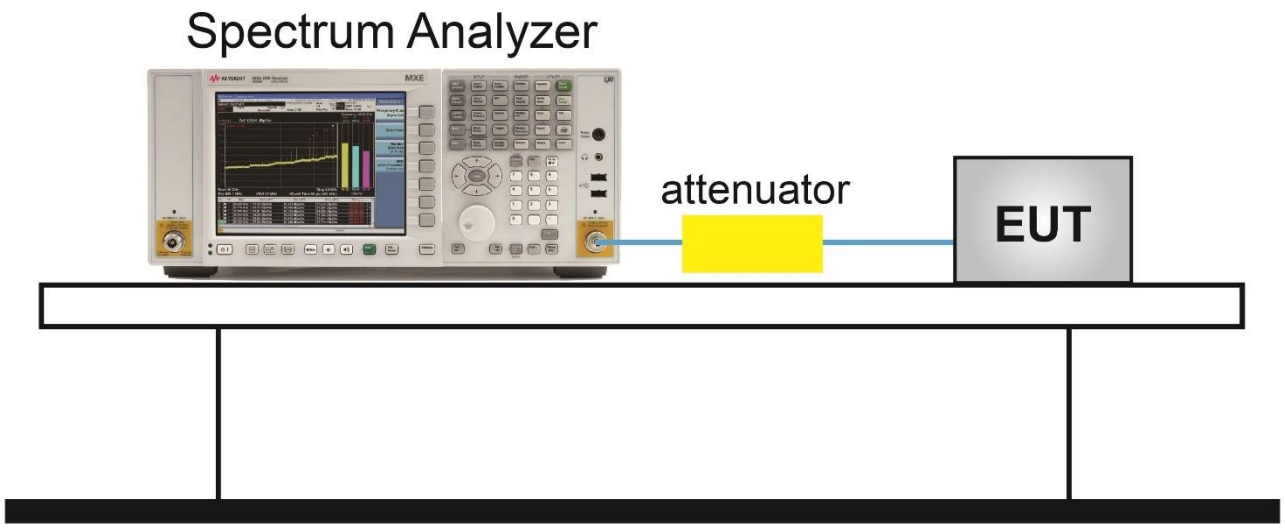
7.4.2.Test Procedure Used

ANSI C63.10 Section 11.10.2

7.4.3.Test Setting

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

7.4.4.Test Setup



7.4.5.Test Result

Product	ACCESS POINT	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	54%
Test Site	SR2	Test Date	2019/06/29
Model No.	APIN0504	Test Item	Power Spectral Density

Test Mode	Modulation Mode	Channel No.	Frequency (MHz)	PK PSD (dBm / 3kHz)	Limit (dBm / 3kHz)	Result
802.15.4	O-QPSK	11	2405	-4.06	≤ 8.00	Pass
802.15.4	O-QPSK	18	2440	-4.27	≤ 8.00	Pass
802.15.4	O-QPSK	26	2480	-4.68	≤ 8.00	Pass

802.15.4 Power Density

Channel 11 (2405MHz)

Channel 18 (2440MHz)

Channel 26 (2480MHz)

Product	ACCESS POINT	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	54%
Test Site	SR2	Test Date	2019/06/29
Model No.	APIN0505	Test Item	Power Spectral Density

Test Mode	Modulation Mode	Channel No.	Frequency (MHz)	PK PSD (dBm / 3kHz)	Limit (dBm / 3kHz)	Result
802.15.4	O-QPSK	11	2405	-3.82	≤ 8.00	Pass
802.15.4	O-QPSK	18	2440	-3.66	≤ 8.00	Pass
802.15.4	O-QPSK	26	2480	-4.01	≤ 8.00	Pass

802.15.4 Power Density

Channel 11 (2405MHz)

Channel 18 (2440MHz)

Channel 26 (2480MHz)

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

7.5.1.Test Limit

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

7.5.2.Test Procedure Used

ANSI C63.10 Section 11.11

7.5.3.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. Start frequency was set to 30MHz and stop frequency was set to 25GHz (separated into two plots per channel)
2. RBW = 1.3MHz
3. VBW = 4MHz
4. Detector = Peak
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

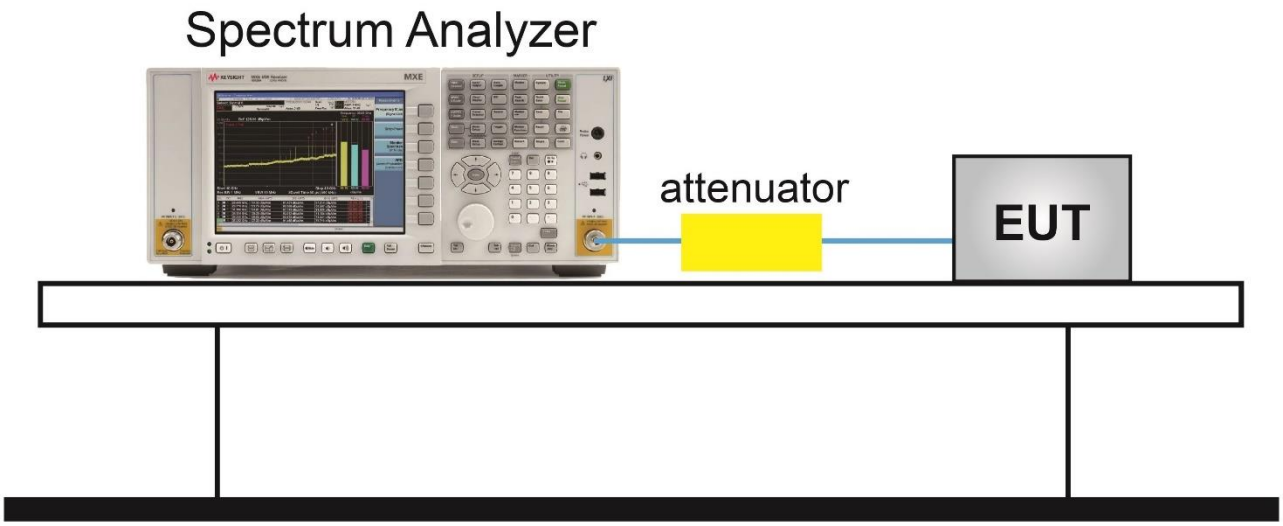
Test Notes

1. RBW was set to 1.3MHz rather than 100kHz in order to increase the measurement speed.

2. The display line shown in the following plots denotes the limit at 20dB below the fundamental emission level measured in a 100kHz bandwidth. However, since the traces in the following plots are measured with a 1.3MHz RBW, the display line may not necessarily appear to be 20dB below the level of the fundamental in a 1.3MHz bandwidth.

3. For plots showing conducted spurious emissions near the limit, the frequencies were investigated with a reduced RBW to ensure that no emissions were present.

7.5.4.Test Setup



7.5.5.Test Result

Product	ACCESS POINT	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	54%
Test Site	SR2	Test Date	2019/06/29
Model No.	APIN0504	Test Item	Conducted Band Edge and Out-of-Band Emissions

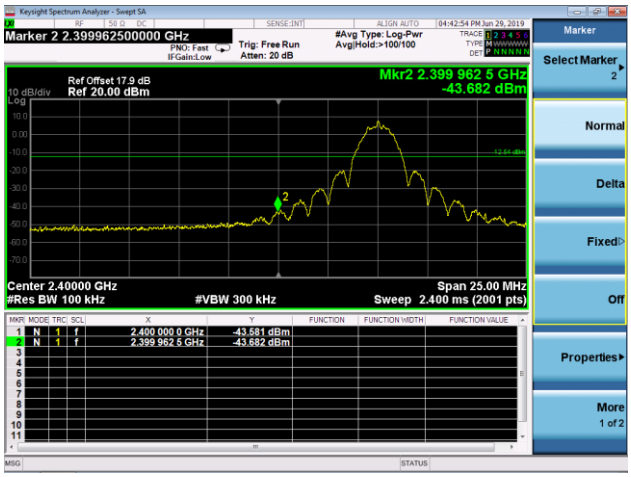
Test Mode	Data Rate / MCS	Channel No.	Frequency (MHz)	Limit	Result
802.15.4	O-QPSK	11	2405	20dBc	Pass
802.15.4	O-QPSK	18	2440	20dBc	Pass
802.15.4	O-QPSK	26	2480	20dBc	Pass

802.15.4 Out-of-Band Emissions - APIN0504

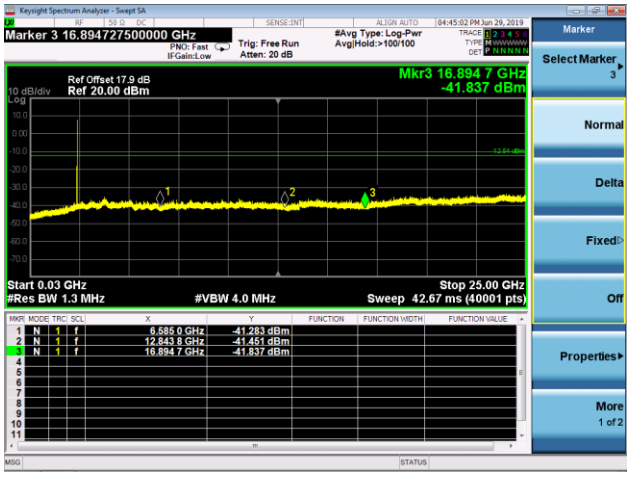
Channel 11 (2405MHz)

100kHz PSD Reference Level

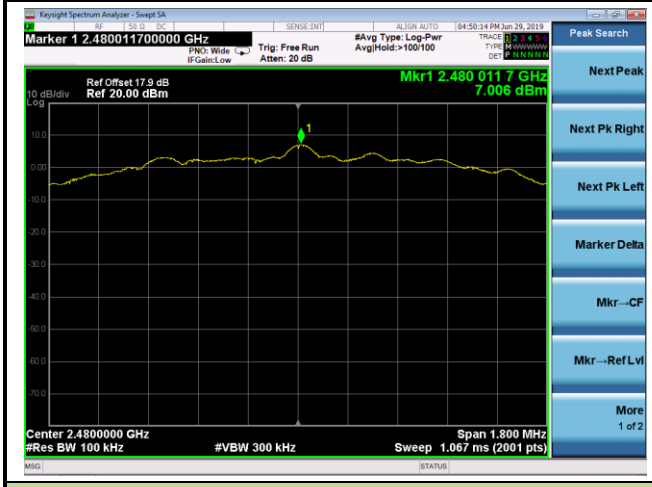
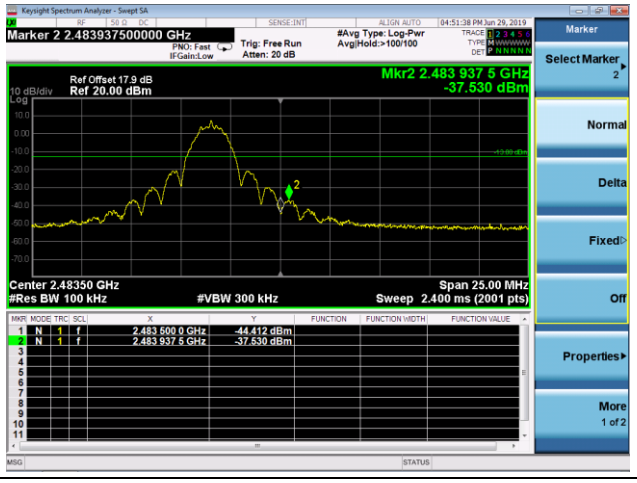
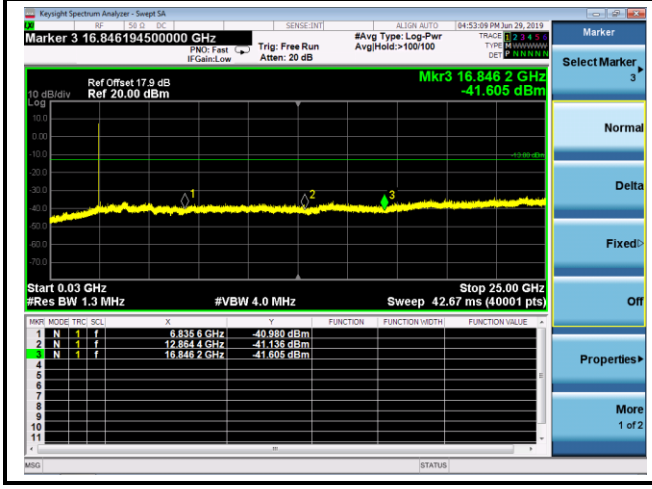
Low Band Edge



Spurious Emission



Note: The Value of the Display Line is -12.54dBm

Channel 18 (2440MHz)	
100kHz PSD Reference Level	Spurious Emission
	
Note: The Value of the Display Line is -12.62dBm	
Channel 26 (2480MHz)	
100kHz PSD Reference Level	High Band Edge
	
Spurious Emission	
	Note: The Value of the Display Line is -13.00dBm

Product	ACCESS POINT	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	54%
Test Site	SR2	Test Date	2019/06/29
Model No.	APIN0505	Test Item	Conducted Band Edge and Out-of-Band Emissions

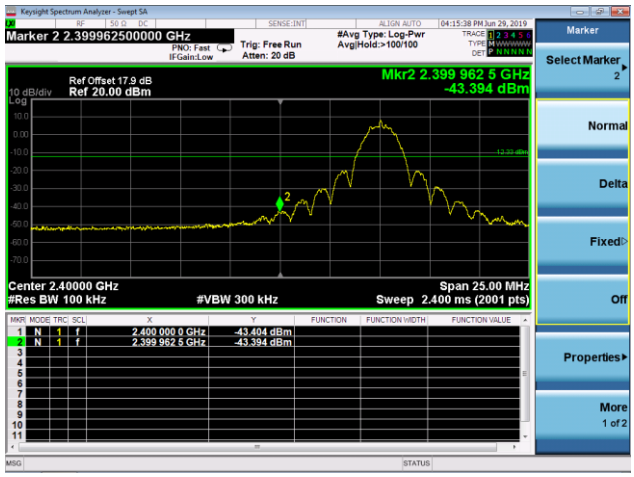
Test Mode	Data Rate / MCS	Channel No.	Frequency (MHz)	Limit	Result
802.15.4	O-QPSK	11	2405	20dBc	Pass
802.15.4	O-QPSK	18	2440	20dBc	Pass
802.15.4	O-QPSK	26	2480	20dBc	Pass

802.15.4 Out-of-Band Emissions - APIN0505

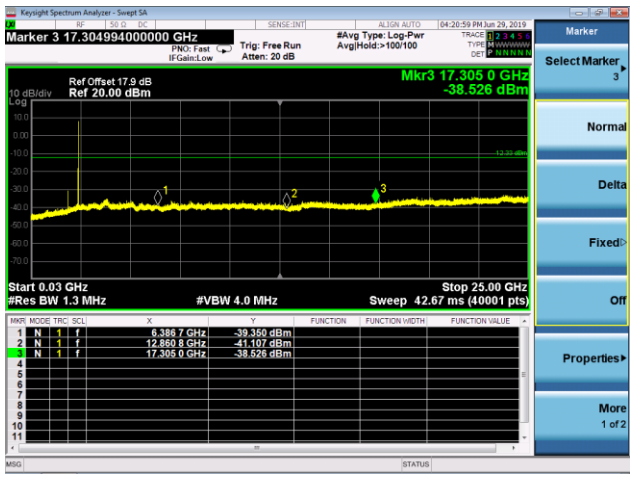
Channel 11 (2405MHz)

100kHz PSD Reference Level

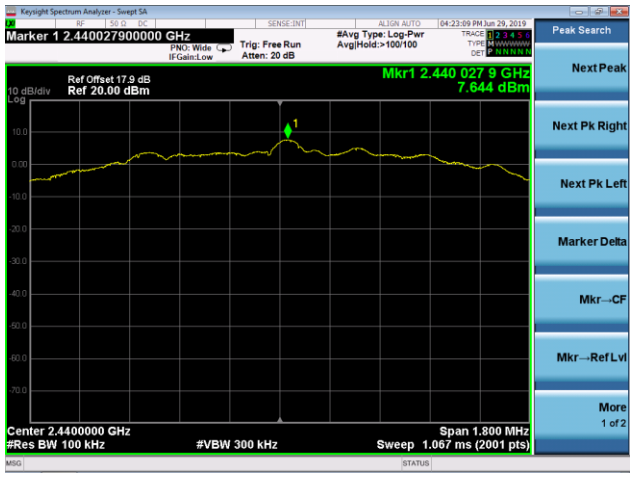
Low Band Edge

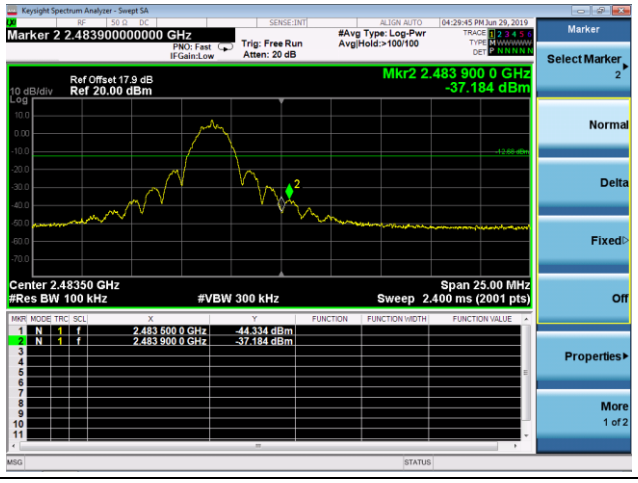
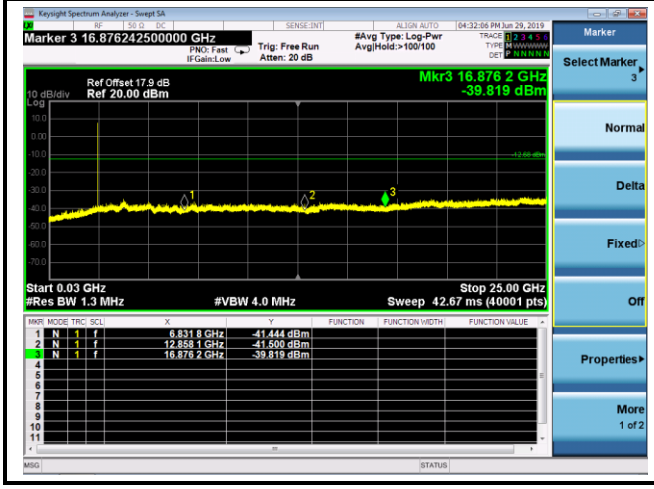


Spurious Emission



Note: The Value of the Display Line is -12.33dBm

Channel 18 (2440MHz)	
100kHz PSD Reference Level	Spurious Emission
	
Note: The Value of the Display Line is -12.36dBm	

Channel 26 (2480MHz)	
100kHz PSD Reference Level	High Band Edge
	
Spurious Emission	
	Note: The Value of the Display Line is -12.68dBm

7.6. Radiated Spurious Emission Measurement

7.6.1.Test Limit

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

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

7.6.2.Test Procedure Used

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)

7.6.3.Test Setting

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

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 = as specified in Table 1

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

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest

2. RBW = 1MHz

3. VBW; If the EUT is configured to transmit with duty cycle ≥ 98%, set VBW = 10 Hz.

If the EUT duty cycle is < 98%, set VBW ≥ 1/T. T is the minimum transmission duration.

4. Detector = Peak

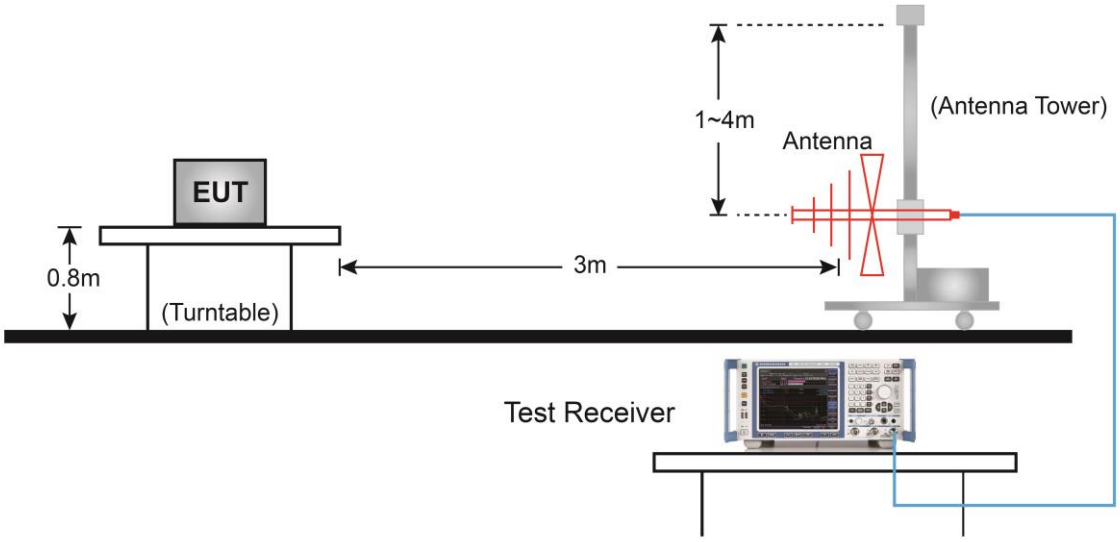
5. Sweep time = auto

6. Trace mode = max hold

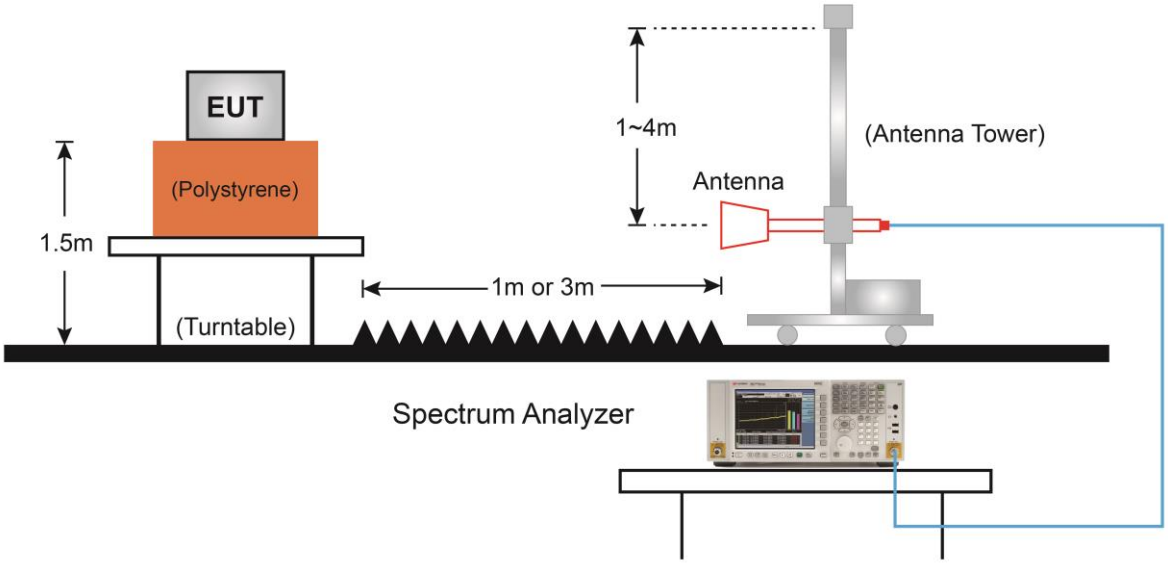
7. Trace was allowed to stabilize

7.6.4.Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



Note: This item was performed with the ZigBee antenna connected.

7.6.5.Test Result

Product	ACCESS POINT	Temperature	26°C
Test Engineer	Kevin Ker	Relative Humidity	56%
Test Site	AC1	Test Date	2019/07/13
Model No.	APIN0504	Test Channel	11
Remark	1. Average measurement was not performed if peak level lower than average limit. So the margin was calculated using the average limit for emissions fall within the restricted bands. 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
*	6244.5	37.3	7.3	44.6	81.9	-37.3	Peak	Horizontal
*	7009.5	36.0	11.3	47.3	81.9	-34.6	Peak	Horizontal
	7468.5	34.5	12.6	47.1	54.0	-6.9	Peak	Horizontal
	8199.5	35.7	13.0	48.7	54.0	-5.3	Peak	Horizontal
*	6023.5	37.7	6.2	43.9	81.9	-38.0	Peak	Vertical
*	6346.5	36.7	7.8	44.5	81.9	-37.4	Peak	Vertical
	7596.0	35.9	12.8	48.7	54.0	-5.3	Peak	Vertical
	8259.0	35.3	13.0	48.3	54.0	-5.7	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (101.9dBμV/m) or 15.209 which is higher.

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

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

Product	ACCESS POINT	Temperature	26°C
Test Engineer	Kevin Ker	Relative Humidity	56%
Test Site	AC1	Test Date	2019/07/13
Model No.	APIN0504	Test Channel	18
Remark	1. Average measurement was not performed if peak level lower than average limit. So the margin was calculated using the average limit for emissions fall within the restricted bands. 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
*	6057.5	36.5	6.4	42.9	81.9	-39.0	Peak	Horizontal
*	6610.0	36.2	9.1	45.3	81.9	-36.6	Peak	Horizontal
	7400.5	34.4	12.4	46.8	54.0	-7.2	Peak	Horizontal
	8250.5	34.9	13.0	47.9	54.0	-6.1	Peak	Horizontal
*	5777.0	37.0	5.2	42.2	81.9	-39.7	Peak	Vertical
*	6542.0	36.8	8.7	45.5	81.9	-36.4	Peak	Vertical
	7647.0	34.7	12.8	47.5	54.0	-6.5	Peak	Vertical
	8208.0	35.2	13.0	48.2	54.0	-5.8	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (101.9dBμV/m) or 15.209 which is higher.

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

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

Product	ACCESS POINT	Temperature	26°C
Test Engineer	Kevin Ker	Relative Humidity	56%
Test Site	AC1	Test Date	2019/07/13
Model No.	APIN0504	Test Channel	26
Remark	1. Average measurement was not performed if peak level lower than average limit. So the margin was calculated using the average limit for emissions fall within the restricted bands. 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
*	5743.0	38.2	5.1	43.3	81.2	-37.9	Peak	Horizontal
*	6508.0	37.6	8.5	46.1	81.2	-35.1	Peak	Horizontal
	7511.0	35.5	12.7	48.2	54.0	-5.8	Peak	Horizontal
	8165.5	35.9	13.0	48.9	54.0	-5.1	Peak	Horizontal
*	5828.0	38.2	5.4	43.6	81.2	-37.6	Peak	Vertical
*	6576.0	37.1	8.9	46.0	81.2	-35.2	Peak	Vertical
	7528.0	36.0	12.7	48.7	54.0	-5.3	Peak	Vertical
	8369.5	35.6	13.1	48.7	54.0	-5.3	Peak	Vertical

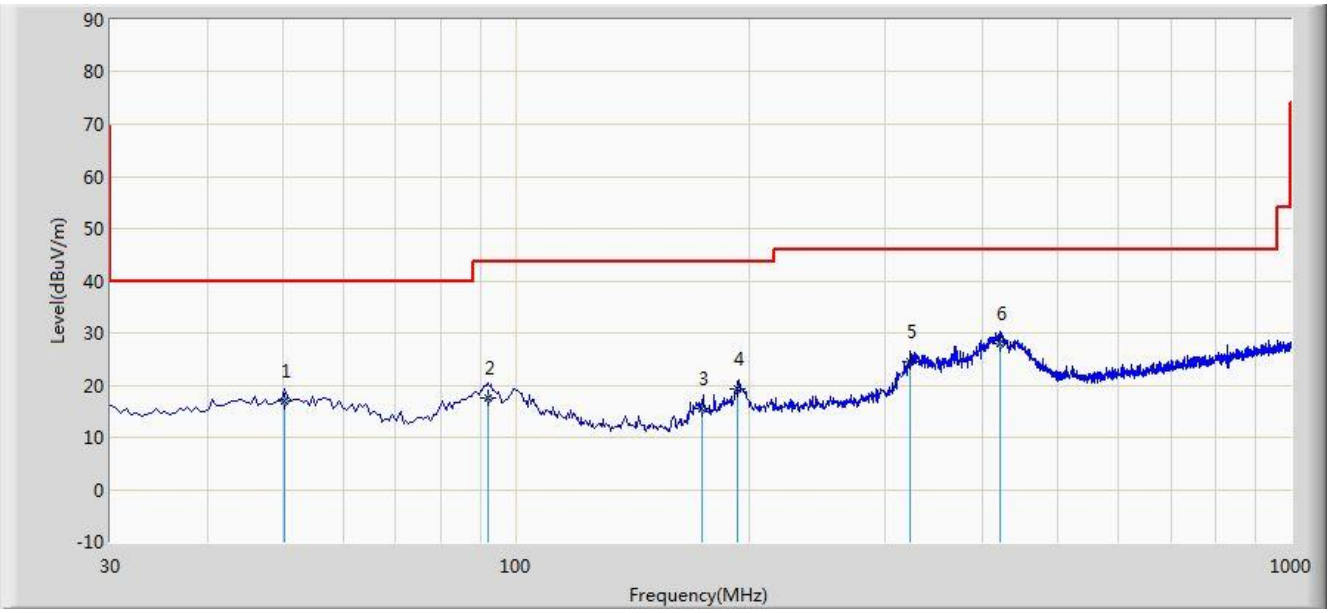
Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (101.2dBμV/m) or 15.209 which is higher.

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

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

The Worst Case of Radiated Emission below 1GHz:

Site: AC1	Time: 2019/07/13 - 12:24
Limit: FCC_Part15.209_RSE(3m)	Engineer: Kevin Ker
Probe: VULB9162_0.03GHz_8GHz	Polarity: Horizontal
EUT: ACCESS POINT	Power: AC 120V/60Hz
Test Mode: There is the worst case within frequency range 30MHz~1GHz.	



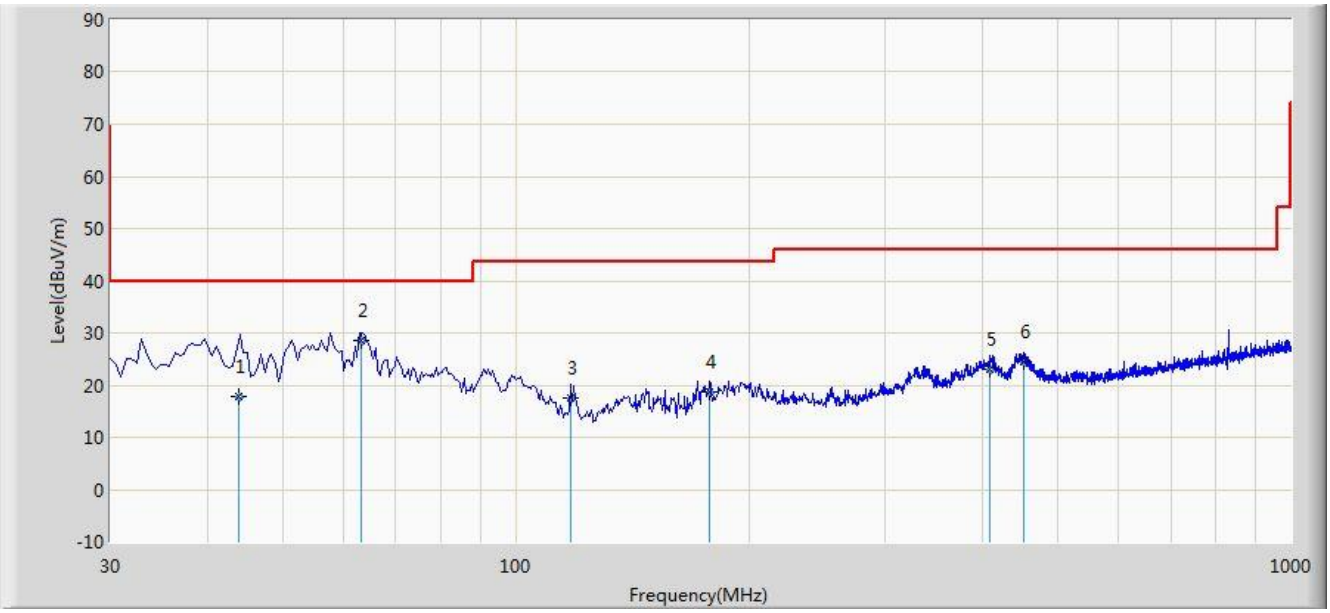
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			50.350	17.095	-4.683	-22.905	40.000	21.778	QP
2			92.000	17.629	0.206	-25.871	43.500	17.423	QP
3			174.150	15.430	-1.240	-28.070	43.500	16.669	QP
4			193.590	19.294	0.487	-24.206	43.500	18.807	QP
5		*	323.156	24.389	2.095	-21.611	46.000	22.294	QP
6			420.980	27.978	3.796	-18.022	46.000	24.182	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. Besides, there is a comparison data of both open-field test site and alternative test site semi-Anechoic chamber according to KDB 414788 D01 radiated test site v01r01, this comparison result was very similar.

Site: AC1	Time: 2019/07/13 - 12:25
Limit: FCC_Part15.209_RSE(3m)	Engineer: Kevin Ker
Probe: VULB9162_0.03GHz_8GHz	Polarity: Vertical
EUT: ACCESS POINT	Power: AC 120V/60Hz
Test Mode: There is the worst case within frequency range 30MHz~1GHz.	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	44.000	17.793	-3.720	-22.207	40.000	21.513	QP
2			63.150	28.529	9.816	-11.471	40.000	18.714	QP
3			117.720	17.632	-0.602	-25.868	43.500	18.234	QP
4			177.598	18.717	1.864	-24.783	43.500	16.853	QP
5			409.598	23.068	-0.993	-22.932	46.000	24.062	QP
6			451.598	24.615	0.076	-21.385	46.000	24.539	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. Besides, there is a comparison data of both open-field test site and alternative test site semi-Anechoic chamber according to KDB 414788 D01 radiated test site v01r01, this comparison result was very similar.

Product	ACCESS POINT	Temperature	26°C
Test Engineer	Kevin Ker	Relative Humidity	56%
Test Site	AC1	Test Date	2019/07/13
Model No.	APIN0505	Test Channel	11
Remark	1. Average measurement was not performed if peak level lower than average limit. So the margin was calculated using the average limit for emissions fall within the restricted bands. 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
*	5777.0	37.2	5.2	42.4	80.3	-37.9	Peak	Horizontal
*	6627.0	35.2	9.2	44.4	80.3	-35.9	Peak	Horizontal
	7536.5	33.7	12.7	46.4	54.0	-7.6	Peak	Horizontal
	8216.5	34.3	13.0	47.3	54.0	-6.7	Peak	Horizontal
*	5989.5	37.7	6.0	43.7	80.3	-36.6	Peak	Vertical
*	6491.0	35.6	8.5	44.1	80.3	-36.2	Peak	Vertical
	7511.0	34.4	12.7	47.1	54.0	-6.9	Peak	Vertical
	8250.5	35.5	13.0	48.5	54.0	-5.5	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (100.3dBμV/m) or 15.209 which is higher.

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

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

Product	ACCESS POINT	Temperature	26°C
Test Engineer	Kevin Ker	Relative Humidity	56%
Test Site	AC1	Test Date	2019/07/13
Model No.	APIN0505	Test Channel	18
Remark	1. Average measurement was not performed if peak level lower than average limit. So the margin was calculated using the average limit for emissions fall within the restricted bands. 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
*	6066.0	36.6	6.4	43.0	80.5	-37.5	Peak	Horizontal
*	7103.0	33.7	11.6	45.3	80.5	-35.2	Peak	Horizontal
	7434.5	33.7	12.5	46.2	54.0	-7.8	Peak	Horizontal
	8318.5	33.3	13.1	46.4	54.0	-7.6	Peak	Horizontal
*	5989.5	37.5	6.0	43.5	80.5	-37.0	Peak	Vertical
*	6338.0	36.9	7.7	44.6	80.5	-35.9	Peak	Vertical
	7451.5	35.1	12.6	47.7	54.0	-6.3	Peak	Vertical
	8259.0	34.9	13.0	47.9	54.0	-6.1	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (100.5dBμV/m) or 15.209 which is higher.

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

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

Product	ACCESS POINT	Temperature	26°C
Test Engineer	Kevin Ker	Relative Humidity	56%
Test Site	AC1	Test Date	2019/07/13
Model No.	APIN0505	Test Channel	26
Remark	1. Average measurement was not performed if peak level lower than average limit. So the margin was calculated using the average limit for emissions fall within the restricted bands. 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
*	5734.5	36.6	5.1	41.7	80.6	-38.9	Peak	Horizontal
*	6244.5	35.7	7.3	43.0	80.6	-37.6	Peak	Horizontal
	7417.5	34.5	12.5	47.0	54.0	-7.0	Peak	Horizontal
	8199.5	34.5	13.0	47.5	54.0	-6.5	Peak	Horizontal
*	5802.5	37.8	5.3	43.1	80.6	-37.5	Peak	Vertical
*	6576.0	36.7	8.9	45.6	80.6	-35.0	Peak	Vertical
	7519.5	34.9	12.7	47.6	54.0	-6.4	Peak	Vertical
	8276.0	33.7	13.1	46.8	54.0	-7.2	Peak	Vertical

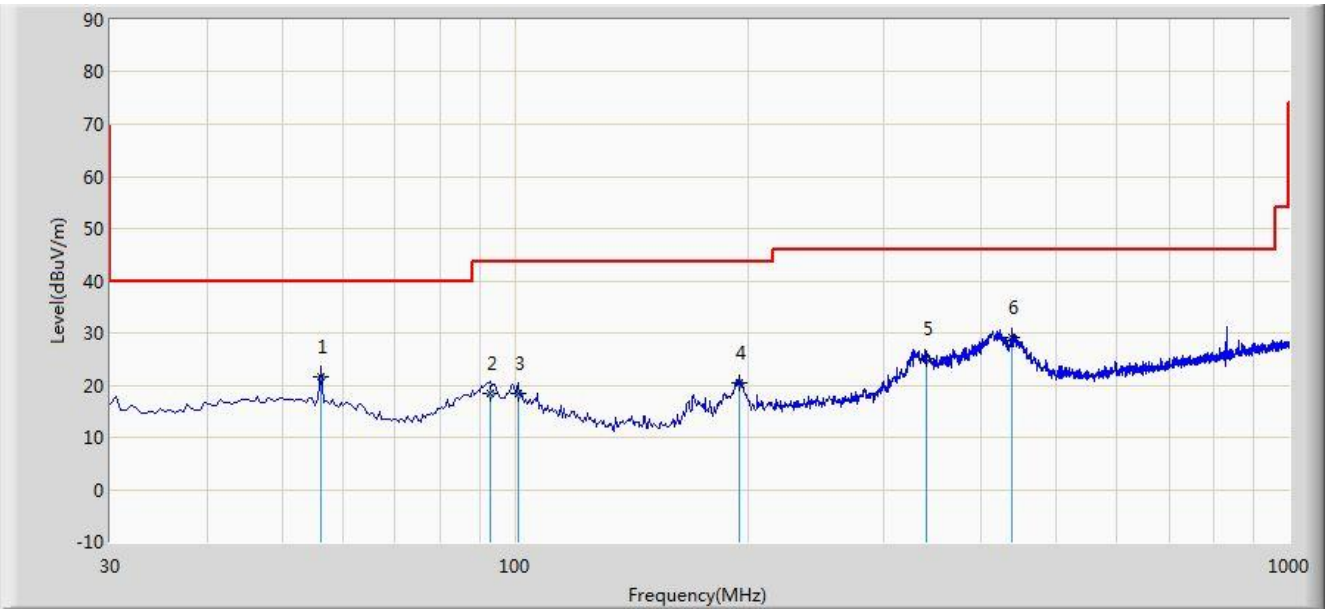
Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (100.6dBμV/m) or 15.209 which is higher.

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

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

The Worst Case of Radiated Emission below 1GHz:

Site: AC1	Time: 2019/07/13 - 12:31
Limit: FCC_Part15.209_RSE(3m)	Engineer: Kevin Ker
Probe: VULB9162_0.03GHz_8GHz	Polarity: Horizontal
EUT: ACCESS POINT	Power: AC 120V/60Hz
Test Mode: There is the worst case within frequency range 30MHz~1GHz.	



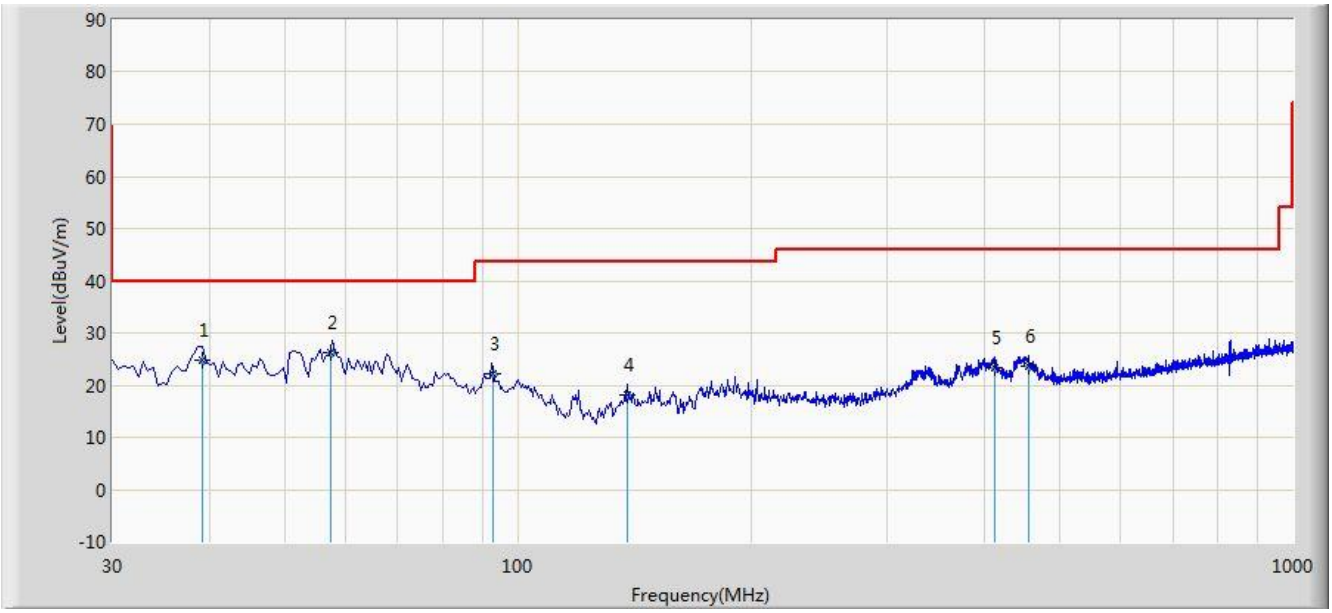
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	56.060	21.478	0.682	-18.522	40.000	20.796	QP
2			93.000	18.348	0.710	-25.152	43.500	17.639	QP
3			100.810	18.443	-0.715	-25.057	43.500	19.158	QP
4			195.359	20.504	1.603	-22.996	43.500	18.902	QP
5			339.490	24.971	2.047	-21.029	46.000	22.923	QP
6			438.120	29.060	4.696	-16.940	46.000	24.364	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. Besides, there is a comparison data of both open-field test site and alternative test site semi-Anechoic chamber according to KDB 414788 D01 radiated test site v01r01, this comparison result was very similar.

Site: AC1	Time: 2019/07/13 - 12:31
Limit: FCC_Part15.209_RSE(3m)	Engineer: Kevin Ker
Probe: VULB9162_0.03GHz_8GHz	Polarity: Vertical
EUT: ACCESS POINT	Power: AC 120V/60Hz
Test Mode: There is the worst case within frequency range 30MHz~1GHz.	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	39.258	24.920	4.433	-15.080	40.000	20.487	QP
2			57.310	26.270	5.691	-13.730	40.000	20.579	QP
3			92.970	22.130	4.498	-21.370	43.500	17.632	QP
4			138.640	17.986	2.253	-25.514	43.500	15.733	QP
5			412.050	23.385	-0.702	-22.615	46.000	24.087	QP
6			456.890	23.689	-1.012	-22.311	46.000	24.701	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. Besides, there is a comparison data of both open-field test site and alternative test site semi-Anechoic chamber according to KDB 414788 D01 radiated test site v01r01, this comparison result was very similar.

7.7. Radiated Restricted Band Edge Measurement

7.7.1.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	8.25 - 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	--	--	--

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

7.7.2.Test Procedure Used

ANSI C63.10 Section 6.3 (General Requirements)

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

7.7.3.Test Setting

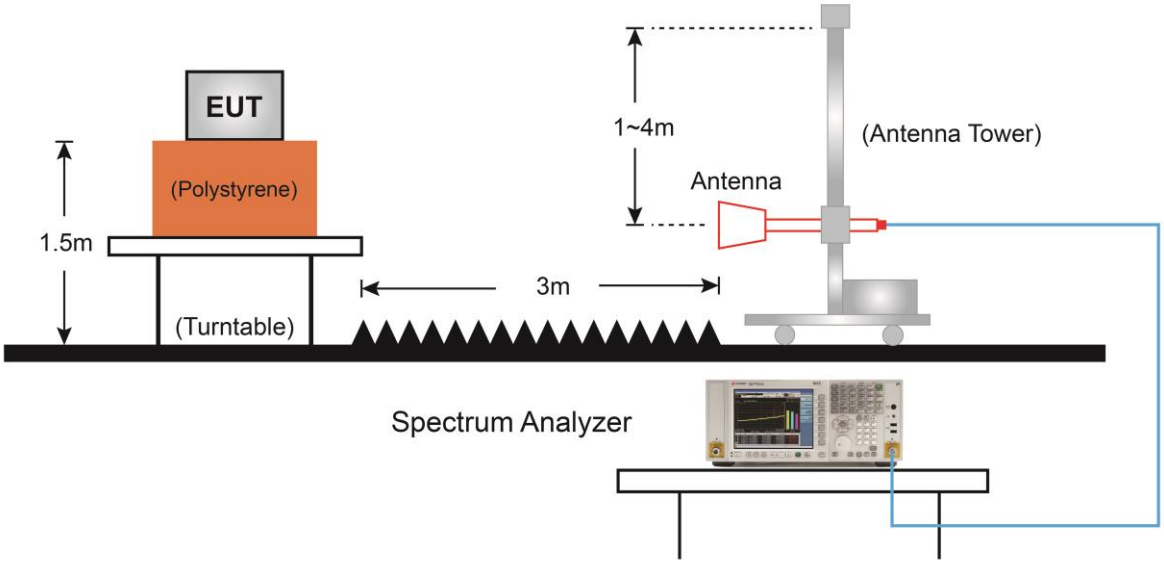
Peak Field Strength Measurements

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 Measurements above 1GHz (Method VB)

Using the peak field strength minus duty cycle factor.

7.7.4.Test Setup

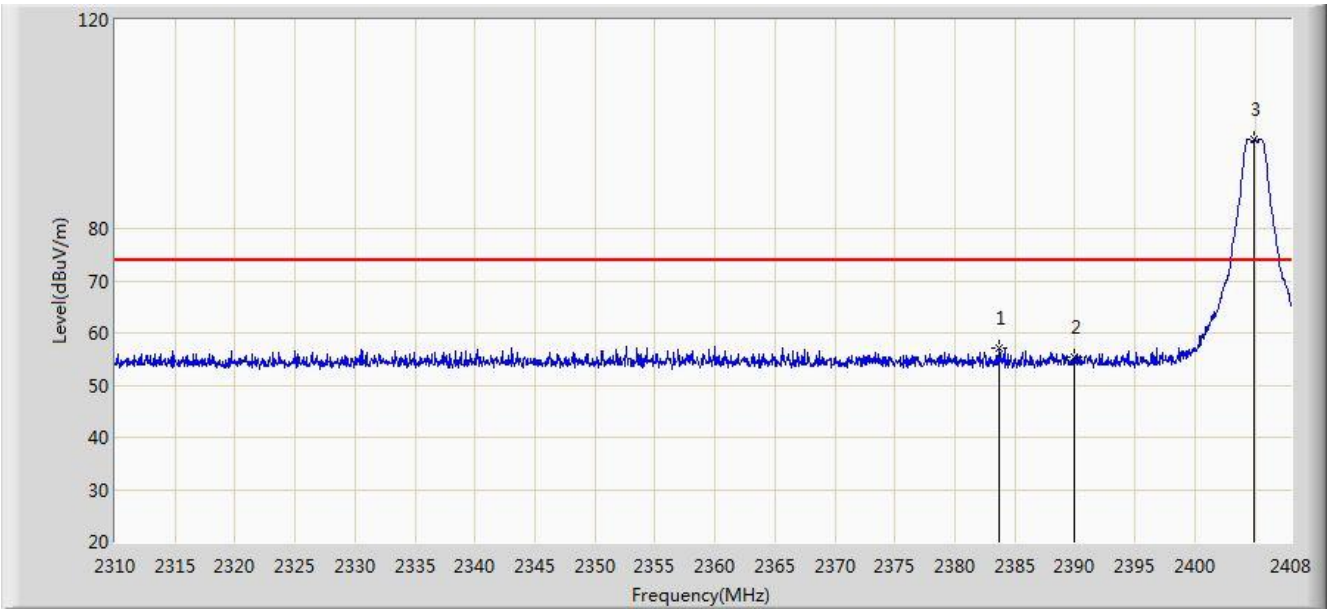


Note: This item was performed with the ZigBee antenna connected.

7.7.5.Test Result

For APIN0504

Site: AC1	Time: 2019/07/12 - 20:56
Limit: FCC_Part15.209_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: ACCESS POINT	Power: AC 120V/60Hz
Test Mode: Transmit by ZigBee at channel 2405MHz	

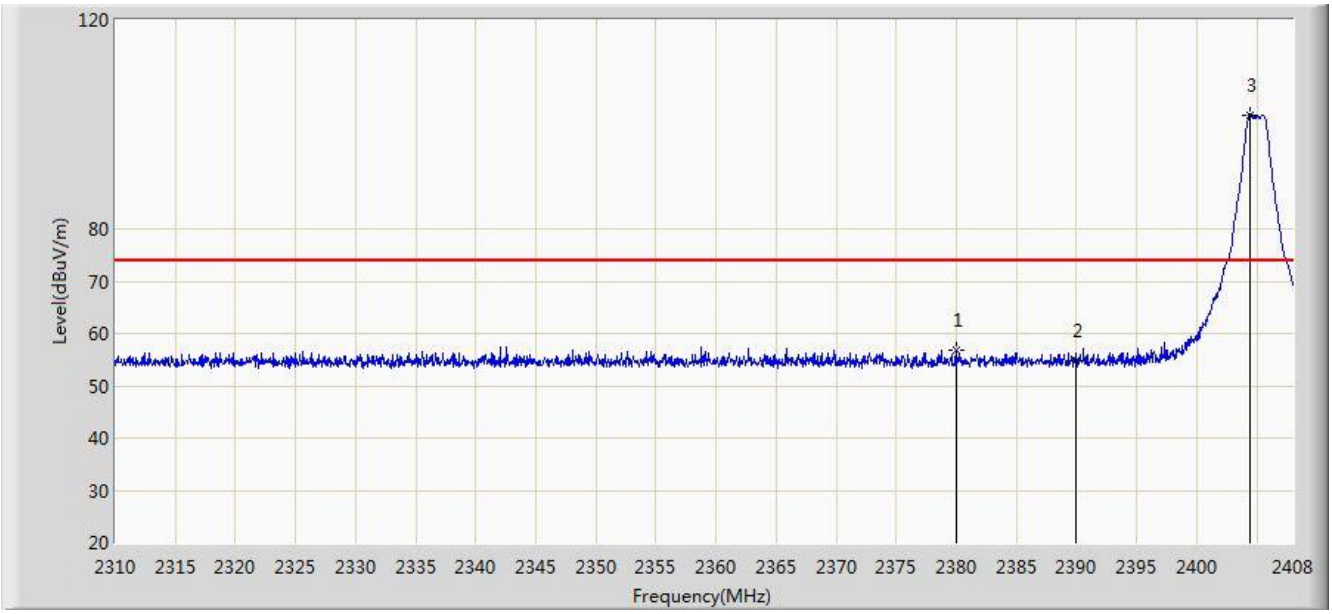


No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Duty Cycle Factor (dB)	Factor (dB)	Type
1	2383.745	57.061	24.569	-16.939	74.000	N/A	32.491	PK
	2383.745	37.061	24.569	-16.939	54.000	-20.000	32.491	AV
2	2390.000	55.274	22.756	-18.726	74.000	N/A	32.518	PK
	2390.000	35.274	22.756	-18.726	54.000	-20.000	32.518	AV
3	2404.962	97.183	64.602	N/A	N/A	N/A	32.581	PK
	2404.962	77.183	64.602	N/A	N/A	-20.000	32.581	AV

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

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

Site: AC1	Time: 2019/07/12 - 20:59
Limit: FCC_Part15.209_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: ACCESS POINT	Power: AC 120V/60Hz
Test Mode: Transmit by ZigBee at channel 2405MHz	

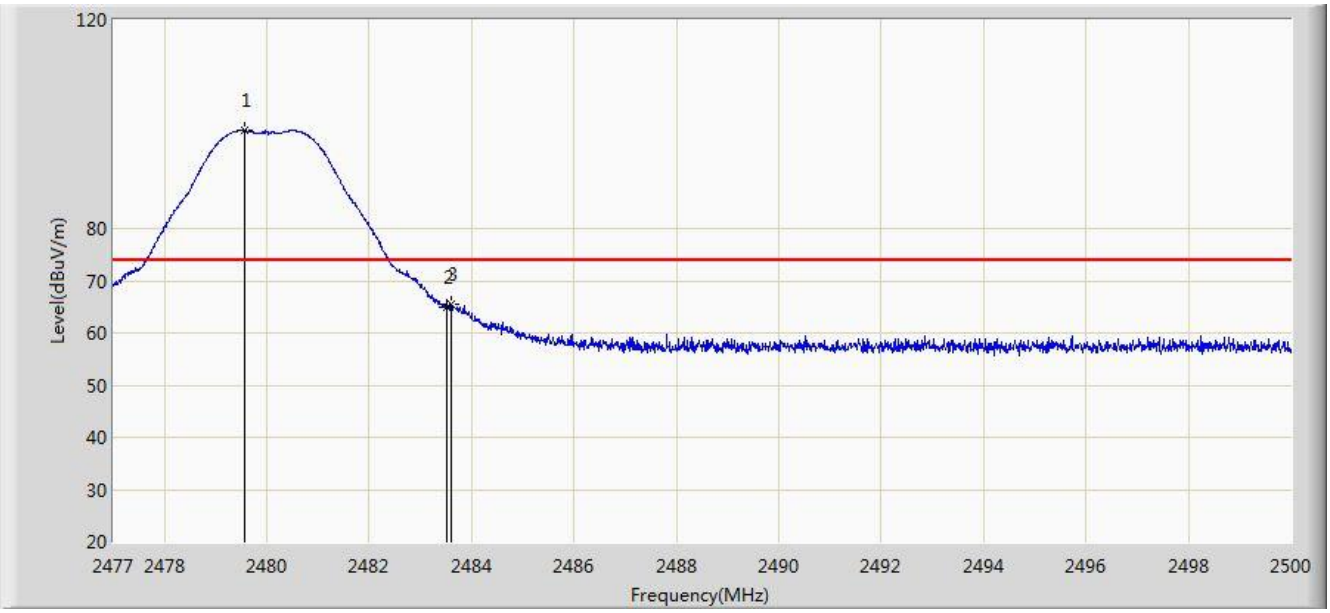


No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Duty Cycle Factor (dB)	Factor (dB)	Type
1	2379.972	56.852	24.376	-17.148	74.000	N/A	32.476	PK
	2379.972	36.852	24.376	-17.148	54.000	-20.000	32.476	AV
2	2390.000	54.817	22.299	-19.183	74.000	N/A	32.518	PK
	2390.000	34.817	22.299	-19.183	54.000	-20.000	32.518	AV
3	2404.423	101.865	69.287	N/A	N/A	N/A	32.578	PK
	2404.962	81.865	69.287	N/A	N/A	-20.000	32.578	AV

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

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

Site: AC1	Time: 2019/07/13 - 06:25
Limit: FCC_Part15.209_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: ACCESS POINT	Power: AC 120V/60Hz
Test Mode: Transmit by ZigBee at channel 2480MHz	

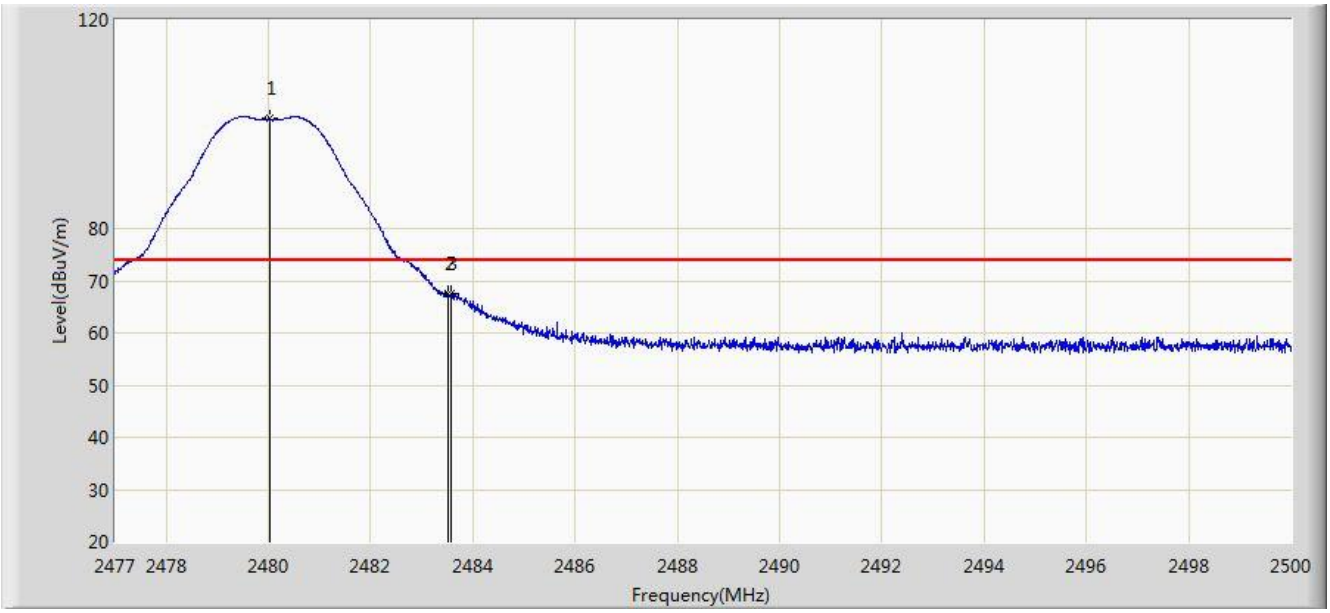


No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Duty Cycle Factor (dB)	Factor (dB)	Type
1	2479.564	98.756	65.862	N/A	N/A	N/A	32.895	PK
	2479.564	78.756	65.862	N/A	N/A	-20.000	32.895	AV
2	2483.500	64.993	32.082	-9.007	74.000	N/A	32.911	PK
	2483.500	44.993	32.082	-9.007	54.000	-20.000	32.911	AV
3	2483.601	65.558	32.647	-8.442	74.000	N/A	32.912	PK
	2483.601	45.558	32.647	-8.442	54.000	-20.000	32.912	AV

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

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

Site: AC1	Time: 2019/07/13 - 06:25
Limit: FCC_Part15.209_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: ACCESS POINT	Power: AC 120V/60Hz
Test Mode: Transmit by ZigBee at channel 2480MHz	



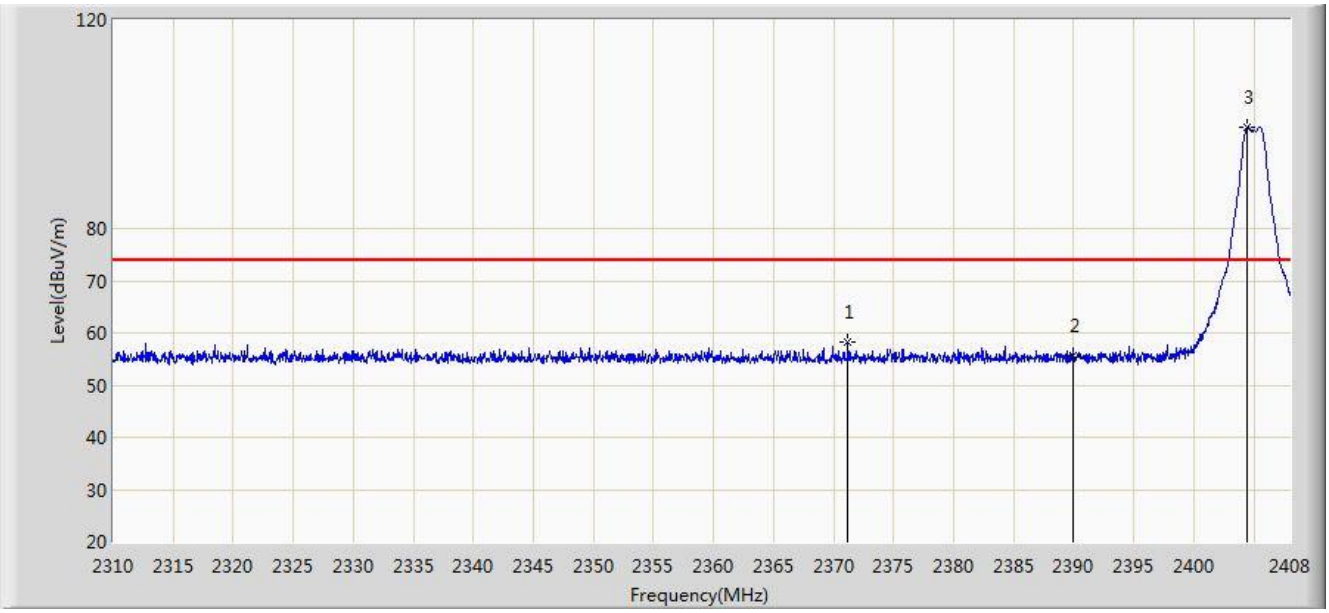
No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Duty Cycle Factor (dB)	Factor (dB)	Type
1	2480.036	101.232	68.336	N/A	N/A	N/A	32.896	PK
	2480.036	81.232	68.336	N/A	N/A	-20.000	32.896	AV
2	2483.500	67.462	34.551	-6.538	74.000	N/A	32.911	PK
	2483.500	47.462	34.551	-6.538	54.000	-20.000	32.911	AV
3	2483.578	67.564	34.653	-6.436	74.000	N/A	32.911	PK
	2483.578	47.564	34.653	-6.436	54.000	-20.000	32.911	AV

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

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

For APIN0505

Site: AC1	Time: 2019/07/12 - 20:12
Limit: FCC_Part15.209_RE(3m)	Engineer: Kevin Ker
Probe: BBHA 9120D_1-18GHz	Polarity: Horizontal
EUT: ACCESS POINT	Power: AC 120V/60Hz
Test Mode: Transmit by ZigBee at channel 2405MHz	

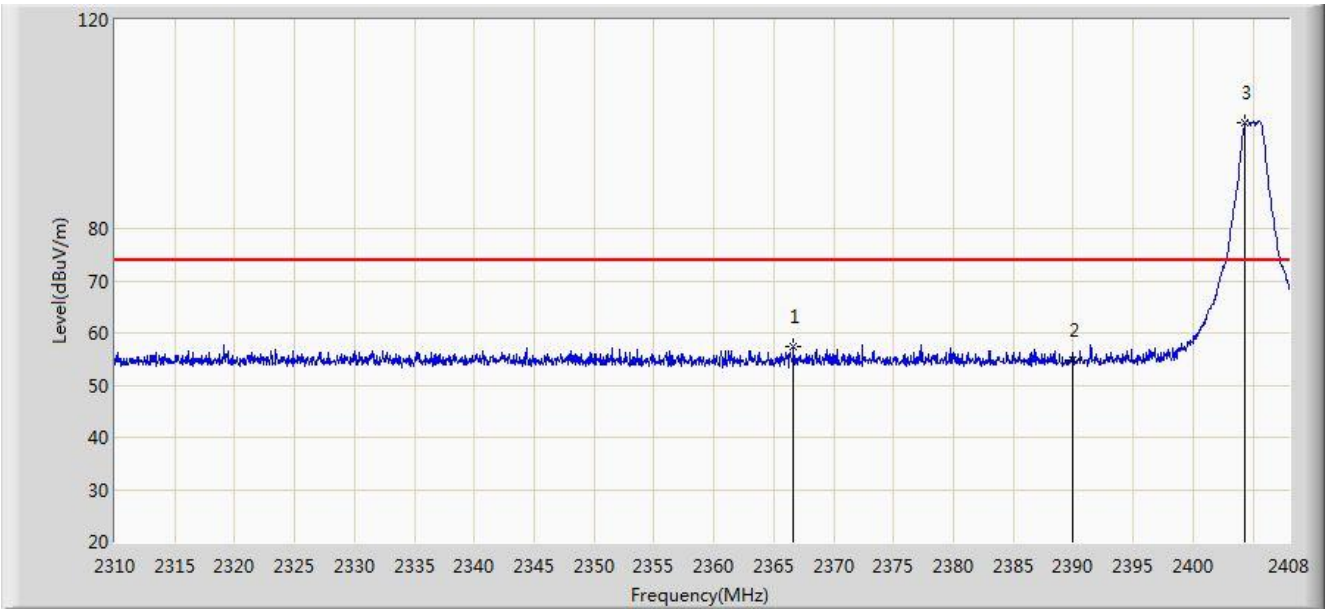


No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Duty Cycle Factor (dB)	Factor (dB)	Type
1	2371.152	58.197	25.758	-15.803	74.000	N/A	32.438	PK
	2371.152	38.197	25.758	-15.803	54.000	-20.000	32.438	AV
2	2390.000	55.557	23.039	-18.443	74.000	N/A	32.518	PK
	2390.000	35.557	23.039	-18.443	54.000	-20.000	32.518	AV
3	2404.472	99.434	66.855	N/A	N/A	N/A	32.578	PK
	2404.472	79.434	66.855	N/A	N/A	-20.000	32.578	AV

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

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

Site: AC1	Time: 2019/07/12 - 19:58
Limit: FCC_Part15.209_RE(3m)	Engineer: Kevin Ker
Probe: BBHA 9120D_1-18GHz	Polarity: Vertical
EUT: ACCESS POINT	Power: AC 120V/60Hz
Test Mode: Transmit by ZigBee at channel 2405MHz	

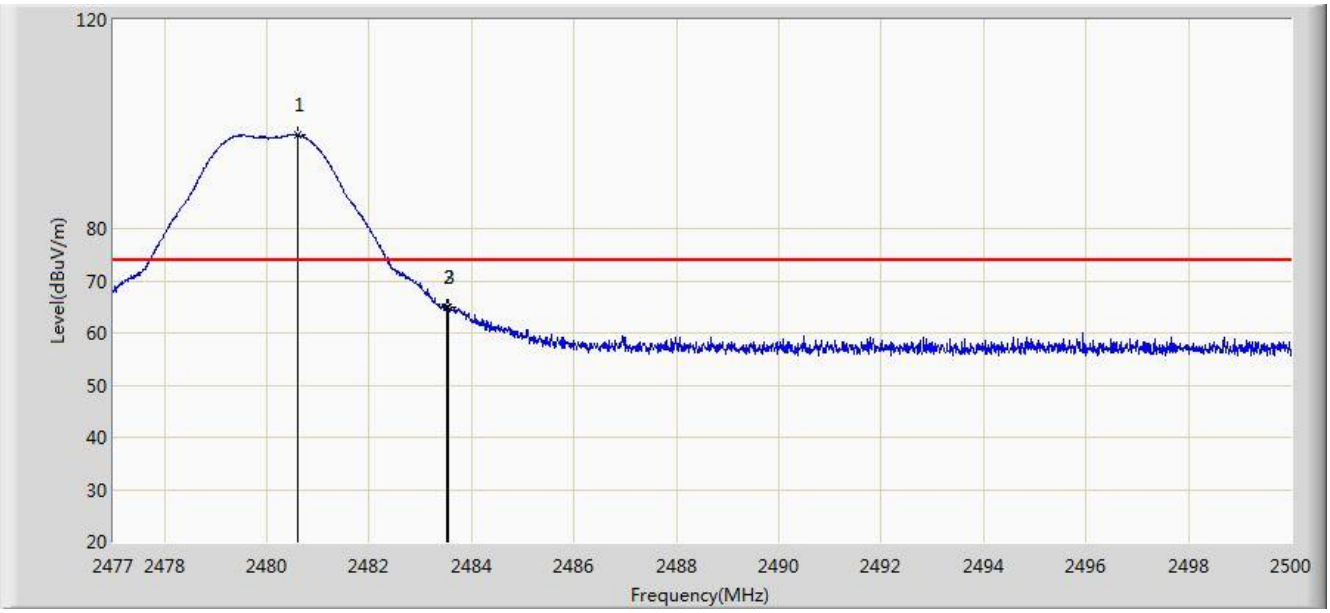


No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Duty Cycle Factor (dB)	Factor (dB)	Type
1	2366.644	57.523	25.103	-16.477	74.000	N/A	32.420	PK
	2366.644	37.523	25.103	-16.477	54.000	-20.000	32.420	AV
2	2390.000	54.677	22.159	-19.323	74.000	N/A	32.518	PK
	2390.000	34.677	22.159	-19.323	54.000	-20.000	32.518	AV
3	2404.374	100.340	67.762	N/A	N/A	N/A	32.578	PK
	2404.374	80.340	67.762	N/A	N/A	-20.000	32.578	AV

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

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

Site: AC1	Time: 2019/07/13 - 02:02
Limit: FCC_Part15.209_RE(3m)	Engineer: Kevin Ker
Probe: BBHA 9120D_1-18GHz	Polarity: Horizontal
EUT: ACCESS POINT	Power: AC 120V/60Hz
Test Mode: Transmit by ZigBee at channel 2480MHz	

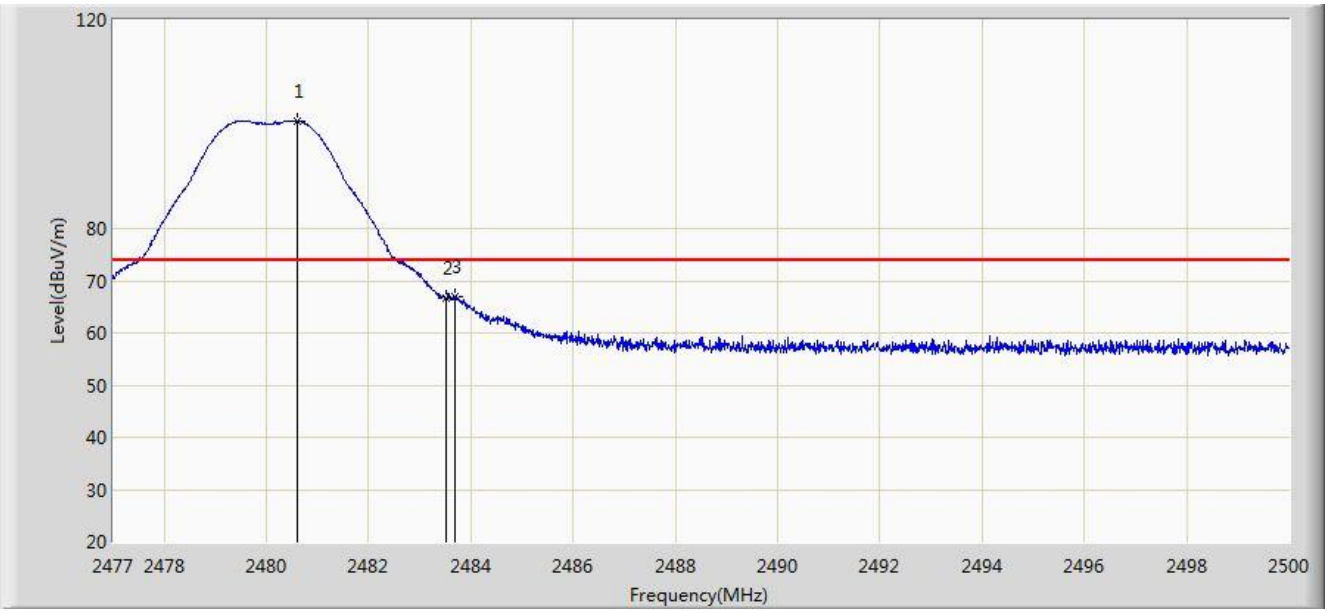


No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Duty Cycle Factor (dB)	Factor (dB)	Type
1	2480.600	97.873	64.974	N/A	N/A	N/A	32.899	PK
	2480.600	77.873	64.974	N/A	N/A	-20.000	32.899	AV
2	2483.500	64.794	31.883	-9.206	74.000	N/A	32.911	PK
	2483.500	44.794	31.883	-9.206	54.000	-20.000	32.911	AV
3	2483.543	65.017	32.106	-8.983	74.000	N/A	32.911	PK
	2483.543	45.017	32.106	-8.983	54.000	-20.000	32.911	AV

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

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

Site: AC1	Time: 2019/07/13 - 01:54
Limit: FCC_Part15.209_RE(3m)	Engineer: Kevin Ker
Probe: BBHA 9120D_1-18GHz	Polarity: Vertical
EUT: ACCESS POINT	Power: AC 120V/60Hz
Test Mode: Transmit by ZigBee at channel 2480MHz	



No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Duty Cycle Factor (dB)	Factor (dB)	Type
1	2480.600	100.599	67.700	N/A	N/A	N/A	32.899	PK
	2480.600	80.599	67.700	N/A	N/A	-20.000	32.899	AV
2	2483.500	66.737	33.826	-7.263	74.000	N/A	32.911	PK
	2483.500	46.737	33.826	-7.263	54.000	-20.000	32.911	AV
3	2483.681	67.072	34.160	-6.928	74.000	N/A	32.912	PK
	2483.681	47.072	34.160	-6.928	54.000	-20.000	32.912	AV

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

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

7.8. AC Conducted Emissions Measurement

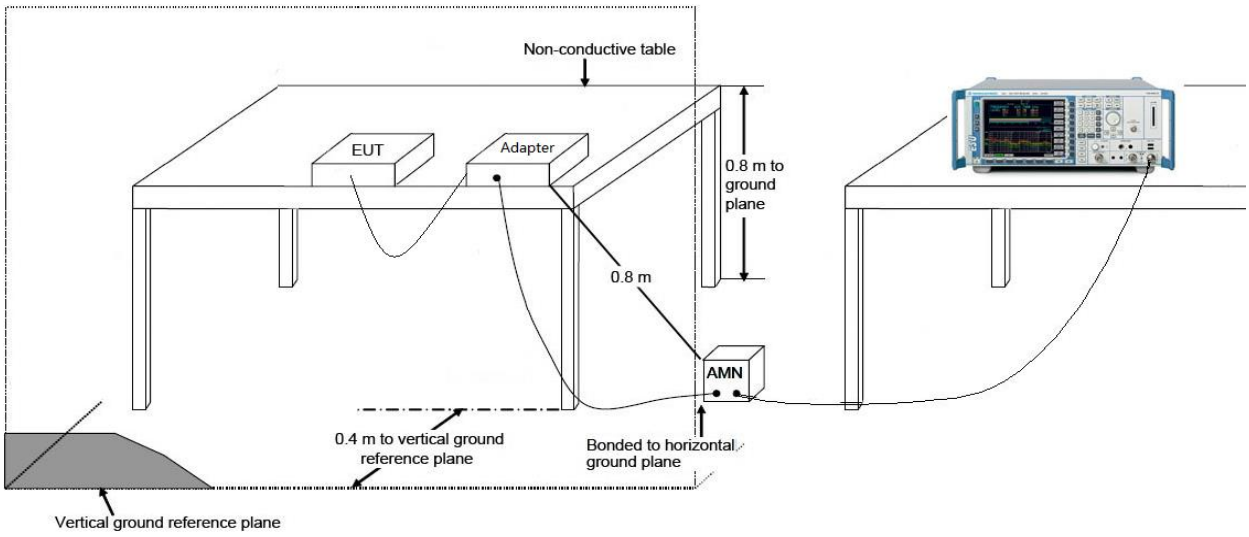
7.8.1.Test Limit

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.

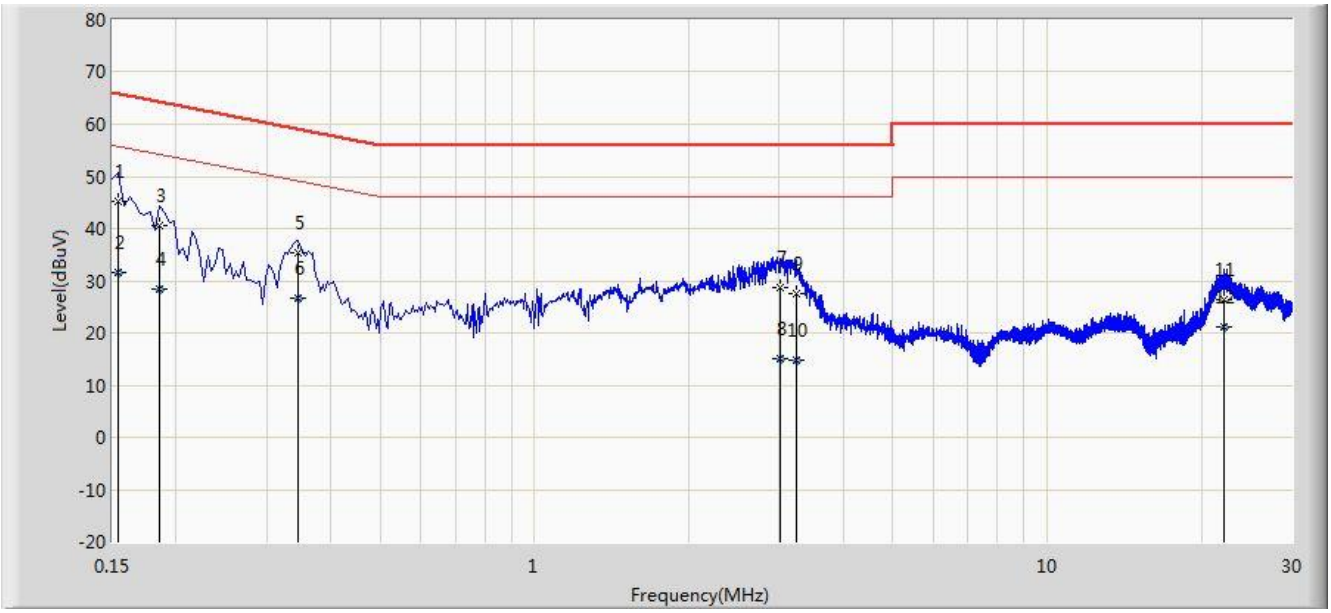
7.8.2.Test Setup



7.8.3.Test Result

For APIN0504

Site: SR2	Time: 2019/07/10 - 11:07
Limit: FCC_Part15.207_CE_AC Power	Engineer: Kevin Ker
Probe: ENV216_101683_Filter On	Polarity: Line
EUT: ACCESS POINT	Power: AC 120V/60Hz
Test Mode 1	

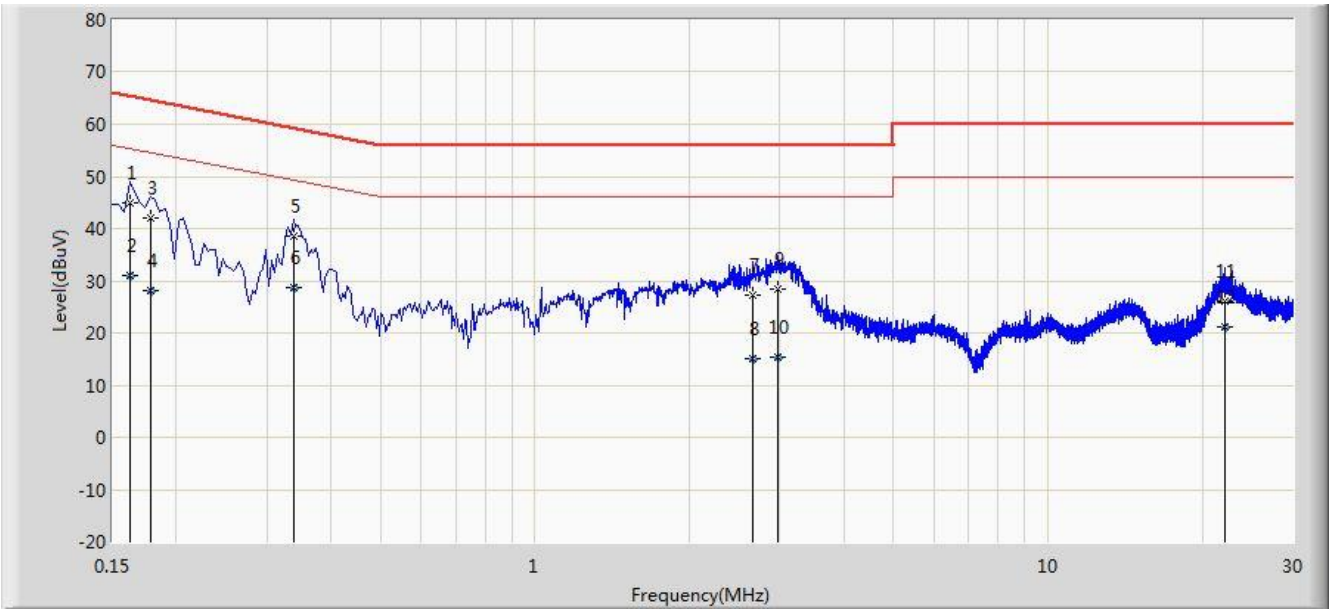


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV)	Factor (dB)	Type
1		*	0.154	45.355	34.616	-20.426	65.781	10.740	QP
2			0.154	31.649	20.909	-24.133	55.781	10.740	AV
3			0.186	40.590	30.552	-23.623	64.213	10.039	QP
4			0.186	28.484	18.445	-25.729	54.213	10.039	AV
5			0.346	35.220	25.178	-23.838	59.058	10.041	QP
6			0.346	26.677	16.636	-22.381	49.058	10.041	AV
7			3.010	28.573	18.709	-27.427	56.000	9.864	QP
8			3.010	14.936	5.072	-31.064	46.000	9.864	AV
9			3.238	27.542	17.666	-28.458	56.000	9.876	QP
10			3.238	14.640	4.764	-31.360	46.000	9.876	AV
11			22.186	26.284	16.121	-33.716	60.000	10.163	QP
12			22.186	21.026	10.863	-28.974	50.000	10.163	AV

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

Factor (dB) = Cable Loss (dB) + LISN Factor (dB)

Site: SR2	Time: 2019/07/10 - 11:16
Limit: FCC_Part15.207_CE_AC Power	Engineer: Kevin Ker
Probe: ENV216_101683_Filter On	Polarity: Neutral
EUT: ACCESS POINT	Power: AC 120V/60Hz
Test Mode 1	



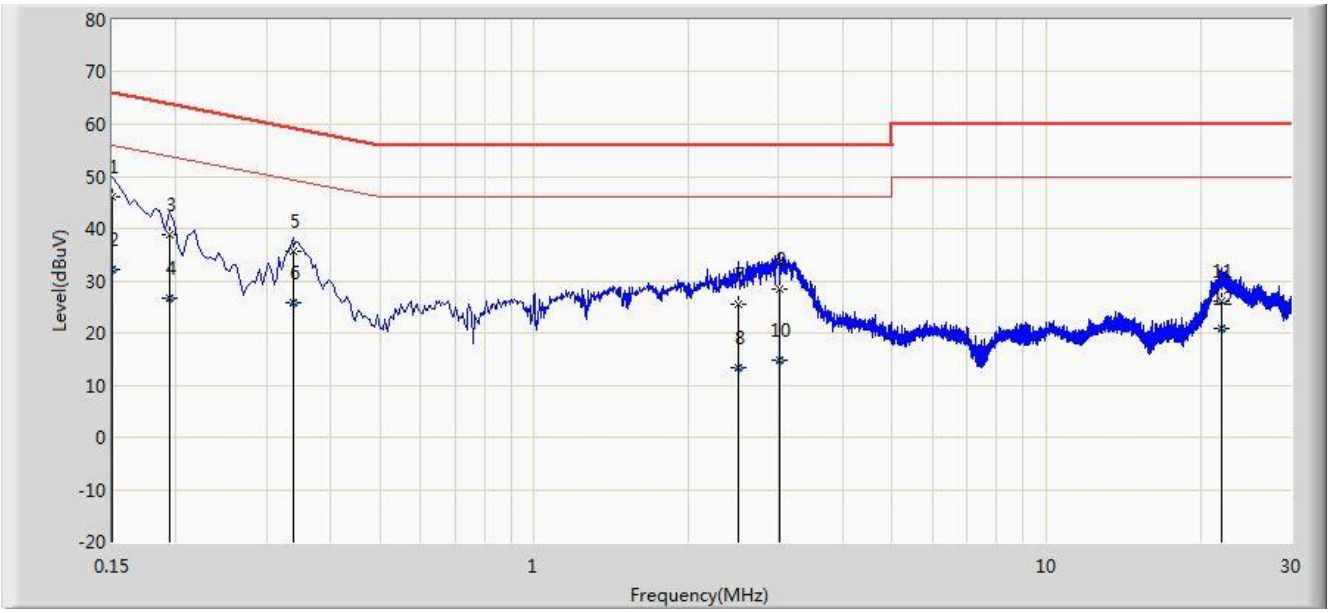
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV)	Factor (dB)	Type
1		*	0.162	44.893	34.814	-20.468	65.361	10.078	QP
2			0.162	31.124	21.046	-24.236	55.361	10.078	AV
3			0.178	42.145	32.096	-22.433	64.578	10.049	QP
4			0.178	28.199	18.149	-26.380	54.578	10.049	AV
5			0.338	38.458	28.392	-20.795	59.252	10.066	QP
6			0.338	28.780	18.715	-20.472	49.252	10.066	AV
7			2.654	27.252	17.396	-28.748	56.000	9.856	QP
8			2.654	15.061	5.205	-30.939	46.000	9.856	AV
9			2.982	28.500	18.635	-27.500	56.000	9.866	QP
10			2.982	15.435	5.569	-30.565	46.000	9.866	AV
11			22.174	26.209	15.990	-33.791	60.000	10.219	QP
12			22.174	21.138	10.919	-28.862	50.000	10.219	AV

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

Factor (dB) = Cable Loss (dB) + LISN Factor (dB)

For APIN0505

Site: SR2	Time: 2019/07/10 - 11:21
Limit: FCC_Part15.207_CE_AC Power	Engineer: Kevin Ker
Probe: ENV216_101683_Filter On	Polarity: Line
EUT: ACCESS POINT	Power: AC 120V/60Hz
Test Mode 1	

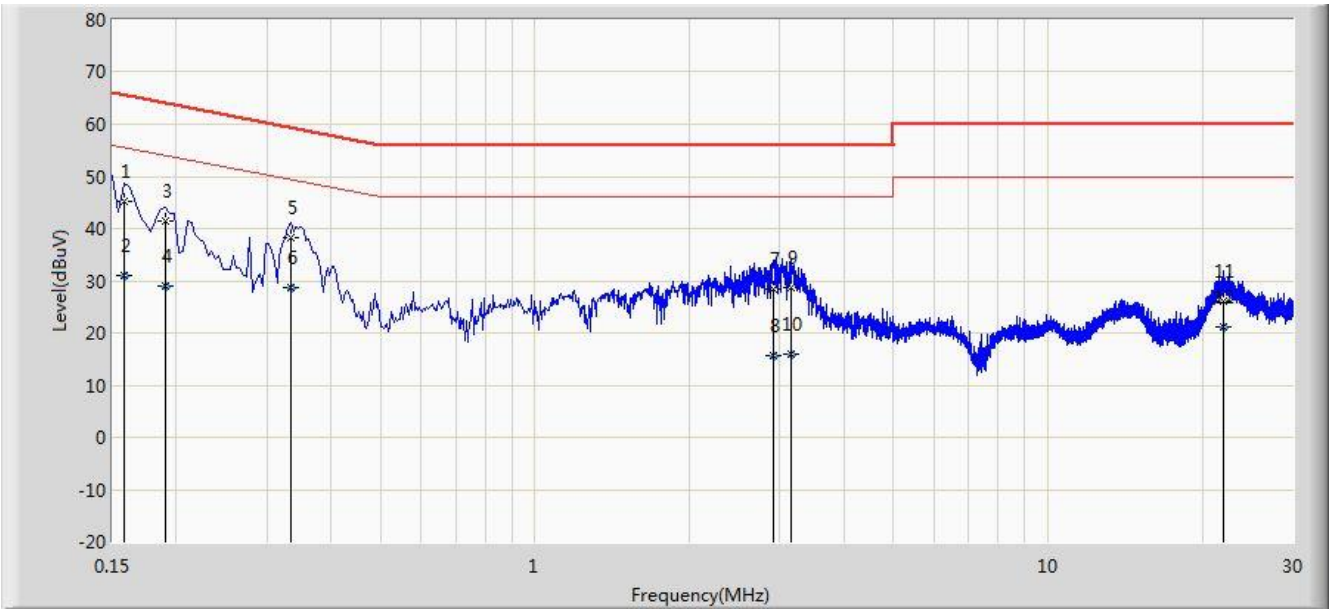


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV)	Factor (dB)	Type
1		*	0.150	45.956	34.788	-20.044	66.000	11.168	QP
2			0.150	32.101	20.933	-23.899	56.000	11.168	AV
3			0.194	38.900	28.883	-24.963	63.864	10.017	QP
4			0.194	26.554	16.538	-27.309	53.864	10.017	AV
5			0.338	35.587	25.552	-23.666	59.252	10.034	QP
6			0.338	25.825	15.790	-23.427	49.252	10.034	AV
7			2.506	25.424	15.567	-30.576	56.000	9.857	QP
8			2.506	13.362	3.506	-32.638	46.000	9.857	AV
9			3.014	28.461	18.598	-27.539	56.000	9.864	QP
10			3.014	14.874	5.010	-31.126	46.000	9.864	AV
11			21.966	26.209	16.038	-33.791	60.000	10.172	QP
12			21.966	20.952	10.781	-29.048	50.000	10.172	AV

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

Factor (dB) = Cable Loss (dB) + LISN Factor (dB)

Site: SR2	Time: 2019/07/10 - 11:31
Limit: FCC_Part15.207_CE_AC Power	Engineer: Kevin Ker
Probe: ENV216_101683_Filter On	Polarity: Neutral
EUT: ACCESS POINT	Power: AC 120V/60Hz
Test Mode 1	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV)	Factor (dB)	Type
1		*	0.158	45.177	34.887	-20.391	65.568	10.290	QP
2			0.158	31.098	20.808	-24.471	55.568	10.290	AV
3			0.190	41.348	31.320	-22.689	64.037	10.028	QP
4			0.190	28.924	18.897	-25.112	54.037	10.028	AV
5			0.334	38.342	28.279	-21.009	59.351	10.063	QP
6			0.334	28.596	18.533	-20.756	49.351	10.063	AV
7			2.910	28.546	18.690	-27.454	56.000	9.856	QP
8			2.910	15.590	5.734	-30.410	46.000	9.856	AV
9			3.150	28.616	18.753	-27.384	56.000	9.862	QP
10			3.150	15.931	6.068	-30.069	46.000	9.862	AV
11			21.990	26.197	15.975	-33.803	60.000	10.222	QP
12			21.990	21.085	10.863	-28.915	50.000	10.222	AV

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

Factor (dB) = Cable Loss (dB) + LISN Factor (dB)

8. CONCLUSION

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

The End

Appendix A - Test Setup Photograph

Refer to “1906TW0102-UT” file.

Appendix B - EUT Photograph

Refer to “1906TW0102-UE” file.