MEASUREMENT REPORT

FCC PART 15.247 WLAN 802.11b/g/n/ax

FCC ID:	2ALJ3AP30X
Applicant:	HAN Networks Co., Ltd.
Application Type:	Certification
Product:	HAN Access Point
Model No.:	AP301
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
Receive Date	August 25, 2020
Test Date:	October 17 ~ December 18, 2020

Tested By : Fran Chen
(Fran Chen)

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-UE	V1.0	Original Report	2020-12-19	Valid

CONTENTS

Description Page

§2.1033 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)
MRT FCC Registration No.	291082
FCC Rule Part(s)	Part 15.247
Model No.	AP301
Test Device Serial No.:	#1 ☐ Production ☒ Pre-Production ☐ Engineering

Test Facility / Accreditations

1. MRT facility is an FCC registered (Reg. No. 291082) test facility with the site description report on file and is designated by the FCC as an Accredited Test Firm.
2. MRT facility is an IC registered (MRT Reg. No. 21723) test laboratory with the site description on file at Industry Canada.
3. MRT Lab is accredited to ISO 17025 by the Taiwan Accreditation Foundation (TAF Cert. No. 3261) in EMC, Telecommunications and Radio testing for FCC (Designation Number: TW3261), Industry Taiwan, EU and TELEC Rules.

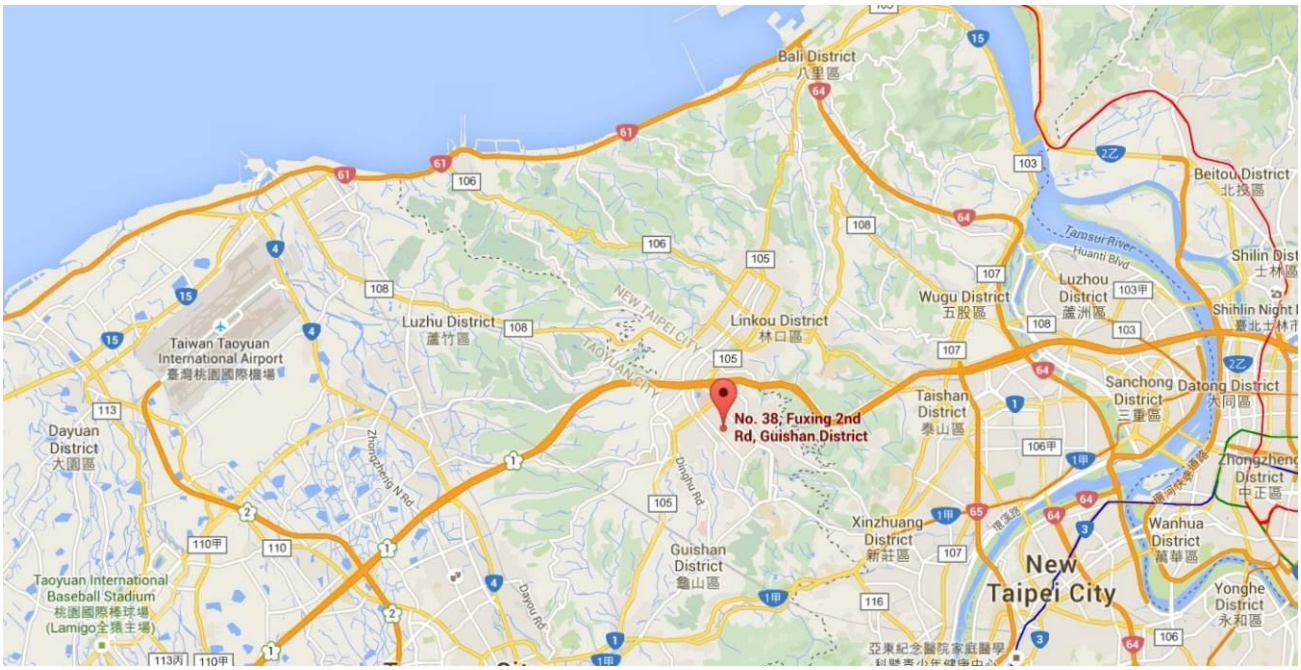
1. INTRODUCTION

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:	HAN Access Point
Model No.:	AP301
Wi-Fi Specification:	802.11a/b/g/n/ac/ax
Operating Temperature:	0 ~ 50 °C
Power Type:	PoE input or AC adapter input
Operating Environment:	Indoor Use

2.2. Product Specification Subjective to this Report

Frequency Range:	802.11b/g/n-HT20/VHT20/ax-HE20: 2412 ~ 2462 MHz 802.11n-HT40/VHT40/ax-HE40: 2422 ~ 2452 MHz
Channel Number:	802.11b/g/n-HT20/VHT20/ax-HE20: 11 802.11n-HT40/VHT40/ax-HE40: 7
Type of Modulation:	802.11b: DSSS; 802.11g/n/VHT: OFDM; 802.11ax: OFDMA
Data Rate:	802.11b: 1/2/5.5/11Mbps 802.11g: 6/9/12/18/24/36/48/54Mbps 802.11n: up to 300Mbps 802.11VHT: up to 400Mbps 802.11ax: up to 573.5Mbps

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

2.3. Working Frequencies for this report

802.11b/g/n-HT20/VHT20/ax-HE20

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

802.11n-HT40/VHT40/ax-HE40

Channel	Frequency	Channel	Frequency	Channel	Frequency
03	2422 MHz	04	2427 MHz	05	2432 MHz
06	2437 MHz	07	2442 MHz	08	2447 MHz
09	2452 MHz	--	--	--	--

2.4. Description of Available Antennas

Antenna Type	Frequency Band (GHz)	T_X Paths	Bandwidth (MHz)	Max Peak Gain (dBi)		CDD 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	6.31
	5150 ~ 5850	2	20, 40, 80	3.10	3.30	3.30	6.31	6.31

Note 1: The EUT supports Cyclic Delay Diversity (CDD) technology for 802.11a/b/g/n/ac/ax 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 Beamforming mode, and the Beamforming support 802.11n/ac/ax, not include 802.11a/b/g. The directional gain = G_{ANT} + Array Gain (3.01dBi).

Note 3: Antenna type and antenna gain are provided by the manufacturer.

2.5. Test Mode

Test Mode	Mode 1: Transmit by 802.11b (1Mbps)
	Mode 2: Transmit by 802.11g (6Mbps)
	Mode 3: Transmit by 802.11n-HT20 (MCS0)
	Mode 4: Transmit by 802.11n-HT40 (MCS0)
	Mode 5: Transmit by VHT20 (MCS0)
	Mode 6: Transmit by VHT40 (MCS0)
	Mode 7: Transmit by 802.11ax-HE20 (MCS0)
	Mode 8: Transmit by 802.11ax-HE40 (MCS0)

2.6. Test Software

The test utility software used during testing was “QSPR”, and the version was “v50-00186”.

2.7. Duty Cycle

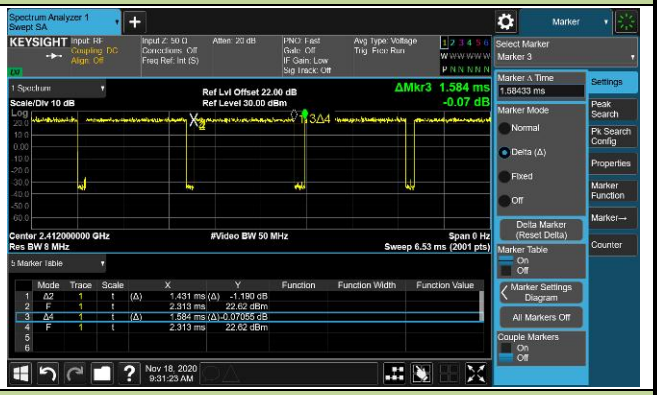
2.4GHz WLAN (DTS) operation is possible in 20MHz, and 40MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = peak. The RBW and VBW were both greater 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	Test Mode	Duty Cycle
802.11b	61.72%	802.11VHT20	94.61%
802.11g	90.34%	802.11VHT40	95.87%
802.11n-HT20	92.78%	802.11ax-HE20	95.63%
802.11n-HT40	89.05%	802.11ax-HE40	95.66%

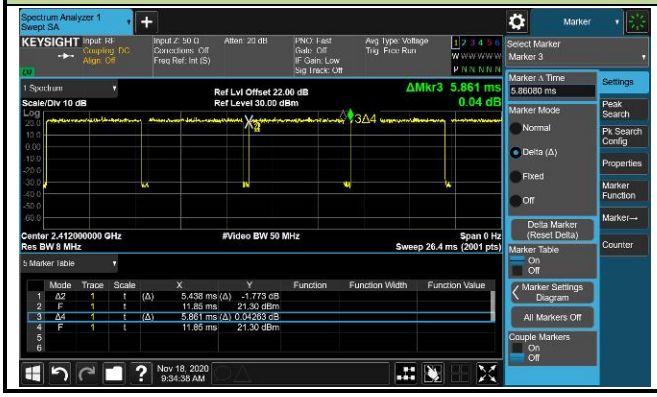
Duty Cycle (T = Transmission Duration)

802.11b (T = 1.2936 ms)

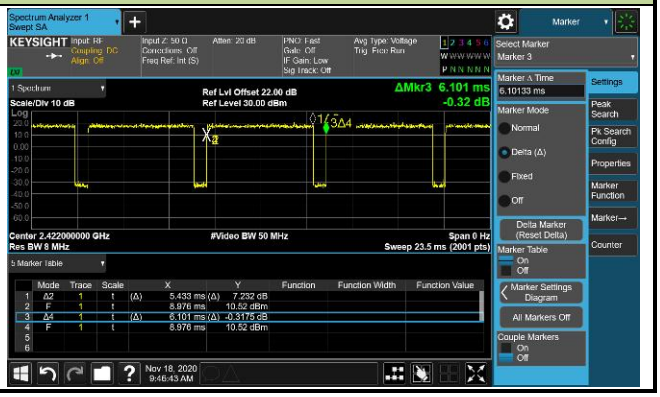
802.11g (T = 1.431 ms)



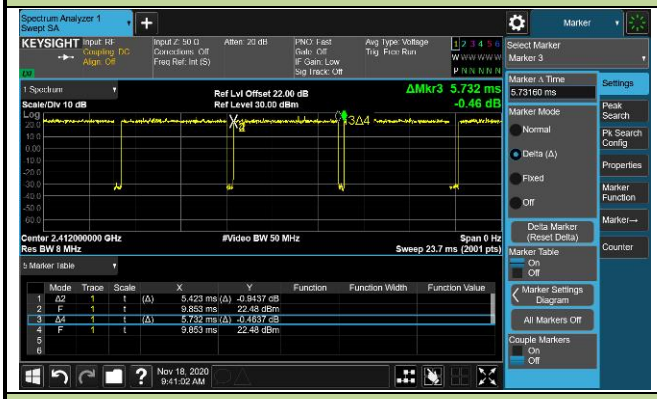
802.11n-HT20 (T = 5.438 ms)



802.11n-HT40 (T = 5.433 ms)

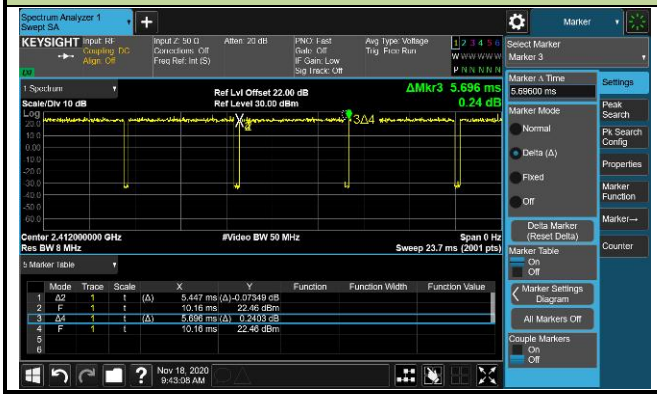


802.11VHT20 (T = 5.423 ms)



802.11VHT40 (T = 5.433 ms)

802.11ax-HE20 (T = 5.447 ms)



802.11ax-HE40 (T = 5.444 ms)

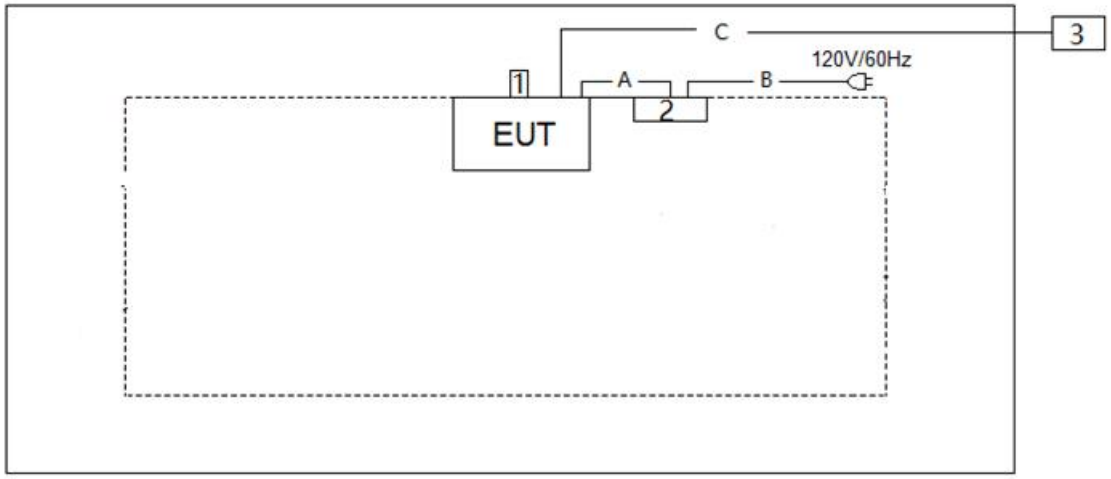
2.8. EMI Suppression Device(s)/Modifications

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

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.
1	USB Dongle	SanDisk	BL161025264V	N/A
2	AC Adapter	DELTA	ADP-30HR B	1WMD05S00T5
3	Notebook	ASUS	PRO45V	N/A

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-AC1：

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-SR2：

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-SR2:

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
Attenuator	MVE	20dB	MRTSUE06547	N/A	N/A
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.

Conducted Emission- Power Line
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 150kHz~30MHz: ± 2.53dB
Radiated Spurious Emission
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz~30MHz: ± 3.92dB 30MHz~1GHz: ± 4.25dB 1GHz~18GHz: ± 4.40dB 18GHz~40GHz: ± 4.45dB
Frequency Error
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): ±78.4Hz
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%
DC Voltage
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): ±0.3%

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) or ≤ 20dBc (Peak)		Pass	Section 6.5
15.205 15.209	General Field Strength (Restricted Bands and Radiated Emission)	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) Output power test was verified over all data rates of each mode, and then choose the maximum power output (low data rate) for final test of each channel.
3) Test Items “6dB Bandwidth” & “Band Edge / Out-of-Band Emissions” have been assessed MIMO transmission, and showed the worst test data in this report.
4) The power setting of CDD & Beamforming mode is same. For 802.11n/VHT/ax uses worst case beamforming mode in the test report. The test results shown in the following sections represent the worst case emissions.
5) For 2417MHz,2427MHz, 2447MHz and 2457MHz Radiated bandedge testing, we choose Low and high channel worst Polarity Vertical in this report.

6.2. 6dB Bandwidth Measurement

6.2.1.Test Limit

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

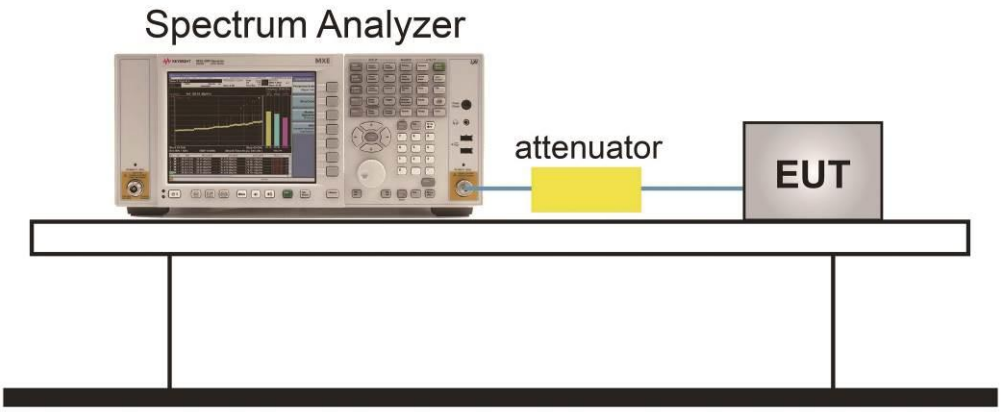
6.2.2.Test Procedure used

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. The trace was allowed to stabilize

6.2.4.Test Setup



6.2.5.Test Result

Product	HAN Access Point, AP301	Test Site	SR2
Test Engineer	Eric Lin	Test Date	2020/11/18
Test Item	6dB Bandwidth		

Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
802.11b	1Mbps	01	2412	8.06	≥ 0.5	Pass
802.11b	1Mbps	06	2437	8.07	≥ 0.5	Pass
802.11b	1Mbps	11	2462	8.07	≥ 0.5	Pass
802.11g	6Mbps	01	2412	15.09	≥ 0.5	Pass
802.11g	6Mbps	06	2437	13.87	≥ 0.5	Pass
802.11g	6Mbps	11	2462	15.09	≥ 0.5	Pass
802.11n-HT20	MCS0	01	2412	13.88	≥ 0.5	Pass
802.11n-HT20	MCS0	06	2437	15.07	≥ 0.5	Pass
802.11n-HT20	MCS0	11	2462	14.97	≥ 0.5	Pass
802.11n-HT40	MCS0	03	2422	33.89	≥ 0.5	Pass
802.11n-HT40	MCS0	06	2437	35.00	≥ 0.5	Pass
802.11n-HT40	MCS0	09	2452	35.11	≥ 0.5	Pass
VHT20	MCS0	01	2412	13.87	≥ 0.5	Pass
VHT20	MCS0	06	2437	15.06	≥ 0.5	Pass
VHT20	MCS0	11	2462	15.09	≥ 0.5	Pass
VHT40	MCS0	03	2422	35.09	≥ 0.5	Pass
VHT40	MCS0	06	2437	33.88	≥ 0.5	Pass
VHT40	MCS0	09	2452	35.09	≥ 0.5	Pass
802.11ax-HE20	MCS0	01	2412	15.03	≥ 0.5	Pass
802.11ax-HE20	MCS0	06	2437	15.10	≥ 0.5	Pass
802.11ax-HE20	MCS0	11	2462	13.86	≥ 0.5	Pass
802.11ax-HE40	MCS0	03	2422	33.88	≥ 0.5	Pass
802.11ax-HE40	MCS0	06	2437	33.92	≥ 0.5	Pass
802.11ax-HE40	MCS0	09	2452	33.48	≥ 0.5	Pass

Note: The Data only show the max power Antenna Port in the test report.

802.11b 6dB Bandwidth

Channel 01 (2412MHz)

Channel 06 (2437MHz)

Channel 11 (2462MHz)

802.11g 6dB Bandwidth

Channel 01 (2412MHz)

Channel 06 (2437MHz)

Channel 11 (2462MHz)

802.11n-HT20 6dB Bandwidth

Channel 01 (2412MHz)

Channel 06 (2437MHz)

Channel 11 (2462MHz)

802.11n-HT40 6dB Bandwidth

Channel 03 (2422MHz)

Channel 06 (2437MHz)

Channel 09 (2452MHz)

VHT20 6dB Bandwidth

Channel 01 (2412MHz)

Channel 06 (2437MHz)

Channel 11 (2462MHz)

VHT40 6dB Bandwidth

Channel 03 (2422MHz)

Channel 06 (2437MHz)

Channel 09 (2452MHz)

802.11ax-HE20 6dB Bandwidth

Channel 01 (2412MHz)

Channel 06 (2437MHz)

Channel 11 (2462MHz)

802.11ax-HE40 6dB Bandwidth

Channel 03 (2422MHz)

Channel 06 (2437MHz)

Channel 09 (2452MHz)

6.3. Output Power Measurement

6.3.1.Test Limit

The maximum out 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.

6.3.2.Test Procedure Used

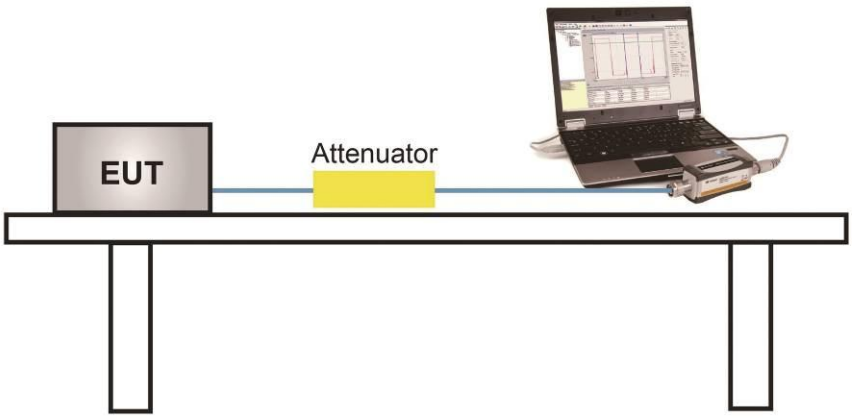
ANSI C63.10-2013 - Section 11.9.2.3

6.3.3.Test Setting

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

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

Output power at various data rates for Ant 0 / Ant 0+1 port:

Test Mode	Bandwidth (MHz)	Channel No.	Frequency (MHz)	Data Rate/ MCS	Average Power (dBm)
802.11b	20	6	2437	1Mbps	22.53
				5.5Mbps	22.48
				11Mbps	22.40
802.11g	20	6	2437	6Mbps	20.97
				24Mbps	20.89
				54Mbps	20.81
802.11n	20	6	2437	MCS0	21.15
				MCS3	21.09
				MCS7	21.02
802.11n	40	6	2437	MCS0	16.06
				MCS3	16.00
				MCS7	15.94
VHT	20	6	2437	MCS0	21.63
				MCS4	21.55
				MCS9	21.48
VHT	40	6	2437	MCS0	16.49
				MCS4	16.41
				MCS9	16.33
802.11ax	20	6	2437	MCS0	20.10
				MCS5	20.01
				MCS11	19.95
802.11ax	40	6	2437	MCS0	16.23
				MCS5	16.15
				MCS11	16.08

Product	HAN Access Point, AP301	Test Site	SR2
Test Engineer	Eric Lin	Test Date	2020/11/18~2020/12/18
Test Item	Output Power		

Test Mode	Data Rate/ MCS	Channel No.	Freq. (MHz)	Ant 0 Average Power (dBm)	Ant 1 Average Power (dBm)	Total Average Power (dBm)	Limit (dBm)	Result
11b	1Mbps	01	2412	21.03	20.89	23.97	≤ 29.69	Pass
11b	1Mbps	06	2437	22.53	21.57	25.09	≤ 29.69	Pass
11b	1Mbps	10	2457	21.32	21.57	24.46	≤ 29.69	Pass
11b	1Mbps	11	2462	20.47	20.98	23.74	≤ 29.69	Pass
11g	6Mbps	01	2412	19.43	18.97	22.22	≤ 29.69	Pass
11g	6Mbps	02	2417	19.24	18.95	22.11	≤ 29.69	Pass
11g	6Mbps	06	2437	20.97	19.81	23.44	≤ 29.69	Pass
11g	6Mbps	10	2457	20.67	20.58	23.64	≤ 29.69	Pass
11g	6Mbps	11	2462	18.88	18.36	21.64	≤ 29.69	Pass
11n-HT20	MCS0	01	2412	17.03	16.83	19.94	≤ 29.69	Pass
11n-HT20	MCS0	02	2417	19.27	19.03	22.16	≤ 29.69	Pass
11n-HT20	MCS0	06	2437	21.15	21.75	24.47	≤ 29.69	Pass
11n-HT20	MCS0	10	2457	20.95	21.04	24.01	≤ 29.69	Pass
11n-HT20	MCS0	11	2462	19.91	18.61	22.32	≤ 29.69	Pass
11n-HT40	MCS0	03	2422	14.07	14.01	17.05	≤ 29.69	Pass
11n-HT40	MCS0	04	2427	15.64	15.83	18.75	≤ 29.69	Pass
11n-HT40	MCS0	06	2437	16.06	16.19	19.14	≤ 29.69	Pass
11n-HT40	MCS0	08	2447	16.14	16.32	19.24	≤ 29.69	Pass
11n-HT40	MCS0	09	2452	15.15	15.24	18.21	≤ 29.69	Pass
VHT20	MCS0	01	2412	18.08	16.73	20.47	≤ 29.69	Pass
VHT20	MCS0	02	2417	19.45	19.26	22.37	≤ 29.69	Pass
VHT20	MCS0	06	2437	21.63	20.37	24.06	≤ 29.69	Pass
VHT20	MCS0	10	2457	20.14	20.00	23.08	≤ 29.69	Pass
VHT20	MCS0	11	2462	17.76	16.98	20.40	≤ 29.69	Pass
VHT40	MCS0	03	2422	14.33	13.81	17.09	≤ 29.69	Pass
VHT40	MCS0	04	2427	16.42	16.25	19.35	≤ 29.69	Pass
VHT40	MCS0	06	2437	16.49	16.23	19.37	≤ 29.69	Pass
VHT40	MCS0	08	2447	16.36	16.32	19.35	≤ 29.69	Pass
VHT40	MCS0	09	2452	15.23	15.10	18.18	≤ 29.69	Pass

Test Mode	Data Rate/ MCS	Channel No.	Freq. (MHz)	Ant 0 Average Power (dBm)	Ant 1 Average Power (dBm)	Total Average Power (dBm)	Limit (dBm)	Result
11ax-HE20	MCS0	01	2412	17.55	17.96	20.77	≤ 29.69	Pass
11ax-HE20	MCS0	02	2417	18.03	18.22	21.14	≤ 29.69	Pass
11ax-HE20	MCS0	06	2437	20.10	20.91	23.53	≤ 29.69	Pass
11ax-HE20	MCS0	10	2457	19.14	19.03	22.10	≤ 29.69	Pass
11ax-HE20	MCS0	11	2462	17.70	16.87	20.32	≤ 29.69	Pass
11ax-HE40	MCS0	03	2422	14.74	14.31	17.54	≤ 29.69	Pass
11ax-HE40	MCS0	04	2427	15.03	15.32	18.19	≤ 29.69	Pass
11ax-HE40	MCS0	06	2437	16.23	15.65	18.96	≤ 29.69	Pass
11ax-HE40	MCS0	08	2447	15.46	15.83	18.66	≤ 29.69	Pass
11ax-HE40	MCS0	09	2452	15.43	15.73	18.59	≤ 29.69	Pass

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

Note 2: Power Limit= 30dBm-(6.31-6) dBi= 29.69dBm.

6.4. Power Spectral Density Measurement

6.4.1.Test Limit

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

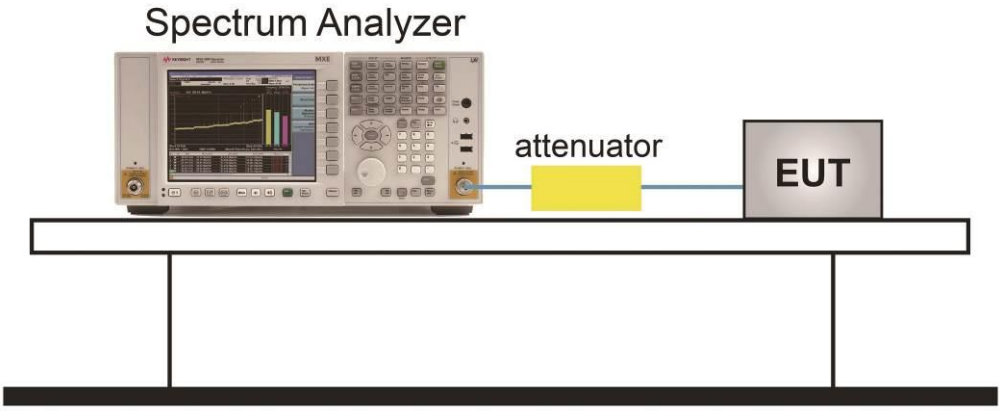
6.4.2.Test Procedure Used

ANSI C63.10 Section 11.10.6

6.4.3.Test Setting

1. Measure the duty cycle (x) of the transmitter output signal
2. Set instrument center frequency to DTS channel center frequency.
3. Set span to at least 1.5 times the OBW.
4. RBW = 10kHz
5. VBW = 30kHz
6. Detector = RMS
7. Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
8. Sweep time = auto couple
9. Don’t use sweep triggering. Allow sweep to “free run”.
10. Employ trace averaging (RMS) mode over a minimum of 100 traces.
11. Use the peak marker function to determine the maximum amplitude level.
12. Add 10 log (1/x), where x is the duty cycle measured in step (a, to the measured PSD to compute the average PSD during the actual transmission time.

6.4.4.Test Setup



6.4.5.Test Result

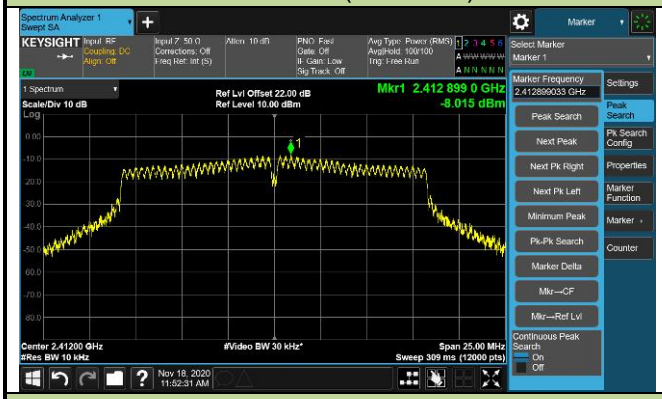
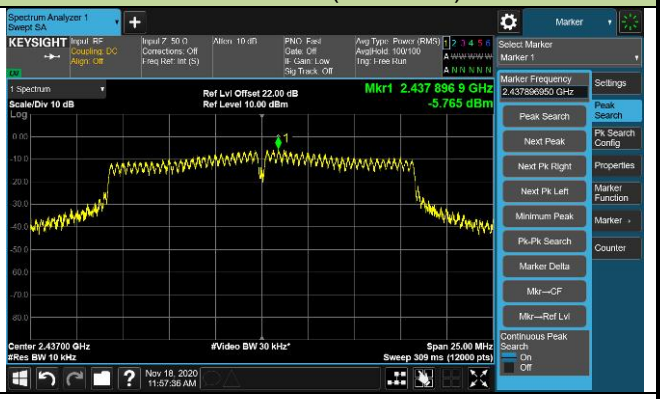
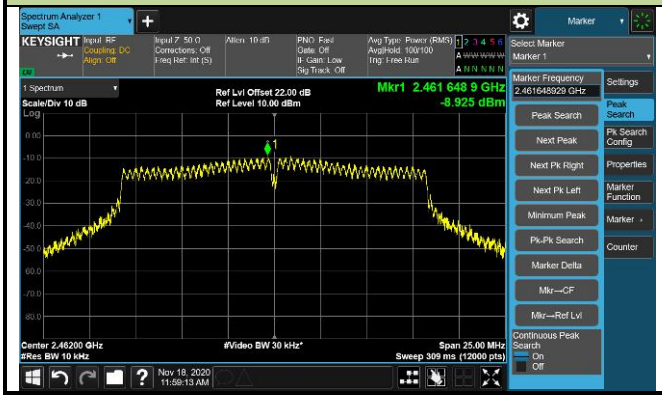
Product	HAN Access Point, AP301	Test Site	SR2
Test Engineer	Eric Lin	Test Date	2020/11/18
Test Item	Power Spectral Density		

Test Mode	Data Rate/ MCS	Channel No.	Freq. (MHz)	Ant 0 AVGPSD (dBm / 10kHz)	Ant 1 AVGPSD (dBm / 10kHz)	Duty Cycle (%)	Total Peak PSD (dBm / 10kHz)	Limit (dBm / 3kHz)	Result
11b	1Mbps	01	2412	-5.37	-5.50	61.72	-0.33	≤ 7.69	Pass
11b	1Mbps	06	2437	-5.16	-5.22	61.72	-0.08	≤ 7.69	Pass
11b	1Mbps	11	2462	-5.57	-5.42	61.72	-0.39	≤ 7.69	Pass
11g	6Mbps	01	2412	-8.02	-9.53	90.34	-5.26	≤ 7.69	Pass
11g	6Mbps	06	2437	-5.77	-6.47	90.34	-2.65	≤ 7.69	Pass
11g	6Mbps	11	2462	-8.93	-8.93	90.34	-5.48	≤ 7.69	Pass
11n-HT20	MCS0	01	2412	-9.78	-9.96	92.78	-6.53	≤ 7.69	Pass
11n-HT20	MCS0	06	2437	-6.55	-6.90	92.78	-3.39	≤ 7.69	Pass
11n-HT20	MCS0	11	2462	-8.56	-9.06	92.78	-5.46	≤ 7.69	Pass
11n-HT40	MCS0	03	2422	-14.88	-15.56	89.05	-11.69	≤ 7.69	Pass
11n-HT40	MCS0	06	2437	-13.90	-14.75	89.05	-10.79	≤ 7.69	Pass
11n-HT40	MCS0	09	2452	-15.05	-15.30	89.05	-11.66	≤ 7.69	Pass
VHT20	MCS0	01	2412	-9.09	-9.92	94.61	-6.23	≤ 7.69	Pass
VHT20	MCS0	06	2437	-6.28	-6.76	94.61	-3.26	≤ 7.69	Pass
VHT20	MCS0	11	2462	-9.39	-10.51	94.61	-6.66	≤ 7.69	Pass
VHT40	MCS0	03	2422	-15.35	-15.33	95.87	-12.15	≤ 7.69	Pass
VHT40	MCS0	06	2437	-13.62	-14.44	95.87	-10.82	≤ 7.69	Pass
VHT40	MCS0	09	2452	-14.33	-15.16	95.87	-11.53	≤ 7.69	Pass
11ax-HE20	MCS0	01	2412	-11.73	-11.19	95.63	-8.25	≤ 7.69	Pass
11ax-HE20	MCS0	06	2437	-7.78	-8.25	95.63	-4.81	≤ 7.69	Pass
11ax-HE20	MCS0	11	2462	-11.49	-11.56	95.63	-8.32	≤ 7.69	Pass
11ax-HE40	MCS0	03	2422	-16.43	-16.87	95.66	-13.44	≤ 7.69	Pass
11ax-HE40	MCS0	06	2437	-16.05	-16.04	95.66	-12.84	≤ 7.69	Pass
11ax-HE40	MCS0	09	2452	-16.03	-16.45	95.66	-13.03	≤ 7.69	Pass

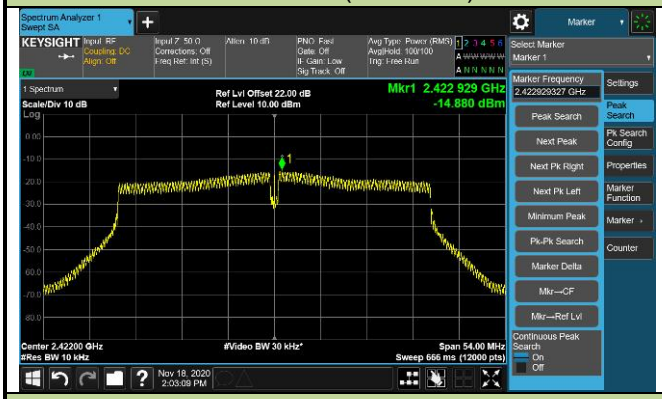
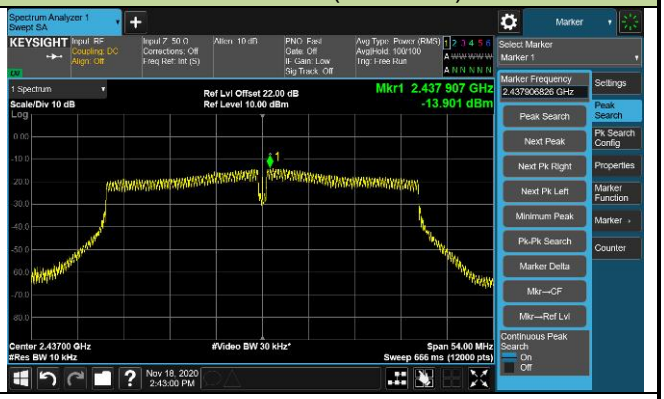
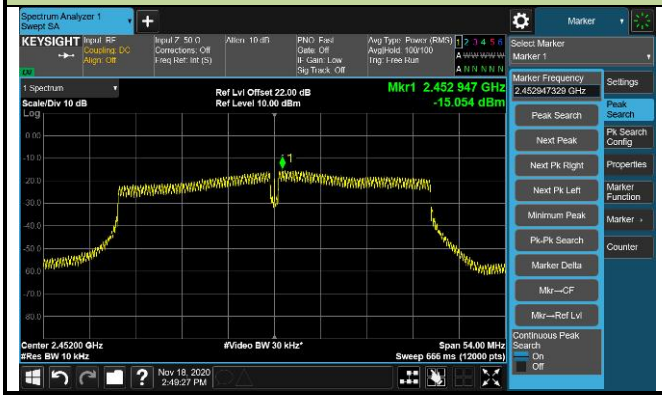
Note 1: When EUT duty cycle < 98%, Total AVGPSD = 10*log $\{10^{(\text{Ant 0 AVGPSD}/10)} + 10^{(\text{Ant 1 AVGPSD}/10)}\}$ + 10*log (1/duty cycle).

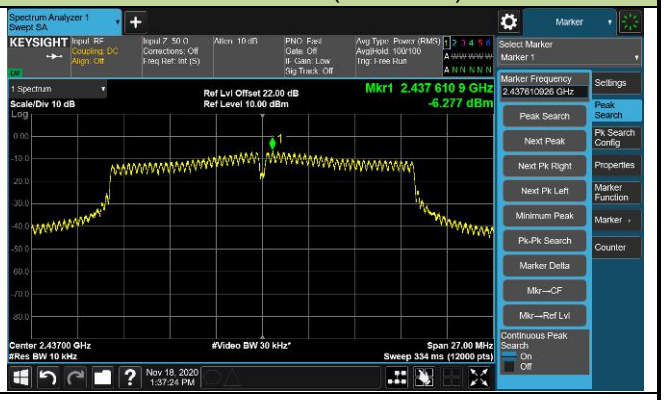
Note 2: PSD Limit= 8dBm/3kHz-(6.31-6) dBi=7.69dBm/3kHz.

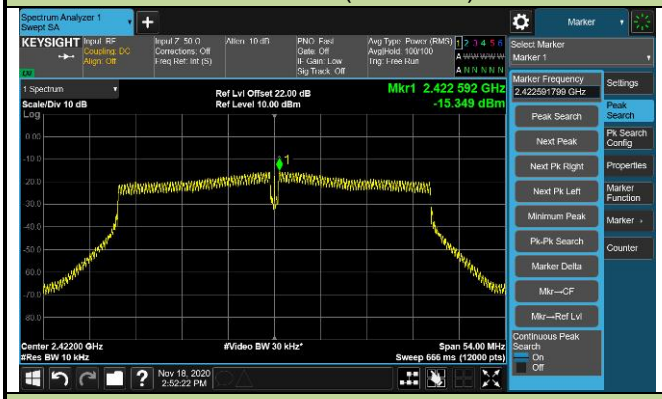
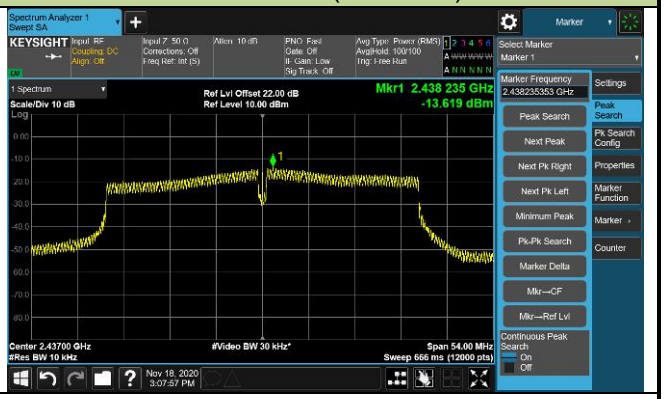
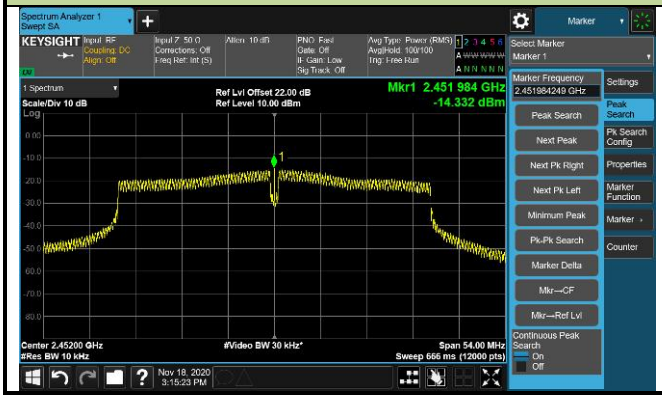
802.11b PSD - Ant 0 / Ant 0 + 1	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

802.11g PSD - Ant 0 / Ant 0 + 1	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

802.11n-HT20 PSD - Ant 0 / Ant 0 + 1	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

802.11n-HT40 PSD - Ant 0 / Ant 0 + 1	
Channel 03 (2422MHz)	Channel 06 (2437MHz)
	
Channel 09 (2452MHz)	
	

VHT20 PSD - Ant 0 / Ant 0 + 1	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

VHT40 PSD - Ant 0 / Ant 0 + 1	
Channel 03 (2422MHz)	Channel 06 (2437MHz)
	
Channel 09 (2452MHz)	
	

802.11ax-HE20 PSD - Ant 0 / Ant 0 + 1	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

802.11ax-HE40 PSD - Ant 0 / Ant 0 + 1	
Channel 03 (2422MHz)	Channel 06 (2437MHz)
	
Channel 09 (2452MHz)	
	

802.11b PSD - Ant 1 / Ant 0 + 1	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

802.11g PSD - Ant 1 / Ant 0 + 1	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

802.11n-HT20 PSD - Ant 1 / Ant 0 + 1	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

802.11n-HT40 PSD - Ant 1 / Ant 0 + 1	
Channel 03 (2422MHz)	Channel 06 (2437MHz)
	
Channel 09 (2452MHz)	
	

VHT20 PSD - Ant 1 / Ant 0 + 1	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

VHT40 PSD - Ant 1 / Ant 0 + 1	
Channel 03 (2422MHz)	Channel 06 (2437MHz)
	
Channel 09 (2452MHz)	
	

802.11ax-HE20 PSD - Ant 1 / Ant 0 + 1	
Channel 01 (2412MHz)	Channel 06 (2437MHz)
	
Channel 11 (2462MHz)	
	

802.11ax-HE40 PSD - Ant 1 / Ant 0 + 1	
Channel 03 (2422MHz)	Channel 06 (2437MHz)
	
Channel 09 (2452MHz)	
	

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 100 kHz bandwidth per the PSD procedure.

6.5.2.Test Procedure Used

ANSI C63.10 Section 11.11

6.5.3.Test Settitng

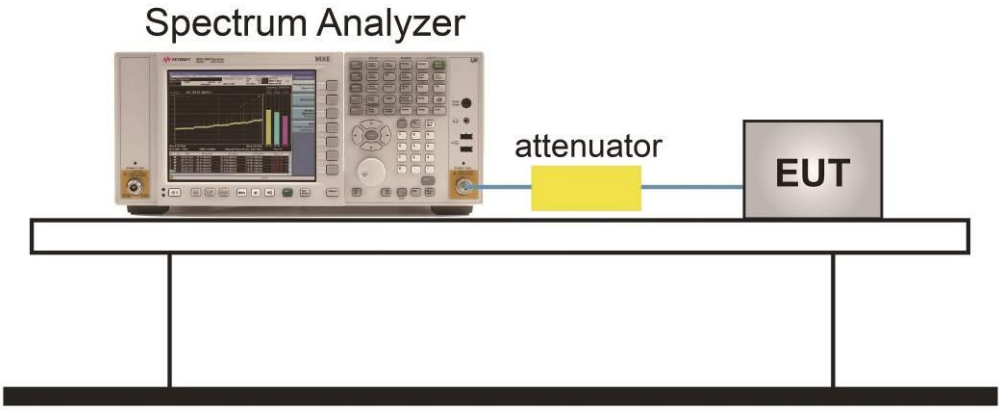
Reference level measurement

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, AP301	Test Site	SR2
Test Engineer	Eric Lin	Test Date	2020/11/18
Test item	Conducted Band Edge and Out-of-Band Emissions		

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Limit	Result
11b	1Mbps	01	2412	30dBc	Pass
11b	1Mbps	06	2437	30dBc	Pass
11b	1Mbps	11	2462	30dBc	Pass
11g	6Mbps	01	2412	30dBc	Pass
11g	6Mbps	06	2437	30dBc	Pass
11g	6Mbps	11	2462	30dBc	Pass
11n-HT20	MCS0	01	2412	30dBc	Pass
11n-HT20	MCS0	06	2437	30dBc	Pass
11n-HT20	MCS0	11	2462	30dBc	Pass
11n-HT40	MCS0	03	2422	30dBc	Pass
11n-HT40	MCS0	06	2437	30dBc	Pass
11n-HT40	MCS0	09	2452	30dBc	Pass
VHT20	MCS0	01	2412	30dBc	Pass
VHT20	MCS0	06	2437	30dBc	Pass
VHT20	MCS0	11	2462	30dBc	Pass
VHT40	MCS0	03	2422	30dBc	Pass
VHT40	MCS0	06	2437	30dBc	Pass
VHT40	MCS0	09	2452	30dBc	Pass
11ax-HE20	MCS0	01	2412	30dBc	Pass
11ax-HE20	MCS0	06	2437	30dBc	Pass
11ax-HE20	MCS0	11	2462	30dBc	Pass
11ax-HE40	MCS0	03	2422	30dBc	Pass
11ax-HE40	MCS0	06	2437	30dBc	Pass
11ax-HE40	MCS0	09	2452	30dBc	Pass

Note: The Data only show the max power Antenna Port in the test report.

802.11b Out-of-Band Emissions

Channel 01 (2412MHz)

100kHz PSD reference Level

Low Band Edge

Spurious Emission

Channel 06 (2437MHz)

100kHz PSD reference Level

Spurious Emission

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

802.11g Out-of-Band Emissions	
Channel 01 (2412MHz)	
100kHz PSD reference Level	Low Band Edge
	
Spurious Emission	
	
Channel 06 (2437MHz)	
100kHz PSD reference Level	Spurious Emission
	

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