

FCC Test Report (Co-Located)

Report No.: RF170905C13A-2

FCC ID: PY317200377

Test Model: RBS50Y

Received Date: Sep. 05, 2017

Test Date: Sep. 22 ~ Sep. 28, 2017

Issued Date: May 29, 2018

Applicant: NETGEAR, INC.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

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**FCC Registration /
Designation Number:** 788550 / TW0003



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Release Control Record

Issue No.	Description	Date Issued
RF170905C13A-2	Original release.	May 29, 2018

1 Certificate of Conformity

Product: Orbi Router, Orbi Satellite, Orbi AC3000 Tri-band WiFi System

Brand: NETGEAR

Test Model: RBS50Y

Sample Status: Engineering sample

Applicant: NETGEAR, INC.

Test Date: Sep. 22 ~ Sep. 28, 2017

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)

47 CFR FCC Part 15, Subpart E (Section 15.407)

ANSI C63.10-2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : Celine Chou , **Date:** May 29, 2018
Celine Chou / Specialist

Approved by : Bruce Chen , **Date:** May 29, 2018
Bruce Chen / Project Engineer

2 Summary of Test Results

Applied Standard:	47 CFR FCC Part 15, Subpart C (Section 15.247) 47 CFR FCC Part 15, Subpart E (Section 15.407)		
FCC Clause	Test Item	Result	Remarks
15.207 15.407(b)(6)	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -10.19dB at 0.30858MHz.
15.205 / 15.209 / 15.247(d) 15.407(b) (1/2/3/4(i/ii)/6)	Radiated Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -0.1dB at 5350.00MHz.

*For U-NII-3 band compliance with rule part 15.407(b)(4)(i), the OOB test plots were recorded in Annex A.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.94 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.63 dB
	200MHz ~ 1000MHz	3.64 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Orbi Router, Orbi Satellite, Orbi AC3000 Tri-band WiFi System	
Brand	NETGEAR	
Test Model	RBS50Y	
Status of EUT	Engineering sample	
Power Supply Rating	12Vdc from adapter	
Modulation Type	WLAN	CCK, DQPSK, DBPSK for DSSS 256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM
	Bluetooth LE	GFSK
Transfer Rate	WLAN	802.11b: 11/5.5/2/1Mbps 802.11a/g: 54/48/36/24/18/12/9/6Mbps 802.11n: up to 300Mbps (2.4GHz) / 600Mbps (5GHz) 802.11ac: up to 867Mbps (2.4GHz) / 1734Mbps (5GHz)
	Bluetooth LE	1Mbps
Operating Frequency	WLAN	2.4GHz: 2412 ~ 2462MHz 5.0GHz: 5180 ~ 5240MHz, 5260 ~ 5320MHz, 5500 ~ 5700MHz, 5745 ~ 5825MHz
	Bluetooth LE	2402 ~ 2480MHz
Number of Channel	WLAN	2412 ~ 2462MHz: 802.11b, 802.11g, 802.11n (HT20): 11 802.11n (HT40): 7 5180 ~ 5240MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 4 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1 5260 ~ 5320MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 4 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1 5500 ~ 5720MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 11 802.11n (HT40), 802.11ac (VHT40): 5 802.11ac (VHT80): 2 5745 ~ 5825MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 5 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1
	Bluetooth LE	40

Output Power	WLAN	CDD Mode: 2412 ~ 2462MHz: 819.478mW 5180 ~ 5240MHz 1TX: 52.000mW 5180 ~ 5240MHz 2TX: 52.124mW 5260 ~ 5320MHz: 236.649mW 5500 ~ 5700MHz: 231.252mW 5745 ~ 5825MHz: 930.220mW Beamforming Mode: 2412 ~ 2462MHz: 569.557mW 5180 ~ 5240MHz: 26.154mW 5260 ~ 5320MHz: 235.552mW 5500 ~ 5700MHz: 133.221mW 5745 ~ 5825MHz: 660.130mW
	Bluetooth LE	6.067mW
Antenna Type	WLAN	Refer to Note
	Bluetooth LE	Chip antenna with 1.5dBi gain
Antenna Connector	WLAN	Refer to Note
	Bluetooth LE	N/A
Accessory Device	Adapter	
Data Cable Supplied	N/A	

Note:

- This report is prepared for FCC class II permissive change. The differences compared with the original report (BV CPS report no.: RF170906C13-3) are list as below:
 - Adding 5.26GHz to 5.32GHz & 5.50GHz to 5.70GHz by software. (Perform testing under 1st Source)
 - Adding 2nd Source.

2. The EUT incorporates a MIMO function. Physically, the EUT provides 4 completed transmitters and 4 receivers.

Band	Modulation Mode	Beamforming Mode	TX Function
5GHz Band 1	802.11a	Not Support	1TX / 2TX
	802.11n (HT20)	Not Support / Support (CDD / NSS=1)	1TX / 2TX
	802.11n (HT40)	Not Support / Support (CDD / NSS=1)	1TX / 2TX
	802.11ac (VHT20)	Not Support / Support (CDD / NSS=1)	1TX / 2TX
	802.11ac (VHT40)	Not Support / Support (CDD / NSS=1)	1TX / 2TX
	802.11ac (VHT80)	Not Support / Support (CDD / NSS=1)	1TX / 2TX
5GHz Band 2	802.11a	Not Support	2TX
	802.11n (HT20)	Support (CDD / NSS=1)	2TX
	802.11n (HT40)	Support (CDD / NSS=1)	2TX
	802.11ac (VHT20)	Support (CDD / NSS=1)	2TX
	802.11ac (VHT40)	Support (CDD / NSS=1)	2TX
	802.11ac (VHT80)	Support (CDD / NSS=1)	2TX
5GHz Band 3 and 4	802.11a	Not Support	4TX
	802.11n (HT20)	Support (CDD / NSS=1)	4TX
	802.11n (HT40)	Support (CDD / NSS=1)	4TX
	802.11ac (VHT20)	Support (CDD / NSS=1)	4TX
	802.11ac (VHT40)	Support (CDD / NSS=1)	4TX
	802.11ac (VHT80)	Support (CDD / NSS=1)	4TX

* For 802.11n, CDD mode is the worst case for final radiated emission and power line conducted emission tests after pretesting CDD mode and beamforming mode.

3. The following RF Modules are for the EUT. (New source are marked in boldface)

Brand	Model	RF Module	Band
NETGEAR	RBS50Y	Module 1	2.4G
			UNII-1
			UNII-2A
		Module 2	UNII-2C
			UNII-3
		BT Module	BT LE

RF Module	Filter	Position	Remark
Module 1	1st	TFL1,TFL2	pin to pin & Same design
	2nd	TFL1,TFL2	pin to pin & Same design
Module 2	1st	BHPF1,BHPF2,BHPF3,BHPF4	pin to pin & Same design
	2nd	BHPF1,BHPF2,BHPF3,BHPF4	pin to pin & Same design

RF Module	RF Switch	Position	Remark
Module 1	1st	AS1,AS2,TS1,TS2	pin to pin & Same design
	2nd	AS1,AS2,TS1,TS2	pin to pin & Same design

4. The EUT uses following antennas.

Ant. Type	Dipole				
Connector Type	i-pex(MHF)				
Directional Antenna Gain (dBi)					
Item	2.4G	UNII-1	UNII-2A	UNII-2C	UNII-3
-	5.31	5.97	5.41	8.74	7.57

5. The EUT consumes power from the following adapters.

Adapter 1 (US)	
Brand	NETGEAR
Model	AD2110F10
P/N	332-10999-01
Input Power	100-120Vac, 50/60Hz, 1.0A
Output Power	12Vdc, 2.5A
Power Line	3m power cable without core attached on adapter

Adapter 2 (US)	
Brand	NETGEAR
Model	2ADF030F1 NA
P/N	332-11000-01
Input Power	100-120Vac, 50/60Hz, 1.0A
Output Power	12Vdc, 2.5A
Power Line	3m power cable without core attached on adapter

* After pre- test, adapter 1 was chosen for final test and presented in the test report.

3.2 Description of Test Modes

For 2.4GHz

11 channels are provided for 802.11b, 802.11g and 802.11n (HT20):

Channel	Frequency	Channel	Frequency
1	2412MHz	7	2442MHz
2	2417MHz	8	2447MHz
3	2422MHz	9	2452MHz
4	2427MHz	10	2457MHz
5	2432MHz	11	2462MHz
6	2437MHz		

7 channels are provided for 802.11n (HT40):

Channel	Frequency	Channel	Frequency
3	2422MHz	7	2442MHz
4	2427MHz	8	2447MHz
5	2432MHz	9	2452MHz
6	2437MHz		

For 5180~5240MHz:

4 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

Channel	Frequency	Channel	Frequency
36	5180 MHz	44	5220 MHz
40	5200 MHz	48	5240 MHz

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
42	5210MHz

For 5260 ~ 5320MHz

4 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

Channel	Frequency	Channel	Frequency
52	5260 MHz	60	5300 MHz
56	5280 MHz	64	5320 MHz

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency	Channel	Frequency
54	5270 MHz	62	5310 MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
58	5290 MHz

For 5500 ~ 5700MHz

11 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

Channel	Frequency	Channel	Frequency
100	5500 MHz	124	5620 MHz
104	5520 MHz	128	5640 MHz
108	5540 MHz	132	5660 MHz
112	5560 MHz	136	5680 MHz
116	5580 MHz	140	5700 MHz
120	5600 MHz		

5 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency	Channel	Frequency
102	5510 MHz	126	5630 MHz
110	5550 MHz	134	5670 MHz
118	5590 MHz		

2 channels are provided for 802.11ac (VHT80):

Channel	Frequency	Channel	Frequency
106	5530MHz	122	5610 MHz

For 5745~5825MHz:

5 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

Channel	Frequency	Channel	Frequency
149	5745MHz	161	5805MHz
153	5765MHz	165	5825MHz
157	5785MHz		

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency	Channel	Frequency
151	5755MHz	159	5795MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
155	5775MHz

For Bluetooth LE:

40 channels are provided to this EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to				Description
	RE≥1G	RE<1G	PLC	OB	
-	√	√	√	√	-

Where **RE≥1G**: Radiated Emission above 1GHz & Bandedge Measurement **RE<1G**: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **OB**: Conducted Out-Band Emission

Note: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Z-plane**.

Radiated Emission Test (Above 1GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Freq. Range (MHz)	Available Channel	Tested Channel	Modulation Technology	TX Function
-	802.11b + 802.11ac (VHT20) + 802.11ac (VHT20) + BT LE	2412 ~ 2462	1 to 11	6 + 48 + 100 + 39	DBPSK	2TX
		5180 ~ 5240	36 to 48		OFDM	2TX
		5500 ~ 5700	100 to 140		OFDM	4TX
		2402 ~ 2480	0 to 39		GFSK	1TX
-	802.11b + 802.11ac (VHT20) + 802.11ac (VHT20) + BT LE	2412 ~ 2462	1 to 11	6 + 64 + 100 + 39	DBPSK	2TX
		5260 ~ 5320	52 to 64		OFDM	2TX
		5500 ~ 5700	100 to 140		OFDM	4TX
		2402 ~ 2480	0 to 39		GFSK	1TX
-	802.11b + 802.11ac (VHT20) + 802.11a + BT LE	2412 ~ 2462	1 to 11	6 + 64 + 165 + 39	DBPSK	2TX
		5260 ~ 5320	52 to 64		OFDM	2TX
		5745 ~ 5825	149 to 165		OFDM	4TX
		2402 ~ 2480	0 to 39		GFSK	1TX

Radiated Emission Test (Below 1GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Freq. Range (MHz)	Available Channel	Tested Channel	Modulation Technology	TX Function
-	802.11b + 802.11ac (VHT20) + 802.11ac (VHT20) + BT LE	2412 ~ 2462	1 to 11	6 + 48 + 100 + 39	DBPSK	2TX
		5180 ~ 5240	36 to 48		OFDM	2TX
		5500 ~ 5700	100 to 140		OFDM	4TX
		2402 ~ 2480	0 to 39		GFSK	1TX
-	802.11b + 802.11ac (VHT20) + 802.11ac (VHT20) + BT LE	2412 ~ 2462	1 to 11	6 + 64 + 100 + 39	DBPSK	2TX
		5260 ~ 5320	52 to 64		OFDM	2TX
		5500 ~ 5700	100 to 140		OFDM	4TX
		2402 ~ 2480	0 to 39		GFSK	1TX
-	802.11b + 802.11ac (VHT20) + 802.11ac (VHT20) + BT LE	2412 ~ 2462	1 to 11	6 + 64 + 165 + 39	DBPSK	2TX
		5260 ~ 5320	52 to 64		OFDM	2TX
		5745 ~ 5825	149 to 165		OFDM	4TX
		2402 ~ 2480	0 to 39		GFSK	1TX

Power Line Conducted Emission Test:

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Freq. Range (MHz)	Available Channel	Tested Channel	Modulation Technology	TX Function
-	802.11b + 802.11ac (VHT20) + 802.11ac (VHT20) + BT LE	2412 ~ 2462	1 to 11	6 + 48 + 100 + 39	DBPSK	2TX
		5180 ~ 5240	36 to 48		OFDM	2TX
		5500 ~ 5700	100 to 140		OFDM	4TX
		2402 ~ 2480	0 to 39		GFSK	1TX
-	802.11b + 802.11ac (VHT20) + 802.11ac (VHT20) + BT LE	2412 ~ 2462	1 to 11	6 + 64 + 100 + 39	DBPSK	2TX
		5260 ~ 5320	52 to 64		OFDM	2TX
		5500 ~ 5700	100 to 140		OFDM	4TX
		2402 ~ 2480	0 to 39		GFSK	1TX
-	802.11b + 802.11ac (VHT20) + 802.11ac (VHT20) + BT LE	2412 ~ 2462	1 to 11	6 + 64 + 165 + 39	DBPSK	2TX
		5260 ~ 5320	52 to 64		OFDM	2TX
		5745 ~ 5825	149 to 165		OFDM	4TX
		2402 ~ 2480	0 to 39		GFSK	1TX

Conducted Out-Band Emission Measurement

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Freq. Range (MHz)	Available Channel	Tested Channel	Modulation Technology	TX Function
-	802.11b + 802.11ac (VHT20)	2412 ~ 2462	1 to 11	6 + 64	DBPSK	2TX
		5260 ~ 5320	52 to 64		OFDM	2TX

Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
RE $\geq$ 1G	25 deg. C, 70% RH	120Vac, 60Hz	Luis Lee
RE<1G	25 deg. C, 70% RH	120Vac, 60Hz	Luis Lee
PLC	25 deg. C, 70% RH	120Vac, 60Hz	Luis Lee
OB	25 deg. C, 70% RH	120Vac, 60Hz	Luis Lee

3.3 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

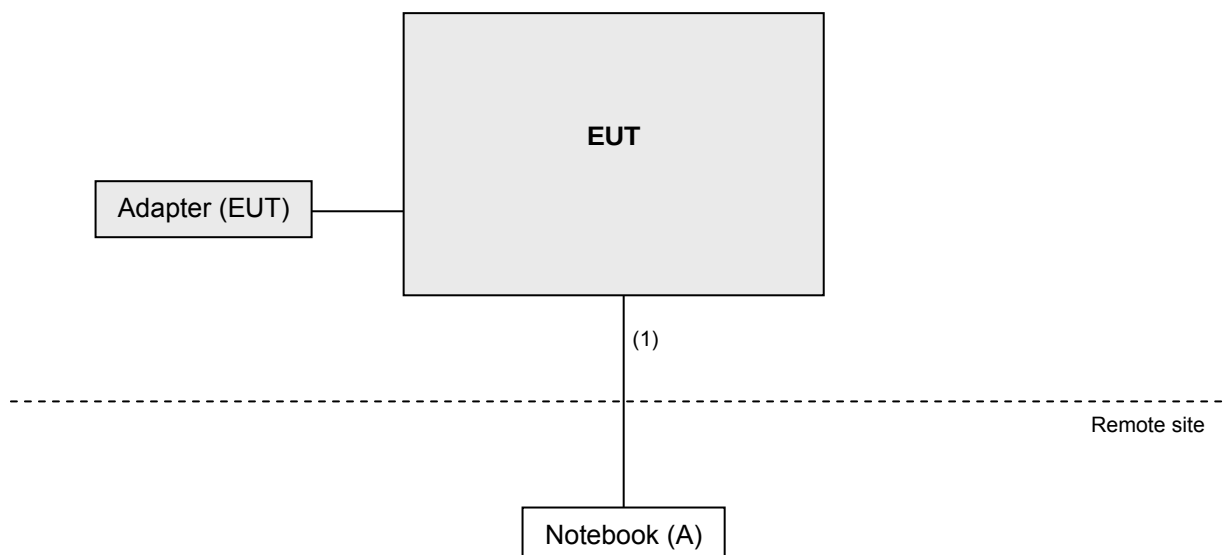
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E5410	6RP2YM1	FCC DoC Approved	-

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item A acted as a communication partner to transfer data.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ45, Cat5e	1	3	N	0	-

3.3.1 Configuration of System under Test



3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specification of the EUT declared by the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.247)

FCC Part 15, Subpart E (15.407)

ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

Note: The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

Limits of unwanted emission out of the restricted bands

Applicable To			Limit	
789033 D02 General UNII Test Procedure New Rules v02r01			Field Strength at 3m	
			PK: 74 (dBµV/m)	AV: 54 (dBµV/m)
Frequency Band	Applicable To		EIRP Limit	Equivalent Field Strength at 3m
5150~5250 MHz	15.407(b)(1)		PK: -27 (dBm/MHz)	PK: 68.2(dBµV/m)
5250~5350 MHz	15.407(b)(2)			
5470~5725 MHz	15.407(b)(3)			
5725~5850 MHz	☒	15.407(b)(4)(i)	PK: -27 (dBm/MHz) ^{*1} PK: 10 (dBm/MHz) ^{*2} PK: 15.6 (dBm/MHz) ^{*3} PK: 27 (dBm/MHz) ^{*4}	PK: 68.2(dBµV/m) ^{*1} PK: 105.2 (dBµV/m) ^{*2} PK: 110.8(dBµV/m) ^{*3} PK: 122.2 (dBµV/m) ^{*4}
	☐	15.407(b)(4)(ii)	Emission limits in section 15.247(d)	
^{*1} beyond 75 MHz or more above of the band edge.			^{*2} below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above.	
^{*3} below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above.			^{*4} from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.	

Note: The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000 \sqrt{30P}}{3} \mu\text{V/m, where P is the eirp (Watts).}$$

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Oct. 24, 2016	Oct. 23, 2017
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Aug. 18, 2017	Aug. 17, 2018
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Dec. 28, 2016	Dec. 27, 2017
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-1170	Dec. 15, 2016	Dec. 14, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Dec. 14, 2016	Dec. 13, 2017
Loop Antenna EMCI	EM-6879	269	Aug. 11, 2017	Aug. 10, 2018
Preamplifier Agilent	8449B	3008A01960	Aug. 08, 2017	Aug. 07, 2018
Preamplifier Agilent	8447D	2944A10631	Aug. 08, 2017	Aug. 07, 2018
RF signal cable HUBER+SUHNER	SUCOFLEX 104	MY 13380+295012/04	Aug. 08, 2017	Aug. 07, 2018
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH4-03 (250724)	Aug. 08, 2017	Aug. 07, 2018
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021703	NA	NA
Turn Table BV ADT	TT100	TT93021703	NA	NA
Turn Table Controller BV ADT	SC100	SC93021703	NA	NA
26GHz ~ 40GHz Amplifier	EM26400	815221	Oct. 17, 2016	Oct. 16, 2017

- Note:
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in HwaYa Chamber 4.
 3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
 4. The FCC Designation Number is TW0003. The number will be varied with the Lab location and scope as attached.
 5. The IC Site Registration No. is IC7450F-4.

4.1.3 Test Procedures

For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Both X and Y axes of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

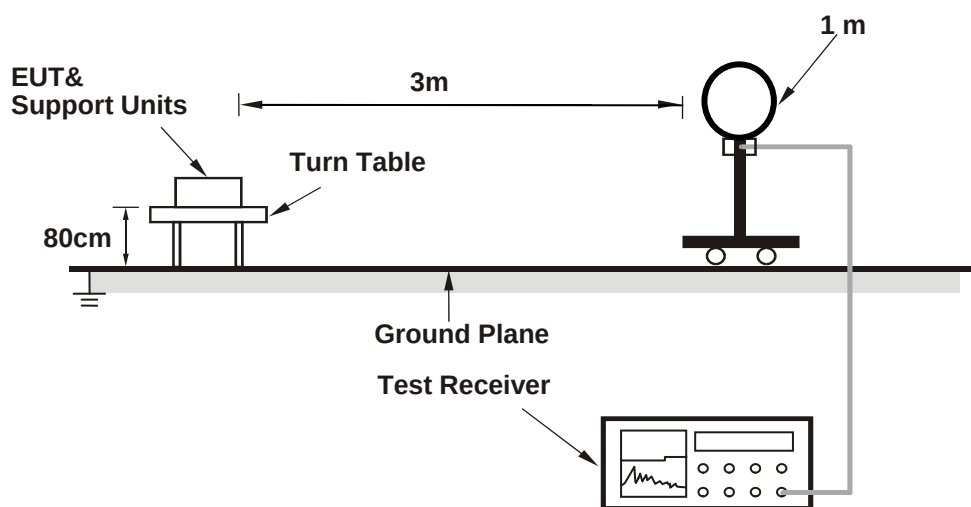
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

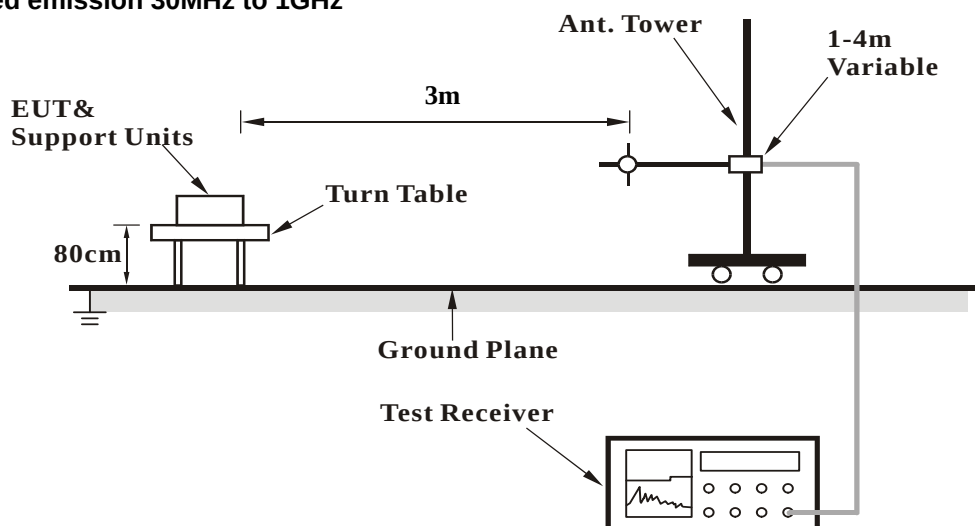
No deviation.

4.1.5 Test Setup

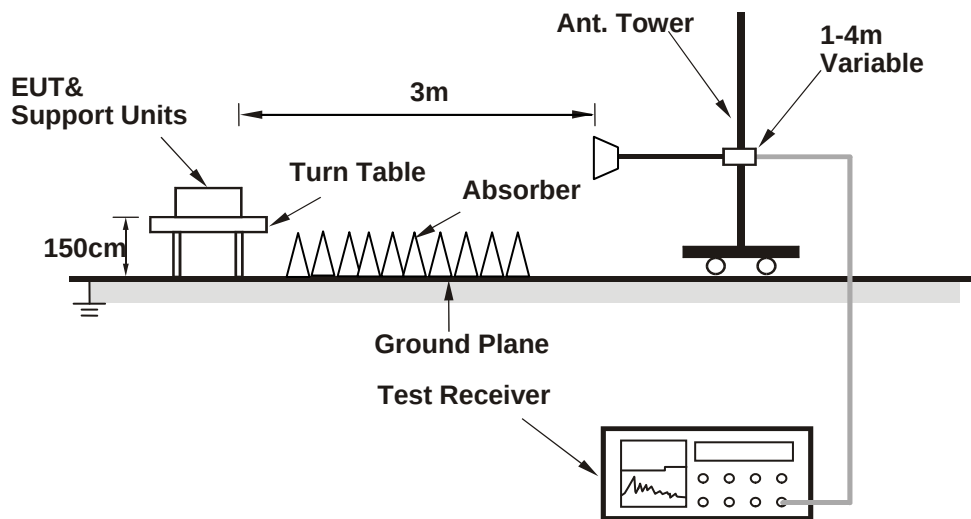
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Conditions

- Placed the EUT on the testing table.
- Prepared a notebook to act as a communication partner and placed it outside of testing area.
- The communication partner connected with EUT via a RJ45 cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
- The communication partner sent data to EUT by command "PING".

4.1.7 Test Results

Above 1GHz Data:

802.11b (2TX) + 802.11ac (VHT20) (2TX) + 802.11ac (VHT20) (4TX) + BT LE (1TX)

CHANNEL	CH 6 + CH 48 + CH 100 + CH 39	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	107.9 PK			3.71 H	322	74.3	33.6
2	*2437.00	103.1 AV			3.71 H	322	69.5	33.6
3	*2480.00	96.3 PK			1.57 H	215	62.4	33.9
4	*2480.00	91.1 AV			1.57 H	215	57.2	33.9
5	2483.50	56.9 PK	74.0	-17.1	1.57 H	215	23.0	33.9
6	2483.50	46.0 AV	54.0	-8.0	1.57 H	215	12.1	33.9
7	4874.00	57.4 PK	74.0	-16.6	2.97 H	108	49.3	8.1
8	4874.00	53.2 AV	54.0	-0.8	2.97 H	108	45.1	8.1
9	4960.00	49.6 PK	74.0	-24.4	2.79 H	68	41.1	8.5
10	4960.00	37.8 AV	54.0	-16.2	2.79 H	68	29.3	8.5
11	*5240.00	111.8 PK			3.65 H	101	70.3	41.5
12	*5240.00	101.2 AV			3.65 H	101	59.7	41.5
13	5350.00	58.7 PK	74.0	-15.3	3.65 H	101	50.7	8.0
14	5350.00	46.4 AV	54.0	-7.6	3.65 H	101	38.4	8.0
15	5460.00	49.3 PK	74.0	-24.7	1.91 H	84	41.1	8.2
16	5460.00	46.5 AV	54.0	-7.5	1.91 H	84	38.3	8.2
17	#5470.00	49.9 PK	74.0	-24.1	1.91 H	84	41.7	8.2
18	#5470.00	46.7 AV	54.0	-7.3	1.91 H	84	38.5	8.2
19	*5500.00	113.1 PK			1.91 H	84	71.1	42.0
20	*5500.00	101.3 AV			1.91 H	84	59.3	42.0
21	#10480.00	62.8 PK	74.0	-11.2	3.19 H	37	42.5	20.3
22	#10480.00	49.7 AV	54.0	-4.3	3.19 H	37	29.4	20.3
23	11000.00	62.5 PK	74.0	-11.5	2.19 H	351	41.1	21.4
24	11000.00	49.5 AV	54.0	-4.5	2.19 H	351	28.1	21.4

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

CHANNEL	CH 6 + CH 48 + CH 100 + CH 39	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	122.1 PK			1.99 V	51	88.5	33.6
2	*2437.00	118.7 AV			1.99 V	51	85.1	33.6
3	*2480.00	99.6 PK			2.13 V	27	65.7	33.9
4	*2480.00	95.2 AV			2.13 V	27	61.3	33.9
5	2483.50	56.1 PK	74.0	-17.9	2.13 V	27	22.2	33.9
6	2483.50	46.0 AV	54.0	-8.0	2.13 V	27	12.1	33.9
7	4874.00	56.1 PK	74.0	-17.9	1.72 V	103	48.0	8.1
8	4874.00	51.7 AV	54.0	-2.3	1.72 V	103	43.6	8.1
9	4960.00	50.0 PK	74.0	-24.0	3.39 V	175	41.5	8.5
10	4960.00	37.8 AV	54.0	-16.2	3.39 V	175	29.3	8.5
11	*5240.00	120.8 PK			1.42 V	278	79.3	41.5
12	*5240.00	109.6 AV			1.42 V	278	68.1	41.5
13	5350.00	59.4 PK	74.0	-14.6	1.42 V	278	51.4	8.0
14	5350.00	46.8 AV	54.0	-7.2	1.42 V	278	38.8	8.0
15	5460.00	60.7 PK	74.0	-13.3	1.67 V	283	52.5	8.2
16	5460.00	48.3 AV	54.0	-5.7	1.67 V	283	40.1	8.2
17	#5470.00	61.9 PK	74.0	-12.1	1.67 V	283	53.7	8.2
18	#5470.00	48.2 AV	54.0	-5.8	1.67 V	283	40.0	8.2
19	*5500.00	119.1 PK			1.67 V	283	77.1	42.0
20	*5500.00	108.2 AV			1.67 V	283	66.2	42.0
21	#10480.00	62.6 PK	74.0	-11.4	1.46 V	207	42.3	20.3
22	#10480.00	49.8 AV	54.0	-4.2	1.46 V	207	29.5	20.3
23	11000.00	63.6 PK	74.0	-10.4	2.39 V	215	42.2	21.4
24	11000.00	50.4 AV	54.0	-3.6	2.39 V	215	29.0	21.4

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

802.11b (2TX) + 802.11ac (VHT20) (2TX) + 802.11ac (VHT20) (4TX) + BT LE (1TX)

CHANNEL	CH 6 + CH 64 + CH 100 + CH 39	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	107.7 PK			3.52 H	315	74.1	33.6
2	*2437.00	103.0 AV			3.52 H	315	69.4	33.6
3	*2480.00	96.2 PK			1.92 H	241	62.3	33.9
4	*2480.00	91.0 AV			1.92 H	241	57.1	33.9
5	2483.50	57.3 PK	74.0	-16.7	1.92 H	241	23.4	33.9
6	2483.50	46.2 AV	54.0	-7.8	1.92 H	241	12.3	33.9
7	4874.00	56.7 PK	74.0	-17.3	1.87 H	163	48.6	8.1
8	4874.00	53.1 AV	54.0	-0.9	1.87 H	163	45.0	8.1
9	4960.00	49.4 PK	74.0	-24.6	2.68 H	110	40.9	8.5
10	4960.00	37.6 AV	54.0	-16.4	2.68 H	110	29.1	8.5
11	*5320.00	110.0 PK			1.36 H	342	68.4	41.6
12	*5320.00	99.1 AV			1.36 H	342	57.5	41.6
13	5350.00	64.3 PK	74.0	-9.7	1.36 H	342	56.3	8.0
14	5350.00	49.1 AV	54.0	-4.9	1.36 H	342	41.1	8.0
15	5460.00	48.4 PK	74.0	-25.6	1.86 H	71	40.2	8.2
16	5460.00	36.4 AV	54.0	-17.6	1.86 H	71	28.2	8.2
17	#5470.00	50.4 PK	74.0	-23.6	1.86 H	71	42.2	8.2
18	#5470.00	36.6 AV	54.0	-17.4	1.86 H	71	28.4	8.2
19	*5500.00	111.8 PK			1.86 H	71	69.8	42.0
20	*5500.00	100.4 AV			1.86 H	71	58.4	42.0
21	10640.00	62.3 PK	74.0	-11.7	2.85 H	193	41.5	20.8
22	10640.00	49.7 AV	54.0	-4.3	2.85 H	193	28.9	20.8
23	11000.00	62.5 PK	74.0	-11.5	1.84 H	231	41.1	21.4
24	11000.00	49.7 AV	54.0	-4.3	1.84 H	231	28.3	21.4

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

CHANNEL	CH 6 + CH 64 + CH 100 + CH 39	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	122.3 PK			1.87 V	25	88.7	33.6
2	*2437.00	118.6 AV			1.87 V	25	85.0	33.6
3	*2480.00	99.8 PK			1.89 V	49	65.9	33.9
4	*2480.00	94.9 AV			1.89 V	49	61.0	33.9
5	2483.50	56.3 PK	74.0	-17.7	1.89 V	49	22.4	33.9
6	2483.50	45.9 AV	54.0	-8.1	1.89 V	49	12.0	33.9
7	4874.00	56.3 PK	74.0	-17.7	2.15 V	83	48.2	8.1
8	4874.00	52.0 AV	54.0	-2.0	2.15 V	83	43.9	8.1
9	4960.00	50.3 PK	74.0	-23.7	2.59 V	97	41.8	8.5
10	4960.00	38.0 AV	54.0	-16.0	2.59 V	97	29.5	8.5
11	*5320.00	117.7 PK			1.59 V	120	76.1	41.6
12	*5320.00	106.6 AV			1.59 V	120	65.0	41.6
13	5350.00	73.6 PK	74.0	-0.4	1.59 V	120	65.6	8.0
14	5350.00	53.9 AV	54.0	-0.1	1.59 V	120	45.9	8.0
15	5460.00	60.9 PK	74.0	-13.1	1.27 V	265	52.7	8.2
16	5460.00	48.9 AV	54.0	-5.1	1.27 V	265	40.7	8.2
17	#5470.00	62.4 PK	74.0	-11.6	1.27 V	265	54.2	8.2
18	#5470.00	50.3 AV	54.0	-3.7	1.27 V	265	42.1	8.2
19	*5500.00	118.3 PK			1.27 V	265	76.3	42.0
20	*5500.00	107.7 AV			1.27 V	265	65.7	42.0
21	10640.00	63.9 PK	74.0	-10.1	1.87 V	214	43.1	20.8
22	10640.00	50.3 AV	54.0	-3.7	1.87 V	214	29.5	20.8
23	11000.00	63.8 PK	74.0	-10.2	2.94 V	193	42.4	21.4
24	11000.00	51.0 AV	54.0	-3.0	2.94 V	193	29.6	21.4

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

802.11b (2TX) + 802.11ac (VHT20) (2TX) + 802.11a (4TX) + BT LE (1TX)

CHANNEL	CH 6 + CH 64 + CH 165 + CH 39	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	107.8 PK			3.71 H	332	74.2	33.6
2	*2437.00	103.2 AV			3.71 H	332	69.6	33.6
3	*2480.00	96.3 PK			1.55 H	209	62.4	33.9
4	*2480.00	91.1 AV			1.55 H	209	57.2	33.9
5	2483.50	56.9 PK	74.0	-17.1	1.55 H	209	23.0	33.9
6	2483.50	46.0 AV	54.0	-8.0	1.55 H	209	12.1	33.9
7	4874.00	56.9 PK	74.0	-17.1	2.71 H	152	48.8	8.1
8	4874.00	53.3 AV	54.0	-0.7	2.71 H	152	45.2	8.1
9	4960.00	49.6 PK	74.0	-24.4	2.88 H	92	41.1	8.5
10	4960.00	37.8 AV	54.0	-16.2	2.88 H	92	29.3	8.5
11	*5320.00	109.9 PK			1.42 H	348	68.3	41.6
12	*5320.00	99.1 AV			1.42 H	348	57.5	41.6
13	5350.00	64.6 PK	74.0	-9.4	1.42 H	348	56.6	8.0
14	5350.00	49.2 AV	54.0	-4.8	1.42 H	348	41.2	8.0
15	#5624.00	59.8 PK	68.2	-8.4	1.58 H	69	51.3	8.5
16	*5825.00	118.3 PK			1.58 H	69	75.4	42.9
17	*5825.00	107.1 AV			1.58 H	69	64.2	42.9
18	#5949.60	60.8 PK	68.2	-7.4	1.58 H	69	51.4	9.4
19	10640.00	62.7 PK	74.0	-11.3	2.81 H	149	41.9	20.8
20	10640.00	50.3 AV	54.0	-3.7	2.81 H	149	29.5	20.8
21	11650.00	62.6 PK	74.0	-11.4	2.59 H	246	41.2	21.4
22	11650.00	49.8 AV	54.0	-4.2	2.59 H	246	28.4	21.4

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

CHANNEL	CH 6 + CH 64 + CH 165 + CH 39	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	122.6 PK			1.95 V	19	89.0	33.6
2	*2437.00	118.9 AV			1.95 V	19	85.3	33.6
3	*2480.00	99.9 PK			1.72 V	39	66.0	33.9
4	*2480.00	95.1 AV			1.72 V	39	61.2	33.9
5	2483.50	56.5 PK	74.0	-17.5	1.72 V	39	22.6	33.9
6	2483.50	46.0 AV	54.0	-8.0	1.72 V	39	12.1	33.9
7	4874.00	56.4 PK	74.0	-17.6	2.37 V	99	48.3	8.1
8	4874.00	52.1 AV	54.0	-1.9	2.37 V	99	44.0	8.1
9	4960.00	50.5 PK	74.0	-23.5	2.43 V	57	42.0	8.5
10	4960.00	38.1 AV	54.0	-15.9	2.43 V	57	29.6	8.5
11	*5320.00	117.4 PK			1.28 V	128	75.8	41.6
12	*5320.00	106.5 AV			1.28 V	128	64.9	41.6
13	5350.00	73.5 PK	74.0	-0.5	1.28 V	128	65.5	8.0
14	5350.00	53.2 AV	54.0	-0.8	1.28 V	128	45.2	8.0
15	#5639.20	60.3 PK	68.2	-7.9	1.81 V	57	52.5	7.8
16	*5825.00	127.0 PK			1.81 V	57	84.1	42.9
17	*5825.00	115.6 AV			1.81 V	57	72.7	42.9
18	#5967.20	60.2 PK	68.2	-8.0	1.81 V	57	51.6	8.6
19	10640.00	63.6 PK	74.0	-10.4	2.08 V	177	42.8	20.8
20	10640.00	50.2 AV	54.0	-3.8	2.08 V	177	29.4	20.8
21	11650.00	63.5 PK	74.0	-10.5	2.12 V	267	42.1	21.4
22	11650.00	50.8 AV	54.0	-3.2	2.12 V	267	29.4	21.4

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Below 1GHz data

802.11b (2TX) + 802.11ac (VHT20) (2TX) + 802.11ac (VHT20) (4TX) + BT LE (1TX)

CHANNEL	CH 6 + CH 48 + CH 100 + CH 39	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	59.01	14.7 QP	40.0	-25.3	1.25 H	254	29.3	-14.6
2	156.03	16.8 QP	43.5	-26.7	1.25 H	293	30.5	-13.7
3	474.25	25.7 QP	46.0	-20.3	2.00 H	232	34.6	-8.9
4	547.99	30.4 QP	46.0	-15.6	1.50 H	250	37.9	-7.5
5	811.88	29.8 QP	46.0	-16.2	1.00 H	122	31.6	-1.8
6	980.70	32.8 QP	54.0	-21.2	1.25 H	314	32.0	0.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	51.24	22.2 QP	40.0	-17.8	1.50 V	213	36.6	-14.4
2	97.81	17.6 QP	43.5	-25.9	2.00 V	101	36.3	-18.7
3	187.07	13.8 QP	43.5	-29.7	2.00 V	306	29.5	-15.7
4	363.65	19.1 QP	46.0	-26.9	2.00 V	226	29.9	-10.8
5	629.48	28.6 QP	46.0	-17.4	1.24 V	168	33.9	-5.3
6	976.82	34.1 QP	54.0	-19.9	1.00 V	32	33.3	0.8

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

802.11b (2TX) + 802.11ac (VHT20) (2TX) + 802.11ac (VHT20) (4TX) + BT LE (1TX)

CHANNEL	CH 6 + CH 64 + CH 100 + CH 39	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	37.66	18.5 QP	40.0	-21.5	2.00 H	218	33.8	-15.3
2	187.07	17.7 QP	43.5	-25.8	1.25 H	266	33.4	-15.7
3	305.44	20.8 QP	46.0	-25.2	1.00 H	146	32.8	-12.0
4	604.26	37.6 QP	46.0	-8.4	1.25 H	155	43.5	-5.9
5	732.32	34.4 QP	46.0	-11.6	1.25 H	100	37.7	-3.3
6	920.54	34.2 QP	46.0	-11.8	1.50 H	148	34.0	0.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	39.60	25.0 QP	40.0	-15.0	1.00 V	45	40.1	-15.1
2	76.47	18.9 QP	40.0	-21.1	1.50 V	33	36.2	-17.3
3	124.98	18.4 QP	43.5	-25.1	1.00 V	313	34.1	-15.7
4	456.79	26.0 QP	46.0	-20.0	1.00 V	72	35.2	-9.2
5	606.20	34.7 QP	46.0	-11.3	1.00 V	63	40.4	-5.7
6	914.72	33.2 QP	46.0	-12.8	1.00 V	160	33.2	0.0

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

802.11b (2TX) + 802.11ac (VHT20) (2TX) + 802.11a (4TX) + BT LE (1TX)

CHANNEL	CH 6 + CH 64 + CH 165 + CH 39	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	93.93	19.4 QP	43.5	-24.1	1.50 H	150	38.6	-19.2
2	142.44	20.8 QP	43.5	-22.7	2.00 H	287	34.8	-14.0
3	183.19	20.5 QP	43.5	-23.0	1.24 H	98	35.8	-15.3
4	344.24	22.6 QP	46.0	-23.4	1.00 H	270	33.9	-11.3
5	551.87	38.2 QP	46.0	-7.8	1.50 H	157	45.7	-7.5
6	924.42	32.5 QP	46.0	-13.5	1.50 H	326	32.3	0.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	76.47	21.7 QP	40.0	-18.3	2.00 V	234	39.0	-17.3
2	165.73	17.1 QP	43.5	-26.4	1.01 V	167	31.0	-13.9
3	427.68	26.0 QP	46.0	-20.0	2.00 V	201	35.6	-9.6
4	579.03	38.2 QP	46.0	-7.8	1.51 V	180	44.9	-6.7
5	730.38	34.0 QP	46.0	-12.0	2.00 V	185	37.4	-3.4
6	932.19	40.2 QP	46.0	-5.8	1.51 V	134	40.0	0.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

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

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 21, 2016	Nov. 20, 2017
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Dec. 22, 2016	Dec. 21, 2017
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Mar. 10, 2017	Mar. 09, 2018
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 15, 2017	Aug. 14, 2018
Software ADT	BV ADT_Conc_ V7.3.7.3	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in HwaYa Shielded Room 1.

3. The VCCI Site Registration No. is C-2040.

4.2.3 Test Procedures

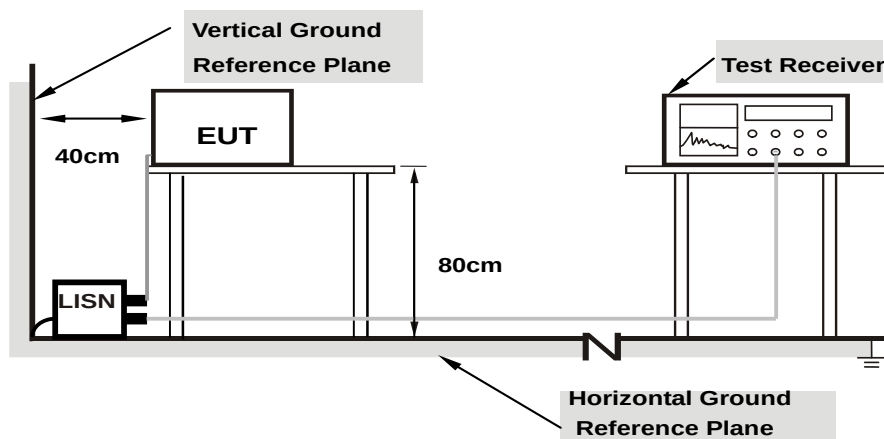
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) were not recorded.

Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT Operating Conditions

Same as 4.1.6.

4.2.7 Test Results

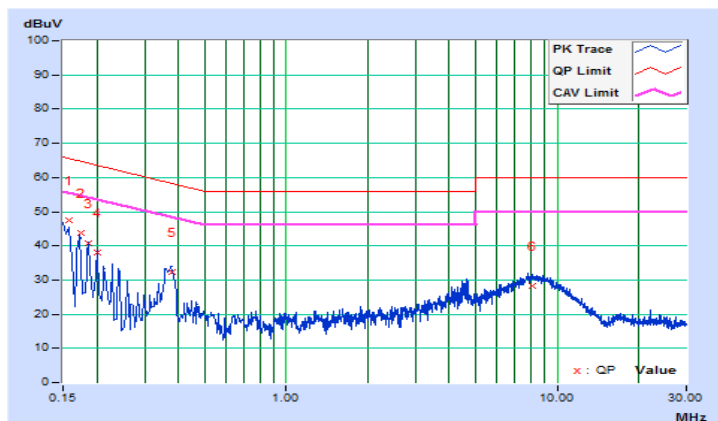
802.11b (2TX) + 802.11ac (VHT20) (2TX) + 802.11ac (VHT20) (4TX) + BT LE (1TX)

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Channel	CH 6 + CH 48 + CH 100 + CH 39		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15719	10.45	36.89	23.55	47.34	34.00	65.61	55.61	-18.27	-21.61
2	0.17374	10.45	33.20	18.01	43.65	28.46	64.78	54.78	-21.13	-26.32
3	0.18508	10.45	30.32	12.39	40.77	22.84	64.25	54.25	-23.48	-31.41
4	0.19978	10.45	27.53	15.01	37.98	25.46	63.62	53.62	-25.64	-28.16
5	0.37700	10.51	21.80	13.52	32.31	24.03	58.35	48.35	-26.04	-24.32
6	8.07557	10.84	17.47	11.56	28.31	22.40	60.00	50.00	-31.69	-27.60

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

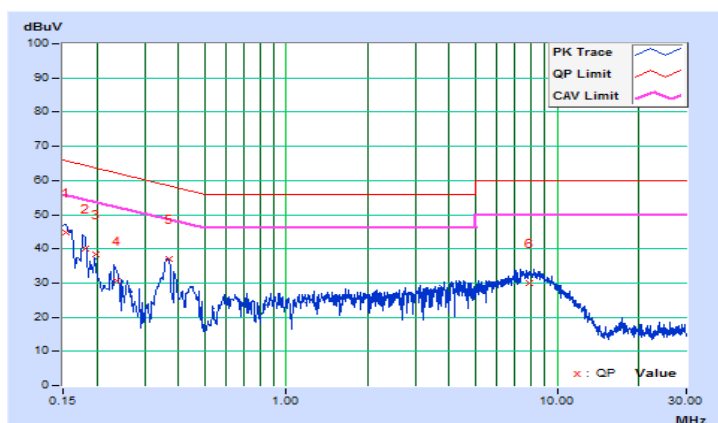


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Channel	CH 6 + CH 48 + CH 100 + CH 39		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	10.21	34.46	23.32	44.67	33.53	65.79	55.79	-21.12	-22.26
2	0.18128	10.22	29.99	20.07	40.21	30.29	64.43	54.43	-24.22	-24.14
3	0.19717	10.22	28.12	14.30	38.34	24.52	63.73	53.73	-25.39	-29.21
4	0.23602	10.23	20.42	4.87	30.65	15.10	62.24	52.24	-31.59	-37.14
5	0.36816	10.23	26.82	21.51	37.05	31.74	58.54	48.54	-21.49	-16.80
6	7.85661	10.58	19.35	13.66	29.93	24.24	60.00	50.00	-30.07	-25.76

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



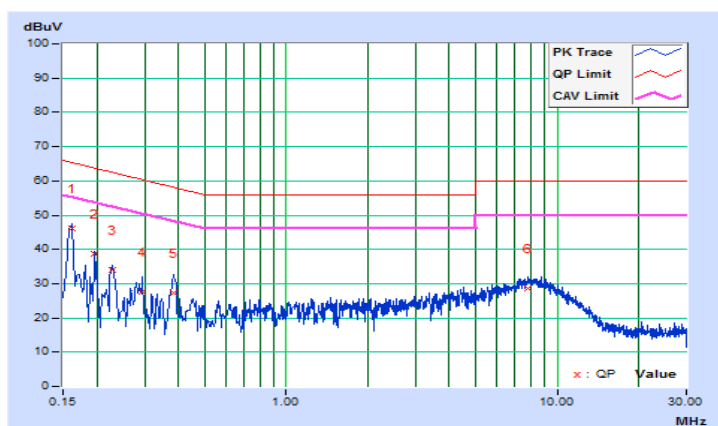
802.11b (2TX) + 802.11ac (VHT20) (2TX) + 802.11ac (VHT20) (4TX) + BT LE (1TX)

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Channel	CH 6 + CH 64 + CH 100 + CH 39		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16173	10.45	35.72	18.77	46.17	29.22	65.37	55.37	-19.20	-26.15
2	0.19692	10.45	28.19	13.88	38.64	24.33	63.74	53.74	-25.10	-29.41
3	0.22791	10.46	23.41	8.43	33.87	18.89	62.53	52.53	-28.66	-33.64
4	0.29467	10.48	17.06	9.34	27.54	19.82	60.39	50.39	-32.85	-30.57
5	0.38460	10.51	16.79	10.21	27.30	20.72	58.18	48.18	-30.88	-27.46
6	7.83315	10.83	17.77	11.37	28.60	22.20	60.00	50.00	-31.40	-27.80

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

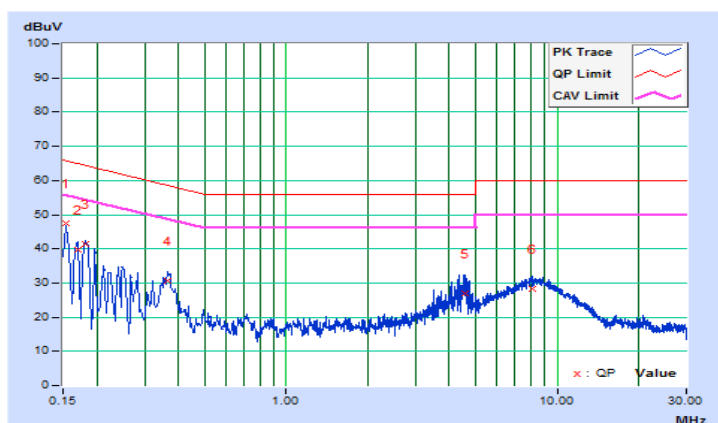


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Channel	CH 6 + CH 64 + CH 100 + CH 39		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	10.21	37.21	23.22	47.42	33.43	65.79	55.79	-18.37	-22.36
2	0.16955	10.21	29.39	10.97	39.60	21.18	64.98	54.98	-25.38	-33.80
3	0.18122	10.22	31.24	16.40	41.46	26.62	64.43	54.43	-22.97	-27.81
4	0.36526	10.23	20.57	15.32	30.80	25.55	58.61	48.61	-27.81	-23.06
5	4.54875	10.43	16.59	4.49	27.02	14.92	56.00	46.00	-28.98	-31.08
6	8.09903	10.59	17.61	12.00	28.20	22.59	60.00	50.00	-31.80	-27.41

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



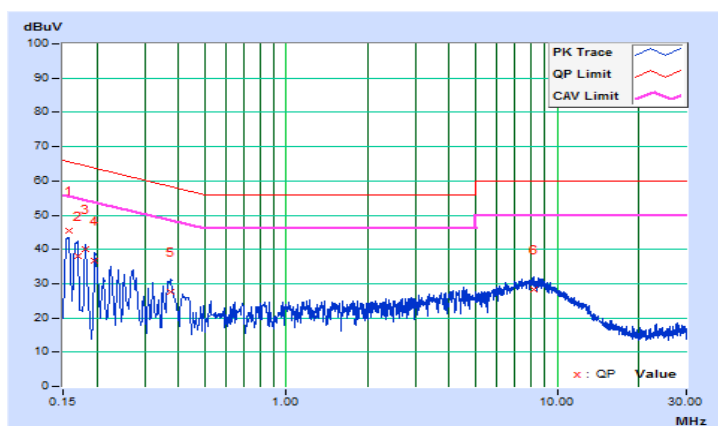
802.11b (2TX) + 802.11ac (VHT20) (2TX) + 802.11a (4TX) + BT LE (1TX)

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Channel	CH 6 + CH 64 + CH 165 + CH 39		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15719	10.45	35.04	21.62	45.49	32.07	65.61	55.61	-20.12	-23.54
2	0.16955	10.45	27.67	10.04	38.12	20.49	64.98	54.98	-26.86	-34.49
3	0.18128	10.45	29.67	15.97	40.12	26.42	64.43	54.43	-24.31	-28.01
4	0.19692	10.45	26.38	12.14	36.83	22.59	63.74	53.74	-26.91	-31.15
5	0.37678	10.51	17.06	9.53	27.57	20.04	58.35	48.35	-30.78	-28.31
6	8.23979	10.85	17.36	10.87	28.21	21.72	60.00	50.00	-31.79	-28.28

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

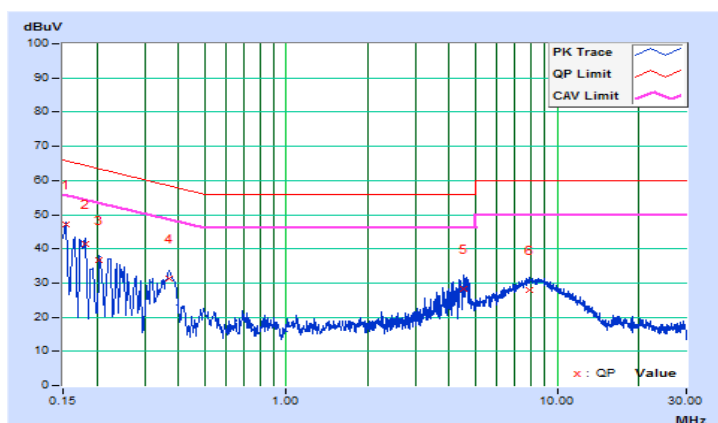


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Channel	CH 6 + CH 64 + CH 165 + CH 39		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	10.21	37.01	23.00	47.22	33.21	65.79	55.79	-18.57	-22.58
2	0.18122	10.22	31.05	16.41	41.27	26.63	64.43	54.43	-23.16	-27.80
3	0.20474	10.22	26.60	12.41	36.82	22.63	63.42	53.42	-26.60	-30.79
4	0.36913	10.23	21.04	15.84	31.27	26.07	58.52	48.52	-27.25	-22.45
5	4.51747	10.43	17.92	7.39	28.35	17.82	56.00	46.00	-27.65	-28.18
6	7.92699	10.58	17.48	11.78	28.06	22.36	60.00	50.00	-31.94	-27.64

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

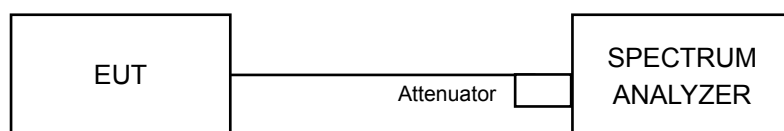


4.3 Conducted Out of Band Emission Measurement

4.3.1 Limits of Conducted Out of Band Emission Measurement

Below 30dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

MEASUREMENT PROCEDURE REF

- Set the RBW = 100 kHz.
- Set the VBW $\geq$ 300 kHz.
- Detector = average.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOB

- Set RBW = 100 kHz.
- Set VBW $\geq$ 300 kHz.
- Detector = average.
- Sweep = auto couple.
- Trace Mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level.

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Condition

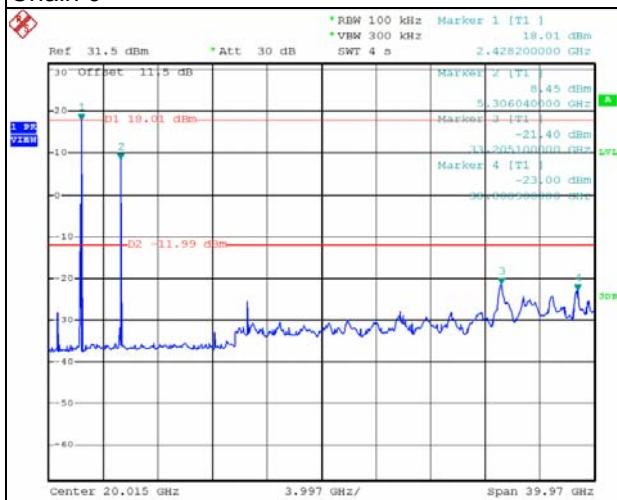
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.3.7 Test Results

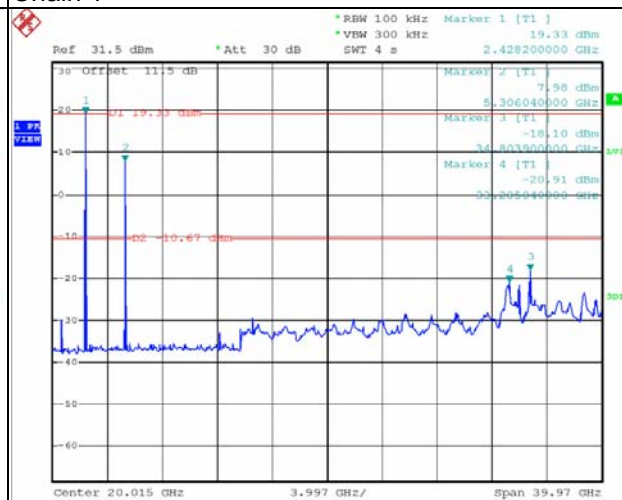
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.

802.11b (2TX) CH 6 + 802.11ac (VHT20) (2TX) CH 64

Chain 0



Chain 1

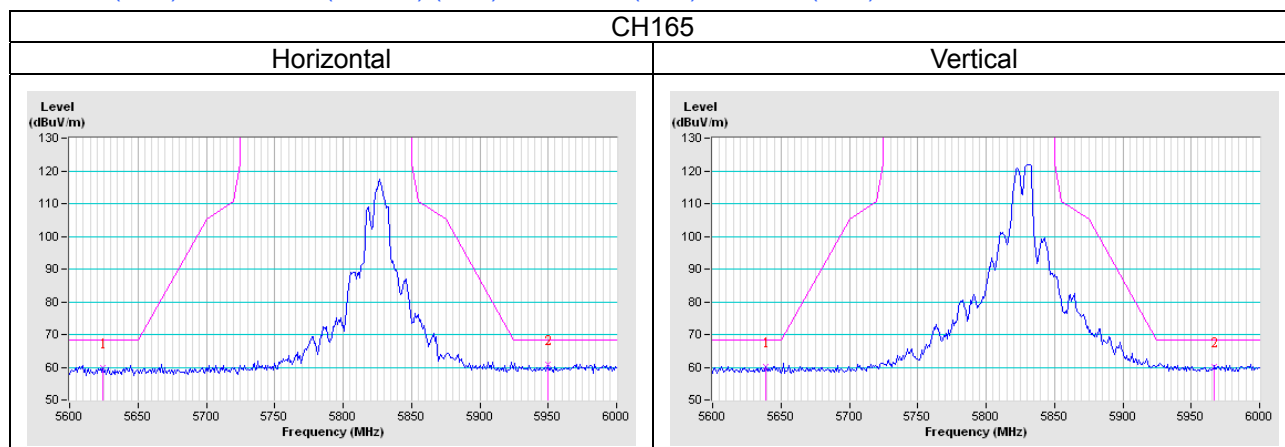


5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Annex A- Radiated Out of Band Emission (OOBE) Measurement (For U-NII-3 band)

802.11b (2TX) + 802.11ac (VHT20) (2TX) + 802.11a (4TX) + BT LE (1TX)



Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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