Partial FCC Test Report

Report No.:	RFBBQZ-WTW-P20080161-1
FCC ID:	PY317300397
Test Model:	RAX120
Received Date:	Aug. 10, 2020
Test Date:	Aug. 13 ~ Aug. 14, 2020
Issued Date:	Aug. 18, 2020
Applicant:	NETGEAR, INC.
Address:	350 East Plumeria Drive San Jose, CA 95134
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location:	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN
FCC Registration / Designation Number:	788550 / TW0003

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RFBBQZ-WTW-P20080161-1	Original release	Aug. 18, 2020

1 Certificate of Conformity

Product:	Nighthawk AX12 12-Stream AX6000 WiFi Router
Brand:	NETGEAR
Test Model:	RAX120
Sample Status:	Engineering sample
Applicant:	NETGEAR, INC.
Test Date:	Aug. 13 ~ Aug. 14, 2020
Standards:	47 CFR FCC Part 15, Subpart E (Section 15.407) ANSI C63.10:2013

This report is issued as a supplementary report of RF180613C24-1 and RF180613C24B. This report shall be used combined together with its original report.

Prepared by : Celine Chou , **Date:** Aug. 18, 2020

Celine Chou / Senior Specialist

Approved by : Bruce Chen , **Date:** Aug. 18, 2020

Bruce Chen / Senior Project Engineer

Note: Radiated emission below 1G and AC Power Conducted Emission are performed for the addendum. Refer to original report for the other test data.

2 Summary of Test Results

47 CFR FCC Part 15, Subpart E (Section 15.407)			
FCC Clause	Test Item	Result	Remarks
15.407(b)(6)	AC Power Conducted Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -20.03dB at 0.15400MHz.
15.407(b) (1/2/3/4(i/ii)/6)	Radiated Emissions & Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -3.6dB at 549.93MHz.
15.407(a)(1/2/3)	Max Average Transmit Power	NA	Refer to Note 1
---	Occupied Bandwidth Measurement	NA	Refer to Note 1
15.407(a)(1/2/3)	Peak Power Spectral Density	NA	Refer to Note 1
15.407(e)	6dB bandwidth	NA	Refer to Note 1
15.407(g)	Frequency Stability	NA	Refer to Note 1
15.203	Antenna Requirement	Pass	Antenna connector is I-PEX not a standard connector.

Note:

1. Radiated emission below 1G and AC Power Conducted Emission are performed for the addendum. Refer to original report for the other test data.
2. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

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	2.79 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	3.63 dB
	200MHz ~1000MHz	3.64 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Nighthawk AX12 12-Stream AX6000 WiFi Router
Brand	NETGEAR
Test Model	RAX120
Sample Status	Engineering sample
Power Supply Rating	19Vdc (adapter)
Modulation Type	256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM 1024QAM for OFDMA
Modulation Technology	OFDM, OFDMA
Transfer Rate	802.11a: 54/48/36/24/18/12/9/6Mbps 802.11n: up to 1200Mbps 802.11ac: up to 3466.4Mbps 802.11ax: up to 4804Mbps
Operating Frequency	5180 ~ 5240MHz, 5260 ~ 5320MHz, 5500 ~ 5720MHz, 5745 ~ 5825MHz
Number of Channel	5180 ~ 5240MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20): 4 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40): 2 802.11ac (VHT80), 802.11ax (HE80): 1 5260 ~ 5320MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20): 4 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40): 2 802.11ac (VHT80), 802.11ax (HE80): 1 5500 ~ 5720MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20): 12 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40): 6 802.11ac (VHT80), 802.11ax (HE80): 3 5745 ~ 5825MHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20): 5 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40): 2 802.11ac (VHT80), 802.11ax (HE80): 1 Simultaneous transmission: 802.11ac (VHT160(80+80)), 802.11ax (HE160(80+80)): 3 sets

Output Power	CDD Mode: 5180 ~ 5240MHz: 882.295mW 5260 ~ 5320MHz: 235.487mW 5500 ~ 5720MHz: 231.760mW 5745 ~ 5825MHz: 995.432mW Beamforming_NSS1 Mode: 5180 ~ 5240MHz: 269.735mW 5260 ~ 5320MHz: 65.714mW 5500 ~ 5720MHz: 71.372mW 5745 ~ 5825MHz: 271.004mW Beamforming_NSS2 Mode: 5180 ~ 5240MHz: 486.676mW 5260 ~ 5320MHz: 129.316mW 5500 ~ 5720MHz: 137.376mW 5745 ~ 5825MHz: 541.982mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter
Cable Supplied	1.95m non-shielded RJ45 cable without core

Note:

1. This report is prepared for FCC class II permissive change. This report is issued as a supplementary report of the original BV CPS report no.: RF180613C24-1 and RF180613C24B. The difference compared with original report are list as below. After evaluation, receiver parameter and the RF portion of the EUT remain unchanged, only radiated emission below 1G and AC power conducted emission are performed for the addendum. Refer to original report for the other test data.
   - Changed its main CPU from IQP8074 (Hawkeye v1.2) to IPQ8074A (Hawkeye 2.0).
   - Changed model name and product name.
   - Changed FW version.

2. The EUT incorporates a MIMO function. Physically, the EUT provides 8 completed transmitter and 8 receivers.

Band	Modulation Mode	CDD mode	Beamforming mode
2.4GHz	802.11b	Support	Not Support
	802.11g	Support	Not Support
	802.11n (HT20)	Support	Not Support
	802.11n (HT40)	Support	Not Support
	802.11ax (HE20)	Support	Not Support
	802.11ax (HE40)	Support	Not Support
5GHz	802.11a	Support	Not Support
	802.11n(HT20)	Support	Support(Nss1/Nss2)
	802.11n(HT40)	Support	Support(Nss1/Nss2)
	802.11ac(VHT20)	Support	Support(Nss1/Nss2)
	802.11ac(VHT40)	Support	Support(Nss1/Nss2)
	802.11ac(VHT80)	Support	Support(Nss1/Nss2)
	802.11ac(VHT80+80)	Support	Not Support
	802.11ax(HE20)	Support	Support(Nss1/Nss2)
	802.11ax(HE40)	Support	Support(Nss1/Nss2)
	802.11ax(HE80)	Support	Support(Nss1/Nss2)
	802.11ax(HE80+80)	Support	Not Support

Note: The CDD mode supports Nss1 to Nss4. The Nss 1 configuration is the worst case for final testing.

Band	Modulation Mode	Ant1	Ant2	Ant3	Ant4	Ant5	Ant6	Ant7	Ant8
2.4GHz	802.11b	TX/RX	TX/RX	TX/RX	TX/RX	-	-	-	-
	802.11g	TX/RX	TX/RX	TX/RX	TX/RX	-	-	-	-
	802.11n (HT20)	TX/RX	TX/RX	TX/RX	TX/RX	-	-	-	-
	802.11n (HT40)	TX/RX	TX/RX	TX/RX	TX/RX	-	-	-	-
	802.11ax (HE20)	TX/RX	TX/RX	TX/RX	TX/RX	-	-	-	-
	802.11ax (HE40)	TX/RX	TX/RX	TX/RX	TX/RX	-	-	-	-
5GHz	802.11a	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX
	802.11n(HT20)	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX
	802.11n(HT40)	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX
	802.11ac(VHT20)	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX
	802.11ac(VHT40)	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX
	802.11ac(VHT80)	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX
	802.11ac(VHT80+80)*	TX/RX (UNII-1)	TX/RX (UNII-1)	TX/RX (UNII-1)	TX/RX (UNII-1)	-	-	-	-
		-	-	-	-	TX/RX (UNII-3)	TX/RX (UNII-3)	TX/RX (UNII-3)	TX/RX (UNII-3)
	802.11ax(HE20)	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX
	802.11ax(HE40)	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX
	802.11ax(HE80)	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX
	802.11ax(HE80+80)*	TX/RX (UNII-1)	TX/RX (UNII-1)	TX/RX (UNII-1)	TX/RX (UNII-1)	-	-	-	-
		-	-	-	-	TX/RX (UNII-3)	TX/RX (UNII-3)	TX/RX (UNII-3)	TX/RX (UNII-3)

Note*: When VHT80+80 configured by 4Tx+4Tx, by using 8Tx directional gain as the worst case for final testing.

* The bandwidth and modulation are similar for HT20/HT40 on 802.11n mode and VHT20/VHT40 on 802.11ac mode and HE20/HE40 on 802.11ax mode. The bandwidth and modulation are similar for VHT80 on 802.11ac mode and HE80 on 802.11ax mode. Therefore the investigated worst case is the representative mode in test report. (Final test mode refer section 3.2.1)
* CDD mode and Beamforming mode are presented in output power test item. For other test items, CDD mode is the worst case for final tests after pretesting.

3. The EUT uses following antenna.

Antenna Type		Dipole			Connecter Type			I-PEX					
Directional Antenna Gain (dBi)													
Antenna No.	2.4G	5G Band 1			5G Band 2			5G Band 3			5G Band 4		
		CDD	NSS1	NSS2	CDD	NSS1	NSS2	CDD	NSS1	NSS2	CDD	NSS1	NSS2
4TX	3.29	-	-	-	-	-	-	-	-	-	-	-	-
8TX	-	3.22	11.37	8.76	3.25	11.72	8.81	3.32	11.38	8.40	3.10	11.55	8.32
4TX+4TX	-	3.22	-	-	3.25	-	-	3.32	-	-	3.10	-	-

4. The EUT consumes power from the following adapters.

Adapter 1	
Brand	NETGEAR
Model	2ABS060K NA
P/N	332-10856-01
Input Power	100-240Vac, 50/60Hz, 1.7A
Output Power	19Vdc, 3.16A
Power Cord	1.8m power cable without core attached on adapter

Adapter 2	
Brand	NETGEAR
Model	AD2073F20
P/N	332-10835-01
Input Power	100-240Vac, 50/60Hz, 1.5A
Output Power	19Vdc, 3.16A
Power Cord	1.8m power cable without core attached on adapter

* Adapter 2 is the worst case for final test after pretesting.

3.2 Description of Test Modes

For 5180 ~ 5240MHz:

4 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20):

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), 802.11ax (HE40):

Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz

1 channel is provided for 802.11ac (VHT80), 802.11ax (HE80):

Channel	Frequency
42	5210MHz

For 5260 ~ 5320MHz:

4 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20):

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), 802.11ax (HE40):

Channel	Frequency	Channel	Frequency
54	5270 MHz	62	5310 MHz

1 channel is provided for 802.11ac (VHT80), 802.11ax (HE80):

Channel	Frequency
58	5290MHz

For 5500 ~ 5700MHz:

12 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20):

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	144	5720 MHz

6 channels are provided for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40):

Channel	Frequency	Channel	Frequency
102	5510 MHz	126	5630 MHz
110	5550 MHz	134	5670 MHz
118	5590 MHz	142	5710 MHz

3 channels are provided for 802.11ac (VHT80), 802.11ax (HE80):

Channel	Frequency	Channel	Frequency
106	5530 MHz	122	5610 MHz
138	5690 MHz		

For 5745 ~ 5825MHz:

5 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20):

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), 802.11ax (HE40):

Channel	Frequency	Channel	Frequency
151	5755MHz	159	5795MHz

1 channel is provided for 802.11ac (VHT80), 802.11ax (HE80):

Channel	Frequency
155	5775MHz

Simultaneous transmission:

3 sets are provided for 802.11ac (VHT160(80+80)), 802.11ax (HE160(80+80)):

Channel	Frequency
42+58	5210 + 5290 MHz
42+155	5210 + 5775 MHz
106+122	5530 + 5610 MHz

3.2.1 Test Mode Applicability and Tested Channel Detail

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

Where RE<1G: Radiated Emission below 1GHz PLC: Power Line Conducted Emission

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	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	802.11a	5180-5240	36 to 48	149	OFDM	6.0
-	802.11a	5260-5320	52 to 64		OFDM	6.0
-	802.11a	5500-5720	100 to 144		OFDM	6.0
-	802.11a	5745-5825	149 to 165		OFDM	6.0

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	Frequency Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Data Rate (Mbps)
-	802.11a	5180-5240	36 to 48	149	OFDM	6.0
-	802.11a	5260-5320	52 to 64		OFDM	6.0
-	802.11a	5500-5720	100 to 144		OFDM	6.0
-	802.11a	5745-5825	149 to 165		OFDM	6.0

Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
RE<1G	25 deg. C, 70% RH	120Vac, 60Hz	Noah Chang
PLC	25 deg. C, 75% RH	120Vac, 60Hz	Noah Chang

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.

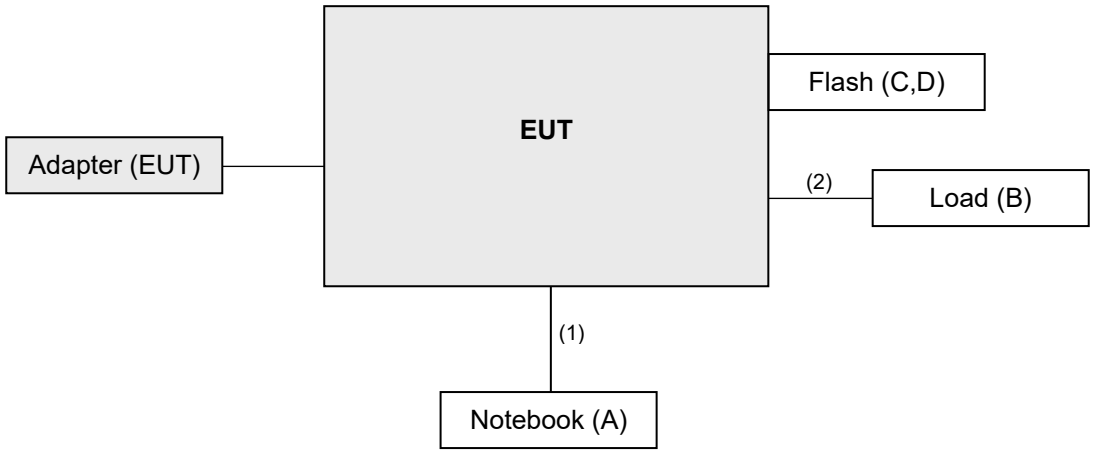
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	HP	11-u018TU	8CG70505V9	FCC DoC Approved	-
B.	Load	NA	NA	NA	NA	-
C.	Flash	HP	v250W	06	NA	-
D.	Flash	HP	v250W	03	NA	-

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.	LAN cable	1	5	N	0	RJ45, Cat5e
2.	LAN cable	5	1.5	N	0	RJ45, Cat5e

3.3.1 Configuration of System under Test



3.4 General Description of Applied Standards and References

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

Test standard:

FCC Part 15, Subpart E (15.407)

ANSI C63.10:2013

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

References Test Guidance:

KDB 789033 D02 General UNII Test Procedure New Rules v02r01

KDB 662911 D01 Multiple Transmitter Output v02r01

All test items have been performed as a reference to the above KDB test guidance.

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.

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

<table>
<tr><td colspan="3">Applicable To</td><td colspan="2">Limit</td></tr>
<tr><td colspan="3" rowspan="2">789033 D02 General UNII Test Procedure New Rules v02r01</td><td colspan="2">Field Strength at 3m</td></tr>
<tr><td>PK: 74 (dBμV/m)</td><td>AV: 54 (dBμV/m)</td></tr>
<tr><td>Frequency Band</td><td colspan="2">Applicable To</td><td>EIRP Limit</td><td>Equivalent Field Strength at 3m</td></tr>
<tr><td>5150~5250 MHz</td><td colspan="2">15.407(b)(1)</td><td rowspan="3">PK: -27 (dBm/MHz)</td><td rowspan="3">PK: 68.2(dBμV/m)</td></tr>
<tr><td>5250~5350 MHz</td><td colspan="2">15.407(b)(2)</td></tr>
<tr><td>5470~5725 MHz</td><td colspan="2">15.407(b)(3)</td></tr>
<tr><td rowspan="2">5725~5850 MHz</td><td>☐</td><td>15.407(b)(4)(i)</td><td>PK: -27 (dBm/MHz) *1
PK: 10 (dBm/MHz) *2
PK: 15.6 (dBm/MHz) *3
PK: 27 (dBm/MHz) *4</td><td>PK: 68.2(dBμV/m) *1
PK: 105.2 (dBμV/m) *2
PK: 110.8(dBμV/m) *3
PK: 122.2 (dBμV/m) *4</td></tr>
<tr><td>☐</td><td>15.407(b)(4)(ii)</td><td colspan="2">Emission limits in section 15.247(d)</td></tr>
<tr><td colspan="5">*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.</td></tr>
</table>

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

$$E = \frac{1000000\sqrt{30P}}{3}$$ μV/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	Dec. 31, 2019	Dec. 30, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Sep. 23, 2019	Sep. 22, 2020
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Nov. 11, 2019	Nov. 10, 2020
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-1170	Nov. 24, 2019	Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 24, 2019	Nov. 23, 2020
Loop Antenna TESEQ	HLA 6121	45745	Jul. 06, 2020	Jul. 05, 2021
Preamplifier Agilent (Below 1GHz)	8447D	2944A10631	Jun. 08, 2020	Jun. 07, 2021
RF Coaxial Cable WOKEN With 5dB PAD	8D-FB	Cable-CH4-01	Aug. 20, 2019	Aug. 19, 2020
RF Coaxial Cable EMCI	EMC102-KM-KM-3000	150929	Aug. 20, 2019	Aug. 19, 2020
RF Coaxial Cable EMCI	EMC102-KM-KM-600	150928	Aug. 20, 2019	Aug. 19, 2020
RF signal cable HUBER+SUHNER	SUCOFLEX 104	MY 13380+295012/04	Jun. 08, 2020	Jun. 07, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH4-03 (250724)	Jun. 08, 2020	Jun. 07, 2021
Software BV ADT	ADT_Radiated_V7.6.15.9.5	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
Boresight Antenna Fixture	FBA-01	FBA-SIP01	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 Chamber 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. Parallel, perpendicular, and ground-parallel orientations 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 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.

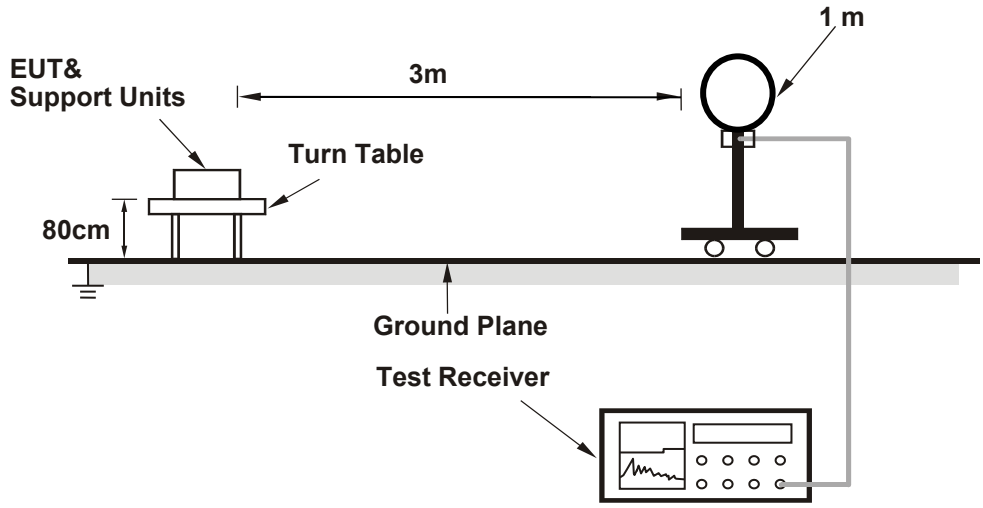
2. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

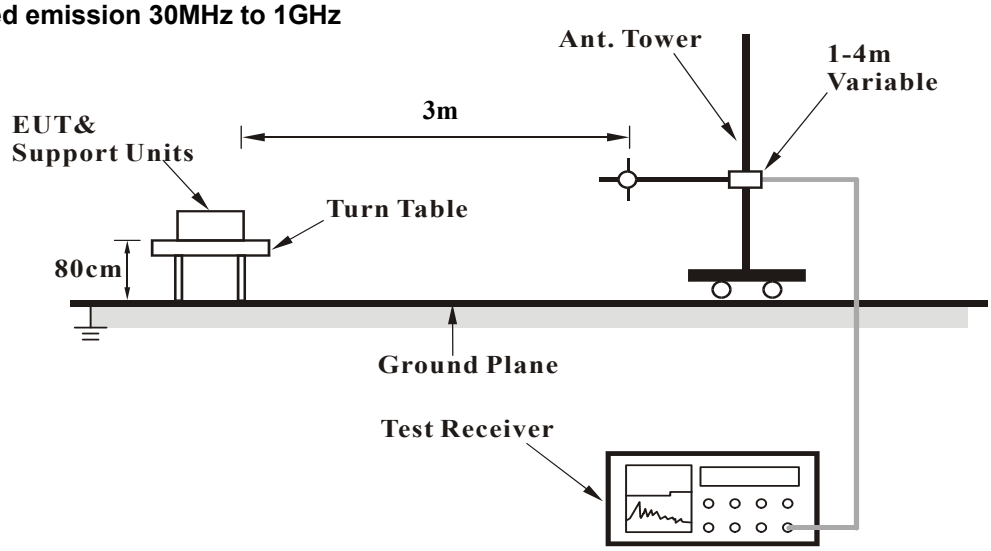
No deviation.

4.1.5 Test Setup

For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



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

4.1.6 EUT Operating Conditions

a. Placed the EUT on the testing table.
b. Prepared a notebook to act as a communication partner and placed it outside of testing area.
c. 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.
d. The communication partner sent data to EUT by command "PING".

4.1.7 Test Results

Below 1GHz Worst-Case Data:

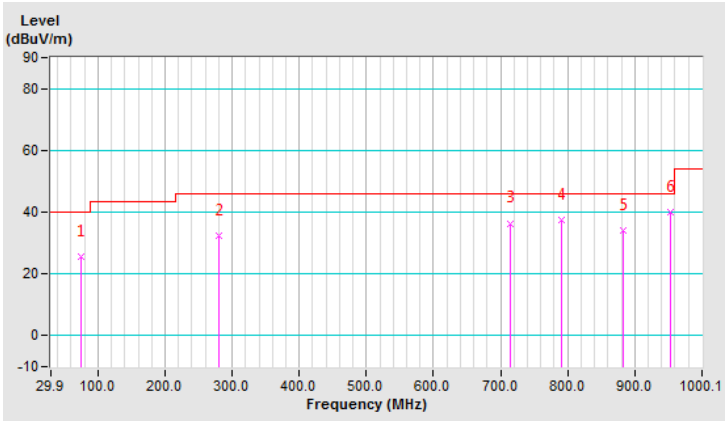
802.11a

CHANNEL	TX Channel 149	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	75.50	25.8 QP	40.0	-14.2	2.00 H	25	37.4	-11.6
2	281.18	32.4 QP	46.0	-13.6	1.00 H	87	40.1	-7.7
3	713.89	36.4 QP	46.0	-9.6	1.00 H	87	33.8	2.6
4	790.54	37.6 QP	46.0	-8.4	1.00 H	266	32.5	5.1
5	883.68	34.1 QP	46.0	-11.9	1.00 H	123	27.1	7.0
6	952.56	40.0 QP	46.0	-6.0	1.50 H	172	31.4	8.6

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 of frequency range 30MHz ~ 1000MHz.
4. Margin value = Emission Level – Limit value.
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

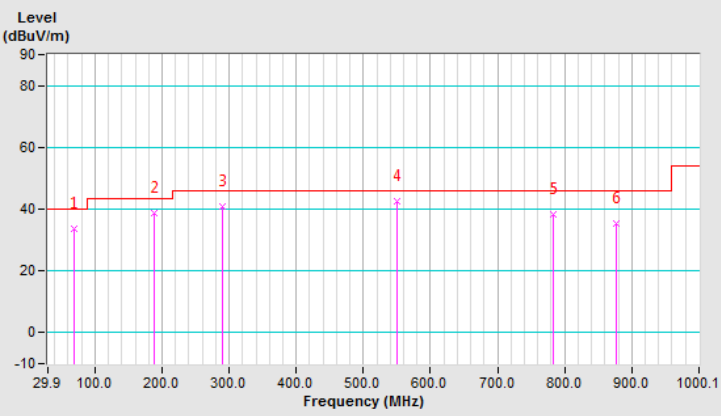


CHANNEL	TX Channel 149	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

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	69.68	33.5 QP	40.0	-6.5	1.00 V	63	44.1	-10.6
2	188.04	38.8 QP	43.5	-4.7	1.00 V	63	49.6	-10.8
3	290.88	40.8 QP	46.0	-5.2	1.00 V	66	48.2	-7.4
4	**549.93**	**42.4 QP**	**46.0**	**-3.6**	**1.00 V**	**63**	**44.3**	**-1.9**
5	783.75	38.5 QP	46.0	-7.5	1.50 V	130	33.5	5.0
6	875.91	35.3 QP	46.0	-10.7	2.00 V	8	28.3	7.0

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 of frequency range 30MHz ~ 1000MHz.
4. Margin value = Emission Level – Limit value.
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



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	Dec. 11, 2019	Dec. 10, 2020
RF signal cable Woken	5D-FB	Cable-cond1-01	Sep. 05, 2019	Sep. 04, 2020
LISN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 20, 2020	Feb. 19, 2021
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 22, 2019	Aug. 21, 2020
Software ADT	BV ADT_Cond_ V7.3.7.4	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-12040.

4.2.3 Test Procedures

a. 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.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

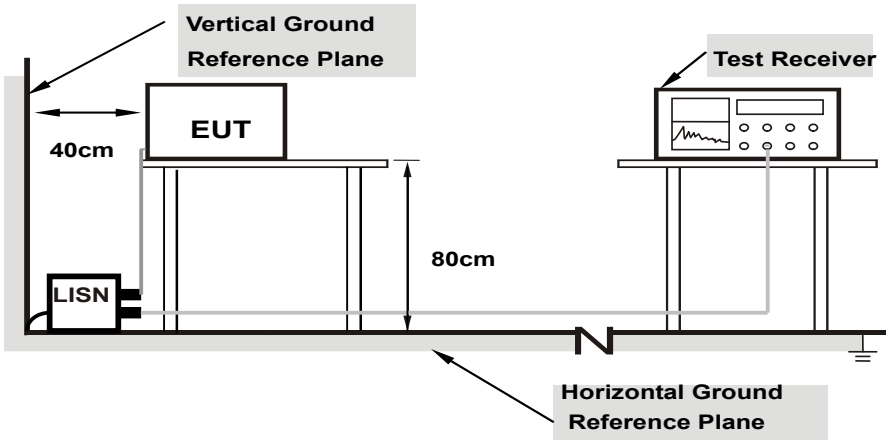
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

Worst-case data:

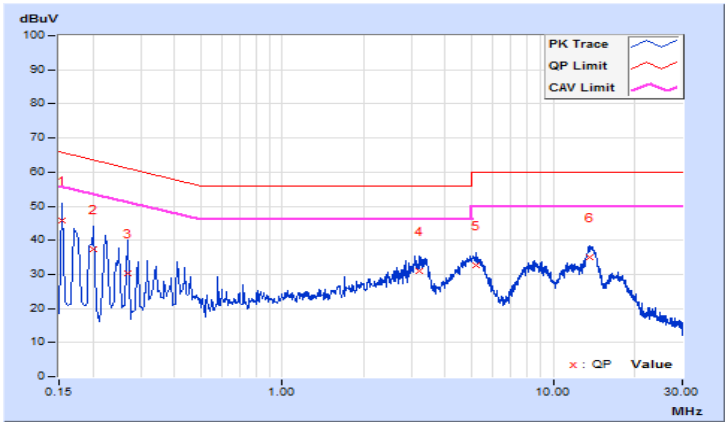
802.11a

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	**0.15400**	**9.63**	**36.12**	**21.73**	**45.75**	**31.36**	**65.78**	**55.78**	**-20.03**	**-24.42**
2	0.20148	9.62	27.65	13.41	37.27	23.03	63.55	53.55	-26.28	-30.52
3	0.26992	9.63	20.64	7.67	30.27	17.30	61.12	51.12	-30.85	-33.82
4	3.20600	9.77	21.27	13.26	31.04	23.03	56.00	46.00	-24.96	-22.97
5	5.17800	9.81	22.76	18.16	32.57	27.97	60.00	50.00	-27.43	-22.03
6	13.61800	9.89	25.15	18.83	35.04	28.72	60.00	50.00	-24.96	-21.28

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.

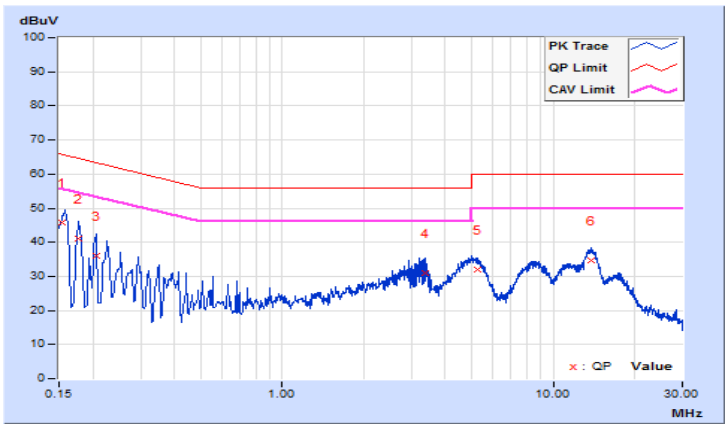


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15400	9.66	36.03	22.33	45.69	31.99	65.78	55.78	-20.09	-23.79
2	0.17800	9.65	31.54	17.59	41.19	27.24	64.58	54.58	-23.39	-27.34
3	0.20600	9.64	26.29	12.86	35.93	22.50	63.37	53.37	-27.44	-30.87
4	3.35400	9.80	21.23	12.91	31.03	22.71	56.00	46.00	-24.97	-23.29
5	5.27800	9.84	22.15	17.74	31.99	27.58	60.00	50.00	-28.01	-22.42
6	13.75168	9.96	24.80	18.25	34.76	28.21	60.00	50.00	-25.24	-21.79

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.



5 Pictures of Test Arrangements

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

Appendix – Information of 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:

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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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