

TEST REPORT

CERTIFICATE OF CONFORMITY

Standard: 47 CFR FCC Part 15, Subpart C (Section 15.247)
47 CFR FCC Part 15, Subpart E (Section 15.407)

Report No.: RFBBQZ-WTW-P24020178-4

FCC ID: PY323400615

Product: Nighthawk BE6500 WiFi 7 Router, Nighthawk BE5000 WiFi 7 Router,
Nighthawk BE4300 WiFi 7 Router (refer to item 3.1 for more details)

Brand: NETGEAR

Model No.: RS200

Series Model: RS150, RS150v2, RS140 (refer to item 3.1 for more details)

Received Date: 2024/2/6

Test Date: 2024/6/6 ~ 2024/7/2

Issued Date: 2024/7/12

Applicant and Manufacturer: 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., Kewi Shan Dist., Taoyuan City 33383, Taiwan

FCC Registration /

Designation Number: 788550 / TW0003

Approved by:


Jeremy Lin / Project Engineer

, Date:

2024/7/12

This test report consists of 31 pages in total. It may be duplicated completely for legal use with the approval of the applicant. It should not be reproduced except in full, without the written approval of our laboratory. The test results in the report only apply to the tested sample. The test results in this report are traceable to the national or international standards.



Prepared by : Polly Chien / Specialist

This report is governed by, and incorporates by reference, the Conditions of Testing as posted at the date of issuance of this report at <http://www.bureauveritas.com/home/about-us/our-business/cps/about-us/terms-conditions/> and is intended for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. Measurement uncertainty is only provided upon request for accredited tests. Statements of conformity are based on simple acceptance criteria without taking measurement uncertainty into account, unless otherwise requested in writing. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence or if you require measurement uncertainty; provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents.

Table of Contents

Release Control Record	3
1 Certificate.....	4
2 Summary of Test Results	5
2.1 Measurement Uncertainty	5
2.2 Supplementary Information	5
3 General Information	6
3.1 General Description of EUT	6
3.2 Antenna Description of EUT	8
3.3 Channel List.....	10
3.4 Test Mode Applicability and Tested Channel Detail.....	13
3.5 Test Program Used and Operation Descriptions	14
3.6 Connection Diagram of EUT and Peripheral Devices	14
3.7 Configuration of Peripheral Devices and Cable Connections	14
4 Test Instruments	15
4.1 Conducted Out of Band Emissions	15
4.2 Unwanted Emissions below 1 GHz	15
4.3 Unwanted Emissions above 1 GHz.....	16
5 Limits of Test Items.....	17
5.1 Conducted Out of Band Emissions	17
5.2 Unwanted Emissions below 1 GHz	17
5.3 Unwanted Emissions above 1 GHz.....	18
6 Test Arrangements.....	20
6.1 Conducted Out of Band Emissions	20
6.1.1 Test Setup	20
6.1.2 Test Procedure	20
6.2 Unwanted Emissions below 1 GHz	21
6.2.1 Test Setup	21
6.2.2 Test Procedure	22
6.3 Unwanted Emissions above 1 GHz.....	23
6.3.1 Test Setup	23
6.3.2 Test Procedure	23
7 Test Results of Test Item	24
7.1 Conducted Out of Band Emissions	24
7.2 Unwanted Emissions below 1 GHz	25
7.3 Unwanted Emissions above 1 GHz.....	27
8 Pictures of Test Arrangements	29
9 Information of the Testing Laboratories	31

Release Control Record

Issue No.	Description	Date Issued
RFBBQZ-WTW-P24020178-4	Original release.	2024/7/12

1 Certificate

Product: NIGHTHAWK BE6500 WiFi 7 Router, NIGHTHAWK BE5000 WiFi 7 Router, NIGHTHAWK BE4300 WiFi 7 Router (refer to item 3.1 for more details)

Brand: NETGEAR

Test Model: RS200

Series Model: RS150, RS150v2, RS140 (refer to item 3.1 for more details)

Sample Status: Engineering sample

**Applicant and
Manufacturer:** NETGEAR, INC.

Test Date: 2024/6/6 ~ 2024/7/2

Standard: 47 CFR FCC Part 15, Subpart C (Section 15.247)
47 CFR FCC Part 15, Subpart E (Section 15.407)

**Measurement
procedure:** 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.

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247) 47 CFR FCC Part 15, Subpart E (Section 15.407)			
Clause	Test Item	Result	Remark
15.205 / 15.209 / 15.247(d) 15.407(b)(9)	Unwanted Emissions below 1 GHz	Pass	Minimum passing margin is -6.3 dB at 51.34 MHz
15.205 / 15.209 / 15.247(d) 15.407(b) (1/10) 15.407(b) (2/10) 15.407(b) (3/10) 15.407(b) (4(i)/10) 15.407(b)(5) 15.407(b)(10)	Unwanted Emissions above 1 GHz	Pass	Minimum passing margin is -4.3 dB at 11490.00 MHz
15.247(d)	Conducted Out of Band Emissions	Pass	Meet the requirement of limit.

Note: 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:

Parameter	Specification	Uncertainty (±)
Unwanted Emissions below 1 GHz	9 kHz ~ 30 MHz	3.59 dB
	30 MHz ~ 1 GHz	3.64 dB
Unwanted Emissions above 1 GHz	1 GHz ~ 18 GHz	2.29 dB
	18 GHz ~ 40 GHz	2.29 dB

The other instruments specified are routine verified to remain within the calibrated levels, no measurement uncertainty is required to be calculated.

2.2 Supplementary Information

There is not any deviation from the test standards for the test method, and no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	NIGHTHAWK BE6500 WiFi 7 Router, NIGHTHAWK BE5000 WiFi 7 Router, NIGHTHAWK BE4300 WiFi 7 Router (Refer to note)
Brand	NETGEAR
Test Model	RS200
Series Model	RS150, RS150v2, RS140
Model Difference	Refer to note
Status of EUT	Engineering sample
Power Supply Rating	12 Vdc from adapter
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in VHT mode 1024QAM for OFDMA in 11ax mode 4096QAM for OFDMA in 11be mode
Modulation Technology	DSSS, OFDM, OFDMA
Transfer Rate	up to 688 Mbps (For 2.4G Band) up to 5764 Mbps (For 5G Band)
Operating Frequency	2.412 GHz ~ 2.462 GHz 5.18 GHz ~ 5.25 GHz 5.25 GHz ~ 5.32 GHz 5.50 GHz ~ 5.72 GHz 5.745 GHz ~ 5.825 GHz 5.815 GHz ~ 5.885 GHz
Number of Channel	2.4 GHz 802.11b, 802.11g, 802.11n (HT20), VHT20, 802.11ax (HE20), 802.11be (EHT20): 11 802.11n (HT40), VHT40, 802.11ax (HE40), 802.11be (EHT40): 7 5 GHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20), 802.11be (EHT20): 28 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40), 802.11be (EHT40): 14 802.11ac (VHT80), 802.11ax (HE80), 802.11be (EHT80): 7 802.11ac (VHT160), 802.11ax (HE160), 802.11be (EHT160): 3
Output Power	2.412 GHz ~ 2.462 GHz: Conducted Power: 913.154 mW (29.61 dBm) 5.18 GHz ~ 5.25 GHz : Conducted Power: 847.316 mW (29.28 dBm) 5.25 GHz ~ 5.32 GHz : Conducted Power: 211.959 mW (23.26 dBm) 5.50 GHz ~ 5.72 GHz : Conducted Power: 211.187 mW (23.25 dBm) 5.745 GHz ~ 5.825 GHz : Conducted Power: 863.959 mW (29.36 dBm) 5.815 GHz ~ 5.885 GHz: EIRP: 3396.253 mW (35.31 dBm)

Note:

1. The following product and models are as below. The model of the RS200 was chosen for final test.

Product	Model	remark
NIGHTHAWK BE6500 WiFi 7 Router	RS200	2.4GHz (2 x 2): 0.7 Gbps 5GHz (4 x 4): 5.8 Gbps
NIGHTHAWK BE5000 WiFi 7 Router	RS150	2.4GHz (2 x 2): 0.7 Gbps 5GHz (3 x 3): 4.3 Gbps
	RS150v2	2.4GHz (2 x 2): 0.7 Gbps 5GHz (3 x 3): 4.3 Gbps
NIGHTHAWK BE4300 WiFi 7 Router	RS140	2.4GHz (2 x 2): 0.7 Gbps 5GHz (3 x 3): 3.6 Gbps

2. The EUT uses following accessories.

AC Adapter 1			
Brand	Model	Part Number	Specification
NETGEAR	ADS-40FPC-12 12030E	332-11699-01	AC Input: 100-240 Vac, 50/60 Hz, 1.0 A DC Output: 12.0 Vdc, 2.5 A, 30 W DC Output Cable: 1.76 m / 0 core Plug: US/EU/AU Manufacturer: Vietnam Honor High Tech Company Limited
AC Adapter 2			
Brand	Model	Part Number	Specification
NETGEAR	2AED030FC	332-11712-01	AC Input: 100-240 Vac, 50/60 Hz, 1.0 A DC Output: 12.0 Vdc, 2.5 A, 30.0W DC Output Cable: 1.8 m / 0 core Plug: US/EU/AU Manufacturer: Channel Well Technology(Guangzhou) Co., Ltd
Ethernet Cable			
Brand	Model	Specification	
NETGEAR	N/A	Signal Line: 1.96 m	

3. Simultaneously transmission condition.

Condition	Technology	
1	WLAN (2.4GHz)	WLAN (5GHz)

4. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Antenna Description of EUT

1. The antenna information is listed as below.

Antenna Type	Dipole
Connector Type	ipex(MHF)
Antenna Gain	Directional Gain (dBi)
2400~2483.5 MHz	3.81
5150~5250 MHz	6.05
5250~5350 MHz	6.06
5470~5725 MHz	6.21
5725~5850 MHz	6.33

*The detailed antenna information, please refer to the BV CPS Directional Gain Measurement Report no.: RFBBQZ-WTW-P24020178-5.

Antenna No.	Gain (dBi)	Antenna Type	Connector Type
	5850 MHz		
ANT 1	3.78	Dipole	ipex(MHF)
ANT 2	3.84	Dipole	ipex(MHF)
ANT 3	4.20	Dipole	ipex(MHF)
ANT 4	3.00	Dipole	ipex(MHF)

* Detail antenna specification please refer to antenna datasheet and/or antenna measurement report.

2. The EUT incorporates a MIMO function:

For 2.4G

2.4 GHz Band		
Modulation Mode	TX & RX Configuration	
802.11b	2TX	2RX
802.11g	2TX	2RX
802.11n (HT20)	2TX	2RX
802.11n (HT40)	2TX	2RX
VHT20	2TX	2RX
VHT40	2TX	2RX
802.11ax (HE20)	2TX	2RX
802.11ax (HE40)	2TX	2RX
802.11be (EHT20)	2TX	2RX
802.11be (EHT40)	2TX	2RX

Note:

1. All of modulation mode support beamforming function except 802.11b/g modulation mode.
2. For 802.11ax/be, the EUT not support Partial RU (resource unit) reduction mechanisms.

For 5G

Modulation Mode	Tx & Rx Configuration	
802.11a	4TX	4RX
802.11n (HT20)	4TX	4RX
802.11n (HT40)	4TX	4RX
802.11ac (VHT20)	4TX	4RX
802.11ac (VHT40)	4TX	4RX
802.11ac (VHT80)	4TX	4RX
802.11ac (VHT160)	4TX	4RX
802.11ax (HE20)	4TX	4RX
802.11ax (HE40)	4TX	4RX
802.11ax (HE80)	4TX	4RX
802.11ax (HE160)	4TX	4RX
802.11be (EHT20)	4TX	4RX
802.11be (EHT40)	4TX	4RX
802.11be (EHT80)	4TX	4RX
802.11be (EHT160)	4TX	4RX

Note:

1. All of modulation mode support beamforming function except 802.11a modulation mode.
2. For 802.11ax/be, the EUT not support Partial RU (resource unit) and channel puncturing/bandwidth reduction mechanisms.

3.3 Channel List

FOR 2412 ~ 2462 MHz

11 channels are provided for 802.11b, 802.11g, 802.11n (HT20), VHT20, 802.11ax (HE20), 802.11be (EHT20):

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

7 channels are provided for 802.11n (HT40), VHT40, 802.11ax (HE40), 802.11be (EHT40):

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

FOR 5180 ~ 5320 MHz

8 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20), 802.11be (EHT20):

Channel	Frequency	Channel	Frequency
36	5180 MHz	52	5260 MHz
40	5200 MHz	56	5280 MHz
44	5220 MHz	60	5300 MHz
48	5240 MHz	64	5320 MHz

4 channels are provided for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40), 802.11be (EHT40):

Channel	Frequency	Channel	Frequency
38	5190 MHz	54	5270 MHz
46	5230 MHz	62	5310 MHz

2 channels are provided for 802.11ac (VHT80), 802.11ax (HE80), 802.11be (EHT80):

Channel	Frequency	Channel	Frequency
42	5210 MHz	58	5290 MHz

1 straddle channel is provided for 802.11ac (VHT160), 802.11ax (HE160), 802.11be (EHT160):

Channel	Frequency
50	5250 MHz

FOR 5500 ~ 5720 MHz

12 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20), 802.11be (EHT20):

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), 802.11be (EHT40):

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), 802.11be (EHT80):

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

1 channel is provided for 802.11ac (VHT160), 802.11ax (HE160), 802.11be (EHT160):

Channel	Frequency
114	5570 MHz

FOR 5745 ~ 5825 MHz:

5 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20), 802.11be (EHT20):

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

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40), 802.11be (EHT40):

Channel	Frequency	Channel	Frequency
151	5755 MHz	159	5795 MHz

1 channel is provided for 802.11ac (VHT80), 802.11ax (HE80), 802.11be (EHT80):

Channel	Frequency
155	5775 MHz

FOR 5815 ~ 5855 MHz:

3 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20), 802.11be (EHT20):

Channel	Frequency	Channel	Frequency	Channel	Frequency
*169	5845 MHz	173	5865 MHz	177	5885 MHz

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40), 802.11be (EHT40):

Channel	Frequency	Channel	Frequency
*167	5835 MHz	175	5875 MHz

1 channel is provided for 802.11ac (VHT80), 802.11ax (HE80), 802.11be (EHT80):

Channel	Frequency
*171	5855 MHz

1 channel is provided for 802.11ac (VHT160), 802.11ax (HE160), 802.11be (EHT160):

Channel	Frequency
*163	5815 MHz

Note: * U-NII-3 & -4 span channels.

3.4 Test Mode Applicability and Tested Channel Detail

Pre-Scan:	1. For Unwanted Emission (below 1GHz) and AC Power Conducted Emissions items: AC Adapter 1 and AC Adapter 2. Pre-scan these modes and find the worst case as a representative test condition. 2. 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).
Worst Case:	1. AC Adapter 1 and AC Adapter 2 Worst Condition: AC Adapter 1 2. The EUT is designed to be positioned on the Z-Plane only.

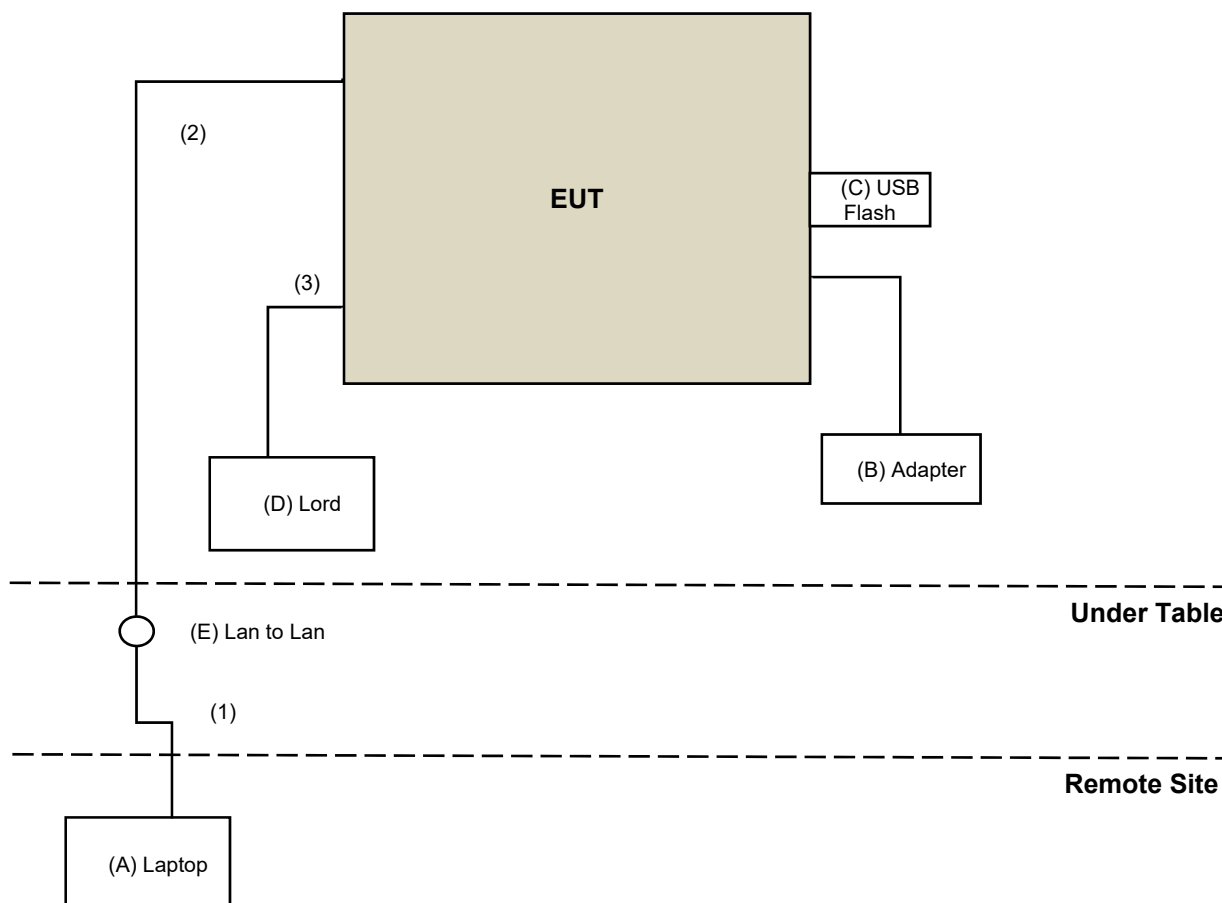
Following channel(s) was (were) selected for the final test as listed below:

Test Item	Mode	Signal Mode	Tested Channel	Modulation	Data Rate Parameter
Unwanted Emissions below 1 GHz	802.11b + 802.11a	CDD + CDD	1 + 149	DBPSK + BPSK	1Mb/s + MCS0
Unwanted Emissions above 1 GHz	802.11b + 802.11a	CDD + CDD	1 + 149	DBPSK + BPSK	1Mb/s + MCS0
Conducted Out of Band Emissions	802.11b + 802.11a	CDD + CDD	1 + 149	DBPSK + BPSK	1Mb/s + MCS0

3.5 Test Program Used and Operation Descriptions

Controlling software Access manual Tool 3.2.1.5 has been activated to set the EUT under transmission condition continuously at specific channel frequency.

3.6 Connection Diagram of EUT and Peripheral Devices



3.7 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Laptop	DELL	E5430	2RL3YW1	N/A	Provided by Lab
B	Adapter	NETGEAR	ADS-40FPC-12 12030E	N/A	N/A	Supplied by applicant
C	USB Flash	SanDisk	SDDDC3-032G	N/A	N/A	Provided by Lab
D	Lord	N/A	N/A	N/A	N/A	Provided by Lab
E	Lan to Lan	N/A	N/A	N/A	N/A	Provided by Lab

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	RJ-45 Cable	1	10	N	N	Provided by Lab
2	RJ-45 Cable	1	1.96	N	N	Accessory of EUT
3	RJ-45 Cable	4	1.5	N	N	Provided by Lab

4 Test Instruments

The calibration interval of the all test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.1 Conducted Out of Band Emissions

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Signal & Spectrum Analyzer R&S	FSV3044	101105	2024/2/27	2025/2/26
Software BV	ADT_RF Test Software V7.6.5.4	N/A	N/A	N/A

Notes:

1. The test was performed in Oven room.
2. Tested Date: 2024/6/18

4.2 Unwanted Emissions below 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower inn-co GmbH	MA 4000	010303	N/A	N/A
Bi_Log Antenna Schwarzbeck	VULB 9168	9168-155	2023/10/13	2024/10/12
EMI Test Receiver R&S	ESR3	102782	2023/12/7	2024/12/6
Loop Antenna Electro-Metrics	EM-6879	269	2023/9/23	2024/9/22
Loop Antenna TESEQ	HLA 6121	45745	2023/8/8	2024/8/7
Preamplifier Agilent	8447D	2944A10631	2024/5/1	2025/4/30
Preamplifier EMCI	EMC001340	980201	2023/9/27	2024/9/26
RF Coaxial Cable Woken	8D-FB	Cable-CH4-01	2023/7/8	2024/7/7
Signal & Spectrum Analyzer R&S	FSW43	101582	2024/4/12	2025/4/11
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	N/A	N/A	N/A
Turn Table BV ADT	TT100	TT93021705	N/A	N/A
Turn Table Controller BV ADT	SC100	SC93021705	N/A	N/A

Notes:

1. The test was performed in HY - 966 chamber 3.
2. Tested Date: 2024/6/6

4.3 Unwanted Emissions above 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower inn-co GmbH	MA 4000	010303	N/A	N/A
Boresight antenna tower fixture BV	BAF-02	5	N/A	N/A
EMI Test Receiver R&S	ESR3	102782	2023/12/7	2024/12/6
Horn Antenna Schwarzbeck	BBHA 9120D	9120D-408	2023/11/12	2024/11/11
	BBHA 9170	9170-480	2023/11/12	2024/11/11
		BBHA9170241	2023/10/16	2024/10/15
		BBHA9170243	2023/11/12	2024/11/11
Preamplifier EMCI	EMC 184045	980116	2023/9/27	2024/9/26
Preamplifier Keysight	83017A	MY53270295	2024/5/1	2025/4/30
RF Coaxial Cable EMCI	EMC102-KM-KM-600	150928	2023/7/8	2024/7/7
	EMC102-KM-KM-3000	150929	2023/7/8	2024/7/7
RF Coaxial Cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH4-03(250724)	2024/5/1	2025/4/30
	Sucoflex 104	MY 13380+295012/04	2024/5/1	2025/4/30
Signal & Spectrum Analyzer R&S	FSW43	101582	2024/4/12	2025/4/11
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	N/A	N/A	N/A
Turn Table BV ADT	TT100	TT93021705	N/A	N/A
Turn Table Controller BV ADT	SC100	SC93021705	N/A	N/A

Notes:

1. The test was performed in HY - 966 chamber 3.
2. Tested Date: 2024/6/7 ~ 2024/7/2

5 Limits of Test Items

5.1 Conducted Out of Band Emissions

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

5.2 Unwanted Emissions below 1 GHz

Radiated emissions up to 1 GHz which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 30 dB 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

Notes:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).

5.3 Unwanted Emissions above 1 GHz

Radiated emissions above 1 GHz which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 30 dB below the highest level of the desired power

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
Above 960	500	3

Notes:

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 1000 MHz, 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 20 dB under any condition of modulation.

For 5.15-5.850 GHz band limits of unwanted emission out of the restricted bands

Applicable To	Limit	
789033 D02 General UNII Test Procedure New Rules v02r01	Field Strength at 3 m	
	PK: 74 (dBμV/m)	AV: 54 (dBμV/m)

For transmitters operating in the 5.15-5.25 GHz band:

Applicable To	EIRP Limit	Equivalent Field Strength at 3 m
15.407(b)(1)	PK: -27 (dBm/MHz)	PK: 68.2 (dBμV/m)

For transmitters operating in the 5.25-5.35 GHz band:

Applicable To	EIRP Limit	Equivalent Field Strength at 3 m
15.407(b)(2)	PK: -27 (dBm/MHz)	PK: 68.2 (dBμV/m)

For transmitters operating in the 5.47-5.725 GHz band:

Applicable To	EIRP Limit	Equivalent Field Strength at 3 m
15.407(b)(3)	PK: -27 (dBm/MHz)	PK: 68.2 (dBμV/m)

For transmitters operating in the 5.725-5.850 GHz band:

Applicable To	EIRP Limit	Equivalent Field Strength at 3 m
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}

^{*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:

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

For 5.815-5.855 GHz band limits of unwanted emission out of the restricted bands

- (i) For an indoor access point or subordinate device, all emissions at or above 5.895 GHz shall not exceed an e.i.r.p. of 15 dBm/MHz and shall decrease linearly to an e.i.r.p. of -7 dBm/MHz at or above 5.925 GHz.
- (ii) For a client device, all emissions at or above 5.895 GHz shall not exceed an e.i.r.p. of -5 dBm/MHz and shall decrease linearly to an e.i.r.p. of -27 dBm/MHz at or above 5.925 GHz.
- (iii) For a client device or indoor access point or subordinate device, all emissions below 5.725 GHz shall not exceed an e.i.r.p. of -27 dBm/MHz at 5.65 GHz increasing linearly to 10 dBm/MHz at 5.7 GHz, and from 5.7 GHz increasing linearly to a level of 15.6 dBm/MHz at 5.72 GHz, and from 5.72 GHz increasing linearly to a level of 27 dBm/MHz at 5.725 GHz.

Note:

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

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

For 5.925-7.125 GHz band limits of unwanted emission out of the restricted bands

Frequencies (MHz)	EIRP Limit	Equivalent Field Strength at 3 m
5925 MHz > F > 7125 MHz	Peak: -7 (dBm/MHz)	88.2 (dBuV/m)
	Average: -27 (dBm/MHz)	68.2 (dBuV/m)

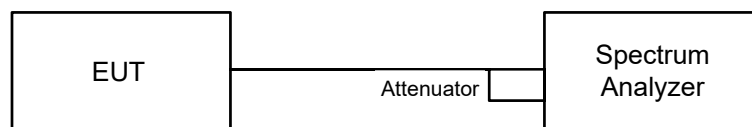
Note: The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

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

6 Test Arrangements

6.1 Conducted Out of Band Emissions

6.1.1 Test Setup



6.1.2 Test Procedure

MEASUREMENT PROCEDURE REF

- Set the RBW = 100 kHz.
- Set the VBW $\geq$ 300 kHz.
- Detector = peak.
- 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.

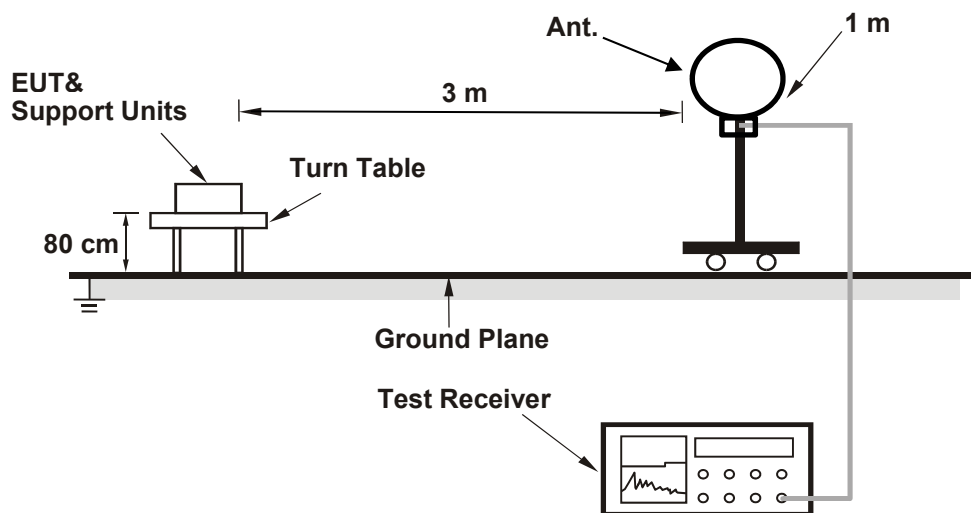
MEASUREMENT PROCEDURE OOB

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

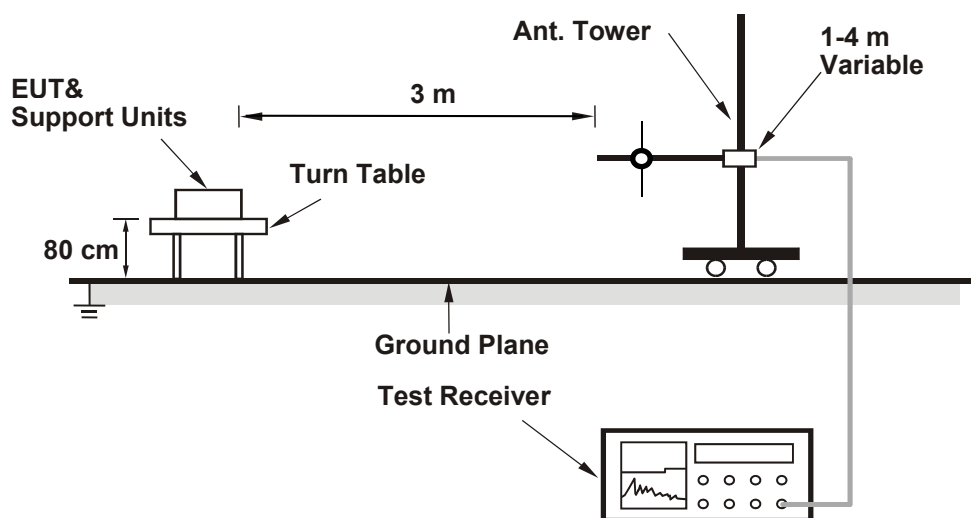
6.2 Unwanted Emissions below 1 GHz

6.2.1 Test Setup

For Radiated emission below 30 MHz



For Radiated emission above 30 MHz



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

6.2.2 Test Procedure

For Radiated emission below 30 MHz

- 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. 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, except for the frequency band (9 kHz to 90 kHz and 110 kHz to 490 kHz) set to average detect function and peak detect function.

Notes:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 200 Hz at frequency below 150 kHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz or 10 kHz at frequency (150 kHz to 30 MHz).
3. All modes of operation were investigated and the worst-case emissions are reported.

For Radiated emission above 30 MHz

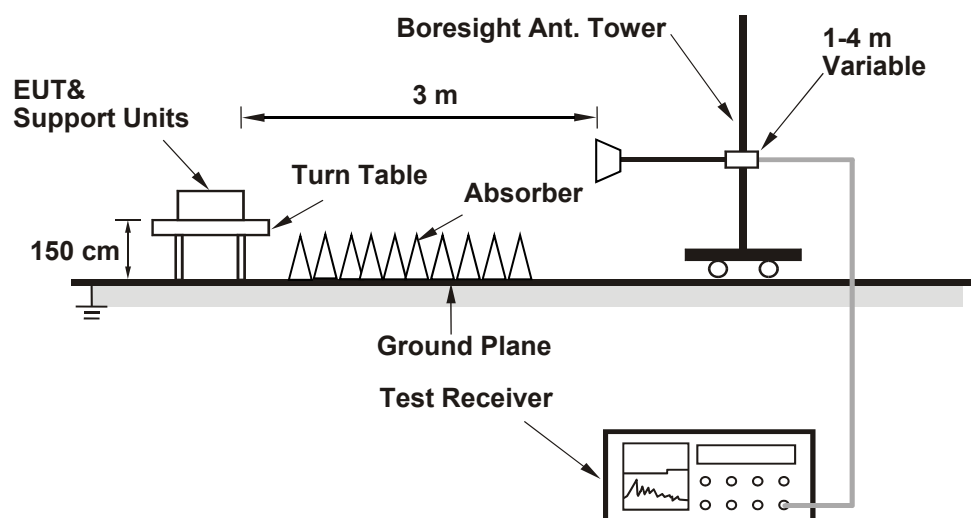
- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the 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.

Notes:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. All modes of operation were investigated and the worst-case emissions are reported.

6.3 Unwanted Emissions above 1 GHz

6.3.1 Test Setup



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

6.3.2 Test Procedure

- The EUT was placed on the top of a rotating table 1.5 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.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- 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.
- The test-receiver system was set to peak and average detects 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.

Notes:

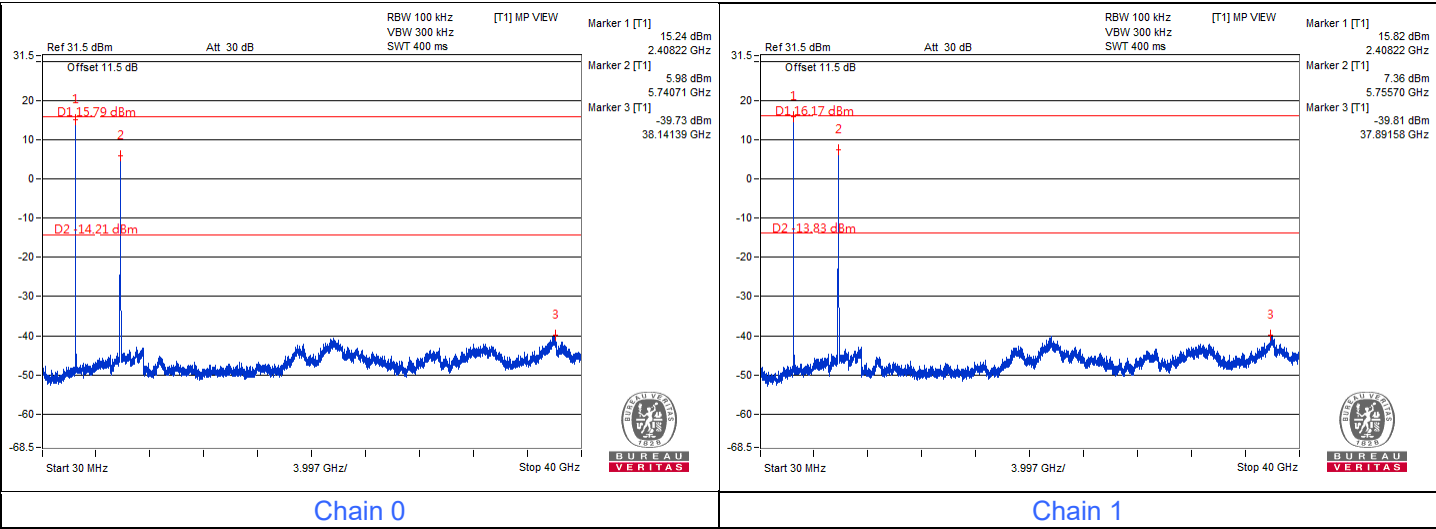
- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) and Average detection (AV) at frequency above 1 GHz.
- For fundamental and harmonic signal measurement, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is $\geq 1/T$ (Duty cycle $< 98\%$) or 10 Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1 GHz.
- All modes of operation were investigated and the worst-case emissions are reported.

7 Test Results of Test Item

7.1 Conducted Out of Band Emissions

Input Power:	120 Vac, 60 Hz	Environmental Conditions:	23°C, 66% RH	Tested By:	Titan Hsu
--------------	----------------	---------------------------	--------------	------------	-----------

802.11b + 802.11a



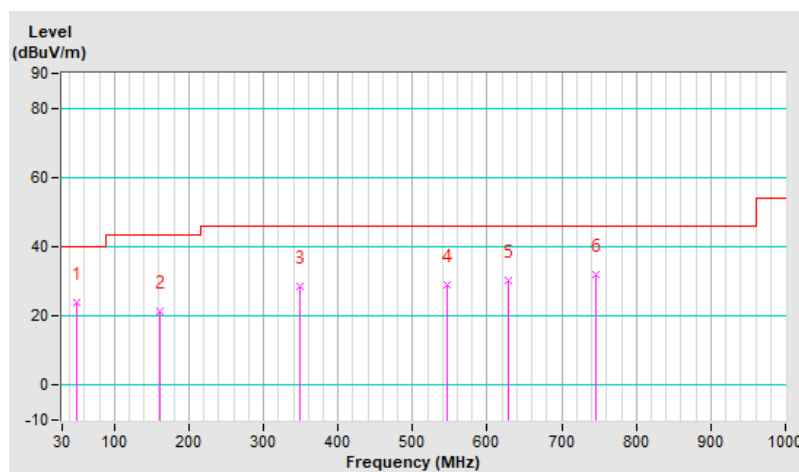
7.2 Unwanted Emissions below 1 GHz

RF Mode	802.11b + 802.11a	Channel	CH 1 : 2412 MHz + CH 149 : 5745 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	23°C, 66% RH
Tested By	Titan Hsu		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	50.37	23.9 QP	40.0	-16.1	1.50 H	261	32.5	-8.6
2	160.95	21.5 QP	43.5	-22.0	1.50 H	7	30.1	-8.6
3	349.13	28.4 QP	46.0	-17.6	1.00 H	316	35.1	-6.7
4	546.04	29.0 QP	46.0	-17.0	1.00 H	0	32.0	-3.0
5	628.49	30.2 QP	46.0	-15.8	1.00 H	341	30.9	-0.7
6	744.89	32.0 QP	46.0	-14.0	1.50 H	245	30.1	1.9

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.

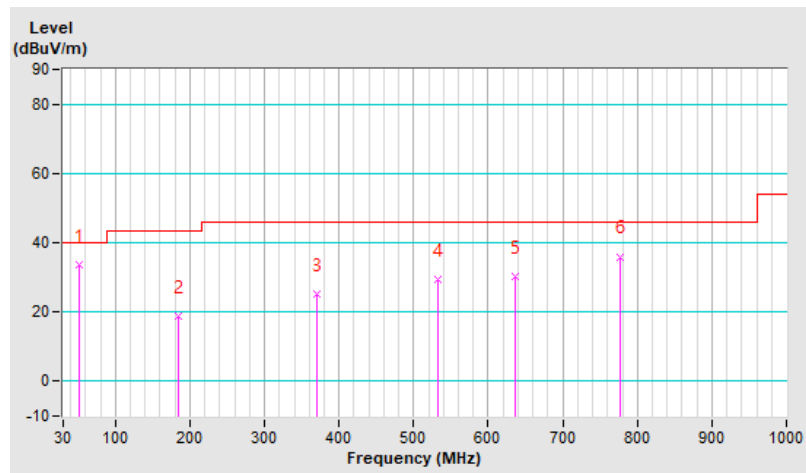


RF Mode	802.11b + 802.11a	Channel	CH 1 : 2412 MHz + CH 149 : 5745 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	23°C, 66% RH
Tested By	Titan Hsu		

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	51.34	33.7 QP	40.0	-6.3	1.00 V	316	42.3	-8.6
2	185.20	18.9 QP	43.5	-24.6	1.50 V	338	29.6	-10.7
3	369.50	25.2 QP	46.0	-20.8	1.00 V	312	31.3	-6.1
4	532.46	29.2 QP	46.0	-16.8	1.50 V	211	32.4	-3.2
5	637.22	30.3 QP	46.0	-15.7	1.00 V	110	30.9	-0.6
6	776.90	36.0 QP	46.0	-10.0	1.00 V	232	33.7	2.3

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.



7.3 Unwanted Emissions above 1 GHz

RF Mode	802.11b + 802.11a	Channel	CH 1 : 2412 MHz + CH 149 : 5745 MHz
Frequency Range	1 GHz ~ 40 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 Hz, DET=Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	23°C, 66% RH
Tested By	Titan Hsu		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	59.5 PK	74.0	-14.5	2.55 H	138	24.6	34.9
2	2390.00	47.2 AV	54.0	-6.8	2.55 H	138	12.3	34.9
3	*2412.00	113.0 PK			2.55 H	138	78.0	35.0
4	*2412.00	110.5 AV			2.55 H	138	75.5	35.0
5	4824.00	50.7 PK	74.0	-23.3	1.85 H	229	37.2	13.5
6	4824.00	41.0 AV	54.0	-13.0	1.85 H	229	27.5	13.5
7	#5642.40	61.1 PK	68.2	-7.1	2.45 H	103	47.7	13.4
8	*5745.00	117.1 PK			2.45 H	103	72.5	44.6
9	*5745.00	107.2 AV			2.45 H	103	62.6	44.6
10	#5969.20	61.4 PK	68.2	-6.8	2.45 H	103	47.4	14.0
11	11490.00	62.8 PK	74.0	-11.2	1.77 H	193	39.4	23.4
12	11490.00	49.3 AV	54.0	-4.7	1.77 H	193	25.9	23.4

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * " : Fundamental frequency, the limit was restricted at the RF Output Power.
6. " # " : The radiated frequency is out of the restricted band.

RF Mode	802.11b + 802.11a	Channel	CH 1 : 2412 MHz + CH 149 : 5745 MHz
Frequency Range	1 GHz ~ 40 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=10 Hz, DET=Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	23°C, 66% RH
Tested By	Titan Hsu		

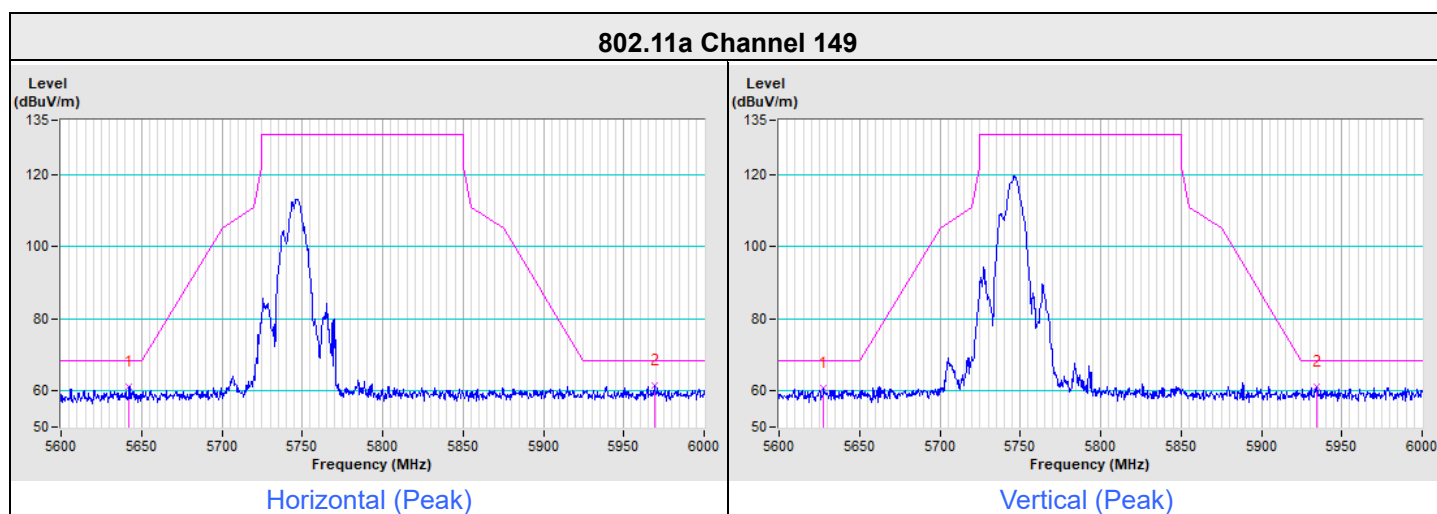
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	60.1 PK	74.0	-13.9	1.56 V	129	25.2	34.9
2	2390.00	47.4 AV	54.0	-6.6	1.56 V	129	12.5	34.9
3	*2412.00	118.5 PK			1.56 V	129	83.5	35.0
4	*2412.00	116.0 AV			1.56 V	129	81.0	35.0
5	4824.00	52.3 PK	74.0	-21.7	1.45 V	250	38.8	13.5
6	4824.00	44.0 AV	54.0	-10.0	1.45 V	250	30.5	13.5
7	#5627.60	60.9 PK	68.2	-7.3	1.51 V	296	47.7	13.2
8	*5745.00	123.3 PK			1.51 V	296	78.7	44.6
9	*5745.00	113.9 AV			1.51 V	296	69.3	44.6
10	#5934.80	61.3 PK	68.2	-6.9	1.51 V	296	47.3	14.0
11	11490.00	63.4 PK	74.0	-10.6	2.31 V	198	40.0	23.4
12	11490.00	49.7 AV	54.0	-4.3	2.31 V	198	26.3	23.4

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency, the limit was restricted at the RF Output Power.
6. " # ": The radiated frequency is out of the restricted band.

Plot of Band Edge

Frequency Range	5.6 GHz ~ 6 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak
-----------------	-----------------	-------------------------------	----------------------------------



8 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo)

9 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 according to ISO/IEC 17025.

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

Lin Kou 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@bureauveritas.com

Web Site: <http://ee.bureauveritas.com.tw>

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

--- END ---