

FCC Test Report

Report No.: RF160913E02C

FCC ID: PY316200342

Test Model: R6400v2

Series Model: R6700v3

Received Date: Sep. 19, 2017

Test Date: Oct. 05 to 27, 2017

Issued Date: Nov. 06, 2017

Applicant: NETGEAR, Inc.

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

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Release Control Record

Issue No.	Description	Date Issued
RF160913E02C	Original release.	Nov. 06, 2017

1 Certificate of Conformity

Product: AC1750 Smart WiFi Router

Brand: NETGEAR

Test Model: R6400v2

Series Model: R6700v3

Sample Status: ENGINEERING SAMPLE

Applicant: NETGEAR, Inc.

Test Date: Oct. 05 to 27, 2017

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
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 EMC characteristics under the conditions specified in this report.

Prepared by : Mary Ko , **Date:** Nov. 06, 2017
Mary Ko / Specialist

Approved by : May Chen , **Date:** Nov. 06, 2017
May Chen / Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.1dB at 2319MHz, 2390MHz.
15.247(b)	Conducted power	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	Antenna connector is i-pex(MHF) not a standard connector.

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) (\pm)
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.32 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.16 dB
	6GHz ~ 18GHz	4.91 dB
	18GHz ~ 40GHz	5.30 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	AC1750 Smart WiFi Router
Brand	NETGEAR
Test Model	R6400v2
Series Model	R6700v3
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	12Vdc from power adapter
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode only
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: up to 11Mbps 802.11a/g: up to 54Mbps 802.11n: up to 450Mbps 802.11ac: up to 1300Mbps
Operating Frequency	2.4GHz: 2.412 ~ 2.462GHz 5GHz: 5.18 ~ 5.24GHz, 5.26 ~ 5.32GHz, 5.50 ~ 5.70GHz and 5.745 ~ 5.825GHz
Number of Channel	2.4GHz: 802.11b, 802.11g, 802.11n (HT20): 11 802.11n (HT40): 7 5GHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 24 802.11n (HT40), 802.11ac (VHT40): 11 802.11ac (VHT80): 5
Output Power	2.4GHz: 560.898mW 5GHz: 5.18GHz ~ 5.24GHz: CDD Mode: 523.594mW Beamforming Mode: 583.131mW 5.26GHz ~ 5.32GHz: CDD Mode: 214.883mW Beamforming Mode: 215.105mW 5.50GHz ~ 5.70GHz: CDD Mode: 210.489mW Beamforming Mode: 224.591mW 5.745GHz ~ 5.825GHz: CDD Mode: 913.29mW Beamforming Mode: 896.659mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter x 1
Data Cable Supplied	NA

Note:

1. This report is prepared for FCC Class II change. The difference compared with the Report No.: RF160913E02 design is as the following:

- ◆ Add model: R6700v3, which are identical to each other in all aspects except for the following:

Brand	Model	Description
NETGEAR	R6400v2	for Marketing
	R6700v3	Removed USB 2.0

From the above model, model: **R6400v2** was selected as representative model for the test and its data was recorded in this report.

- ◆ Reduce the Heatspreader's size.

Size (mm)	
Original	Newly
226x127	196x90

Note: Both are same materials

- ◆ Remove 2 shielding can on bottom PCBA.

2. According to above conditions, only Conducted power and Radiated emissions test items need to be performed. And all data was verified to meet the requirements.
3. Simultaneously transmission condition.

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

Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.

4. The EUT must be supplied with a power adapter and following different models could be chosen as following table:

No	Brand Name	Model No.	PN	Spec.
1	NETGEAR	2ABL030F 1 NA	332-10758-01	Input: 100-120Vac, 50/60Hz, 1.0A Output: 12Vdc, 2.5A DC output cable (Unshielded, 1.8m)
2	NETGEAR	AD2067F10	332-10797-01	Input: 100-120Vac, 50/60Hz, 1.0A Output: 12Vdc, 2.5A DC output cable (Unshielded, 1.8m)

Note: In the original report, from the above adapters, the radiated emission worse case was found in Adapter 2. Therefore only the test data of the mode was recorded in this report.

5. The antennas provided to the EUT, please refer to the following table:

Frequency range (MHz)	Directional Antenna Gain (dBi)
2412 ~ 2462	5.65
5180 ~ 5240	5.95
5260 ~ 5320	5.95
5500 ~ 5700	5.98
5745 ~ 5825	5.98

6. The EUT incorporates a MIMO function.

2.4GHz Band			
MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
802.11b	1 ~ 11Mbps	3TX	3RX
802.11g	6 ~ 54Mbps	3TX	3RX
802.11n (HT20)	MCS 0~7	3TX	3RX
	MCS 8~15	3TX	3RX
	MCS16~23	3TX	3RX
802.11n (HT40)	MCS 0~7	3TX	3RX
	MCS 8~15	3TX	3RX
	MCS16~23	3TX	3RX
5GHz Band			
MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
802.11a	6 ~ 54Mbps	3TX	3RX
802.11n (HT20)	MCS 0~7	3TX	3RX
	MCS 8~15	3TX	3RX
	MCS16~23	3TX	3RX
802.11n (HT40)	MCS 0~7	3TX	3RX
	MCS 8~15	3TX	3RX
	MCS16~23	3TX	3RX
802.11ac (VHT20)	MCS0~8 Nss=1	3TX	3RX
	MCS0~8 Nss=2	3TX	3RX
	MCS0~9 Nss=3	3TX	3RX
802.11ac (VHT40)	MCS0~9 Nss=1	3TX	3RX
	MCS0~9 Nss=2	3TX	3RX
	MCS0~9 Nss=3	3TX	3RX
802.11ac (VHT80)	MCS0~9 Nss=1	3TX	3RX
	MCS0~9 Nss=2	3TX	3RX
	MCS0~9 Nss=3	3TX	3RX

Note:

- All of modulation mode support beamforming function except 802.11a modulation mode and 2.4GHz band.

7. 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 Description of Test Modes

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		

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO			DESCRIPTION
	RE \geq 1G	RE $<$ 1G	APCM	
-	√	√	√	With adapter 2

Where RE \geq 1G: Radiated Emission above 1GHz & Bandedge Measurement
 RE $<$ 1G: Radiated Emission below 1GHz
 APCM: Antenna Port Conducted Measurement

NOTE: 1. In the original report, the EUT had been pre-tested on the positioned of each 2 axis. The worst case was found when positioned on **X-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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	6	OFDM	BPSK	1

Antenna Port Conducted Measurement:

- This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- 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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE \geq 1G	22deg. C, 64%RH	120Vac, 60Hz	Rey Chen
RE<1G	24deg. C, 68%RH	120Vac, 60Hz	Rey Chen
APCM	25deg. C, 60%RH	120Vac, 60Hz	Anderson Chen

3.3 Duty Cycle of Test Signal

If duty cycle of test signal is $\geq 98\%$, duty factor is not required.

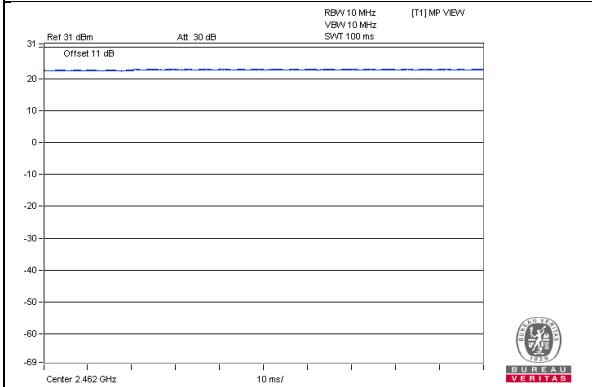
802.11b: duty cycle of test signal is 100 %

802.11g: Duty cycle = $2.063/2.084 = 0.99$

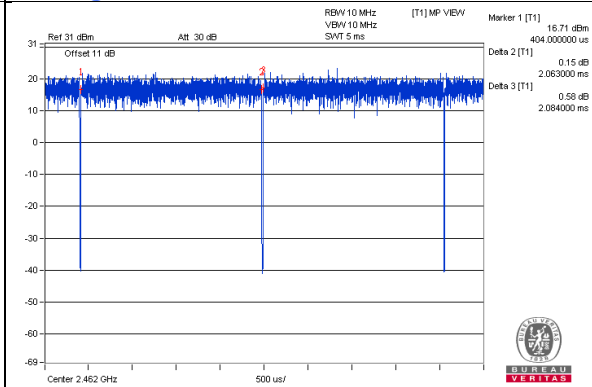
802.11n (HT20): Duty cycle = $1.919/1.914 = 0.989$

802.11n (HT40): Duty cycle = $0.946/0.962 = 0.983$

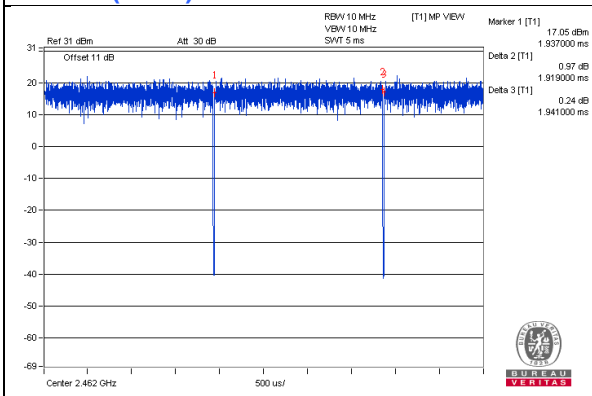
802.11b



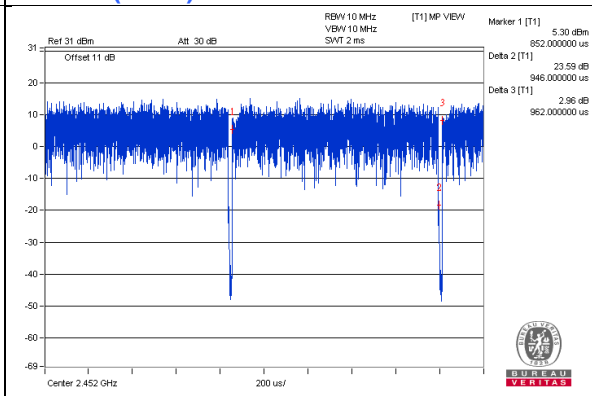
802.11g



802.11n (HT20)



802.11n (HT40)



3.4 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.

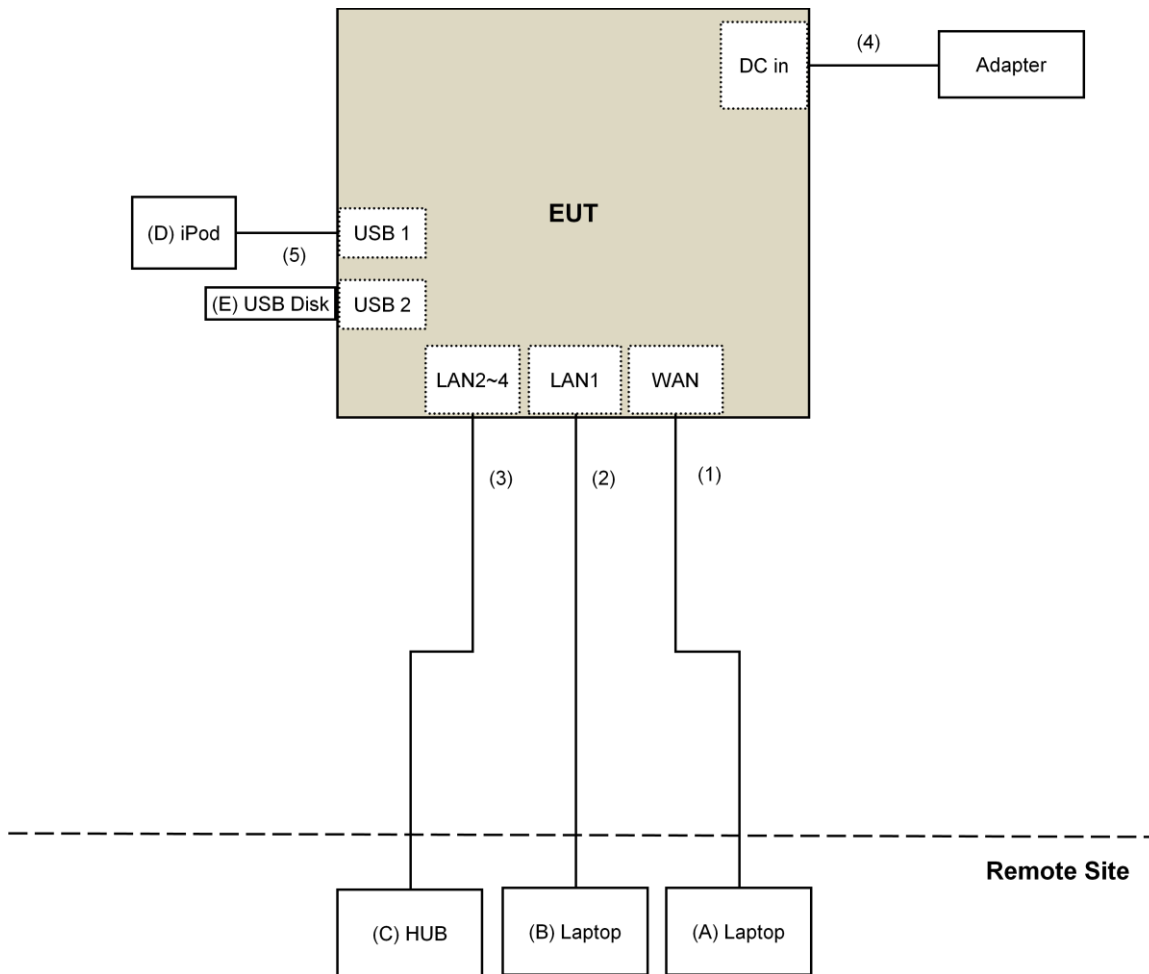
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Laptop	DELL	E5430	4YV4VY1	FCC DoC	Provided by Lab
B.	Laptop	DELL	E5430	HYV4VY1	FCC DoC	Provided by Lab
C.	HUB	ZyXEL	ES-116P	S060H02000215	FCC DoC	Provided by Lab
D.	iPod	Apple	MC749TA/A	CC4DN25WDFDM	NA	Provided by Lab
E.	USB Disk	Transcend(16GB)	NA	NA	NA	Provided by Lab

Note:

1. All power cords of the above support units are non-shielded (1.8m).

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ-45 Cable	1	10	No	0	Provided by Lab
2.	RJ-45 Cable	1	10	No	0	Provided by Lab
3.	RJ-45 Cable	3	10	No	0	Provided by Lab
4.	DC Cable	1	1.8	No	0	Supplied by client
5.	USB Cable	1	0.1	No	0	Provided by Lab

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards

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

FCC Part 15, Subpart C (15.247)
KDB 558074 D01 DTS Meas Guidance v04
KDB 662911 D01 Multiple Transmitter Output v02r01
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 30dB 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.

4.1.2 Test Instruments

For below 1GHz test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver Agilent	N9038A	MY50010156	July 12, 2017	July 11, 2018
Pre-Amplifier ^(*) EMCI	EMC001340	980142	Jan. 20, 2016	Jan. 19, 2018
Loop Antenna ^(*) Electro-Metrics	EM-6879	264	Dec. 16, 2016	Dec. 15, 2018
RF Cable	NA	LOOPCAB-001 LOOPCAB-002	Jan. 17, 2017	Jan. 16, 2018
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-05	May 06, 2017	May 05, 2018
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Dec. 29, 2016	Dec. 28, 2017
RF Cable	8D	966-3-1 966-3-2 966-3-3	Apr. 01, 2017	Mar. 31, 2018
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-3-01	Oct. 03, 2017	Oct. 02, 2018
Software	ADT_Radiated_V8. 7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208406	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 calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in 966 Chamber No. 3.
4. The FCC Designation Number is TW2022.
5. The CANADA Site Registration No. is 20331-1
6. Loop antenna was used for all emissions below 30 MHz.
7. Tested Date: Oct. 05, 2017

For other test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver Keysight	N9038A	MY54450088	July 08, 2017	July 07, 2018
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Dec. 27, 2016	Dec. 26, 2017
Pre-Amplifier EMCI	EMC12630SE	980385	Feb. 02, 2017	Feb. 01, 2018
RF Cable	EMC104-SM-SM-1 200 EMC104-SM-SM-2 000 EMC104-SM-SM-5 000	160923 150318 150321	Feb. 02, 2017 Mar. 29, 2017 Mar. 29, 2017	Feb. 01, 2018 Mar. 28, 2018 Mar. 28, 2018
Pre-Amplifier EMCI	EMC184045SE	980387	Feb. 02, 2017	Feb. 01, 2018
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170608	Dec. 15, 2016	Dec. 14, 2017
RF Cable	SUCOFLEX 102	36432/2 36433/2	Jan. 15, 2017	Jan. 14, 2018
Software	ADT_Radiated_V8. 7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208410	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP02	NA	NA
Spectrum Analyzer R&S	FSv40	100964	July 1, 2017	June 30, 2018
Power meter Anritsu	ML2495A	1014008	May 11, 2017	May 10, 2018
Power sensor Anritsu	MA2411B	0917122	May 11, 2017	May 10, 2018

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 calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in 966 Chamber No. 4.
4. The FCC Designation Number is TW2022.
5. The CANADA Site Registration No. is 20331-2
- 6 Loop antenna was used for all emissions below 30 MHz.
7. Tested Date: Oct. 27, 2017

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:

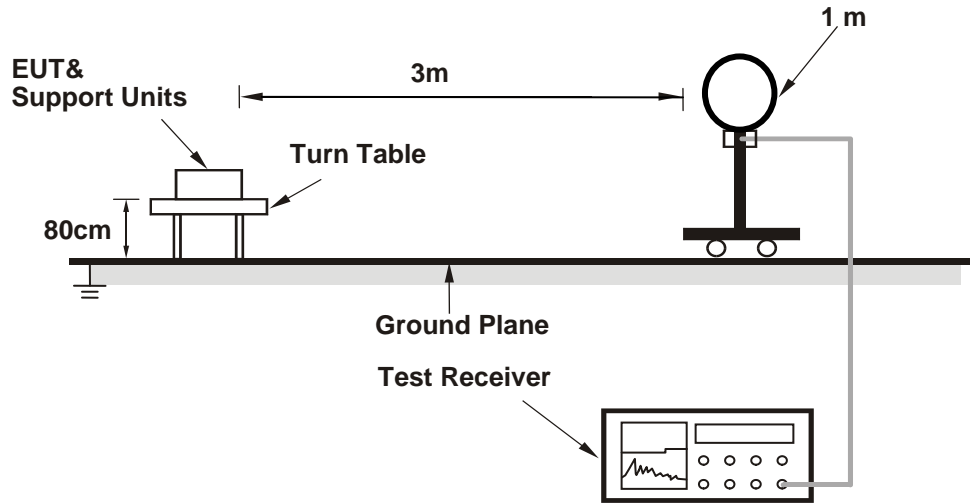
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
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

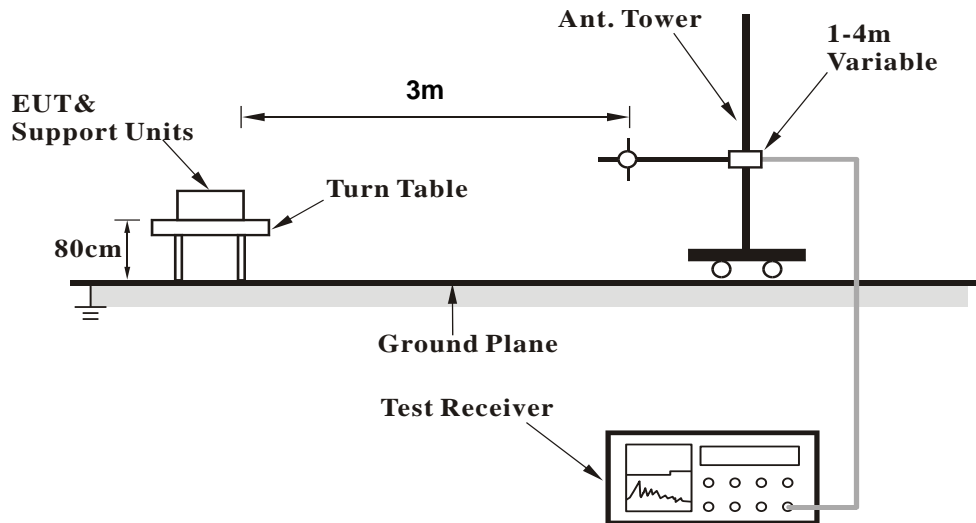
No deviation.

4.1.5 Test Setup

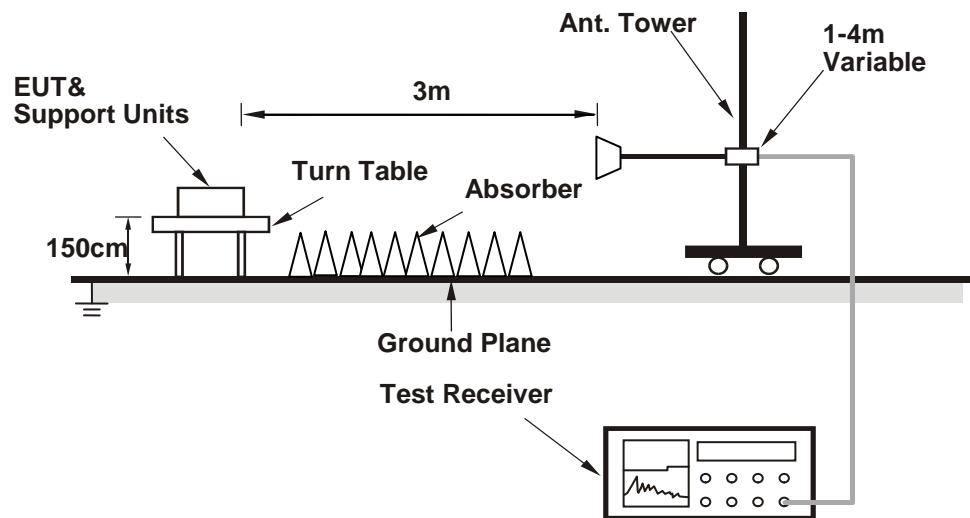
For Radiated emission below 30MHz



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

- Connected the EUT with the laptop which is placed on remote site.
- Contorlling software (Mtool 2.0.1.8.exe) has been activated to set the EUT on specific status.

4.1.7 Test Results

Above 1GHz Data :

802.11b

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	2390.00	57.7 PK	74.0	-16.3	1.11 H	115	59.0	-1.3
2	2390.00	46.0 AV	54.0	-8.0	1.11 H	115	47.3	-1.3
3	*2412.00	107.8 PK			1.11 H	115	108.9	-1.1
4	*2412.00	105.6 AV			1.11 H	115	106.7	-1.1
5	4824.00	43.1 PK	74.0	-30.9	1.10 H	88	39.9	3.2
6	4824.00	39.1 AV	54.0	-14.9	1.10 H	88	35.9	3.2

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	2390.00	65.2 PK	74.0	-8.8	1.74 V	180	66.5	-1.3
2	2390.00	53.9 AV	54.0	-0.1	1.74 V	180	55.2	-1.3
3	*2412.00	116.5 PK			1.74 V	180	117.6	-1.1
4	*2412.00	114.2 AV			1.74 V	180	115.3	-1.1
5	4824.00	42.8 PK	74.0	-31.2	1.70 V	202	39.6	3.2
6	4824.00	39.0 AV	54.0	-15.0	1.70 V	202	35.8	3.2

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
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	2319.00	56.2 PK	74.0	-17.8	1.09 H	125	57.8	-1.6
2	2319.00	46.0 AV	54.0	-8.0	1.09 H	125	47.6	-1.6
3	*2437.00	112.2 PK			1.09 H	125	113.4	-1.2
4	*2437.00	109.9 AV			1.09 H	125	111.1	-1.2
5	2500.00	56.1 PK	74.0	-17.9	1.09 H	125	57.0	-0.9
6	2500.00	47.7 AV	54.0	-6.3	1.09 H	125	48.6	-0.9
7	4874.00	44.2 PK	74.0	-29.8	1.10 H	77	40.9	3.3
8	4874.00	40.3 AV	54.0	-13.7	1.10 H	77	37.0	3.3
9	7311.00	45.7 PK	74.0	-28.3	1.22 H	246	35.9	9.8
10	7311.00	36.3 AV	54.0	-17.7	1.22 H	246	26.5	9.8

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	2319.00	63.7 PK	74.0	-10.3	1.72 V	178	65.3	-1.6
2	2319.00	53.9 AV	54.0	-0.1	1.72 V	178	55.5	-1.6
3	*2437.00	120.9 PK			1.72 V	178	122.1	-1.2
4	*2437.00	118.5 AV			1.72 V	178	119.7	-1.2
5	2500.00	61.6 PK	74.0	-12.4	1.72 V	178	62.5	-0.9
6	2500.00	53.6 AV	54.0	-0.4	1.72 V	178	54.5	-0.9
7	4874.00	48.5 PK	74.0	-25.5	1.56 V	189	45.2	3.3
8	4874.00	46.4 AV	54.0	-7.6	1.56 V	189	43.1	3.3
9	7311.00	45.6 PK	74.0	-28.4	1.33 V	218	35.8	9.8
10	7311.00	36.2 AV	54.0	-17.8	1.33 V	218	26.4	9.8

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
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	*2462.00	110.1 PK			1.10 H	118	111.2	-1.1
2	*2462.00	107.9 AV			1.10 H	118	109.0	-1.1
3	2500.00	57.8 PK	74.0	-16.2	1.10 H	118	58.7	-0.9
4	2500.00	47.6 AV	54.0	-6.4	1.10 H	118	48.5	-0.9
5	4924.00	43.2 PK	74.0	-30.8	1.12 H	88	39.7	3.5
6	4924.00	38.9 AV	54.0	-15.1	1.12 H	88	35.4	3.5
7	7386.00	45.2 PK	74.0	-28.8	1.27 H	261	35.3	9.9
8	7386.00	36.1 AV	54.0	-17.9	1.27 H	261	26.2	9.9

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	*2462.00	118.8 PK			1.70 V	181	119.9	-1.1
2	*2462.00	116.5 AV			1.70 V	181	117.6	-1.1
3	2500.00	63.3 PK	74.0	-10.7	1.70 V	181	64.2	-0.9
4	2500.00	53.5 AV	54.0	-0.5	1.70 V	181	54.4	-0.9
5	4924.00	43.1 PK	74.0	-30.9	1.72 V	206	39.6	3.5
6	4924.00	39.1 AV	54.0	-14.9	1.72 V	206	35.6	3.5
7	7386.00	45.2 PK	74.0	-28.8	1.34 V	208	35.3	9.9
8	7386.00	35.8 AV	54.0	-18.2	1.34 V	208	25.9	9.9

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

802.11n (HT40)

CHANNEL	TX Channel 3	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	2390.00	56.0 PK	74.0	-18.0	1.04 H	101	57.3	-1.3
2	2390.00	42.6 AV	54.0	-11.4	1.04 H	101	43.9	-1.3
3	*2422.00	95.0 PK			1.04 H	101	96.3	-1.3
4	*2422.00	84.8 AV			1.04 H	101	86.1	-1.3
5	4844.00	43.4 PK	74.0	-30.6	1.17 H	80	40.1	3.3
6	4844.00	39.2 AV	54.0	-14.8	1.17 H	80	35.9	3.3
7	7266.00	45.2 PK	74.0	-28.8	1.23 H	260	35.4	9.8
8	7266.00	36.1 AV	54.0	-17.9	1.23 H	260	26.3	9.8

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	2390.00	61.6 PK	74.0	-12.4	1.76 V	173	62.9	-1.3
2	2390.00	50.3 AV	54.0	-3.7	1.76 V	173	51.6	-1.3
3	*2422.00	103.6 PK			1.76 V	173	104.9	-1.3
4	*2422.00	93.2 AV			1.76 V	173	94.5	-1.3
5	4844.00	43.1 PK	74.0	-30.9	1.64 V	222	39.8	3.3
6	4844.00	39.4 AV	54.0	-14.6	1.64 V	222	36.1	3.3
7	7266.00	45.3 PK	74.0	-28.7	1.43 V	211	35.5	9.8
8	7266.00	35.7 AV	54.0	-18.3	1.43 V	211	25.9	9.8

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
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	2390.00	58.7 PK	74.0	-15.3	1.13 H	105	60.0	-1.3
2	2390.00	44.8 AV	54.0	-9.2	1.13 H	105	46.1	-1.3
3	*2437.00	103.0 PK			1.13 H	105	104.2	-1.2
4	*2437.00	93.0 AV			1.13 H	105	94.2	-1.2
5	2500.00	59.3 PK	74.0	-14.7	1.13 H	105	60.2	-0.9
6	2500.00	45.9 AV	54.0	-8.1	1.13 H	105	46.8	-0.9
7	4874.00	44.3 PK	74.0	-29.7	1.10 H	88	41.0	3.3
8	4874.00	40.2 AV	54.0	-13.8	1.10 H	88	36.9	3.3
9	7311.00	46.1 PK	74.0	-27.9	1.16 H	240	36.3	9.8
10	7311.00	36.7 AV	54.0	-17.3	1.16 H	240	26.9	9.8

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	2390.00	64.3 PK	74.0	-9.7	1.78 V	174	65.6	-1.3
2	2390.00	52.5 AV	54.0	-1.5	1.78 V	174	53.8	-1.3
3	*2437.00	111.6 PK			1.78 V	174	112.8	-1.2
4	*2437.00	101.4 AV			1.78 V	174	102.6	-1.2
5	2500.00	64.9 PK	74.0	-9.1	1.78 V	174	65.8	-0.9
6	2500.00	53.6 AV	54.0	-0.4	1.78 V	174	54.5	-0.9
7	4874.00	48.9 PK	74.0	-25.1	1.54 V	200	45.6	3.3
8	4874.00	46.5 AV	54.0	-7.5	1.54 V	200	43.2	3.3
9	7311.00	45.4 PK	74.0	-28.6	1.39 V	207	35.6	9.8
10	7311.00	36.0 AV	54.0	-18.0	1.39 V	207	26.2	9.8

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
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 9	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	*2452.00	97.3 PK			1.10 H	106	98.4	-1.1
2	*2452.00	86.9 AV			1.10 H	106	88.0	-1.1
3	2500.00	57.3 PK	74.0	-16.7	1.10 H	106	58.2	-0.9
4	2500.00	45.1 AV	54.0	-8.9	1.10 H	106	46.0	-0.9
5	4904.00	43.1 PK	74.0	-30.9	1.09 H	81	39.6	3.5
6	4904.00	38.6 AV	54.0	-15.4	1.09 H	81	35.1	3.5
7	7356.00	45.7 PK	74.0	-28.3	1.24 H	248	35.8	9.9
8	7356.00	36.4 AV	54.0	-17.6	1.24 H	248	26.5	9.9

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	*2452.00	105.9 PK			1.77 V	181	107.0	-1.1
2	*2452.00	95.3 AV			1.77 V	181	96.4	-1.1
3	2500.00	62.9 PK	74.0	-11.1	1.77 V	181	63.8	-0.9
4	2500.00	52.8 AV	54.0	-1.2	1.77 V	181	53.7	-0.9
5	4904.00	43.2 PK	74.0	-30.8	1.70 V	218	39.7	3.5
6	4904.00	39.2 AV	54.0	-14.8	1.70 V	218	35.7	3.5
7	7356.00	45.7 PK	74.0	-28.3	1.39 V	224	35.8	9.9
8	7356.00	36.0 AV	54.0	-18.0	1.39 V	224	26.1	9.9

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

Below 1GHz Data:

802.11b

CHANNEL	TX Channel 6	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	106.70	36.3 QP	43.5	-7.2	2.00 H	188	47.7	-11.4
2	141.19	34.3 QP	43.5	-9.2	2.00 H	74	42.7	-8.4
3	207.22	34.3 QP	43.5	-9.2	1.50 H	178	45.8	-11.5
4	393.90	38.5 QP	46.0	-7.5	2.00 H	316	44.1	-5.6
5	410.92	37.6 QP	46.0	-8.4	2.00 H	301	42.7	-5.1
6	437.38	35.8 QP	46.0	-10.2	2.00 H	299	39.7	-3.9

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	44.67	35.5 QP	40.0	-4.5	1.50 V	303	43.7	-8.2
2	106.70	35.9 QP	43.5	-7.6	1.00 V	242	47.3	-11.4
3	357.50	38.8 QP	46.0	-7.2	1.00 V	310	45.1	-6.3
4	384.49	42.4 QP	46.0	-3.6	1.00 V	246	48.1	-5.7
5	424.04	37.3 QP	46.0	-8.7	1.00 V	261	41.8	-4.5
6	488.23	38.0 QP	46.0	-8.0	1.00 V	12	41.3	-3.3

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

4.2 Conducted Output Power Measurement

4.2.1 Limits of Conducted Output Power Measurement

For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

Per KDB 662911 D01 Multiple Transmitter Output Method of conducted output power measurement on IEEE 802.11 devices,

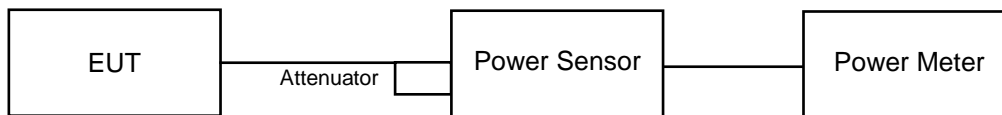
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT} ;

Array Gain = $5 \log(N_{ANT}/N_{SS})$ dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.

For power measurements on all other devices: Array Gain = $10 \log(N_{ANT}/N_{SS})$ dB.

4.2.2 Test Setup



4.2.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.2.4 Test Procedures

A peak / average power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak / average power sensor. Record the power level.

4.2.5 Deviation from Test Standard

No deviation.

4.2.6 EUT Operating Conditions

Same as Item 4.3.6.

4.2.7 Test Results

802.11b

Chan.	Chan. Freq. (MHz)	Average Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
1	2412	19.64	19.02	19.20	255.02	24.07	30	Pass
6	2437	22.96	22.95	22.20	560.898	27.49	30	Pass
11	2462	19.45	19.43	18.65	249.087	23.96	30	Pass

802.11g

Chan.	Chan. Freq. (MHz)	Average Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
1	2412	16.77	16.27	16.12	130.824	21.17	30	Pass
6	2437	22.90	22.77	22.01	543.073	27.35	30	Pass
11	2462	15.35	15.12	15.07	98.923	19.95	30	Pass

802.11n (HT20)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
1	2412	14.76	14.21	14.22	82.71	19.18	30	Pass
6	2437	22.53	22.56	21.93	515.318	27.12	30	Pass
11	2462	15.02	14.72	15.87	100.054	20.00	30	Pass

802.11n (HT40)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
3	2422	7.89	7.52	10.18	22.224	13.47	30	Pass
6	2437	13.66	13.50	15.60	81.922	19.13	30	Pass
9	2452	9.38	9.36	11.69	32.057	15.06	30	Pass

5 Pictures of Test Arrangements

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

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 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

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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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