

FCC Test Report (2.4GHz WLAN)

Report No.: RF190807D08

FCC ID: TK4WLE1216V220

Test Model: WLE1216V2-20, WLE1216V2-20-I

Received Date: Aug. 7, 2019

Test Date: Aug. 19 to Sep. 11, 2019

Issued Date: Sep. 16, 2019

Applicant: Compex Systems Pte Ltd

Address: No 9 Harrison Road, Harrison Industrial Building, #05-01, 369651, Singapore

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

**FCC Registration /
Designation Number:** 198487 / TW2021



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Release Control Record

Issue No.	Description	Date Issued
RF190807D08	Original release.	Sep. 16, 2019

1 Certificate of Conformity

Product: 4x4 Wave-2 802.11BGN Mini PCIe WiFi Module

Brand: COMPEX

Test Model: WLE1216V2-20, WLE1216V2-20-I

Sample Status: Pre-Production

Applicant: Compex Systems Pte Ltd

Test Date: Aug. 19 to Sep. 11, 2019

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 RF characteristics under the conditions specified in this report.

Prepared by :



Jessica Cheng / Senior Specialist

Date: Sep. 16, 2019

Approved by :



Rex Lai / Associate Technical Manager

Date: Sep. 16, 2019

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -12.66dB at 0.47813MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -0.51dB at 2483.50MHz.
15.247(d)	Antenna Port Emission	N/A	Refer to Note 2 below
15.247(a)(2)	6dB bandwidth	N/A	Refer to Note 2 below
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	N/A	Refer to Note 2 below
15.203	Antenna Requirement	Pass	Antenna connector is Reverse SMA not a standard connector.

Note:

- Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
- Test items: AC Power Conducted Emission, Radiated Emissions and Conducted power were performed for this addendum. The others testing data refer to original test report.
- N/A: Not Applicable

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	2.38 dB
	30MHz ~ 1000MHz	5.43 dB
Radiated Emissions above 1 GHz	Above 1GHz	5.42 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	4x4 Wave-2 802.11BGN Mini PCIe WiFi Module
Brand	COMPEX
Test Model	WLE1216V2-20, WLE1216V2-20-I
Status of EUT	Pre-Production
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: up to 11Mbps 802.11g: up to 54Mbps 802.11n: up to 600Mbps
Operating Frequency	2412 ~ 2462MHz
Number of Channel	11 for 802.11b, 802.11g, 802.11n (20MHz) 7 for 802.11n (40MHz)
Output Power	398.027mW
Antenna Type	Refer to note as below
Antenna Connector	Reverse SMA
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

1. The difference compared with original test report is adding a platform: Network Security Appliance (Brand: Check Point / Model: V-81W), therefore only AC Power Conducted Emission, Radiated Emissions and Conducted power were performed for this addendum, and the others testing data refer to original test report.
2. This report is prepared for FCC class II permissive change.
3. 2.4GHz & 5GHz technologies can transmit at same time.
4. The emission of the simultaneous operation has been evaluated and no non-compliance was found.
5. The antenna information is listed as below: (Add new Dipole antenna model: RFDPA171300SBLB801)

Description	Limited Single Modular		Platform: Network Security Appliance (Brand: Check Point / Model: V-81W)	
	2412-2462MHz		2412-2462MHz	5180-5825MHz
Antenna Type	Ant.	Ant.	Dipole Antenna	Dipole Antenna
	Dipole	Panel		
Maximum Gain (dBi)	5.0	11	2.22	4.29
Remark	Original Approved		Additional	

The Platform is authorized for use frequency bands: 2412-2462MHz, 5180-5240MHz and 5745-5825MHz only.

6. The EUT provides 4 completed transmitters and 4 receivers.

Modulation Mode	TX Function
802.11b	1TX
802.11g	1TX
802.11n (20MHz)	4TX
802.11n (40MHz)	4TX

7. Accessory device of platform as follows.

Brand	Model	Rating
FSP	FSP060-DHAN3	AC I/P : 100-240V ~ 1.8A 50-60Hz DC O/P 12V==5.0A Power cord: AC 2 Pin, Non-shielded DC cable (1.2m) With one Core

8. 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 (20MHz):

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 (40MHz):

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	PLC	APCM	
-	√	√	√	√	-

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

NOTE: The EUT had been pre-tested on the positioned of each 3 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.

EUT Configure Mode	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 (20MHz)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
-	802.11n (40MHz)	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.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11n (20MHz)	1 to 11	6	OFDM	BPSK	6.5

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	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11n (20MHz)	1 to 11	6	OFDM	BPSK	6.5

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.

EUT Configure Mode	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 (20MHz)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
-	802.11n (40MHz)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested By
RE$\geq$1G	23deg. C, 71%RH	120Vac, 60Hz	Dalen Dai
RE<1G	18deg. C, 66%RH	120Vac, 60Hz	Dalen Dai
PLC	25deg. C, 75%RH	120Vac, 60Hz	Starltaly Wu
APCM	25deg. C, 76%RH	120Vac, 60Hz	Saxon Lee

3.3 Duty Cycle of Test Signal

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

If duty cycle of test signal is $< 98\%$, duty factor shall be considered.

802.11b: Duty cycle = $12.42/12.5 = 0.994$

802.11g: Duty cycle = 100%

802.11n (20MHz): Duty cycle = $5.04/5.08 = 0.992$

802.11n (40MHz): Duty cycle = $2.455/2.515 = 0.976$, Duty factor = $10 * \log(1/0.976) = 0.10$



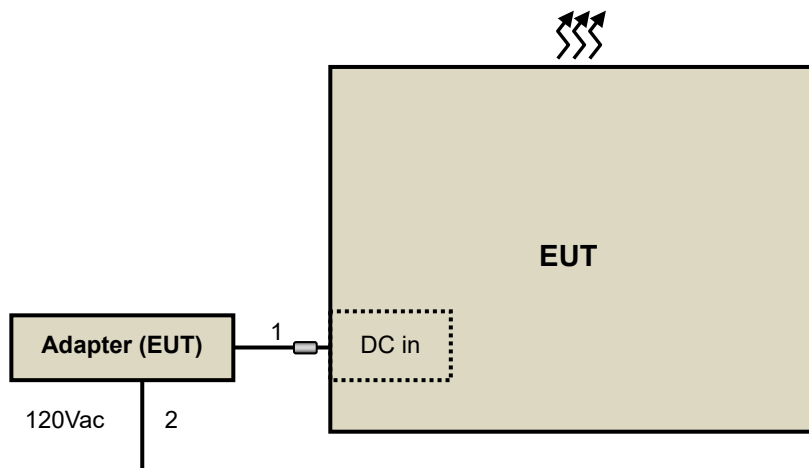
3.4 Description of Support Units

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	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC cable	1	1.2	N	1	Supplied by client
2.	AC power cord	1	1.8	N	0	Provided by Lab

Note: The core(s) is(are) originally attached to the cable(s).

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 15.247 Meas Guidance v05r02

KDB 662911 D01 Multiple Transmitter Output v02r01

ANSI C63.10-2013

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

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

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

NOTE:

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

4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
HP Preamplifier	8447D	2432A03504	Feb. 20, 2019	Feb. 19, 2020
HP Preamplifier	8449B	3008A01201	Feb. 21, 2019	Feb. 20, 2020
MITEQ Preamplifier	AMF-6F-260400-33-8P	892164	Feb. 20, 2019	Feb. 19, 2020
Agilent TEST RECEIVER	N9038A	MY51210129	Mar. 05, 2019	Mar. 04, 2020
Schwarzbeck Antenna	VULB 9168	139	Nov. 26, 2018	Nov. 25, 2019
Schwarzbeck Antenna	VHBA 9123	480	Jun. 3, 2019	Jun. 2, 2021
Schwarzbeck Horn Antenna	BBHA-9170	212	Nov. 25, 2018	Nov. 24, 2019
Schwarzbeck Horn Antenna	BBHA 9120-D1	D130	Nov. 25, 2018	Nov. 24, 2019
ADT. Turn Table	TT100	0306	NA	NA
ADT. Tower	AT100	0306	NA	NA
Software	Radiated V7.6.15.9.5	NA	NA	NA
SUHNER RF cable With 4dB PAD	SF102	Cable-CH6-01	Jul. 10, 2019	Jul. 9, 2020
SUHNER RF cable With 3/4dB PAD	SF102	Cable-CH8-3.6m	Jul. 10, 2019	Jul. 9, 2020
KEYSIGHT MIMO Powermeasurement Test set	U2021XA	U2021XA-001	Jun. 11, 2019	Jun. 10, 2020
KEYSIGHT Spectrum Analyzer	N9030A	MY54490260	Jul. 30, 2019	Jul. 29, 2020
Loop Antenna EMCI	LPA600	270	Aug. 23, 2017 Aug. 23, 2019	Aug. 22, 2019 Aug. 22, 2021
EMCO Horn Antenna	3115	00028257	Nov. 25, 2018	Nov. 24, 2019
Highpass filter Wainwright Instruments	WHK 3.1/18G-10SS	SN 8	NA	NA
ROHDE & SCHWARZ Spectrum Analyzer	FSV40	101042	Sep. 27, 2018	Sep. 26, 2019
Anritsu Power Sensor	MA2411B	0738404	Apr. 16, 2019	Apr. 15, 2020
Anritsu Power Meter	ML2495A	0842014	Apr. 16, 2019	Apr. 15, 2020

- NOTE:**
1. The calibration interval of the above test instruments is 12/24 months. And the calibrations are traceable to NML/ROC and NIST/USA.
 2. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
 3. The test was performed in Chamber No. 6.

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: 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 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.

Note:

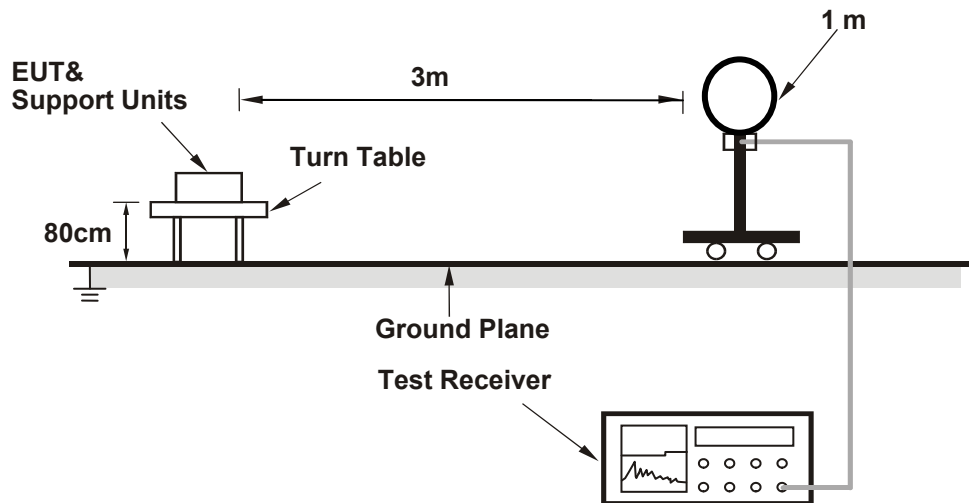
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

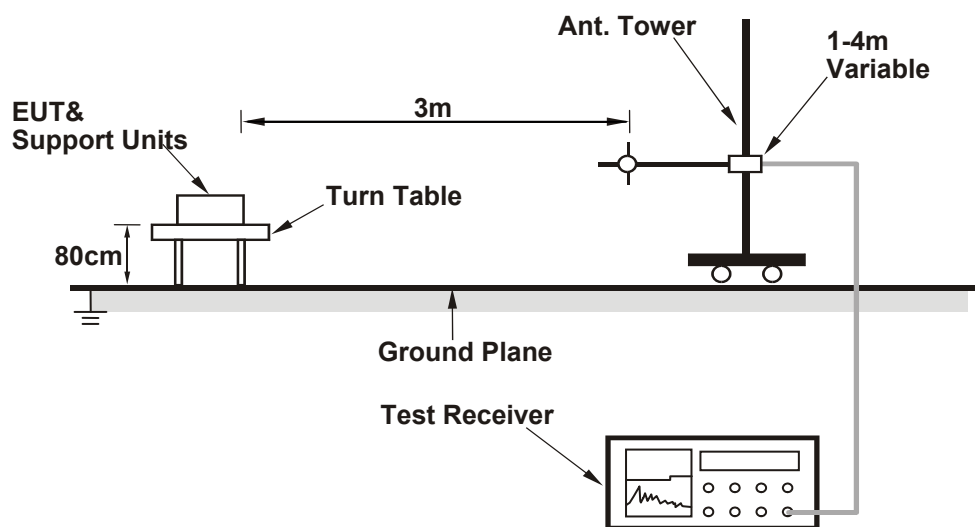
No deviation.

4.1.5 Test Setup

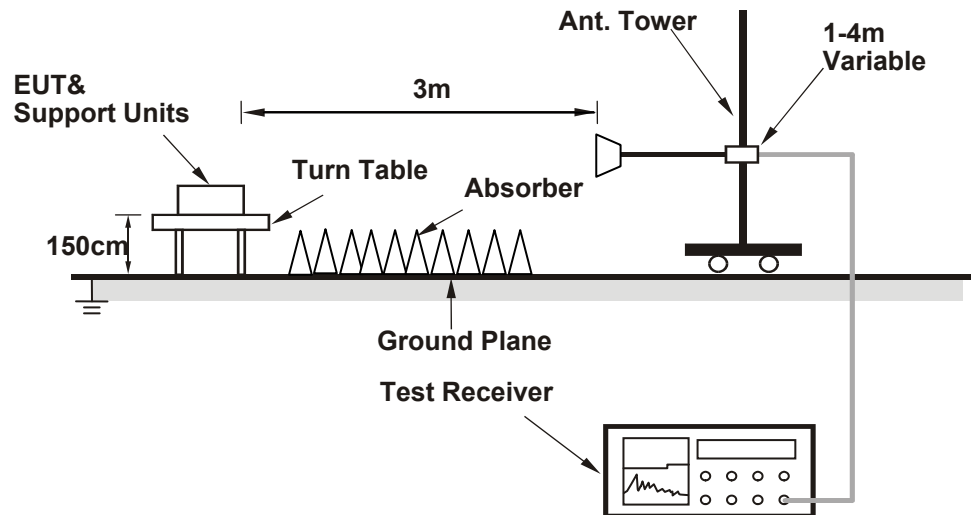
For Radiated emission below 30MHz



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

Set the EUT under transmission condition continuously at specific channel frequency.

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	59.96 PK	74.00	-14.04	1.42 H	327	59.95	0.01
2	2390.00	49.47 AV	54.00	-4.53	1.42 H	327	49.46	0.01
3	*2412.00	105.73 PK			1.42 H	327	105.71	0.02
4	*2412.00	103.16 AV			1.42 H	327	103.14	0.02
5	4824.00	47.36 PK	74.00	-26.64	1.29 H	308	40.76	6.60
6	4824.00	35.97 AV	54.00	-18.03	1.29 H	308	29.37	6.60
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	63.98 PK	74.00	-10.02	1.00 V	283	63.97	0.01
2	2390.00	52.65 AV	54.00	-1.35	1.00 V	283	52.64	0.01
3	*2412.00	109.38 PK			1.00 V	283	109.36	0.02
4	*2412.00	107.75 AV			1.00 V	283	107.73	0.02
5	4824.00	48.38 PK	74.00	-25.62	2.11 V	253	41.78	6.60
6	4824.00	37.22 AV	54.00	-16.78	2.11 V	253	30.62	6.60

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.

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	*2437.00	106.65 PK			1.44 H	329	106.62	0.03
2	*2437.00	105.00 AV			1.44 H	329	104.97	0.03
3	4874.00	47.84 PK	74.00	-26.16	1.24 H	303	41.29	6.55
4	4874.00	37.06 AV	54.00	-16.94	1.24 H	303	30.51	6.55
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	110.27 PK			1.00 V	281	110.24	0.03
2	*2437.00	107.76 AV			1.00 V	281	107.73	0.03
3	4874.00	49.46 PK	74.00	-24.54	2.09 V	255	42.91	6.55
4	4874.00	37.93 AV	54.00	-16.07	2.09 V	255	31.38	6.55

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.

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	106.56 PK			1.40 H	331	106.51	0.05
2	*2462.00	104.77 AV			1.40 H	331	104.72	0.05
3	2483.50	63.59 PK	74.00	-10.41	1.40 H	331	63.52	0.07
4	2483.50	46.95 AV	54.00	-7.05	1.40 H	331	46.88	0.07
5	4924.00	47.45 PK	74.00	-26.55	1.26 H	304	40.95	6.50
6	4924.00	36.76 AV	54.00	-17.24	1.26 H	304	30.26	6.50
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	110.18 PK			1.01 V	284	110.13	0.05
2	*2462.00	107.67 AV			1.01 V	284	107.62	0.05
3	2483.50	66.42 PK	74.00	-7.58	1.01 V	284	66.35	0.07
4	2483.50	49.00 AV	54.00	-5.00	1.01 V	284	48.93	0.07
5	4924.00	48.38 PK	74.00	-25.62	2.15 V	250	41.88	6.50
6	4924.00	37.79 AV	54.00	-16.21	2.15 V	250	31.29	6.50

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.

802.11g

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	63.38 PK	74.00	-10.62	1.42 H	329	63.37	0.01
2	2390.00	50.07 AV	54.00	-3.93	1.42 H	329	50.06	0.01
3	*2412.00	105.58 PK			1.42 H	329	105.56	0.02
4	*2412.00	95.31 AV			1.42 H	329	95.29	0.02
5	4824.00	46.93 PK	74.00	-27.07	1.24 H	302	40.33	6.60
6	4824.00	35.51 AV	54.00	-18.49	1.24 H	302	28.91	6.60
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	66.98 PK	74.00	-7.02	1.00 V	281	66.97	0.01
2	2390.00	52.68 AV	54.00	-1.32	1.00 V	281	52.67	0.01
3	*2412.00	109.87 PK			1.00 V	281	109.85	0.02
4	*2412.00	99.41 AV			1.00 V	281	99.39	0.02
5	4824.00	47.28 PK	74.00	-26.72	1.89 V	246	40.68	6.60
6	4824.00	36.15 AV	54.00	-17.85	1.89 V	246	29.55	6.60

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.

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	*2437.00	108.96 PK			1.45 H	330	108.93	0.03
2	*2437.00	98.77 AV			1.45 H	330	98.74	0.03
3	4874.00	48.17 PK	74.00	-25.83	1.27 H	298	41.62	6.55
4	4874.00	36.12 AV	54.00	-17.88	1.27 H	298	29.57	6.55
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	113.44 PK			1.00 V	281	113.41	0.03
2	*2437.00	103.30 AV			1.00 V	281	103.27	0.03
3	4874.00	48.88 PK	74.00	-25.12	2.17 V	249	42.33	6.55
4	4874.00	36.63 AV	54.00	-17.37	2.17 V	249	30.08	6.55

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.

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	104.91 PK			1.43 H	327	104.86	0.05
2	*2462.00	94.67 AV			1.43 H	327	94.62	0.05
3	2483.50	65.49 PK	74.00	-8.51	1.43 H	327	65.42	0.07
4	2483.50	49.85 AV	54.00	-4.15	1.43 H	327	49.78	0.07
5	4924.00	46.77 PK	74.00	-27.23	1.30 H	294	40.27	6.50
6	4924.00	35.35 AV	54.00	-18.65	1.30 H	294	28.85	6.50
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	109.32 PK			1.02 V	282	109.27	0.05
2	*2462.00	99.01 AV			1.02 V	282	98.96	0.05
3	2483.50	68.14 PK	74.00	-5.86	1.02 V	282	68.07	0.07
4	2483.50	52.63 AV	54.00	-1.37	1.02 V	282	52.56	0.07
5	4924.00	47.31 PK	74.00	-26.69	1.92 V	243	40.81	6.50
6	4924.00	36.08 AV	54.00	-17.92	1.92 V	243	29.58	6.50

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.

802.11n (20MHz)

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	62.08 PK	74.00	-11.92	1.39 H	338	62.07	0.01
2	2390.00	47.12 AV	54.00	-6.88	1.39 H	338	47.11	0.01
3	*2412.00	109.81 PK			1.39 H	338	109.79	0.02
4	*2412.00	99.53 AV			1.39 H	338	99.51	0.02
5	4824.00	47.45 PK	74.00	-26.55	1.20 H	299	40.85	6.60
6	4824.00	35.87 AV	54.00	-18.13	1.20 H	299	29.27	6.60
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	64.82 PK	74.00	-9.18	2.17 V	110	64.81	0.01
2	2390.00	49.57 AV	54.00	-4.43	2.17 V	110	49.56	0.01
3	*2412.00	114.56 PK			2.17 V	110	114.54	0.02
4	*2412.00	103.75 AV			2.17 V	110	103.73	0.02
5	4824.00	47.93 PK	74.00	-26.07	1.76 V	253	41.33	6.60
6	4824.00	36.66 AV	54.00	-17.34	1.76 V	253	30.06	6.60

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.

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	*2437.00	115.00 PK			1.41 H	327	114.97	0.03
2	*2437.00	104.53 AV			1.41 H	327	104.50	0.03
3	4874.00	48.51 PK	74.00	-25.49	1.19 H	293	41.96	6.55
4	4874.00	37.77 AV	54.00	-16.23	1.19 H	293	31.22	6.55
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	119.64 PK			2.13 V	114	119.61	0.03
2	*2437.00	109.08 AV			2.13 V	114	109.05	0.03
3	4874.00	50.30 PK	74.00	-23.70	1.80 V	259	43.75	6.55
4	4874.00	39.11 AV	54.00	-14.89	1.80 V	259	32.56	6.55

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.

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	108.96 PK			1.42 H	331	108.91	0.05
2	*2462.00	98.48 AV			1.42 H	331	98.43	0.05
3	2483.50	65.05 PK	74.00	-8.95	1.42 H	331	64.98	0.07
4	2483.50	51.70 AV	54.00	-2.30	1.42 H	331	51.63	0.07
5	4924.00	47.34 PK	74.00	-26.66	1.25 H	296	40.84	6.50
6	4924.00	35.90 AV	54.00	-18.10	1.25 H	296	29.40	6.50
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	113.67 PK			2.17 V	111	113.62	0.05
2	*2462.00	103.55 AV			2.17 V	111	103.50	0.05
3	2483.50	67.42 PK	74.00	-6.58	2.17 V	111	67.35	0.07
4	2483.50	53.23 AV	54.00	-0.77	2.17 V	111	53.16	0.07
5	4924.00	47.99 PK	74.00	-26.01	1.73 V	257	41.49	6.50
6	4924.00	36.78 AV	54.00	-17.22	1.73 V	257	30.28	6.50

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.

802.11n (40MHz)

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	64.08 PK	74.00	-9.92	1.45 H	329	64.07	0.01
2	2390.00	51.29 AV	54.00	-2.71	1.45 H	329	51.28	0.01
3	*2422.00	108.49 PK			1.45 H	329	108.46	0.03
4	*2422.00	96.36 AV			1.45 H	329	96.33	0.03
5	4844.00	47.54 PK	74.00	-26.46	1.22 H	295	40.98	6.56
6	4844.00	36.30 AV	54.00	-17.70	1.22 H	295	29.74	6.56
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	66.30 PK	74.00	-7.70	3.27 V	314	66.29	0.01
2	2390.00	52.88 AV	54.00	-1.12	3.27 V	314	52.87	0.01
3	*2422.00	113.84 PK			3.27 V	314	113.81	0.03
4	*2422.00	103.65 AV			3.27 V	314	103.62	0.03
5	4844.00	48.06 PK	74.00	-25.94	1.79 V	252	41.50	6.56
6	4844.00	36.94 AV	54.00	-17.06	1.79 V	252	30.38	6.56

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.

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	*2437.00	108.82 PK			1.42 H	325	108.79	0.03
2	*2437.00	98.26 AV			1.42 H	325	98.23	0.03
3	4874.00	47.40 PK	74.00	-26.60	1.26 H	298	40.85	6.55
4	4874.00	36.36 AV	54.00	-17.64	1.26 H	298	29.81	6.55
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	114.28 PK			3.25 V	316	114.25	0.03
2	*2437.00	104.21 AV			3.25 V	316	104.18	0.03
3	4874.00	48.11 PK	74.00	-25.89	1.82 V	254	41.56	6.55
4	4874.00	37.02 AV	54.00	-16.98	1.82 V	254	30.47	6.55

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.

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	105.42 PK			1.44 H	327	105.37	0.05
2	*2452.00	95.09 AV			1.44 H	327	95.04	0.05
3	2483.50	65.76 PK	74.00	-8.24	1.44 H	327	65.69	0.07
4	2483.50	52.84 AV	54.00	-1.16	1.44 H	327	52.77	0.07
5	4904.00	46.91 PK	74.00	-27.09	1.21 H	294	40.38	6.53
6	4904.00	35.37 AV	54.00	-18.63	1.21 H	294	28.84	6.53
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	110.73 PK			3.29 V	313	110.68	0.05
2	*2452.00	100.20 AV			3.29 V	313	100.15	0.05
3	2483.50	68.20 PK	74.00	-5.80	3.29 V	313	68.13	0.07
4	2483.50	53.49 AV	54.00	-0.51	3.29 V	313	53.42	0.07
5	4904.00	47.20 PK	74.00	-26.80	1.77 V	258	40.67	6.53
6	4904.00	35.80 AV	54.00	-18.20	1.77 V	258	29.27	6.53

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.

BELOW 1GHz WORST-CASE DATA

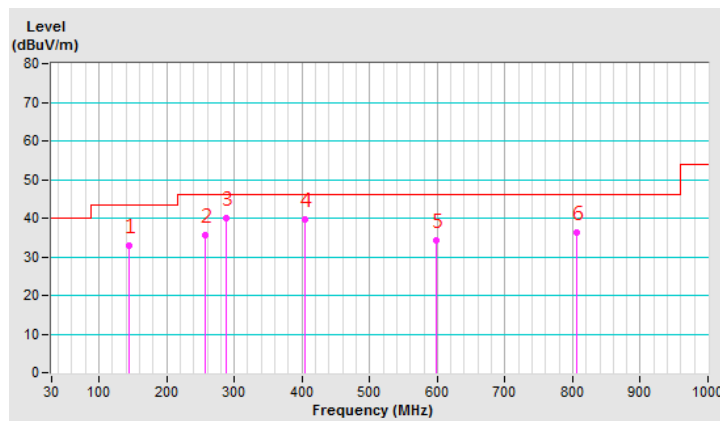
802.11n (20MHz)

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	144.02	32.99 QP	43.50	-10.51	1.53 H	76	39.98	-6.99
2	256.01	35.61 QP	46.00	-10.39	3.58 H	165	42.27	-6.66
3	288.02	39.98 QP	46.00	-6.02	2.06 H	153	45.22	-5.24
4	404.37	39.63 QP	46.00	-6.37	3.33 H	12	42.62	-2.99
5	599.39	34.30 QP	46.00	-11.70	3.67 H	311	32.52	1.78
6	806.00	36.42 QP	46.00	-9.58	3.06 H	245	30.95	5.47

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 30MHz~1000MHz.
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.

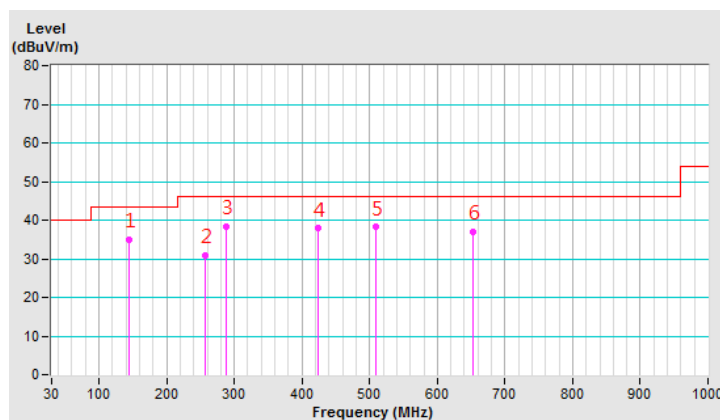


CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

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	144.02	35.08 QP	43.50	-8.42	1.52 V	170	42.07	-6.99
2	256.01	30.95 QP	46.00	-15.05	2.96 V	57	37.61	-6.66
3	288.02	38.25 QP	46.00	-7.75	3.21 V	87	43.49	-5.24
4	423.63	37.87 QP	46.00	-8.13	3.75 V	61	40.24	-2.37
5	508.31	38.14 QP	46.00	-7.86	1.10 V	328	38.65	-0.51
6	652.89	37.03 QP	46.00	-8.97	3.33 V	200	34.38	2.65

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 30MHz~1000MHz.
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
ROHDE & SCHWARZ TEST RECEIVER	ESR3	102414	Jan. 17, 2019	Jan. 16, 2020
ROHDE & SCHWARZ Artificial Mains Network (for EUT)	ENV216	101196	Apr. 16, 2019	Apr. 15, 2020
LISN With Adapter (for EUT)	101196	NA	Apr. 16, 2019	Apr. 15, 2020
ROHDE & SCHWARZ Artificial Mains Network (for peripherals)	ESH3-Z5	100218	Nov. 30, 2018	Nov. 29, 2019
SCHWARZBECK Artificial Mains Network (For EUT)	NNLK8129	8129229	May 14, 2019	May 13, 2020
Software	Cond_V7.3.7.4	NA	NA	NA
RF cable (JYEBAO) With 10dB PAD	5D-FB	Cable-C10.01	Feb. 13, 2019	Feb. 12, 2020
LYNICS Terminator (For ROHDE & SCHWARZ LISN)	0900510	E1-011484	May 13, 2019	May 12, 2020
ROHDE & SCHWARZ Artificial Mains Network (For TV EUT)	ESH3-Z5	100220	Nov. 21, 2018	Nov. 20, 2019
LISN With Adapter (for TV EUT)	100220	NA	Nov. 21, 2018	Nov. 20, 2019

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 Shielded Room No. 10.

4.2.3 Test Procedures

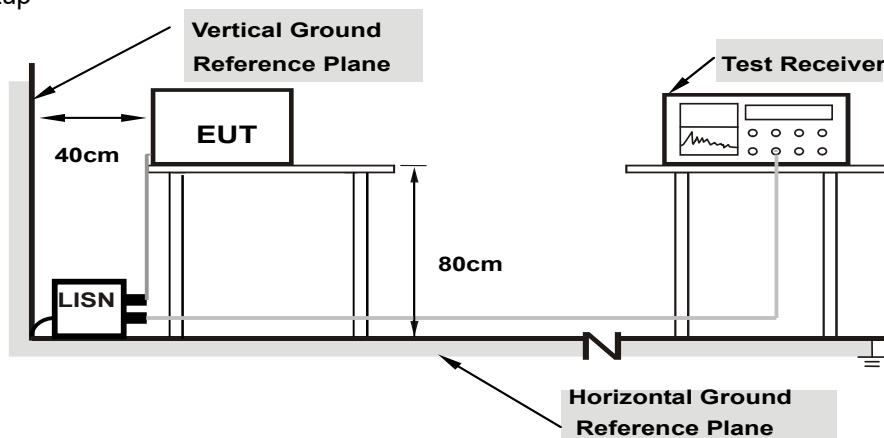
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) 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 section 4.1.6.

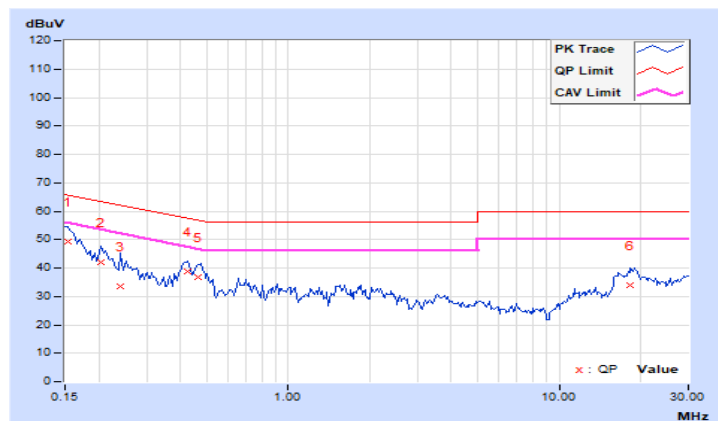
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	9.64	39.53	26.97	49.17	36.61	65.79	55.79	-16.62	-19.18
2	0.20469	9.65	32.28	18.55	41.93	28.20	63.42	53.42	-21.49	-25.22
3	0.23984	9.65	23.86	5.51	33.51	15.16	62.10	52.10	-28.59	-36.94
4	0.42734	9.67	29.03	23.46	38.70	33.13	57.30	47.30	-18.60	-14.17
5	0.46641	9.68	27.09	19.56	36.77	29.24	56.58	46.58	-19.81	-17.34
6	18.38672	9.99	23.90	18.41	33.89	28.40	60.00	50.00	-26.11	-21.60

Remarks:

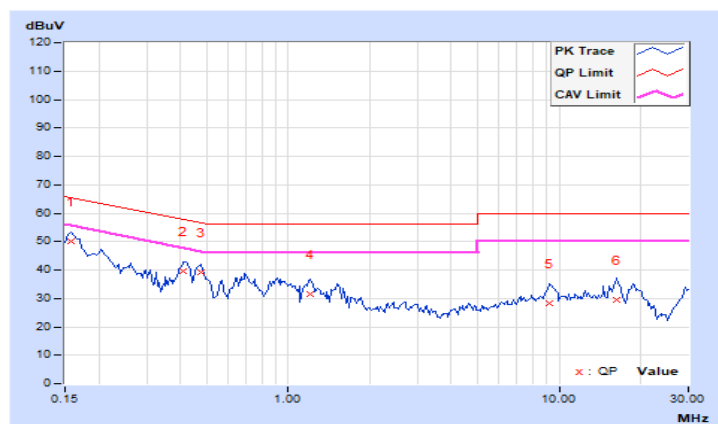
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



Phase		Neutral (N)		Detector Function		Quasi-Peak (QP) / Average (AV)				
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15781	9.67	40.30	30.29	49.97	39.96	65.58	55.58	-15.61	-15.62
2	0.41172	9.70	29.98	22.05	39.68	31.75	57.61	47.61	-17.93	-15.86
3	0.47813	9.71	29.66	24.00	39.37	33.71	56.37	46.37	-17.00	-12.66
4	1.20313	9.76	21.72	12.66	31.48	22.42	56.00	46.00	-24.52	-23.58
5	9.16797	9.95	18.52	12.57	28.47	22.52	60.00	50.00	-31.53	-27.48
6	16.40625	10.05	19.43	11.06	29.48	21.11	60.00	50.00	-30.52	-28.89

Remarks:

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



4.3 Conducted Output Power Measurement

4.3.1 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,

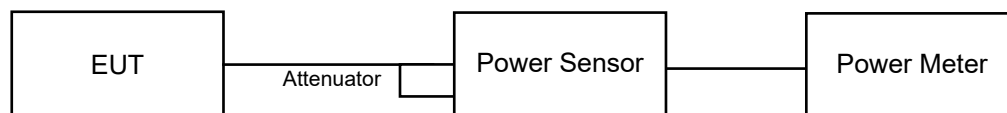
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

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.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedures

Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

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

4.3.7 Test Results

FOR AVERAGE POWER

802.11b

Chan.	Freq. (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	68.391	18.35	30	Pass
6	2437	88.308	19.46	30	Pass
11	2462	86.497	19.37	30	Pass

802.11g

Chan.	Freq. (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	40.832	16.11	30	Pass
6	2437	98.401	19.93	30	Pass
11	2462	34.277	15.35	30	Pass

802.11n (20MHz)

Chan.	Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
1	2412	14.80	14.36	14.01	13.33	104.195	20.18	30	Pass
6	2437	19.76	20.34	19.98	19.81	398.027	26.00	30	Pass
11	2462	15.40	14.48	13.96	14.73	117.334	20.69	30	Pass

802.11n (40MHz)

Chan.	Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
3	2422	13.54	13.31	12.22	12.18	77.215	18.88	30	Pass
6	2437	14.01	13.52	12.97	13.22	88.472	19.47	30	Pass
9	2452	9.16	8.77	8.42	8.91	30.505	14.84	30	Pass

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 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@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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