TEST REPORT

CERTIFICATE OF CONFORMITY

Standard:	**47 CFR FCC Part 15, Subpart C (Section 15.247)**
Report No.:	RFBCIC-WTW-P24100659
FCC ID:	U8G-P1MT01
Product:	Peplink Pepwave Wireless Product
Brand:	peplink PEPWAVE
Model No.:	MAX BR1 Mini
Series Model:	MAX-BR1-MINI-LTE-US-T-PRM, MAX-BR1-MINI-LTEA-US-T-PRM, MAX-BR1-MINI-LTE-US-DC-T-PRM, MAX-BR1-MINI-LTEA-US-DC-T-PRM, AP One Rugged, APO-AC-RUG (refer to item 3.1 for more details)
Received Date:	2024/10/29
Test Date:	2024/11/20 ~ 2024/11/21
Issued Date:	2024/12/11
Applicant:	PISMO LABS TECHNOLOGY LIMITED
Address:	A8, 5/F, HK Spinners Industrial Building, Phase 6, 481 Castle Peak Road, Cheung Sha Wan, Hong Kong
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 (1):	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, Taiwan
Test Location (2):	No. 70, Wenming Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)
FCC Registration / Designation Number:	788550 / TW0003 281270 / TW0032

Approved by: Jeremy Lin , **Date:** 2024/12/11

Jeremy Lin / Project Engineer

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Prepared by : Lena Wang / Specialist

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Release Control Record

Issue No.	Description	Date Issued
RFBCIC-WTW-P24100659	Original release.	2024/12/11

1 Certificate

Product:	Peplink Pepwave Wireless Product
Brand:	peplink PEPWAVE
Test Model:	MAX BR1 Mini
Series Model:	MAX-BR1-MINI-LTE-US-T-PRM, MAX-BR1-MINI-LTEA-US-T-PRM, MAX-BR1-MINI-LTE-US-DC-T-PRM, MAX-BR1-MINI-LTEA-US-DC-T-PRM, AP One Rugged, APO-AC-RUG (refer to item 3.1 for more details)
Sample Status:	Engineering sample
Applicant:	PISMO LABS TECHNOLOGY LIMITED
Test Date:	2024/11/20 ~ 2024/11/21
Standard:	47 CFR FCC Part 15, Subpart C (Section 15.247)
Measurement procedure:	ANSI C63.10-2013 KDB 558074 D01 15.247 Meas Guidance v05r02 KDB 662911 D01 Multiple Transmitter Output v02r01

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)			
Standard / Clause	Test Item	Result	Remark
15.247(b)	RF Output Power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	N/A	Refer to note
15.247(a)(2)	6 dB Bandwidth	N/A	Refer to note
15.247(d)	Conducted Out of Band Emissions	N/A	Refer to note
15.207	AC Power Conducted Emissions	Pass	Minimum passing margin is -12.71 dB at 0.34487 MHz
15.205 / 15.209 / 15.247(d)	Unwanted Emissions below 1 GHz	Pass	Minimum passing margin is -6.0 dB at 80.44 MHz
15.205 / 15.209 / 15.247(d)	Unwanted Emissions above 1 GHz	Pass	Minimum passing margin is -2.4 dB at 2483.50 MHz
15.203	Antenna Requirement	Pass	Antenna connector is RP-SMA not a standard connector.

Notes:

1. Only test items of RF Output Power, AC Power Conducted Emissions and Unwanted Emissions tests were verified and recorded in this report. Other testing data please refer to Sporton report no.: FR250205A.
2. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

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

Measurement	Specification	Expanded Uncertainty (k=2) (±)
RF Output Power	-	1.371 dB
AC Power Conducted Emissions	9 kHz ~ 30 MHz	2.90 dB
Unwanted Emissions below 1 GHz	9 kHz ~ 30 MHz	3 dB
	30 MHz ~ 1 GHz	2.93 dB
Unwanted Emissions above 1 GHz	1 GHz ~ 18 GHz	1.76 dB
	18 GHz ~ 40 GHz	1.77 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

Product	Peplink Pepwave Wireless Product
Brand	peplink PEPWAVE
Test Model	MAX BR1 Mini
Series Model	MAX-BR1-MINI-LTE-US-T-PRM, MAX-BR1-MINI-LTEA-US-T-PRM, MAX-BR1-MINI-LTE-US-DC-T-PRM, MAX-BR1-MINI-LTEA-US-DC-T-PRM, AP One Rugged, APO-AC-RUG
Model Difference	Refer to Note as below
Status of EUT	Engineering sample
Power Supply Rating	Refer to Note as below
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: 11.0 / 5.5 / 2.0 / 1.0 Mbps 802.11g: 54.0 / 48.0 / 36.0 / 24.0 / 18.0 / 12.0 / 9.0 / 6.0 Mbps 802.11n: up to 300 Mbps
Operating Frequency	2.412 GHz ~ 2.462 GHz
Number of Channel	802.11b, 802.11g, 802.11n (HT20):11 802.11n (HT40):7
Output Power	173.397 mW (22.39 dBm)

Note:

1. This report is prepared for FCC class II permissive change. This report is issued as a supplementary report of Sporton report no.: FR250205A. The differences from the original report are listed as below. Only test items of RF Output Power, AC Power Conducted Emissions and Unwanted Emissions tests were verified and recorded in this report. Other testing data please refer to Sporton report no.: FR250205A.

- Adding FTDI component
- Adding 2nd source WiFi / WWAN / GPS Antenna
- Adding 2nd source Adapter
- Adding 2 different eSIM (WP68-M002C-MFOCMW & MFXS-M006b-MFOCMW)

2. All models are listed as below.

Brand	Model	Difference
peplink PEPWAVE	MAX BR1 Mini	The differences are only the model and market segmentation. (with Cellular & GPS feature)
	MAX-BR1-MINI-LTE-US-T-PRM	
	MAX-BR1-MINI-LTEA-US-T-PRM	
	MAX-BR1-MINI-LTE-US-DC-T-PRM	
	MAX-BR1-MINI-LTEA-US-DC-T-PRM	
	AP One Rugged	For marketing purpose (without Cellular & GPS feature)
	APO-AC-RUG	

3. The EUT uses following accessories.

Item	Brand	Model	AC Input	DC Output	DC Output Cable
Adapter	LEI	MU24D1120200-A1	100-240Vac 50/60Hz 0.7A	12Vdc 2.0A	Non-Shielded, 1.5m

4. There are WLAN (2.4 GHz) and WLAN (5 GHz) technology used for the EUT.

5. Simultaneously transmission combination.

Combination	Technology		
1	WLAN 2.4 GHz	WLAN 5 GHz	WWAN
Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.			

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

3.2 Antenna Description of EUT

1. The antenna information is listed as below.

Antenna NO.	RF Chain NO.	Brand	Model	Antenna Net Gain(dBi)	Frequency range	Antenna Type	Connector Type
WiFi_2-1 / WiFi_2-2 (Newly)	0/1	WIESON	ARY121-1976-001-00	2.25	2.4 GHz ~ 2.4835 GHz	Omni-directional	RP-SMA
				2.55	5.15 GHz ~ 5.25 GHz		
				3.36	5.725 GHz ~ 5.85 GHz		
WiFi_1-1 / WiFi_1-2 (Original)	0/1	YUAN CHEN	ACA-0040-6G1A1-A10	3.15	2.4 GHz ~ 2.4835 GHz	Omni-directional	RP-SMA
				3.29	5.15 GHz ~ 5.25 GHz		
				4.76	5.725 GHz ~ 5.85 GHz		

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

2. The EUT incorporates a MIMO function:

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

3.3 Channel List

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

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):

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		

3.4 Test Mode Applicability and Tested Channel Detail

Pre-Scan:	1. EUT has the following operations/ usages: 10Vdc from Terminal Block / 30Vdc from Terminal Block / 12Vdc from Adapter / POE. Pre-scan these operations/ usages and find the worst case as a representative test condition. 2. EUT has the following operations/ usages: eSIM_1 WP68-M002C-MFOCMW / eSIM_2 MFXS-M006b-MFOCMW. Pre-scan these operations/ usages and find the worst case as a representative test condition. 3. EUT can be used in the following ways: Lying/ Wall Mount. Pre-scan these ways and find the worst case as a representative test condition. 4. 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. 10Vdc from Terminal Block / 30Vdc from Terminal Block / 12Vdc from Adapter / POE Worst Condition: 12Vdc from Adapter 2. eSIM_1 WP68-M002C-MFOCMW / eSIM_2 MFXS-M006b-MFOCMW Worst Condition: eSIM_1 WP68-M002C-MFOCMW 3. Lying/ Wall Mount Worst Condition: Wall Mount

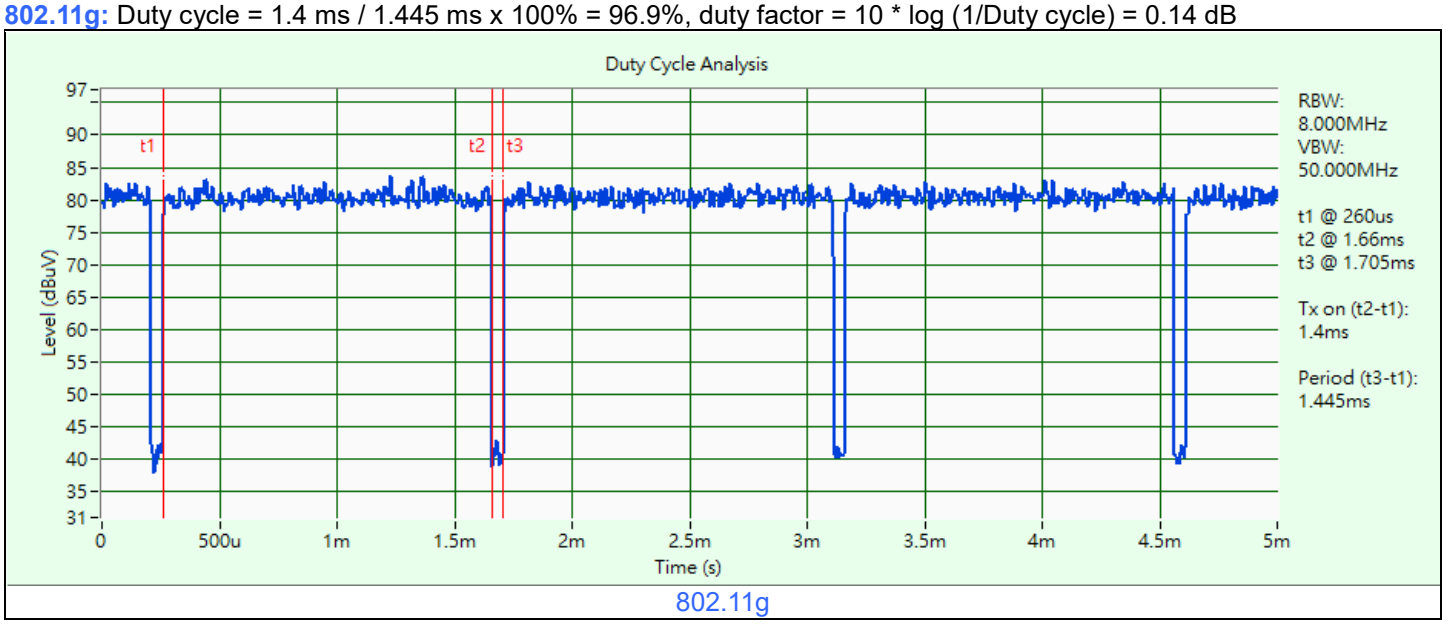
Following channel(s) was (were) selected for the final test as listed below:

Test Item	EUT Configure Mode	Mode	Tested Channel	Modulation	Data Rate Parameter
RF Output Power	A	802.11g	1, 6, 11	BPSK	6Mb/s
AC Power Conducted Emissions	A	802.11g	6	BPSK	6Mb/s
Unwanted Emissions below 1 GHz	A	802.11g	6	BPSK	6Mb/s
Unwanted Emissions above 1 GHz	A	802.11g	1, 6, 11	BPSK	6Mb/s
EUT Configure Mode:	A	EUT with WWAN module : EM7411 with the below antennas: WiFi antennas: ACA-0040-6G1A1-A10 WWAN antennas: DAM-D13-S1-N0-000-08-20			

Note:
1. The above evaluation models and related information are based on the original WiFi certification report and the information provided by the manufacturer.
2. This evaluation mainly focuses on output power and radiated spurious emission with worst condition.
3. After evaluation, the WiFi antennas was used with the highest gain as the representative antenna for testing.

3.5 Duty Cycle of Test Signal

802.11g: Duty cycle = 1.4 ms / 1.445 ms x 100% = 96.9%, duty factor = 10 * log (1/Duty cycle) = 0.14 dB

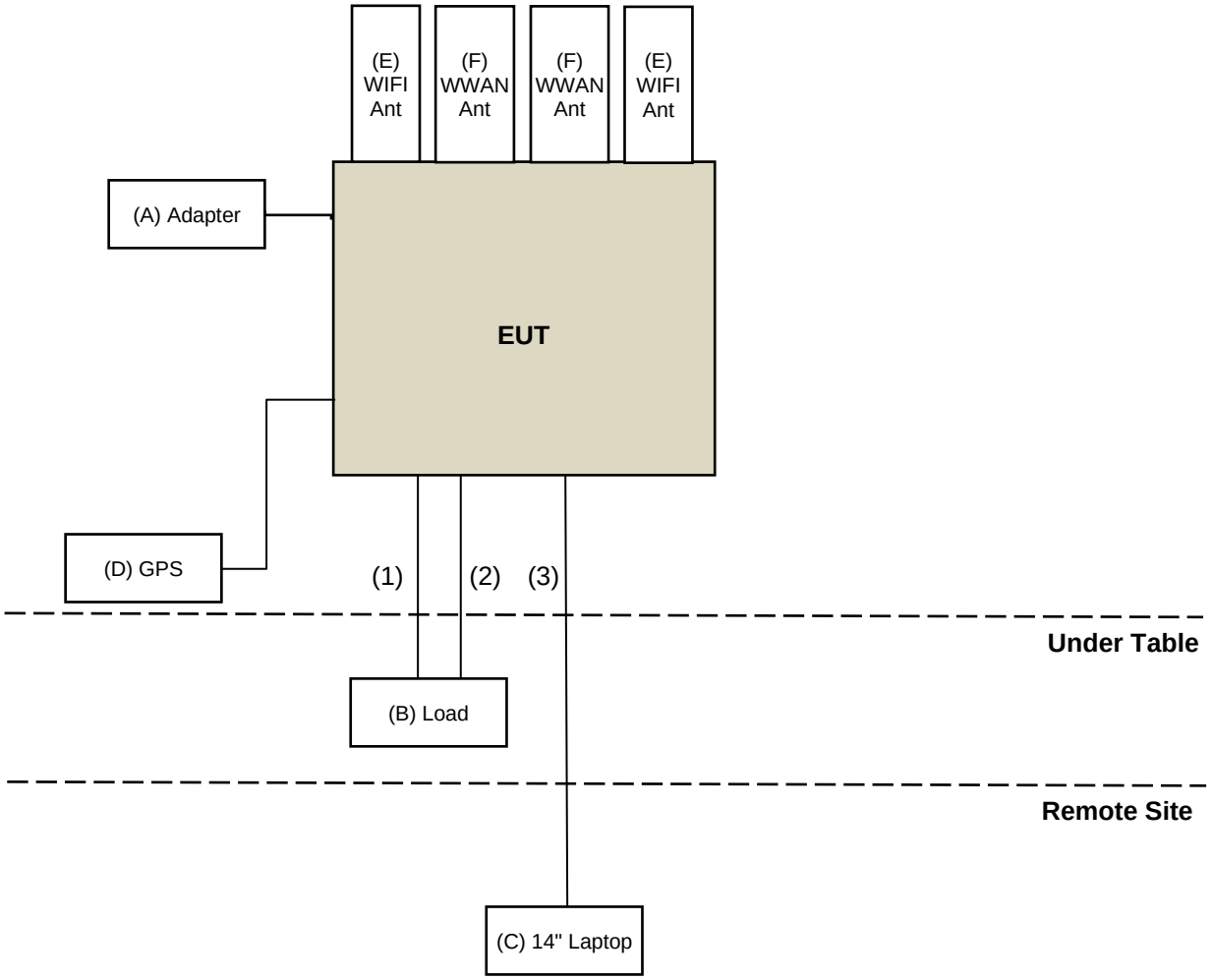


802.11g

3.6 Test Program Used and Operation Descriptions

Controlling software QA tool has been activated to set the EUT under transmission condition continuously at specific channel frequency.

3.7 Connection Diagram of EUT and Peripheral Devices



3.8 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Adapter	LEI	MU24D1120200-A1	N/A	N/A	Accessory of the EUT
B	Load	N/A	N/A	N/A	N/A	Provided by Lab
C	14" Laptop	Lenovo	L440	R9-0GFJKK	N/A	Supplied by applicant (for RF Setup)
D	GPS	YUAN CHEN TECH CO., LTD	A400-00001-01	N/A	N/A	Supplied by applicant
E	WIFI ANT	YUAN CHEN	ACA-0040-6G1A1-A10	N/A	N/A	Supplied by applicant
F	WWAN ANT	INPAQ	DAM-D13-S1-N0-000-08-20	N/A	N/A	Supplied by applicant

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	RJ-45 Cable	1	1.5	N	0	Provided by Lab
2	RJ-45 Cable	1	1.5	N	0	Provided by Lab
3	RJ-45 Cable	1	10	N	0	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 RF Output Power

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Peak Power Analyzer Keysight	8990B	MY51000485	2024/1/21	2025/1/20
Wideband Power Sensor Keysight	N1923A	MY58020002	2024/1/18	2025/1/17
		MY58140009	2024/1/18	2025/1/17

Notes:

1. The test was performed in Oven room.
2. Tested Date: 2024/11/21

4.2 AC Power Conducted Emissions

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
50 ohm terminal resistance HUBER+SUHNER	E1-011315	13	2023/11/22	2024/11/21
50 ohm terminal resistance	E1-011279	04	2023/11/22	2024/11/21
	E1-011280	05	2023/11/22	2024/11/21
DC-LISN Schwarzbeck	NNBM 8126G	8126G-069	2024/11/5	2025/11/4
EMI Test Receiver R&S	ESCI	100412	2024/9/3	2025/9/2
Fixed Attenuator Mini-Circuits	HAT-10+	PAD-COND1-01	2024/1/6	2025/1/5
LISN R&S	ENV216	101826	2024/3/25	2025/3/24
	ESH3-Z5	100311	2024/9/5	2025/9/4
RF Coaxial Cable Woken	5D-FB	Cable-cond1-01	2024/1/6	2025/1/5
Software BVADT	BVADT_Cond_ V7.4.1.0	N/A	N/A	N/A
V-LISN Schwarzbeck	NNBL 8226-2	8226-142	2024/8/28	2025/8/27

Notes:

1. The test was performed in HY - Conduction 1.
2. Tested Date: 2024/11/21

4.3 Unwanted Emissions below 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower Max-Full	MFA-515BSN	N/A	N/A	N/A
Bi_Log Antenna Schwarzbeck	VULB 9168	9168-1214	2024/10/15	2025/10/14
EXA Signal Analyzer Agilent	N9010A	MY52220207	2023/12/28	2024/12/27
Loop Antenna TESEQ	HLA 6121	45745	2024/8/21	2025/8/20
MXE EMI Receiver Agilent	N9038A	MY52260177	2024/9/19	2025/9/18
Preamplifier EMCI	EMC330N	980798	2024/1/15	2025/1/14
	EMC001340	980201	2024/9/24	2025/9/23
RF Coaxial Cable EMCI	EMCCFD400-NM-NM-500	201248	2024/1/15	2025/1/14
	EMCCFD400-NM-NM-3000	201249	2024/1/15	2025/1/14
	EMCCFD400-NM-NM-9000	201251(with PAD)	2024/1/15	2025/1/14
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	N/A	N/A	N/A
Turn Table Max-Full	MFT-201SS	N/A	N/A	N/A
Turn Table Controller Max-Full	MF-7802BS	MF780208676	N/A	N/A

Notes:

1. The test was performed in WM - 966 chamber 9.
2. Tested Date: 2024/11/21

4.4 Unwanted Emissions above 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower Max-Full	MFA-515BSN	N/A	N/A	N/A
EXA Signal Analyzer Agilent	N9010A	MY52220207	2023/12/28	2024/12/27
Horn Antenna RFSPIN	DRH18-E	210104A18E	2024/11/10	2025/11/9
Horn Antenna Schwarzbeck	BBHA 9170	9170-1049	2024/11/10	2025/11/9
MXE EMI Receiver Agilent	N9038A	MY52260177	2024/9/19	2025/9/18
Preamplifier Agilent	83017A	MY39501357	2024/6/12	2025/6/11
Preamplifier EMCI	EMC184045SE	980788	2024/1/15	2025/1/14
RF Coaxial Cable EMCI	EMC101G-KM-KM-2000	201254	2024/1/15	2025/1/14
	EMC101G-KM-KM-3000	201258	2024/1/15	2025/1/14
	EMC101G-KM-KM-5000	201261	2024/1/15	2025/1/14
	EMC104-SM-SM-1000	210103	2024/1/15	2025/1/14
	EMC104-SM-SM-3000	201241	2024/1/15	2025/1/14
	EMC104-SM-SM-9000	201244	2024/1/15	2025/1/14
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	N/A	N/A	N/A
Turn Table Max-Full	MFT-201SS	N/A	N/A	N/A
Turn Table Controller Max-Full	MF-7802BS	MF780208676	N/A	N/A

Notes:

1. The test was performed in WM - 966 chamber 9.
2. Tested Date: 2024/11/20

5 Limits of Test Items

5.1 RF Output Power

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

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.

For transmitting antennas with a directional gain greater than 6 dBi, as long as the antenna's directional gain exceeds 6 dBi every 3 dB, the maximum conducted output power of the deliberate radiator is reduced by 1 dB.

5.2 AC Power Conducted Emissions

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

Notes:

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 0.50 MHz.

5.3 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 20 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).

5.4 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

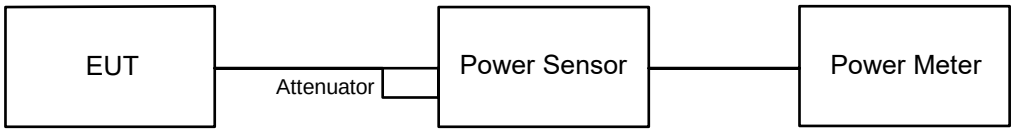
Notes:

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.

6 Test Arrangements

6.1 RF Output Power

6.1.1 Test Setup

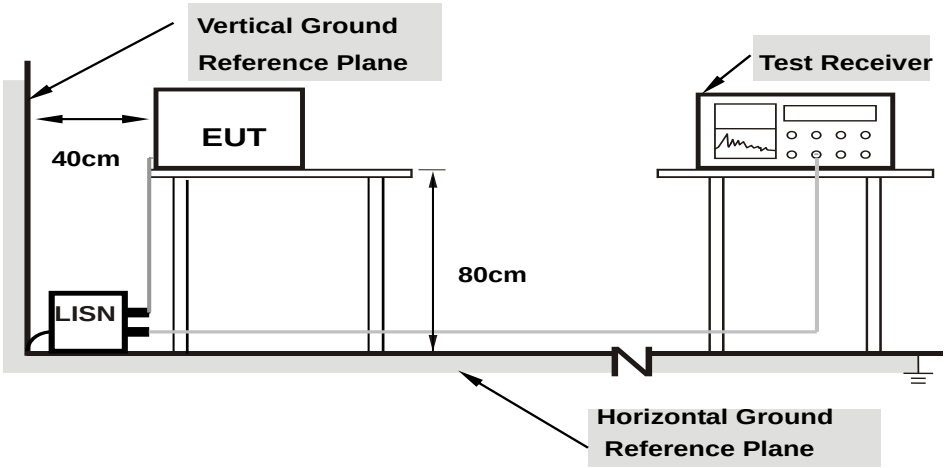


6.1.2 Test Procedure

Average Power:
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.

6.2 AC Power Conducted Emissions

6.2.1 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).

6.2.2 Test Procedure

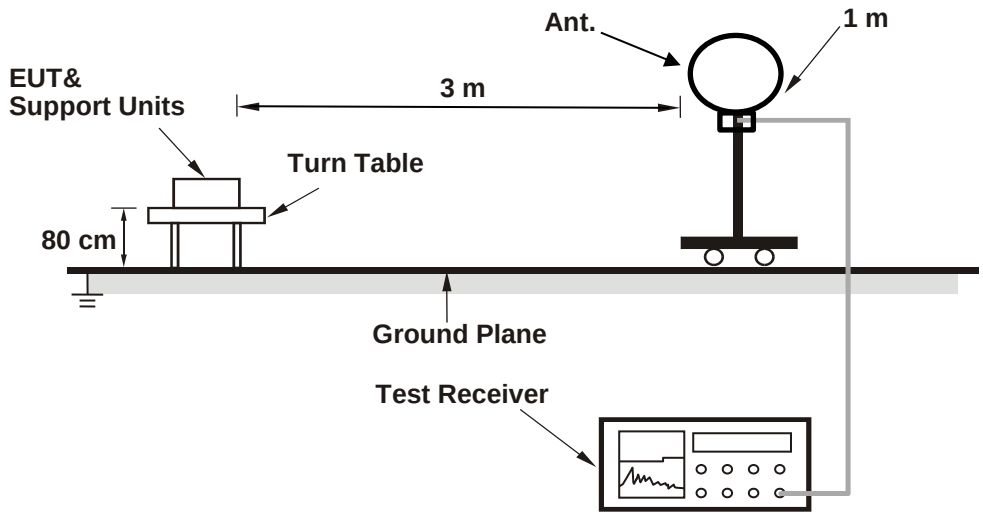
a. The EUT was placed on a 0.8 meter to the top of table and placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50 uH of coupling impedance for the measuring instrument.
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20 dB) was not recorded.

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

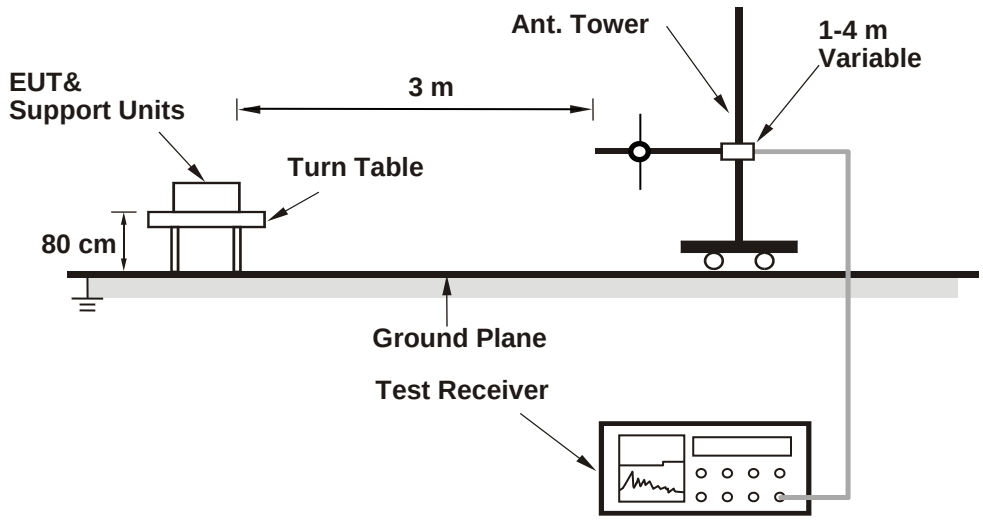
6.3 Unwanted Emissions below 1 GHz

6.3.1 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).

6.3.2 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.

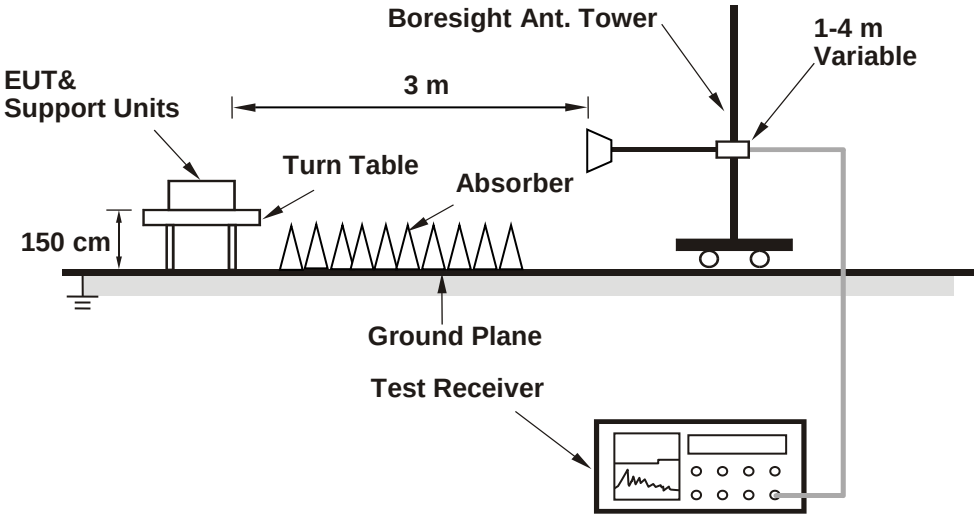
e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

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.

6.4 Unwanted Emissions above 1 GHz

6.4.1 Test Setup



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

6.4.2 Test Procedure

a. 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.

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 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:

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

7 Test Results of Test Item

7.1 RF Output Power

Input Power:	120 Vac, 60 Hz	Environmental Conditions:	25°C, 60% RH	Tested By:	Frank

802.11g

For Average Power

Chan.	Chan. Freq. (MHz)	Average Power (dBm)		Total Average Power (mW)	Total Average Power (dBm)
		Chain 0	Chain 1		
1	2412	13.27	13.02	41.277	16.16
6	2437	19.41	19.35	173.397	22.39
11	2462	13.08	12.90	39.822	16.00

Notes:

1. Directional gain is the maximum gain of antennas.
2. The maximum gain is 3.15 dBi < 6 dBi, so the output power limit shall not be reduced.

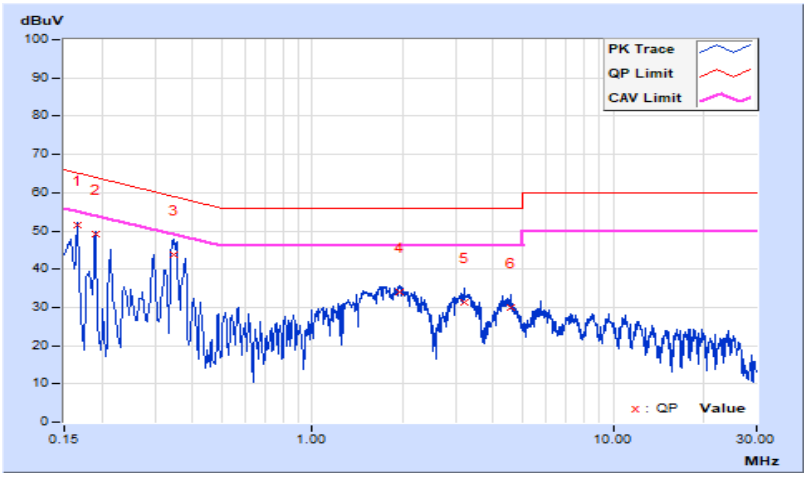
7.2 AC Power Conducted Emissions

RF Mode	802.11g	**Channel**	CH 6：2437 MHz
Frequency Range	150 kHz ~ 30 MHz	**Detector Function & Resolution Bandwidth**	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120 Vac, 60 Hz	**Environmental Conditions**	25 °C, 75 % RH
Tested By	Greg Lin		

Phase Of Power : Line (L)										
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	0.16535	9.72	41.88	27.64	51.60	37.36	65.19	55.19	-13.59	-17.83
2	0.19000	9.72	39.30	27.02	49.02	36.74	64.04	54.04	-15.02	-17.30
3	**0.34487**	**9.80**	**34.03**	**26.58**	**43.83**	**36.38**	**59.09**	**49.09**	**-15.26**	**-12.71**
4	1.95400	9.96	24.19	16.77	34.15	26.73	56.00	46.00	-21.85	-19.27
5	3.22200	10.00	21.43	13.89	31.43	23.89	56.00	46.00	-24.57	-22.11
6	4.55400	10.04	19.79	12.07	29.83	22.11	56.00	46.00	-26.17	-23.89

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

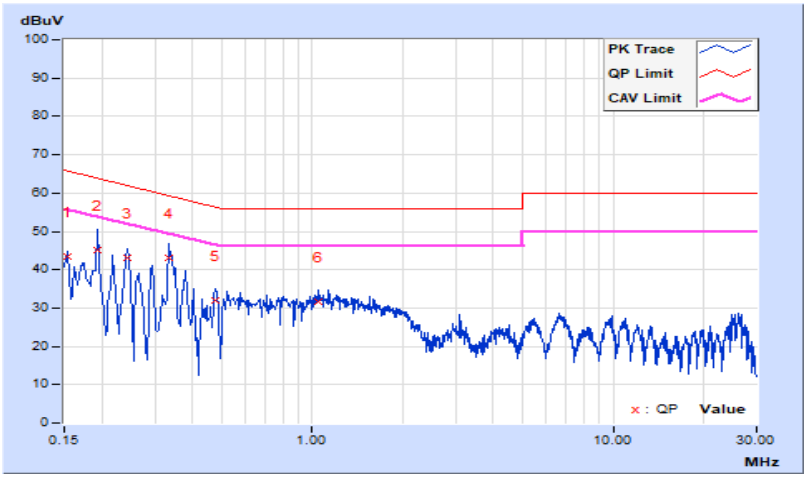


RF Mode	802.11g	**Channel**	CH 6：2437 MHz
Frequency Range	150 kHz ~ 30 MHz	**Detector Function & Resolution Bandwidth**	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120 Vac, 60 Hz	**Environmental Conditions**	25 °C, 75 % RH
Tested By	Greg Lin		

Phase Of Power : Neutral (N)										
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	0.15400	9.69	33.70	20.44	43.39	30.13	65.78	55.78	-22.39	-25.65
2	0.19400	9.71	35.48	21.04	45.19	30.75	63.86	53.86	-18.67	-23.11
3	0.24200	9.74	33.41	23.04	43.15	32.78	62.03	52.03	-18.88	-19.25
4	0.33400	9.82	33.36	17.57	43.18	27.39	59.35	49.35	-16.17	-21.96
5	0.47686	9.88	21.94	13.62	31.82	23.50	56.39	46.39	-24.57	-22.89
6	1.04600	9.93	21.72	14.69	31.65	24.62	56.00	46.00	-24.35	-21.38

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



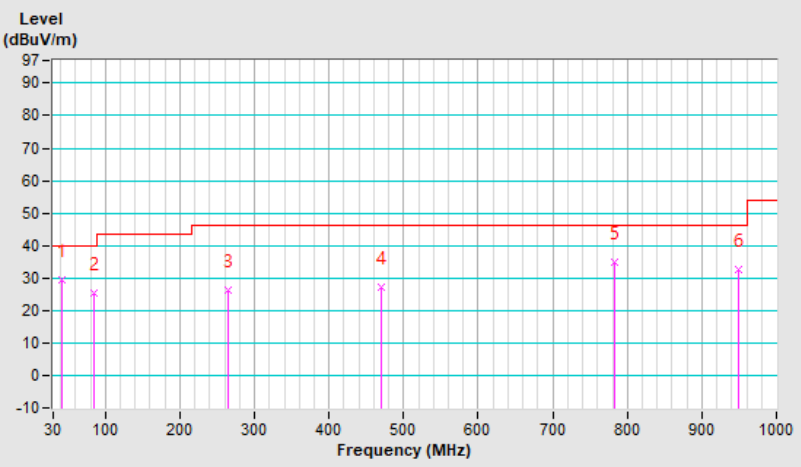
7.3 Unwanted Emissions below 1 GHz

RF Mode	802.11g	**Channel**	CH 6：2437 MHz
Frequency Range	30 MHz ~ 1 GHz	**Detector Function & Bandwidth**	QP: RB=120kHz, DET=Quasi-Peak
Input Power	120 Vac, 60 Hz	**Environmental Conditions**	21 °C, 69 % RH
Tested By	Edison Lee		

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	42.61	29.5 QP	40.0	-10.5	1.50 H	322	42.7	-13.2
2	85.29	25.5 QP	40.0	-14.5	1.00 H	90	44.3	-18.8
3	264.74	26.4 QP	46.0	-19.6	2.00 H	148	39.9	-13.5
4	470.38	27.1 QP	46.0	-18.9	1.00 H	122	35.0	-7.9
5	783.69	35.0 QP	46.0	-11.0	1.50 H	89	37.0	-2.0
6	949.56	32.6 QP	46.0	-13.4	1.00 H	135	32.4	0.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. 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.

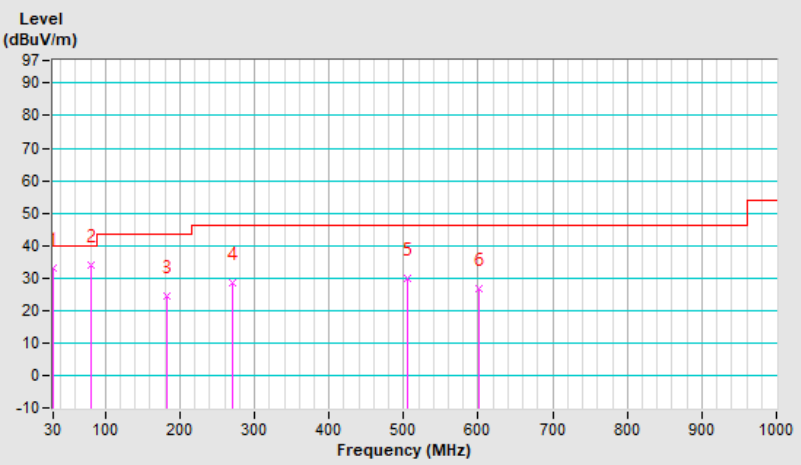


RF Mode	802.11g	**Channel**	CH 6：2437 MHz
Frequency Range	30 MHz ~ 1 GHz	**Detector Function & Bandwidth**	QP: RB=120kHz, DET=Quasi-Peak
Input Power	120 Vac, 60 Hz	**Environmental Conditions**	21 °C, 69 % RH
Tested By	Edison Lee		

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	30.00	33.0 QP	40.0	-7.0	2.00 V	273	47.2	-14.2
2	**80.44**	**34.0 QP**	**40.0**	**-6.0**	**1.00 V**	**48**	**52.1**	**-18.1**
3	182.29	24.6 QP	43.5	-18.9	1.00 V	333	39.4	-14.8
4	269.59	28.6 QP	46.0	-17.4	1.50 V	292	41.9	-13.3
5	505.30	29.9 QP	46.0	-16.1	2.00 V	16	37.3	-7.4
6	600.36	26.7 QP	46.0	-19.3	1.00 V	260	31.8	-5.1

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.



7.4 Unwanted Emissions above 1 GHz

RF Mode	802.11g	**Channel**	CH 1：2412 MHz
Frequency Range	1 GHz ~ 25 GHz	**Detector Function & Bandwidth**	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=1 kHz, DET=Peak
Input Power	120 Vac, 60 Hz	**Environmental Conditions**	21 °C, 69 % RH
Tested By	Greg Lin		

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	58.2 PK	74.0	-15.8	1.31 H	192	26.1	32.1
2	2390.00	47.3 AV	54.0	-6.7	1.31 H	192	15.2	32.1
3	*2412.00	103.9 PK			1.31 H	192	71.8	32.1
4	*2412.00	96.7 AV			1.31 H	192	64.6	32.1
5	4824.00	46.8 PK	74.0	-27.2	1.83 H	114	43.8	3.0
6	4824.00	39.1 AV	54.0	-14.9	1.83 H	114	36.1	3.0
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	61.0 PK	74.0	-13.0	3.03 V	163	28.9	32.1
2	2390.00	49.8 AV	54.0	-4.2	3.03 V	163	17.7	32.1
3	*2412.00	110.7 PK			3.03 V	163	78.6	32.1
4	*2412.00	103.6 AV			3.03 V	163	71.5	32.1
5	4824.00	47.3 PK	74.0	-26.7	3.02 V	137	44.3	3.0
6	4824.00	39.3 AV	54.0	-14.7	3.02 V	137	36.3	3.0

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. 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.

RF Mode	802.11g	Channel	CH 6：2437 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=1 kHz, DET=Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	21 °C, 69 % RH
Tested By	Greg Lin		

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	*2437.00	110.5 PK			1.37 H	194	78.4	32.1
2	*2437.00	103.3 AV			1.37 H	194	71.2	32.1
3	4874.00	47.4 PK	74.0	-26.6	1.86 H	118	44.1	3.3
4	4874.00	39.8 AV	54.0	-14.2	1.86 H	118	36.5	3.3
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	*2437.00	117.6 PK			2.95 V	167	85.5	32.1
2	*2437.00	110.4 AV			2.95 V	167	78.3	32.1
3	4874.00	48.1 PK	74.0	-25.9	2.93 V	142	44.8	3.3
4	4874.00	40.0 AV	54.0	-14.0	2.93 V	142	36.7	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. 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.

RF Mode	802.11g	Channel	CH 11：2462 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=1 kHz, DET=Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	21 °C, 69 % RH
Tested By	Greg Lin		

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	*2462.00	105.7 PK			1.37 H	196	73.4	32.3
2	*2462.00	98.6 AV			1.37 H	196	66.3	32.3
3	2483.50	62.2 PK	74.0	-11.8	1.37 H	196	29.7	32.5
4	2483.50	50.8 AV	54.0	-3.2	1.37 H	196	18.3	32.5
5	4924.00	47.5 PK	74.0	-26.5	1.82 H	116	44.1	3.4
6	4924.00	39.8 AV	54.0	-14.2	1.82 H	116	36.4	3.4
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	*2462.00	112.5 PK			2.91 V	165	80.2	32.3
2	*2462.00	105.5 AV			2.91 V	165	73.2	32.3
3	2483.50	63.6 PK	74.0	-10.4	2.91 V	165	31.1	32.5
4	**2483.50**	**51.6 AV**	**54.0**	**-2.4**	**2.91 V**	**165**	**19.1**	**32.5**
5	4924.00	47.7 PK	74.0	-26.3	2.98 V	136	44.3	3.4
6	4924.00	40.0 AV	54.0	-14.0	2.98 V	136	36.6	3.4

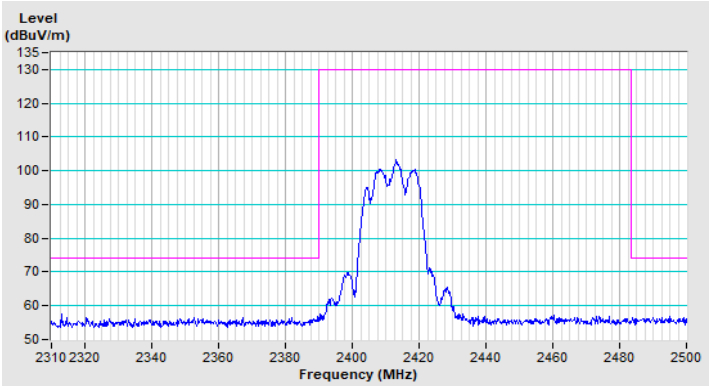
Remarks:

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.

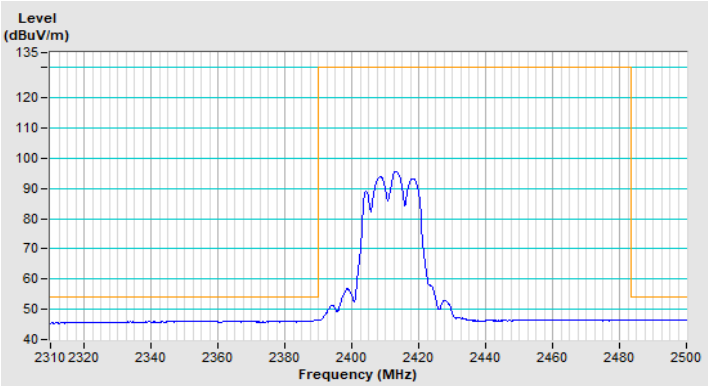
Plot of Band Edge

Frequency Range	2.31 GHz ~ 2.5 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=1 kHz, DET=Peak

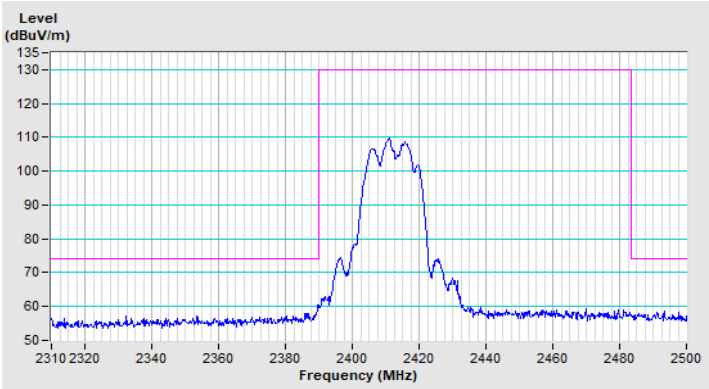
802.11g Channel 1



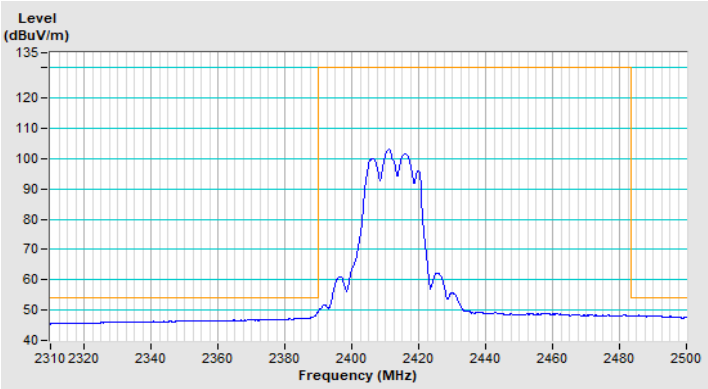
Horizontal (Peak)



Horizontal (Average)

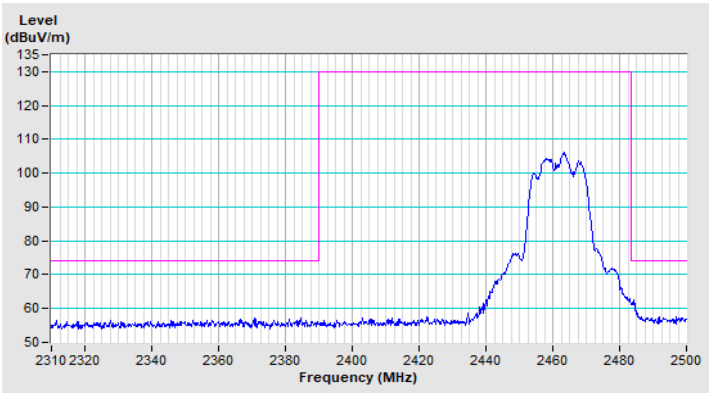


Vertical (Peak)

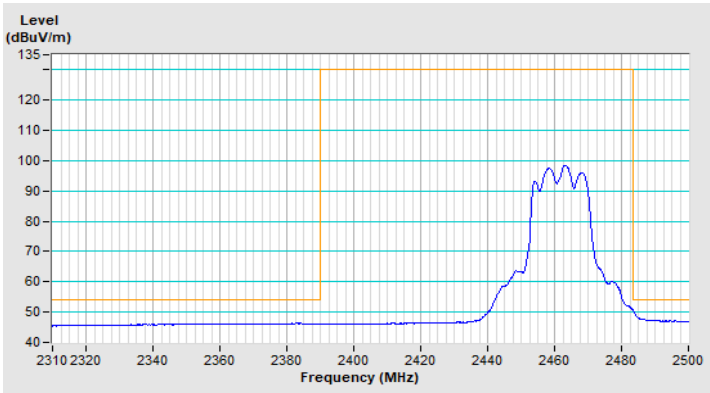


Vertical (Average)

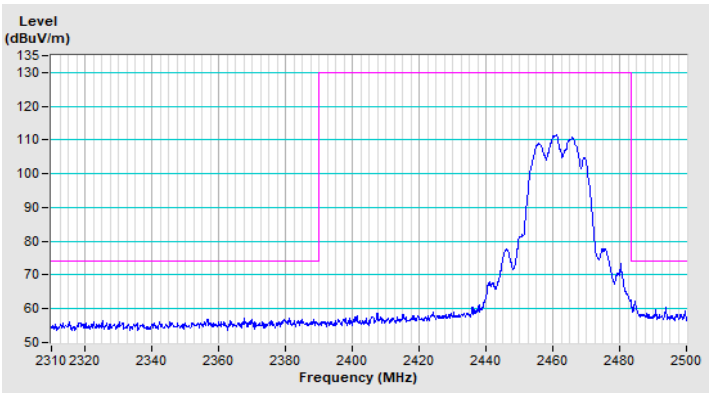
802.11g Channel 11



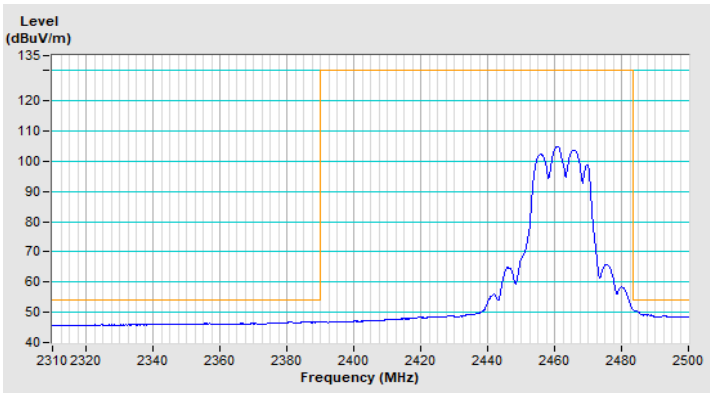
Horizontal (Peak)



Horizontal (Average)



Vertical (Peak)



Vertical (Average)

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:

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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.

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