

FCC C2PC Test Report

FCC ID : I4L-MRBE50
Equipment : Roamii BE Lite Mesh System
Model No. : MRBE50
Brand Name : msi
Applicant : Micro-Star Int'l Co.,Ltd
Address : No.69, Lide St., Zhonghe Dist., New Taipei City
235, Taiwan
Standard : 47 CFR FCC Part 15.247
Received Date : Mar. 07, 2024
Tested Date : Jul. 08 ~ Jul. 31, 2024

We, International Certification Corporation, would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by:

Approved by:



Along Chen / Assistant Manager



Gary Chang / Manager

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Release Record

Report No.	Version	Description	Issued Date
FR430702-01AC	Rev. 01	Initial issue	Aug. 13, 2024

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	AC Power Line Conducted Emission	[dBuV]: 0.198MHz 46.61 (Margin -17.10dB) - QP	Pass
15.247(d) 15.209	Unwanted Emissions	[dBuV/m at 3m]: 2483.50MHz 53.55 (Margin -0.45dB) - AV	Pass
15.247(b)(3)	Conducted Output Power	Max Power [dBm]: Non-beamforming mode 29.47 Beamforming mode 29.05	Pass

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

1 General Description

1.1 Information

This is a Class II Permissive Change report (C2PC).

This report is issued as a supplementary report to original report no. FR430702AC.

Reasons for the change are listed as follows:

- (1) Add/Change/Remove hardware components (capacitor, resistor, filter bead)
- (2) Add thermal pad (PAD 12/14/16)
- (3) Change thermal pad (PAD 1/2/7/11)

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information					
Frequency Range (MHz)	IEEE Std. 802.11	Ch. Freq. (MHz)	Channel Number	Transmit Chains (N _{TX})	Data Rate / MCS
2400-2483.5	b	2412-2462	1-11 [11]	2	1-11 Mbps
2400-2483.5	g	2412-2462	1-11 [11]	2	6-54 Mbps
2400-2483.5	n (HT20)	2412-2462	1-11 [11]	2	MCS 0-15
2400-2483.5	n (HT40)	2422-2452	3-9 [7]	2	MCS 0-15
2400-2483.5	ac (VHT20)	2412-2462	1-11 [11]	2	MCS 0-9
2400-2483.5	ac (VHT40)	2422-2452	3-9 [7]	2	MCS 0-9
2400-2483.5	ax (HE20)	2412-2462	1-11 [11]	2	MCS 0-11
2400-2483.5	ax (HE40)	2422-2452	3-9 [7]	2	MCS 0-11
2400-2483.5	be (EHT20)	2412-2462	1-11 [11]	2	MCS 0-13
2400-2483.5	be (EHT40)	2422-2452	3-9 [7]	2	MCS 0-13

Note 1: RF output power specifies that Maximum Conducted (Average) Output Power.
 Note 2: DBPSK, DQPSK, CCK modulation
 BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM and 4096QAM modulation.
 Note 3: 802.11n/ac/ax/be supports beamforming function.

1.1.2 Antenna Details

Brand	Model	Type	Connector	Operating Frequencies (MHz) / Antenna Gain (dBi)					
				2400~2483.5	5150~5250	5250~5350	5470~5725	5725~5850	5850~5895
Aristotle	JP887-2G-P1 (2G-1)	Dipole	UFL	2.41	---	---	---	---	---
Aristotle	JP868-2G-V2 (2G-2)	Dipole	UFL	2.36	---	---	---	---	---
Aristotle	JP887-5G-P1 (5G-1)	Dipole	UFL	---	3.66	3.88	3.24	2.99	3.33
Aristotle	JP887-5G-P2-V2 (5G-2)	Dipole	UFL	---	3.76	4.34	4.09	3.74	3.48

1.1.3 EUT Operational Condition

Power Supply Type	12Vdc from adapter	
RU Configuration	<input checked="" type="checkbox"/> Full RU	<input type="checkbox"/> Partial RU

1.1.4 Accessories

Accessories		
No.	Equipment	Description
1	AC adapter	Brand: DVE Model: DSA-18PFCA-09 120150 Power Rating: I/P: 100-240V~ 50/60Hz, 0.6A O/P: 12.0V= 1.5A, 18.0W Power line: 1.5m non-shielded without core
2	Ethernet Cable	1m non-shielded without core
3	Wall mount	---
4	Wall mount screw bag	---

1.1.5 Channel List

Frequency band (MHz)		2400~2483.5	
802.11 b / g / n HT20 / ac VHT20 / ax HE20 / be EHT20		802.11n HT40 / ac VHT40 / ax HE40 / be EHT40	
Channel	Frequency(MHz)	Channel	Frequency(MHz)
1	2412	3	2422
2	2417	4	2427
3	2422	5	2432
4	2427	6	2437
5	2432	7	2442
6	2437	8	2447
7	2442	9	2452
8	2447	---	---
9	2452	---	---
10	2457	---	---
11	2462	---	---

1.1.6 Test Tool and Duty Cycle

Test Tool	QSPR, V6.00.00110.1				
Duty Cycle and Duty Factor	Mode	2T1S		2T2S	
		Duty cycle (%)	Duty factor (dB)	Duty cycle (%)	Duty factor (dB)
	11b	99.18%	0.04	---	---
	11g	100.00%	0.00	---	---
	be EHT20	99.48%	0.02	98.44%	0.07
be EHT40	99.36%	0.03	98.44%	0.07	

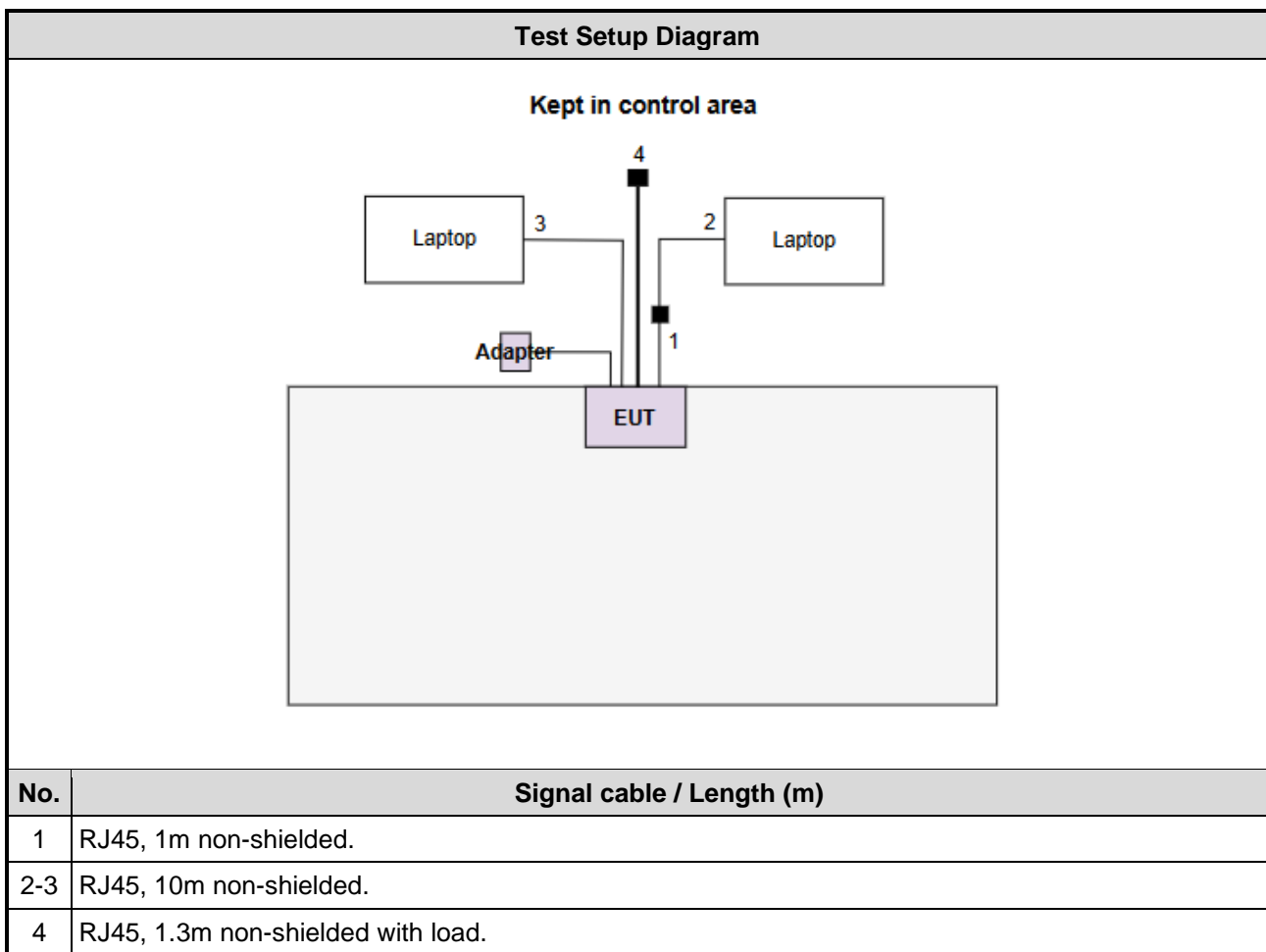
1.1.7 Power Index of Test Tool

Modulation Mode	Test Frequency (MHz)	Power Index	
		2T1S	2T2S
11b	2412	26	---
11b	2437	26	---
11b	2462	26	---
11g	2412	23.5	---
11g	2437	26.5	---
11g	2462	24	---
be EHT20	2412	23	23
be EHT20	2437	26	26.5
be EHT20	2462	23	24.5
be EHT40	2422	21.5	22
be EHT40	2437	23	23
be EHT40	2452	22	23

1.2 Local Support Equipment List

Support Equipment List					
No.	Equipment	Brand	Model	FCC ID	Remarks
1	Laptop	DELL	Latitude 5400	DoC	---
2	Laptop	DELL	Latitude 3440	DoC	---
3	RJ45 Load	ICC	DTSE9	---	---

1.3 Test Setup Chart



1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Tested Date	Jul. 30, 2024				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101658	Feb. 23, 2024	Feb. 22, 2025
LISN	R&S	ENV216	101579	May 09, 2023	May 08, 2024
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Oct. 11, 2023	Oct. 10, 2024
LISN (Support Unit)	SCHWARZBECK	Schwarzbeck 8127	8127666	Mar. 05, 2024	Mar. 04, 2025
50 ohm terminal (Support Unit)	NA	50	03	Aug. 08, 2023	Aug. 07, 2024
Measurement Software	AUDIX	e3	6.120210k	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission Below 1GHz				
Test Site	966 chamber 3 / (03CH03-WS)				
Tested Date	Jul. 30, 2024				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101657	Mar. 05, 2024	Mar. 04, 2025
Loop Antenna	R&S	HFH2-Z2	100330	Oct. 31, 2023	Oct. 30, 2024
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-685	Jul. 02, 2024	Jul. 01, 2025
Preamplifier	EMC	EMC02325	980187	Jun. 27, 2024	Jun. 26, 2025
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 03, 2023	Oct. 02, 2024
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800-001	Sep. 22, 2023	Sep. 21, 2024
LF cable-3M	EMC	EMC8D-NM-NM-3000	131103	Sep. 22, 2023	Sep. 21, 2024
LF cable-13M	EMC	EMC8D-NM-NM-13000	131104	Sep. 22, 2023	Sep. 21, 2024
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission above 1GHz				
Test Site	966 chamber 3 / (03CH03-WS)				
Tested Date	Jul. 08 ~ Jul. 12, 2024				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101499	Apr. 02, 2024	Apr. 01, 2025
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1206	Dec. 14, 2023	Dec. 13, 2024
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Oct. 30, 2023	Oct. 29, 2024
Preamplifier	EMC	EMC118A45SE	980897	Aug. 01, 2023	Jul. 31, 2024
Preamplifier	EMC	EMC184045SE	980903	Jul. 17, 2023	Jul. 16, 2024
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22620/4	Sep. 22, 2023	Sep. 21, 2024
RF cable-8M	EMC	EMC104-SM-SM-80 00	181107	Sep. 22, 2023	Sep. 21, 2024
Attenuator	Pasternack	PE7005-10	10-3	Sep. 27, 2023	Sep. 26, 2024
HIGHPASS FILTER	K&L	11SH10-7000/T1800 0-O/OP	21	Sep. 27, 2023	Sep. 26, 2024
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Tested Date	Jul. 30 ~ Jul. 31, 2024				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101910	Apr. 18, 2024	Apr. 17, 2025
Power Meter	Anritsu	ML2495A	1241002	Nov. 21, 2023	Nov. 20, 2024
Power Sensor	Anritsu	MA2411B	1207366	Nov. 21, 2023	Nov. 20, 2024
Attenuator	Pasternack	PE7005-10	10-2	Oct. 05, 2023	Oct. 04, 2024
Measurement Software	Sporton	SENSE-15247_DTS	V5.11	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

47 CFR FCC Part 15.247
ANSI C63.10-2013

1.6 Reference Guidance

FCC KDB 558074 D01 15.247 Meas Guidance v05r02
FCC KDB 662911 D01 Multiple Transmitter Output v02r01

1.7 Deviation from Test Standard and Measurement Procedure

None

1.8 Measurement Uncertainty

The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)).

Measurement Uncertainty	
Parameters	Uncertainty
Bandwidth	±34.130 Hz
Conducted power	±0.808 dB
Power density	±0.583 dB
Conducted emission	±2.715 dB
AC conducted emission	±2.92 dB
Radiated emission ≤ 1GHz	±3.96 dB
Radiated emission > 1GHz	±4.51 dB

2 Test Configuration

2.1 Testing Facility

Test Laboratory	International Certification Corporation
Test Site	CO01-WS, TH01-WS
Address of Test Site	No.3-1, Lane 6, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 33381, Taiwan (R.O.C.)
Test Site	03CH03-WS
Address of Test Site	No.14-1, Lane 19, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 33381, Taiwan (R.O.C.)

- FCC Designation No.: TW0009
- FCC site registration No.: 207696
- ISED#: 10807C
- CAB identifier: TW2732

2.2 The Worst Test Modes and Channel Details

Test item	Modulation Mode	Test Frequency (MHz)	Data Rate	Test Configuration
Non-beamforming mode				
AC Power Line Conducted Emission	11b	2437	1 Mbps	2T1S
Unwanted Emissions ≤ 1GHz Unwanted Emissions >1GHz	11b be EHT40	2437 2437	1 Mbps MCS 0	2T1S
Conducted Output Power	11b 11g be EHT20 be EHT40	2412 / 2437 / 2462 2412 / 2437 / 2462 2412 / 2437 / 2462 2422 / 2437 / 2452	1 Mbps 6 Mbps MCS 0 MCS 0	2T1S
Conducted Output Power	be EHT20 be EHT40	2412 / 2437 / 2462 2422 / 2437 / 2452	MCS 0 MCS 0	2T2S
Beamforming mode				
Conducted Output Power	be EHT20 be EHT40	2412 / 2437 / 2462 2422 / 2437 / 2452	MCS 0 MCS 0	2T1S, 2T2S

3 Transmitter Test Results

3.1 Conducted Output Power

3.1.1 Limit of Conducted Output Power

Conducted power shall not exceed 1Watt.

Antenna gain \leq 6dBi, no any corresponding reduction is in output power limit.

Antenna gain $>$ 6dBi

Non Fixed, point to point operations.

The conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB

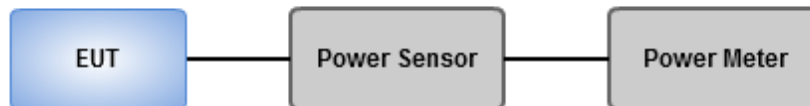
Fixed, point to point operations

Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point Operations, maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

3.1.2 Test Procedures

A broadband RF power meter is used for output power measurement. The video bandwidth of power meter is greater than DTS bandwidth of EUT. If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power.

3.1.3 Test Setup



3.1.4 Test Results

Ambient Condition	23-24°C / 65-67%	Tested By	Roger Lu
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Refer to Appendix A.

3.2 Unwanted Emissions into Restricted Frequency Bands

3.2.1 Limit of Unwanted Emissions into Restricted Frequency Bands

Restricted Band Emissions Limit			
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1:
Quasi-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit

Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.2.2 Test Procedures

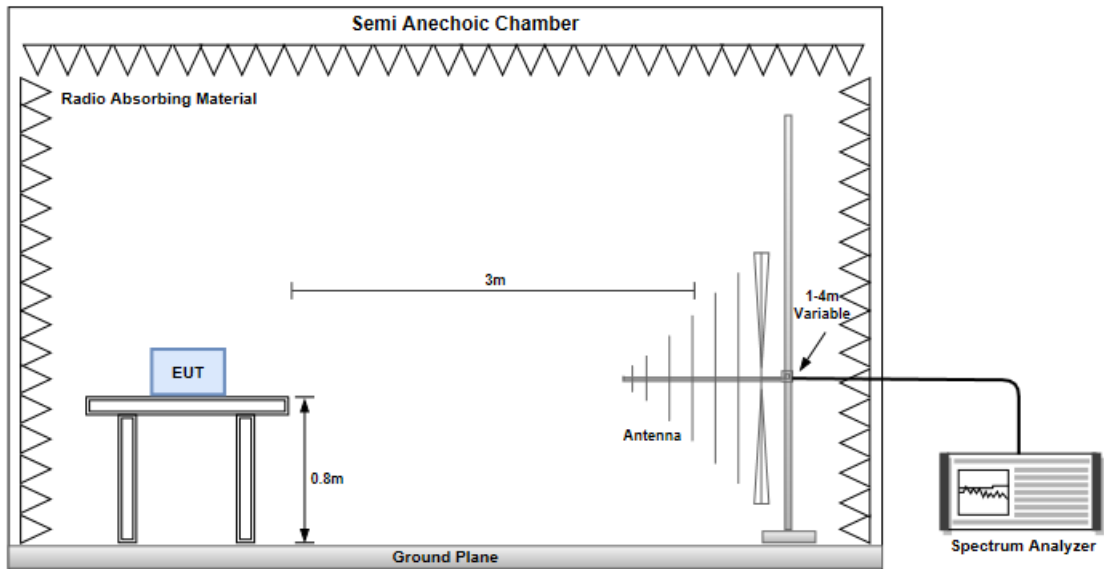
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

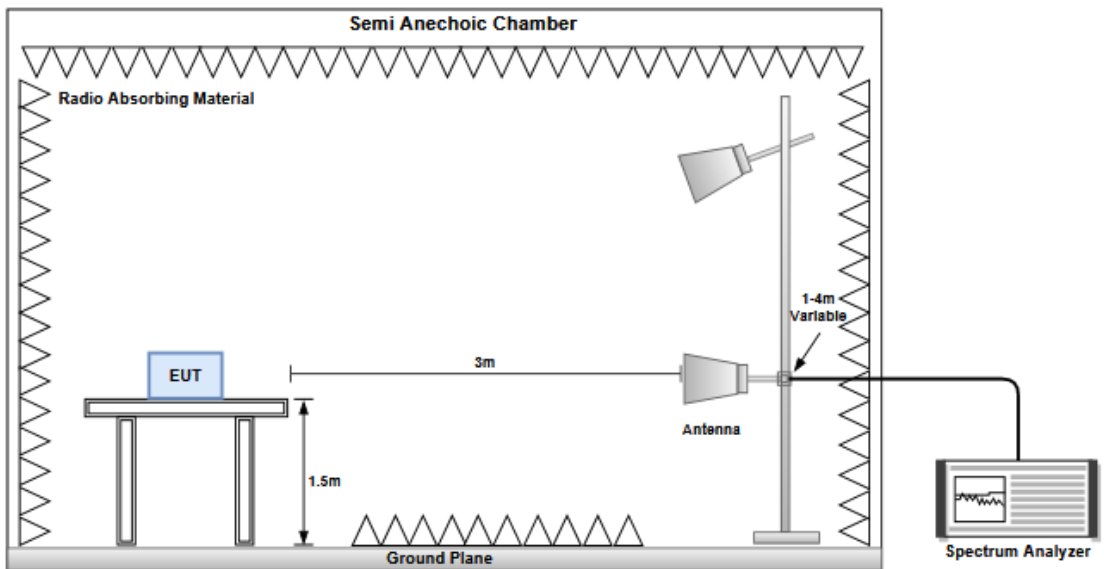
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 1GHz.

3.2.3 Test Setup

Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz



3.2.4 Test Results

Refer to Appendix B.

3.3 AC Power Line Conducted Emissions

3.3.1 Limit of AC Power Line Conducted Emissions

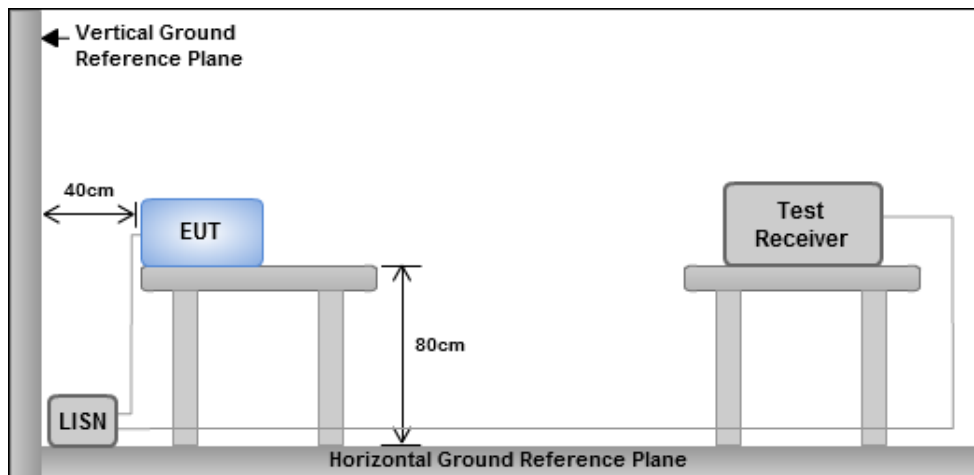
Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

Note 1: * Decreases with the logarithm of the frequency.

3.3.2 Test Procedures

1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels of AC power line conducted emission are across the 50 Ω LISN port.
3. AC conducted emission measurements is made over frequency range from 150 kHz to 30 MHz.
4. This measurement was performed with AC 120V / 60Hz.

3.3.3 Test Setup



Note: 1. Support units were connected to second LISN.

2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.3.4 Test Results

Refer to Appendix C.

4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corporation (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website <http://www.icertifi.com.tw>.

Linkou

Tel: 886-2-2601-1640

No.30-2, Ding Fwu Tsuen, Lin Kou
District, New Taipei City, Taiwan
(R.O.C.)

Kwei Shan

Tel: 886-3-271-8666

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St., Kwei Shan Dist., Tao Yuan
City 33381, Taiwan (R.O.C.)
No.2-1, Lane 6, Wen San 3rd
St., Kwei Shan Dist., Tao Yuan
City 33381, Taiwan (R.O.C.)

Kwei Shan Site II

Tel: 886-3-271-8640

No.14-1, Lane 19, Wen San 3rd
St., Kwei Shan Dist., Tao Yuan
City 33381, Taiwan (R.O.C.)

If you have any suggestion, please feel free to contact us as below information.

Tel: 886-3-271-8666

Fax: 886-3-318-0345

Email: ICC_Service@icertifi.com.tw

==END==



Non-beamforming mode

Summary

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
802.11b_Nss1,(1Mbps)_2TX	29.47	0.88512
802.11g_Nss1,(6Mbps)_2TX	29.45	0.88105
802.11be EHT20_Nss1,(MCS0)_2TX	29.11	0.81470
802.11be EHT40_Nss1,(MCS0)_2TX	26.37	0.43351

Result

Mode	Result	DG (dBi)	Port 1 (dBm)	Port 2 (dBm)	Total Power (dBm)	Power Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)
802.11b_Nss1,(1Mbps)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	2.41	26.74	26.15	29.47	30.00	31.88	36.00
2437MHz	Pass	2.41	26.66	26.25	29.47	30.00	31.88	36.00
2462MHz	Pass	2.41	26.44	26.36	29.41	30.00	31.82	36.00
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	2.41	23.73	23.51	26.63	30.00	29.04	36.00
2437MHz	Pass	2.41	26.65	26.22	29.45	30.00	31.86	36.00
2462MHz	Pass	2.41	24.22	23.99	27.12	30.00	29.53	36.00
802.11be EHT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	2.41	23.58	22.63	26.14	30.00	28.55	36.00
2437MHz	Pass	2.41	26.59	25.55	29.11	30.00	31.52	36.00
2462MHz	Pass	2.41	23.19	23.42	26.32	30.00	28.73	36.00
802.11be EHT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-
2422MHz	Pass	2.41	22.45	21.53	25.02	30.00	27.43	36.00
2437MHz	Pass	2.41	23.76	22.91	26.37	30.00	28.78	36.00
2452MHz	Pass	2.41	22.89	22.98	25.95	30.00	28.36	36.00

DG = Directional Gain; Port X = Port X output power



Beamforming mode

Summary

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
802.11be EHT20-BF_Nss1,(MCS0)_2TX	28.43	0.69663
802.11be EHT40-BF_Nss1,(MCS0)_2TX	25.69	0.37068

Result

Mode	Result	DG (dBi)	Port 1 (dBm)	Port 2 (dBm)	Total Power (dBm)	Power Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)
802.11be EHT20-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	3.09	22.9	21.95	25.46	30.00	28.55	36.00
2437MHz	Pass	3.09	25.91	24.87	28.43	30.00	31.52	36.00
2462MHz	Pass	3.09	22.51	22.74	25.64	30.00	28.73	36.00
802.11be EHT40-BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-
2422MHz	Pass	3.09	21.77	20.85	24.34	30.00	27.43	36.00
2437MHz	Pass	3.09	23.08	22.23	25.69	30.00	28.78	36.00
2452MHz	Pass	3.09	22.21	22.3	25.27	30.00	28.36	36.00

DG = Directional Gain; Port X = Port X output power

Directional Gain is measured.



Non-beamforming mode

Summary

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
802.11be EHT20_Nss2,(MCS0)_2TX	29.07	0.80724
802.11be EHT40_Nss2,(MCS0)_2TX	26.41	0.43752

Result

Mode	Result	DG (dBi)	Port 1 (dBm)	Port 2 (dBm)	Total Power (dBm)	Power Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)
802.11be EHT20_Nss2,(MCS0)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	2.39	22.62	22.89	25.77	30.00	28.16	36.00
2437MHz	Pass	2.39	26.39	25.71	29.07	30.00	31.46	36.00
2462MHz	Pass	2.39	23.89	23.76	26.84	30.00	29.23	36.00
802.11be EHT40_Nss2,(MCS0)_2TX	-	-	-	-	-	-	-	-
2422MHz	Pass	2.39	22.57	22.15	25.38	30.00	27.77	36.00
2437MHz	Pass	2.39	23.48	23.31	26.41	30.00	28.80	36.00
2452MHz	Pass	2.39	23.31	23.39	26.36	30.00	28.75	36.00

DG = Directional Gain; Port X = Port X output power

$$\text{Directional Gain} = 10 \log \left[\frac{(10^{2.41/10} + 10^{2.36/10})}{2} \right] = 2.39 \text{ dBi}$$



Beamforming mode

Summary

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
802.11be EHT20-BF_Nss2,(MCS0)_2TX	29.05	0.80353
802.11be EHT40-BF_Nss2,(MCS0)_2TX	26.39	0.43551

Result

Mode	Result	DG (dBi)	Port 1 (dBm)	Port 2 (dBm)	Total Power (dBm)	Power Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)
802.11be EHT20-BF_Nss2,(MCS0)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	2.41	22.6	22.87	25.75	30.00	28.16	36.00
2437MHz	Pass	2.41	26.37	25.69	29.05	30.00	31.46	36.00
2462MHz	Pass	2.41	23.87	23.74	26.82	30.00	29.23	36.00
802.11be EHT40-BF_Nss2,(MCS0)_2TX	-	-	-	-	-	-	-	-
2422MHz	Pass	2.41	22.55	22.13	25.36	30.00	27.77	36.00
2437MHz	Pass	2.41	23.46	23.29	26.39	30.00	28.80	36.00
2452MHz	Pass	2.41	23.29	23.37	26.34	30.00	28.75	36.00

DG = Directional Gain; Port X = Port X output power

Directional Gain is measured.



Unwanted Emissions (Below 1GHz)

Modulation	11b	Test Freq. (MHz)	2437
Polarization	Horizontal		
Test By	:Akun Chung	Temperature(°C):25	Humidity(%):62

The graph displays the emission level in dBuV/m across a frequency range from 30 MHz to 1000 MHz. A red line represents the CLASS-B limit, which is constant at 40 dBuV/m until approximately 100 MHz, then steps up to 43.5 dBuV/m. A blue line shows the actual emission level, with several peaks labeled 1 through 6. Peak 1 is at 39.70 MHz, peak 2 at 77.53 MHz, peak 3 at 91.11 MHz, peak 4 at 102.75 MHz, peak 5 at 152.22 MHz, and peak 6 at 178.41 MHz. The emission level generally increases with frequency, staying below the CLASS-B limit.

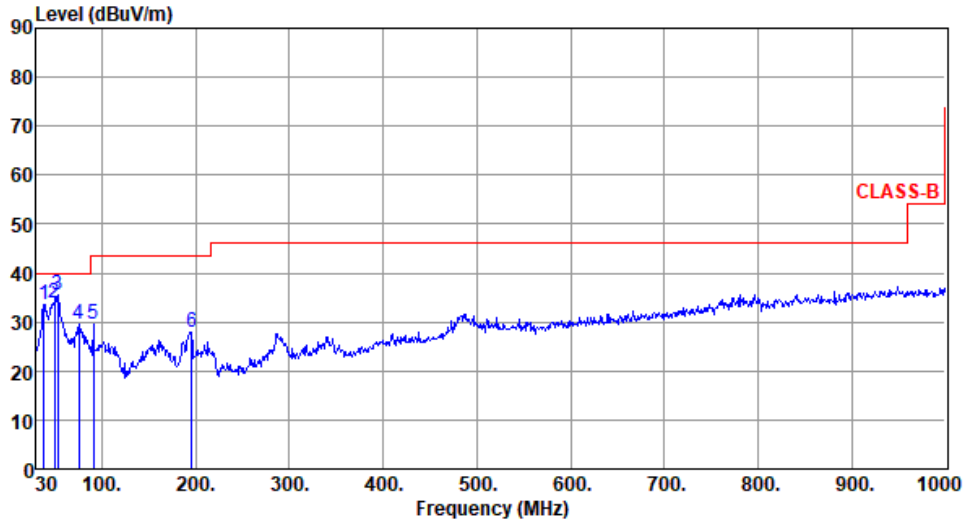
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	39.70	25.61	40.00	-14.39	35.00	-9.39	Peak	---	---
2	77.53	27.84	40.00	-12.16	40.79	-12.95	Peak	---	---
3	91.11	28.38	43.50	-15.12	42.87	-14.49	Peak	---	---
4	102.75	26.95	43.50	-16.55	39.77	-12.82	Peak	---	---
5	152.22	27.59	43.50	-15.91	36.06	-8.47	Peak	---	---
6	178.41	25.75	43.50	-17.75	35.69	-9.94	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)
 *Factor includes antenna factor , cable loss and amplifier gain
 Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
 Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.



Modulation	11b	Test Freq. (MHz)	2437
Polarization	Vertical		

Test By : Akun Chung Temperature(°C): 25 Humidity(%): 62



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	37.76	33.42	40.00	-6.58	43.02	-9.60	Peak	---	---
2	49.40	34.04	40.00	-5.96	42.73	-8.69	Peak	---	---
3	53.28	35.54	40.00	-4.46	44.12	-8.58	Peak	---	---
4	75.59	29.53	40.00	-10.47	41.82	-12.29	Peak	---	---
5	91.11	29.43	43.50	-14.07	43.92	-14.49	Peak	---	---
6	195.87	28.06	43.50	-15.44	39.64	-11.58	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.



Unwanted Emission (Above 1GHz)

Modulation	11b	Test Freq. (MHz)	2437
Polarization	Horizontal		
Test By	:Akun Chung	Temperature(°C):26	Humidity(%):62

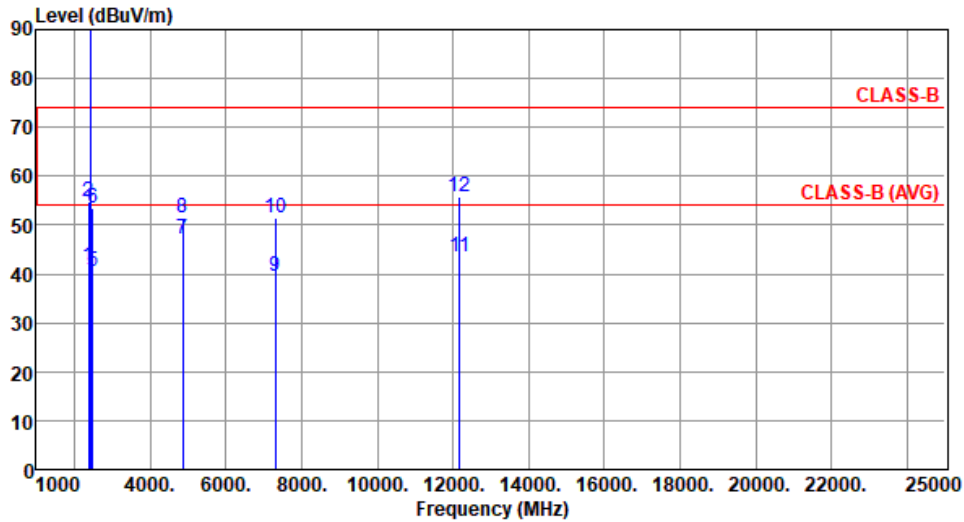
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2390.00	42.43	54.00	-11.57	46.06	-3.63	Average	187	235
2	2390.00	53.82	74.00	-20.18	57.45	-3.63	Peak	187	235
3 *	2437.00	114.43			118.19	-3.76	Average	187	235
4 *	2437.00	118.07			121.83	-3.76	Peak	187	235
5	2483.50	42.49	54.00	-11.51	46.41	-3.92	Average	187	235
6	2483.50	52.35	74.00	-21.65	56.27	-3.92	Peak	187	235
7	4874.00	45.11	54.00	-8.89	45.06	0.05	Average	105	295
8	4874.00	50.18	74.00	-23.82	50.13	0.05	Peak	105	295
9	7311.00	39.32	54.00	-14.68	33.94	5.38	Average	191	274
10	7311.00	51.24	74.00	-22.76	45.86	5.38	Peak	191	274
11	12185.00	47.05	54.00	-6.95	39.61	7.44	Average	197	33
12	12185.00	56.86	74.00	-17.14	49.42	7.44	Peak	197	33

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)
 *Factor includes antenna factor , cable loss and amplifier gain
 Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).



Modulation	11b	Test Freq. (MHz)	2437
Polarization	Vertical		

Test By : Akun Chung Temperature(°C): 26 Humidity(%): 62



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2390.00	41.43	54.00	-12.57	45.06	-3.63	Average	255	191
2	2390.00	54.92	74.00	-19.08	58.55	-3.63	Peak	255	191
3 *	2437.00	117.10			120.86	-3.76	Average	255	191
4 *	2437.00	120.77			124.53	-3.76	Peak	255	191
5	2483.50	40.47	54.00	-13.53	44.39	-3.92	Average	255	191
6	2483.50	53.52	74.00	-20.48	57.44	-3.92	Peak	255	191
7	4874.00	47.06	54.00	-6.94	47.01	0.05	Average	247	331
8	4874.00	51.52	74.00	-22.48	51.47	0.05	Peak	247	331
9	7311.00	39.57	54.00	-14.43	34.19	5.38	Average	234	177
10	7311.00	51.34	74.00	-22.66	45.96	5.38	Peak	234	177
11	12185.00	43.39	54.00	-10.61	35.95	7.44	Average	111	336
12	12185.00	55.65	74.00	-18.35	48.21	7.44	Peak	111	336

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

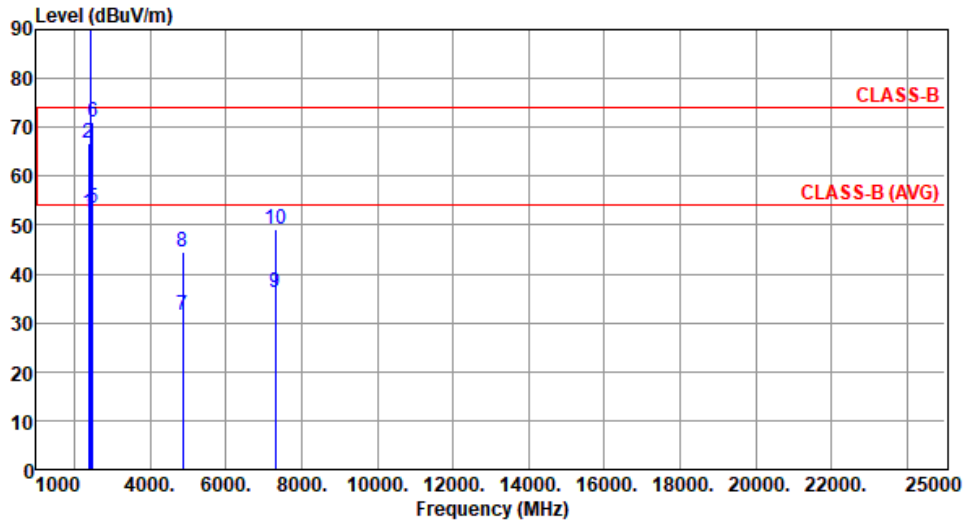


Modulation	be EHT40		Test Freq. (MHz)	2437					
Polarization	Horizontal								
Test By : Akun Chung		Temperature(°C): 26		Humidity(%): 62					
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2390.00	51.02	54.00	-2.98	54.65	-3.63	Average	100	259
2	2390.00	67.50	74.00	-6.50	71.13	-3.63	Peak	100	259
3 *	2437.00	105.66			109.42	-3.76	Average	100	259
4 *	2437.00	118.15			121.91	-3.76	Peak	100	259
5	2483.50	48.28	54.00	-5.72	52.20	-3.92	Average	100	259
6	2483.50	65.32	74.00	-8.68	69.24	-3.92	Peak	100	259
7	4874.00	31.81	54.00	-22.19	31.76	0.05	Average	100	9
8	4874.00	44.99	74.00	-29.01	44.94	0.05	Peak	100	9
9	7311.00	36.24	54.00	-17.76	30.86	5.38	Average	100	21
10	7311.00	49.07	74.00	-24.93	43.69	5.38	Peak	100	21
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).</p>									



Modulation	be EHT40	Test Freq. (MHz)	2437
Polarization	Vertical		

Test By :Akun Chung Temperature(°C):26 Humidity(%):62



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2390.00	52.46	54.00	-1.54	56.09	-3.63	Average	173	296
2	2390.00	66.64	74.00	-7.36	70.27	-3.63	Peak	173	296
3 *	2437.00	106.00			109.76	-3.76	Average	173	296
4 *	2437.00	117.81			121.57	-3.76	Peak	173	296
5	2483.50	53.55	54.00	-0.45	57.47	-3.92	Average	173	296
6	2483.50	70.97	74.00	-3.03	74.89	-3.92	Peak	173	296
7	4874.00	31.44	54.00	-22.56	31.39	0.05	Average	100	35
8	4874.00	44.58	74.00	-29.42	44.53	0.05	Peak	100	35
9	7311.00	36.19	54.00	-17.81	30.81	5.38	Average	100	24
10	7311.00	49.04	74.00	-24.96	43.66	5.38	Peak	100	24

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

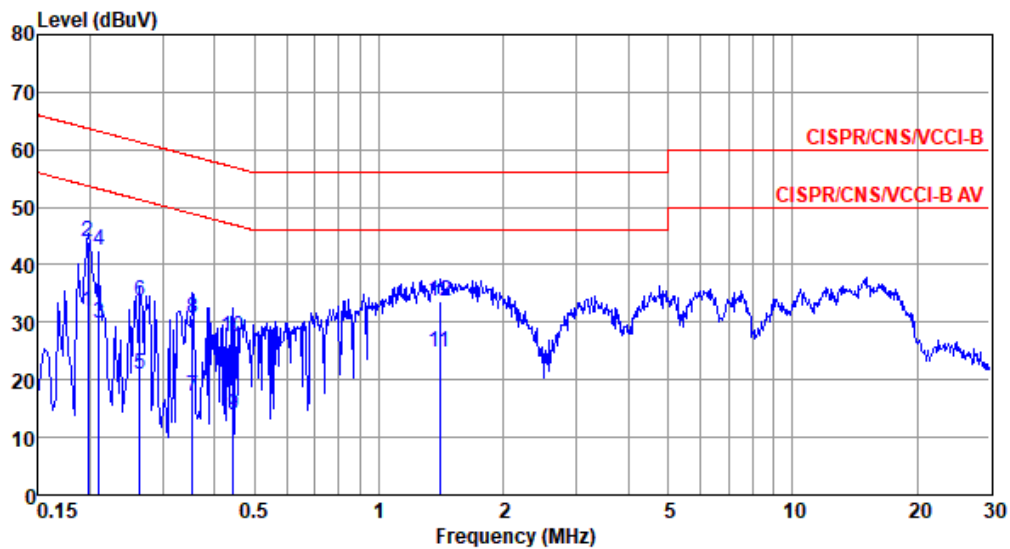
*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).



Modulation Mode	11b	Test Freq. (MHz)	2437
Power Phase	Line		

Test by : Joe Liao_AK Temperature: 26°C Humidity: 66%



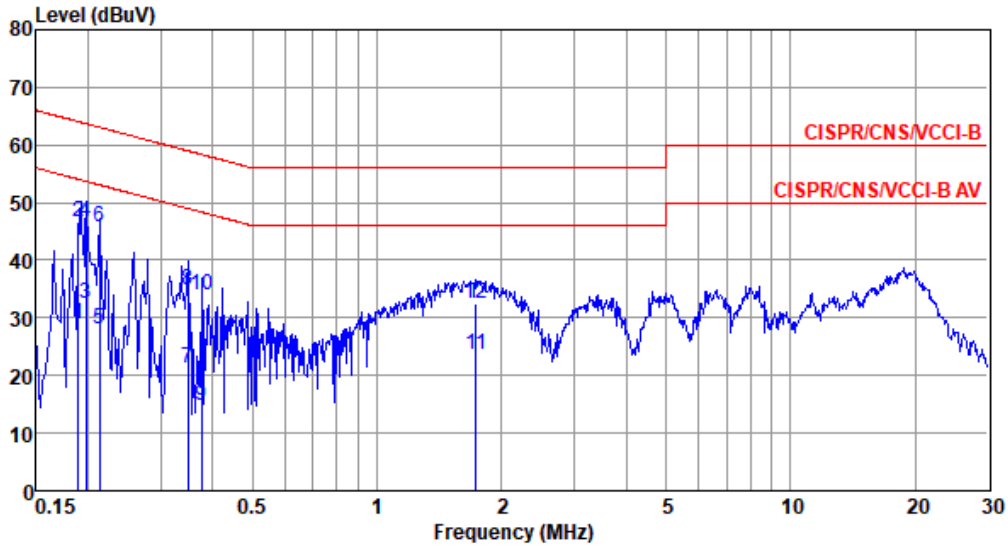
	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Aux dB	Remark
1	0.198	31.89	53.71	-21.82	21.93	9.65	0.06	0.25	Average
2*	0.198	43.94	63.71	-19.77	33.98	9.65	0.06	0.25	QP
3	0.211	29.87	53.18	-23.31	19.90	9.65	0.06	0.26	Average
4	0.211	42.39	63.18	-20.79	32.42	9.65	0.06	0.26	QP
5	0.264	20.87	51.29	-30.42	10.87	9.65	0.07	0.28	Average
6	0.264	33.73	61.29	-27.56	23.73	9.65	0.07	0.28	QP
7	0.354	17.23	48.87	-31.64	7.19	9.64	0.08	0.32	Average
8	0.354	30.72	58.87	-28.15	20.68	9.64	0.08	0.32	QP
9	0.444	13.85	46.98	-33.13	3.80	9.64	0.08	0.33	Average
10	0.444	27.32	56.98	-29.66	17.27	9.64	0.08	0.33	QP
11	1.403	24.67	46.00	-21.33	14.55	9.65	0.10	0.37	Average
12	1.403	33.57	56.00	-22.43	23.45	9.65	0.10	0.37	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB) + Aux (dB).
 Note 2: Over Limit (dB) = Level (dBuV) - Limit Line (dBuV).



Modulation Mode	11b	Test Freq. (MHz)	2437
Power Phase	Neutral		

Test by : Joe Liao_AK Temperature: 26°C Humidity: 66%



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Aux dB	Remark
1	0.189	28.95	54.07	-25.12	19.08	9.65	0.06	0.16	Average
2	0.189	46.60	64.07	-17.47	36.73	9.65	0.06	0.16	QP
3	0.198	32.41	53.71	-21.30	22.53	9.65	0.06	0.17	Average
4*	0.198	46.61	63.71	-17.10	36.73	9.65	0.06	0.17	QP
5	0.213	27.92	53.10	-25.18	18.03	9.65	0.06	0.18	Average
6	0.213	45.68	63.10	-17.42	35.79	9.65	0.06	0.18	QP
7	0.348	21.36	49.00	-27.64	11.41	9.64	0.08	0.23	Average
8	0.348	34.92	59.00	-24.08	24.97	9.64	0.08	0.23	QP
9	0.377	14.73	48.34	-33.61	4.77	9.64	0.08	0.24	Average
10	0.377	33.95	58.34	-24.39	23.99	9.64	0.08	0.24	QP
11	1.734	23.74	46.00	-22.26	13.64	9.66	0.11	0.33	Average
12	1.734	32.33	56.00	-23.67	22.23	9.66	0.11	0.33	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB) + Aux (dB).
 2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).