

## Supplemental “Transmit Simultaneously” Test Report

**Report No.:** RFBBUI-WTW-P22100654-6

**FCC ID:** TX2-RTL8851B

**Test Model:** RTL8851B

**Received Date:** 2022/10/25

**Test Date:** 2023/3/21 ~ 2023/5/4

**Issued Date:** 2023/5/15

**Applicant:** Realtek Semiconductor Corp.

**Address:** No. 2, Innovation Road II, Hsinchu Science Park, Hsinchu 300, Taiwan

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

**Lab Address:** E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,  
Taiwan

**Test Location:** E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,  
Taiwan

**FCC Registration /  
Designation Number:** 723255 / TW2022



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### Release Control Record

Issue No.	Description	Date Issued
RFBBUI-WTW-P22100654-6	Original release.	2023/5/15

## 1 Certificate of Conformity

**Product:** 11ax RTL8851BE one antenna Combo module

**Brand:** REALTEK

**Test Model:** RTL8851B

**Sample Status:** Engineering sample

**Applicant:** Realtek Semiconductor Corp.

**Test Date:** 2023/3/21 ~ 2023/5/4

**Standards:** 47 CFR FCC Part 15, Subpart C (Section 15.247)

47 CFR FCC Part 15, Subpart E (Section 15.407)

ANSI C63.10: 2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**Prepared by :**

*Vito Lung*

**Date:**

2023/5/15

Vito Lung / Specialist

**Approved by :**

*May Chen*

**Date:**

2023/5/15

May Chen / Manager

## 2 Summary of Test Results

47 CFR FCC Part 15, Subpart C, E (SECTION 15.247, 15.407)			
FCC Clause	Test Item	Result	Remarks
15.207 15.407(b)(8)	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -9.76 dB at 0.18516 MHz.
15.205 / 15.209 / 15.247(d) 15.407(b) (1/2/3/4(i/ii)/8)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -4.8 dB at 11690.00 MHz.

Note:

Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

### 2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) ( $\pm$ )
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.9 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.1 dB
	30MHz ~ 1GHz	5.5 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.1 dB
	18GHz ~ 40GHz	5.3 dB

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

Product	11ax RTL8851BE one antenna Combo module
Brand	REALTEK
Test Model	RTL8851B
Status of EUT	Engineering sample
Power Supply Rating	3.3 Vdc from host equipment
Modulation Type	<b>WLAN:</b> CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode 1024QAM for OFDMA in 11ax mode <b>BT-EDR:</b> GFSK, $\pi/4$ -DQPSK, 8DPSK <b>BT-LE:</b> GFSK
Modulation Technology	<b>WLAN:</b> DSSS, OFDM, OFDMA <b>BT-EDR:</b> FHSS <b>BT-LE:</b> DTS
Transfer Rate	<b>WLAN:</b> 802.11b: up to 11 Mbps 802.11a/g: up to 54 Mbps 802.11n: up to 150 Mbps VHT: up to 200 Mbps 802.11ac: up to 433.3 Mbps 802.11ax: up to 600.4 Mbps <b>BT-EDR:</b> up to 3 Mbps <b>BT-LE:</b> up to 2 Mbps
Operating Frequency	<b>WLAN:</b> <b>2.4GHz:</b> 2.412 ~ 2.472 GHz <b>5GHz:</b> 5.18 ~ 5.24 GHz, 5.26 ~ 5.32 GHz, 5.50 ~ 5.72 GHz, 5.745 ~ 5.825 GHz 5.835 GHz ~ 5.885 GHz <b>BT-EDR:</b> 2.402 ~ 2.480 GHz <b>BT-LE:</b> 2.402 ~ 2.480 GHz
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Cable Supplied	NA

Note:

1. There are Bluetooth and WLAN (2.4 GHz & 5 GHz) technology used for the EUT.
2. Simultaneously transmission condition.

Condition	Technology	
1	WLAN (5 GHz)	Bluetooth

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

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

Antenna NO.	RF Chain NO.	Brand	Model	Antenna Net Gain (dBi)	Frequency range	Antenna Type	Connector Type	Cable Length (mm)
1	Chain 1	REALTEK	RTK-ANT-0022	3.4	2.4~2.4835GHz	PIFA	IPEX4	300
				5	5.15~5.895GHz			
2	Chain 1	Aristotle	RFA-27-C38H1-MHF4300	3	2.4~2.4835GHz	Dipole	IPEX4	300
				5	5.15~5.895GHz			
3	Chain 1	LYNwave	ALX22F-120AA0-00	3.2	2.4~2.4835GHz	Monopole	IPEX4	200
				4	5.15~5.895GHz			

Note: PIFA antenna was selected for the AC Power Conducted Emission test.

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

4. The EUT incorporates a SISO function:

2.4 GHz Band		
Modulation Mode	TX & RX Configuration	
802.11b	1TX	1RX
802.11g	1TX	1RX
802.11n (HT20)	1TX	1RX
802.11n (HT40)	1TX	1RX
VHT20	1TX	1RX
VHT40	1TX	1RX
802.11ax (HE20)	1TX	1RX
802.11ax (HE40)	1TX	1RX
802.11ax (RU26/52/106/242/484)	1TX	1RX
5 GHz Band		
Modulation Mode	TX & RX Configuration	
802.11a	1TX	1RX
802.11n (HT20)	1TX	1RX
802.11n (HT40)	1TX	1RX
802.11ac (VHT20)	1TX	1RX
802.11ac (VHT40)	1TX	1RX
802.11ac (VHT80)	1TX	1RX
802.11ax (HE20)	1TX	1RX
802.11ax (HE40)	1TX	1RX
802.11ax (HE80)	1TX	1RX
802.11ax (RU26/52/106/242/484/996)	1TX	1RX

5. 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.

### 3.1.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	OB	
-	√	√	√	√	-

Where **RE≥1G**: Radiated Emission above 1GHz & Bandedge Measurement  
**RE<1G**: Radiated Emission below 1GHz  
**PLC**: Power Line Conducted Emission  
**OB**: Conducted Out-Band Emission Measurement

Note:

1. The EUT's PIFA antenna had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Y-plane**.
2. The EUT's Monopole antenna had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.
3. The EUT's Dipole antenna is was used on the **Y-axis** plane of the typical position of the test.

#### **Radiated Emission Test (Above 1GHz):**

- ☒ The tested configurations represent the worst-case mode from all possible combinations by the maximum power.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
5GHz: 802.11ax (HE40) + BT-LE(2M)	167	OFDMA	BPSK
	1	DTS	GFSK

#### **Radiated Emission Test (Below 1GHz):**

- ☒ The tested configurations represent the worst-case mode from all possible combinations by the maximum power.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
5GHz: 802.11ax (HE40) + BT-LE(2M)	167	OFDMA	BPSK
	1	DTS	GFSK

#### **Power Line Conducted Emission Test:**

- ☒ The tested configurations represent the worst-case mode from all possible combinations by the maximum power.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
5GHz: 802.11ax (HE40) + BT-LE(2M)	167	OFDMA	BPSK
	1	DTS	GFSK



### Conducted Out-Band Emission Measurement:

- ☒ The tested configurations represent the worst-case mode from all possible combinations by the maximum power.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
5GHz: 802.11ax (HE40) + BT-LE(2M)	167	OFDMA	BPSK
	1	DTS	GFSK

### Test Condition:

Applicable To	Environmental Conditions	Input Power (System)	Tested By
RE $\geq$ 1G	28deg. C, 76%RH	120Vac, 60Hz	Louis Yang
RE<1G	27deg. C, 75%RH	120Vac, 60Hz	Louis Yang
PLC	23deg. C, 71%RH	120Vac, 60Hz	Sampson Chen
OB	25deg. C, 60%RH	120Vac, 60Hz	Katina Lu

### 3.2 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

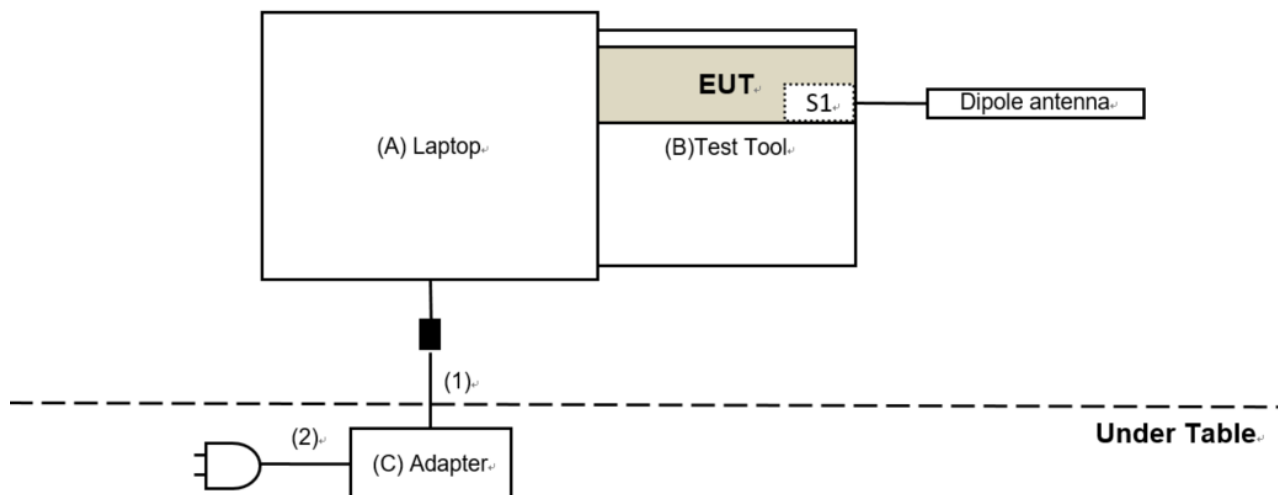
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Laptop	Dell	E5420	FHNS4S1	N/A	Provided by Lab
B	Test Tool	Realtek	N/A	N/A	N/A	Supplied by applicant
C	Adapter	Dell	FA65NE0-00	N/A	N/A	Provided by Lab

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	DC Cable	1	1.8	NO	1	Provided by Lab
2	AC Cable	1	1	NO	0	Provided by Lab

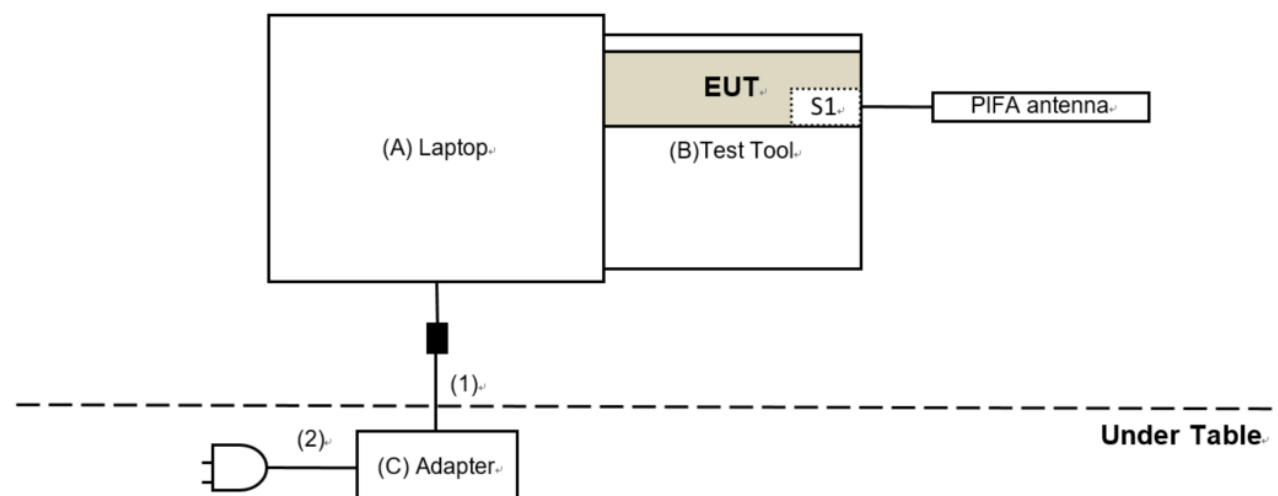
### 3.2.1 Configuration of System under Test

#### For Radiated Emission Test

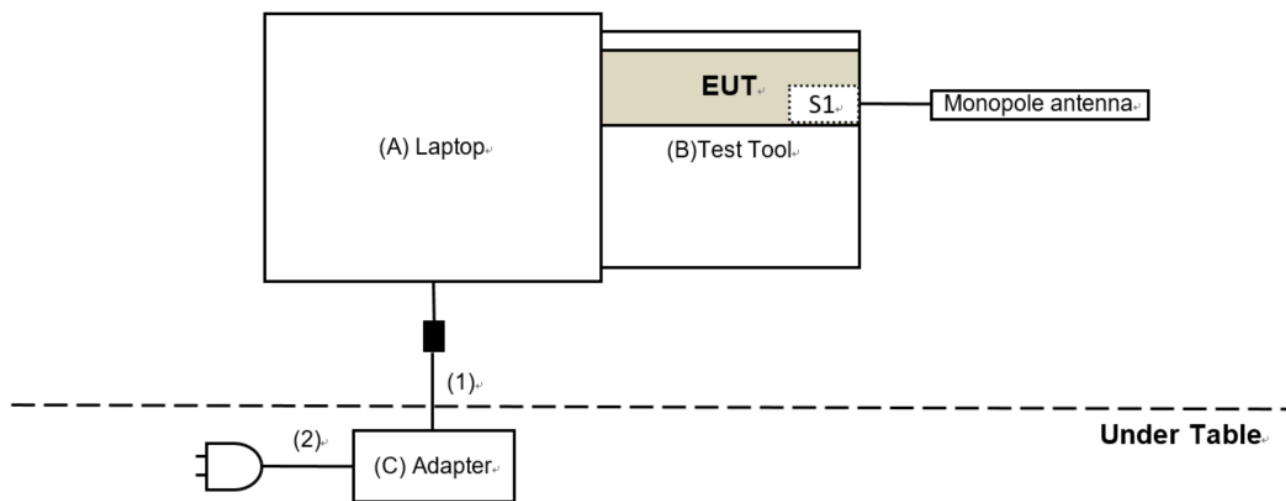
##### Dipole



##### PIFA

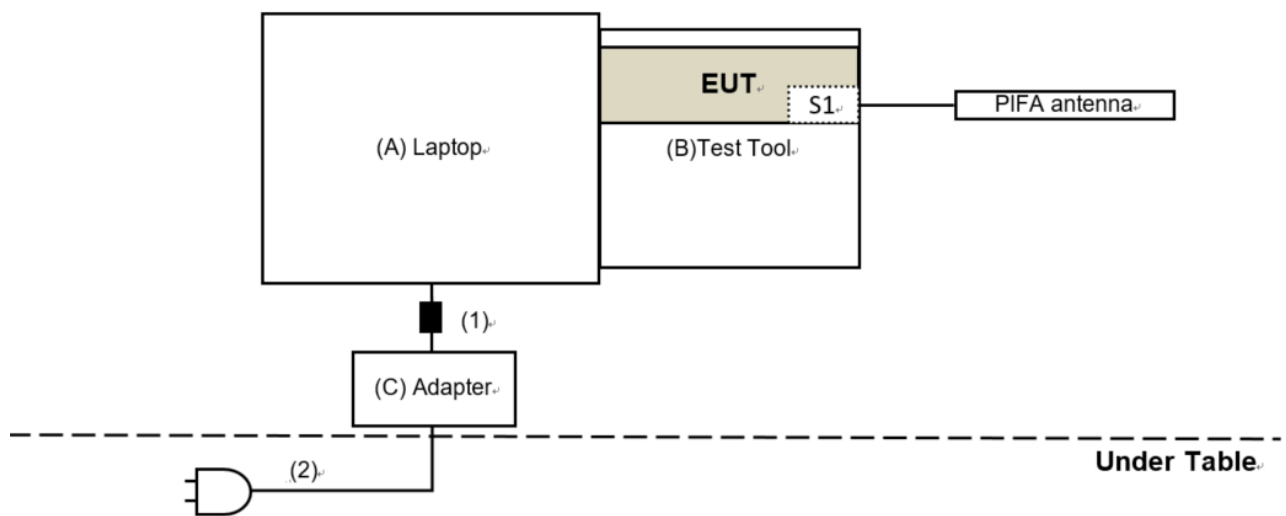


## Monopole



## For AC Power Conducted Emission Test

### PIFA



## 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.

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.

# Limits of unwanted emission out of the restricted bands

Applicable To		Limit	
789033 D02 General UNII Test Procedure New Rules v02r01		Field Strength at 3m	
		PK:74 (dBμV/m)	AV:54 (dBμV/m)
Frequency Band	Applicable To	EIRP Limit	Equivalent Field Strength at 3m
5150~5250 MHz	15.407(b)(1)	PK:-27 (dBm/MHz)	PK:68.2(dBμV/m)
5250~5350 MHz	15.407(b)(2)		
5470~5725 MHz	15.407(b)(3)		
5725~5850 MHz	15.407(b)(4)(i)	PK: -27 (dBm/MHz) <sup>*1</sup> PK: 10 (dBm/MHz) <sup>*2</sup> PK: 15.6 (dBm/MHz) <sup>*3</sup> PK: 27 (dBm/MHz) <sup>*4</sup>	PK: 68.2(dBμV/m) <sup>*1</sup> PK: 105.2 (dBμV/m) <sup>*2</sup> PK: 110.8(dBμV/m) <sup>*3</sup> PK: 122.2 (dBμV/m) <sup>*4</sup>
5725~5850 MHz	15.407(b)(4)(i)	PK: -27 (dBm/MHz) <sup>*1</sup> PK: 10 (dBm/MHz) <sup>*2</sup> PK: 15.6 (dBm/MHz) <sup>*3</sup> PK: 27 (dBm/MHz) <sup>*4</sup>	PK: 68.2(dBμV/m) <sup>*1</sup> PK: 105.2 (dBμV/m) <sup>*2</sup> PK: 110.8(dBμV/m) <sup>*3</sup> PK: 122.2 (dBμV/m) <sup>*4</sup>
<sup>*1</sup> beyond 75 MHz or more above of the band edge. <sup>*2</sup> below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above. <sup>*3</sup> below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above. <sup>*4</sup> from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.			

## Note:

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

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

#### 4.1.2 Test Instruments

##### For Radiated emission test:

Description & Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Spectrum Analyzer KEYSIGHT	N9030B	MY57142938	2023/3/6	2024/3/5
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	NA	NA
Pre_Amplifier Agilent	8447D	2944A10636	2023/3/12	2024/3/11
LOOP ANTENNA Electro-Metrics	EM-6879	264	2023/2/21	2024/2/20
RF Coaxial Cable JYEBO	5D-FB	LOOPCAB-001	2022/12/19	2023/12/18
RF Coaxial Cable JYEBO	5D-FB	LOOPCAB-002	2022/12/19	2023/12/18
Pre_Amplifier EMCI	EMC330N	980538	2022/4/25 2023/4/6	2023/4/24 2024/4/5
Trilog Broadband Antenna Schwarzbeck	VULB 9168	9168-406	2022/10/21	2023/10/20
RF Coaxial Cable COMMATE/PEWC	8D	966-4-1	2023/2/18	2024/2/17
RF Coaxial Cable COMMATE/PEWC	8D	966-4-2	2023/2/18	2024/2/17
RF Coaxial Cable COMMATE/PEWC	8D	966-4-3	2023/2/18	2024/2/17
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-ATT5-03	2022/12/28	2023/12/27
Horn Antenna Schwarzbeck	BBHA 9120D	9120D-783	2022/11/13	2023/11/12
Pre_Amplifier EMCI	EMC12630SE	980688	2022/10/4	2023/10/3
RF Cable-Frequency Range : 1-26.5GHz EMCI	EMC104-SM-SM-1200	160922	2022/12/15	2023/12/14
RF Coaxial Cable EMCI	EMC104-SM-SM-2000	180501	2022/4/25 2023/4/7	2023/4/24 2024/4/6
RF Coaxial Cable EMCI	EMC104-SM-SM-6000	210704	2022/11/4	2023/11/3
Pre_Amplifier EMCI	EMC184045SE	980387	2022/12/28	2023/12/27
Horn Antenna Schwarzbeck	BBHA 9170	9170-739	2022/11/13	2023/11/12
RF Cable-Frequency range: 1-40GHz EMCI	EMC102-KM-KM-1200	160924	2022/12/28	2023/12/27
RF Coaxial Cable EMCI	EMC-KM-KM-4000	200214	2023/2/20	2024/2/19

##### 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 966 Chamber No. 5.
3. Tested Date: 2023/3/24 ~ 2023/5/4

**For other test items:**

Description & Manufacturer	Model no.	Serial No.	Calibrated DATE	Calibrated Until
Spectrum Analyzer Keysight	N9020B	MY60112409	2023/2/18	2024/2/17
10dB Attenuator Woken	MDCS18N-10	MDCS18N-10-01	2022/4/5	2023/4/4
Software	ADT_RF Test Software V6.6.5.4	NA	NA	NA

- NOTE:**
1. The test was performed in Oven room 2.
  2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
  3. Tested Date: 2023/3/29



#### 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:**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

##### **For Radiated emission above 30MHz**

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

##### **Note:**

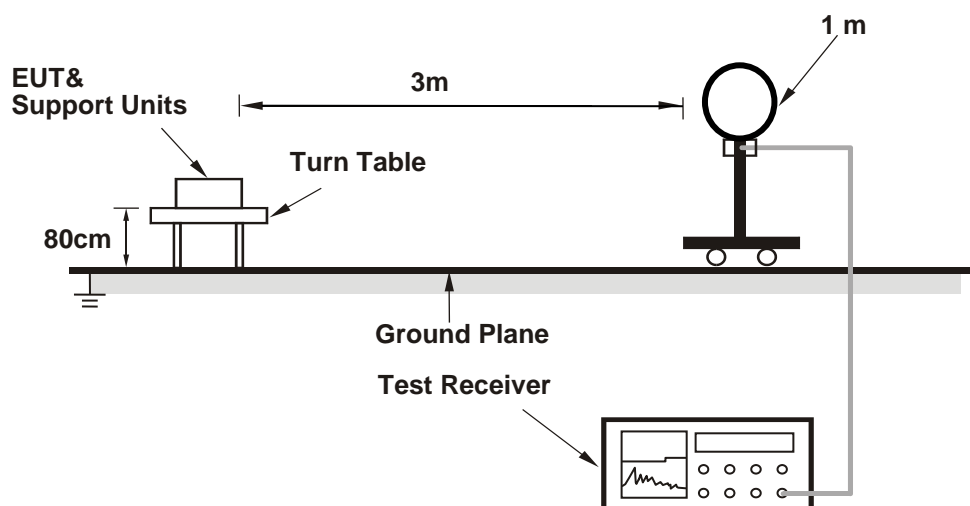
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle < 98%) or 10Hz (Duty cycle  $\geq 98\%$ ) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.1.4 Deviation from Test Standard

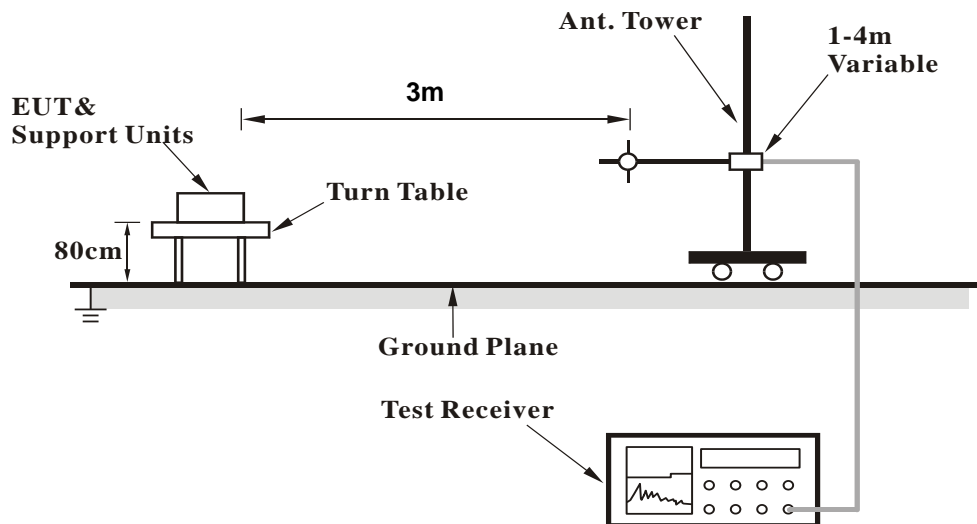
No deviation.

#### 4.1.5 Test Setup

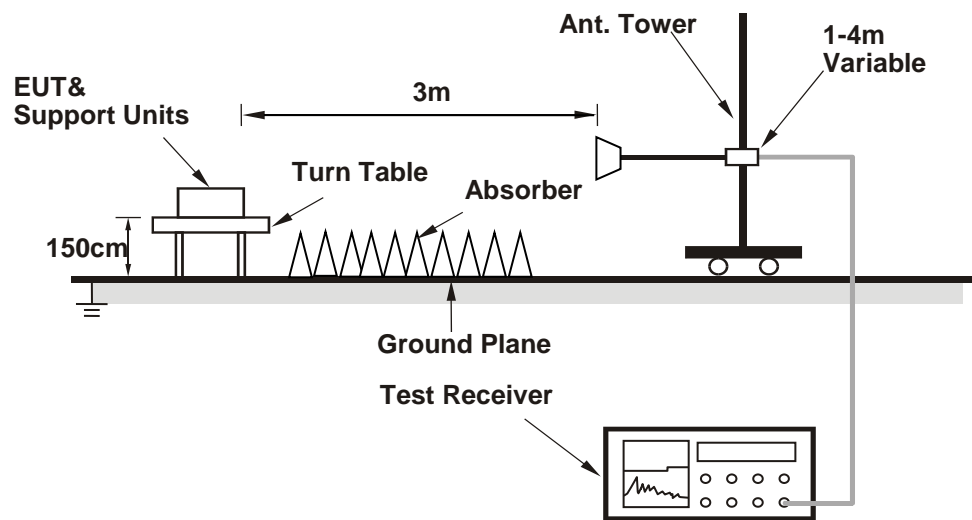
##### For Radiated emission below 30MHz



##### For Radiated emission 30MHz to 1GHz



### For Radiated emission above 1GHz



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

#### 4.1.6 EUT Operating Conditions

- Placed the EUT on the testing table.
- Controlling software (RTL8851B\_PCIE\_MP\_Package\_ALPHA\_v2.0.20\_homologation (94894) & Bluetooth RF test tool (5.3.2.49)) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

#### 4.1.7 Test Results

##### Above 1GHz Data:

##### Dipole

Frequency Range	1GHz ~ 40GHz	Detector Function	Peak (PK) Average (AV)
-----------------	--------------	-------------------	---------------------------

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	4808.00	38.5 PK	74.0	-35.5	1.78 H	229	37.0	1.5
2	4808.00	35.7 AV	54.0	-18.3	1.78 H	229	34.2	1.5
3	11690.00	61.3 PK	74.0	-12.7	2.39 H	324	49.6	11.7
4	11690.00	47.0 AV	54.0	-7.0	2.39 H	324	35.3	11.7
5	17535.00	54.9 PK	88.2	-33.3	3.06 H	299	36.1	18.8
6	17535.00	41.5 AV	68.2	-26.7	3.06 H	299	22.7	18.8
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	4808.00	36.6 PK	74.0	-37.4	1.51 V	18	35.1	1.5
2	4808.00	33.7 AV	54.0	-20.3	1.51 V	18	32.2	1.5
3	11690.00	63.5 PK	74.0	-10.5	1.50 V	158	51.8	11.7
4	11690.00	49.2 AV	54.0	-4.8	1.50 V	158	37.5	11.7
5	17535.00	55.8 PK	88.2	-32.4	1.69 V	344	37.0	18.8
6	17535.00	41.7 AV	68.2	-26.5	1.69 V	344	22.9	18.8

##### Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " # ": The radiated frequency is out of the restricted band.

# PIFA

Frequency Range	1GHz ~ 40GHz	Detector Function	Peak (PK) Average (AV)
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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	4808.00	37.8 PK	74.0	-36.2	1.80 H	219	36.3	1.5
2	4808.00	35.0 AV	54.0	-19.0	1.80 H	219	33.5	1.5
3	11690.00	61.7 PK	74.0	-12.3	2.36 H	327	50.0	11.7
4	11690.00	47.3 AV	54.0	-6.7	2.36 H	327	35.6	11.7
5	17535.00	55.1 PK	88.2	-33.1	3.11 H	286	36.3	18.8
6	17535.00	41.3 AV	68.2	-26.9	3.11 H	286	22.5	18.8
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	4808.00	36.2 PK	74.0	-37.8	1.61 V	21	34.7	1.5
2	4808.00	33.5 AV	54.0	-20.5	1.61 V	21	32.0	1.5
3	11690.00	63.3 PK	74.0	-10.7	1.52 V	157	51.6	11.7
4	11690.00	49.0 AV	54.0	-5.0	1.52 V	157	37.3	11.7
5	17535.00	55.7 PK	88.2	-32.5	1.69 V	325	36.9	18.8
6	17535.00	41.6 AV	68.2	-26.6	1.69 V	325	22.8	18.8

## Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " # ": The radiated frequency is out of the restricted band.

## Monopole

Frequency Range	1GHz ~ 40GHz	Detector Function	Peak (PK) Average (AV)
-----------------	--------------	-------------------	---------------------------

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	4808.00	36.8 PK	74.0	-37.2	1.86 H	177	35.3	1.5
2	4808.00	34.0 AV	54.0	-20.0	1.86 H	177	32.5	1.5
3	11690.00	60.6 PK	74.0	-13.4	2.33 H	305	48.9	11.7
4	11690.00	46.2 AV	54.0	-7.8	2.33 H	305	34.5	11.7
5	17535.00	55.8 PK	88.2	-32.4	2.99 H	316	37.0	18.8
6	17535.00	41.5 AV	68.2	-26.7	2.99 H	316	22.7	18.8
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	4808.00	35.2 PK	74.0	-38.8	1.53 V	35	33.7	1.5
2	4808.00	33.1 AV	54.0	-20.9	1.53 V	35	31.6	1.5
3	11690.00	62.8 PK	74.0	-11.2	1.42 V	162	51.1	11.7
4	11690.00	49.1 AV	54.0	-4.9	1.42 V	162	37.4	11.7
5	17535.00	54.5 PK	88.2	-33.7	1.72 V	328	35.7	18.8
6	17535.00	40.4 AV	68.2	-27.8	1.72 V	328	21.6	18.8

### Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " # ": The radiated frequency is out of the restricted band.

## Below 1GHz Data:

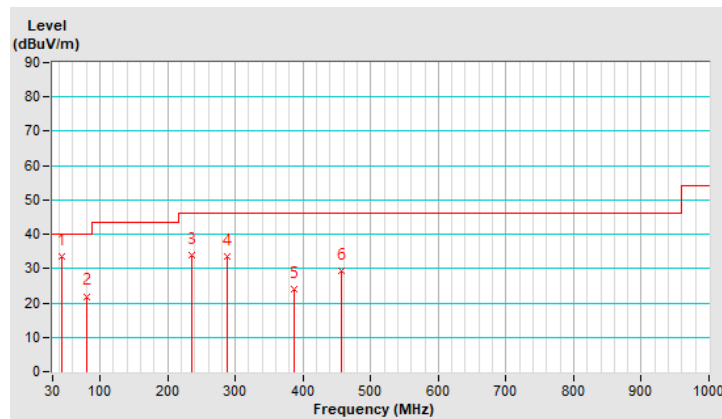
### Dipole

Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
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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	43.80	33.5 QP	40.0	-6.5	1.12 H	360	46.4	-12.9
2	81.20	21.9 QP	40.0	-18.1	1.00 H	325	39.9	-18.0
3	236.50	33.9 QP	46.0	-12.1	1.52 H	360	48.6	-14.7
4	288.69	33.6 QP	46.0	-12.4	1.50 H	74	46.1	-12.5
5	387.60	24.0 QP	46.0	-22.0	1.05 H	360	34.2	-10.2
6	457.60	29.4 QP	46.0	-16.6	1.00 H	122	37.5	-8.1

### 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 emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

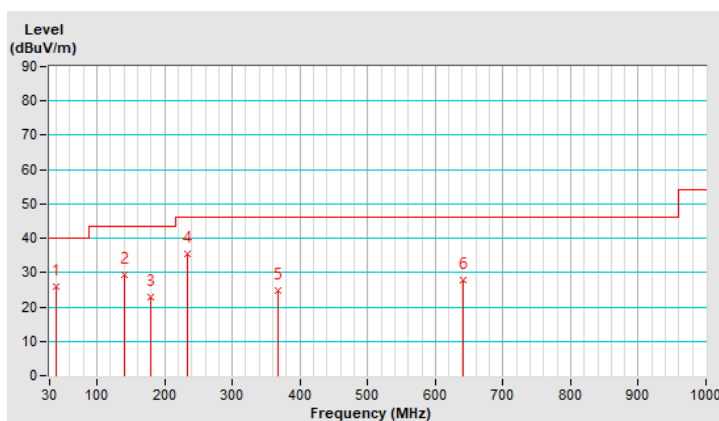


Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
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Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	40.10	25.9 QP	40.0	-14.1	1.05 V	62	39.1	-13.2
2	140.70	29.4 QP	43.5	-14.1	1.00 V	325	42.5	-13.1
3	179.10	22.8 QP	43.5	-20.7	1.00 V	299	37.1	-14.3
4	234.50	35.3 QP	46.0	-10.7	1.00 V	172	50.2	-14.9
5	368.00	24.7 QP	46.0	-21.3	1.00 V	38	35.4	-10.7
6	641.20	27.7 QP	46.0	-18.3	1.12 V	355	32.2	-4.5

**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 emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.





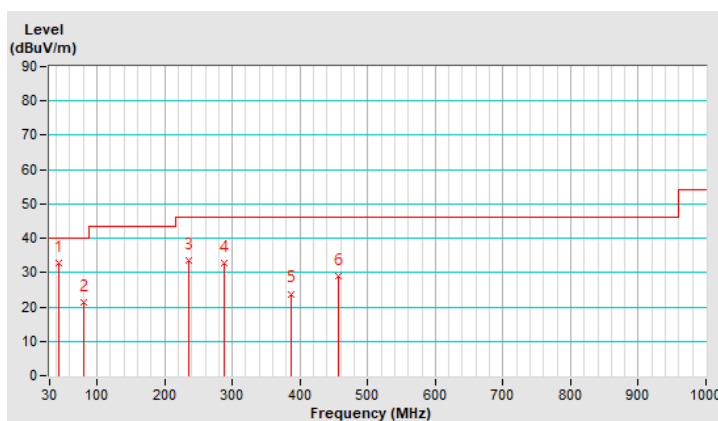
# PIFA

Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
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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	43.30	32.8 QP	40.0	-7.2	1.12 H	360	45.7	-12.9
2	80.60	21.4 QP	40.0	-18.6	1.00 H	325	39.2	-17.8
3	235.90	33.4 QP	46.0	-12.6	1.52 H	360	48.1	-14.7
4	288.09	32.8 QP	46.0	-13.2	1.50 H	74	45.3	-12.5
5	387.20	23.8 QP	46.0	-22.2	1.05 H	360	34.0	-10.2
6	457.10	28.9 QP	46.0	-17.1	1.00 H	122	37.0	-8.1

## 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 emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

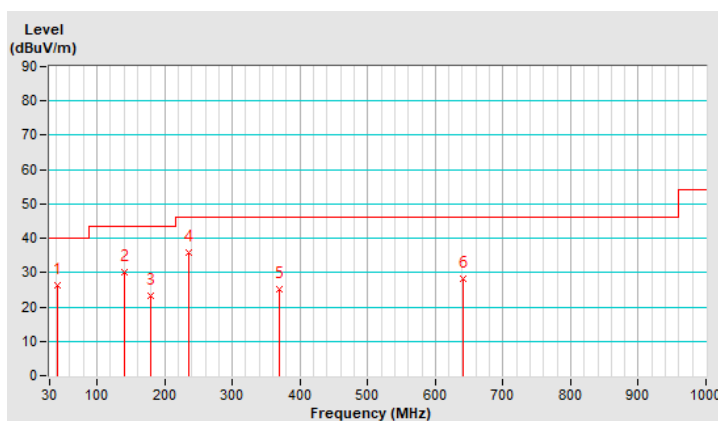


Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
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Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	40.70	26.2 QP	40.0	-13.8	1.05 V	62	39.3	-13.1
2	141.20	30.0 QP	43.5	-13.5	1.00 V	325	43.0	-13.0
3	180.00	23.2 QP	43.5	-20.3	1.00 V	299	37.6	-14.4
4	235.10	35.8 QP	46.0	-10.2	1.00 V	172	50.6	-14.8
5	368.60	25.1 QP	46.0	-20.9	1.00 V	38	35.8	-10.7
6	641.80	28.2 QP	46.0	-17.8	1.12 V	355	32.7	-4.5

**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 emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



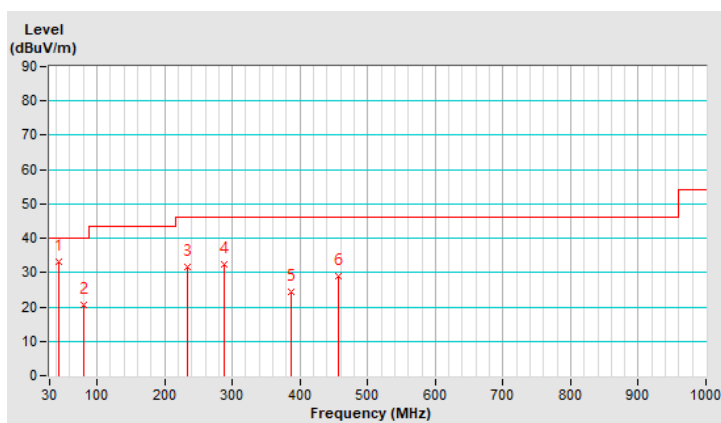
## Monopole

Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
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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	43.40	33.1 QP	40.0	-6.9	1.12 H	360	46.0	-12.9
2	80.00	20.7 QP	40.0	-19.3	1.00 H	325	38.3	-17.6
3	234.30	31.7 QP	46.0	-14.3	1.52 H	360	46.6	-14.9
4	287.69	32.4 QP	46.0	-13.6	1.50 H	74	44.9	-12.5
5	386.40	24.3 QP	46.0	-21.7	1.05 H	360	34.5	-10.2
6	456.50	29.0 QP	46.0	-17.0	1.00 H	122	37.1	-8.1

### 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 emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

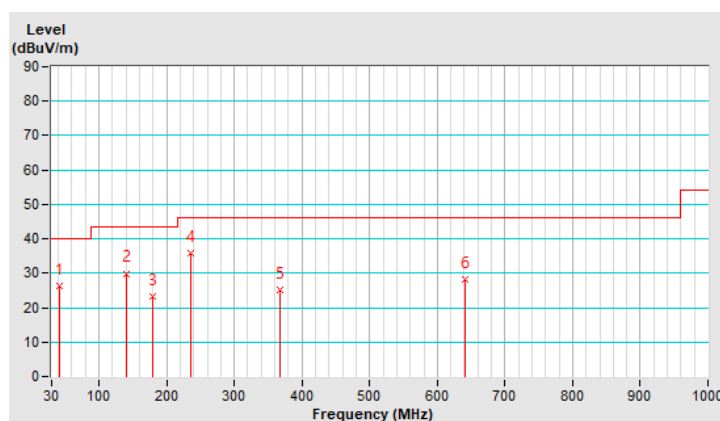


Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
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Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	40.80	26.2 QP	40.0	-13.8	1.05 V	62	39.2	-13.0
2	141.20	29.9 QP	43.5	-13.6	1.00 V	325	42.9	-13.0
3	179.70	23.3 QP	43.5	-20.2	1.00 V	299	37.7	-14.4
4	235.00	35.7 QP	46.0	-10.3	1.00 V	172	50.5	-14.8
5	368.50	25.0 QP	46.0	-21.0	1.00 V	38	35.7	-10.7
6	641.70	28.1 QP	46.0	-17.9	1.12 V	355	32.6	-4.5

**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 emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: 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.	Calibrated Date	Calibrated Until
TEST RECEIVER R&S	ESCS 30	847124/029	2022/10/14	2023/10/13
LISN R&S	ESH3-Z5	848773/004	2022/10/18	2023/10/17
50 ohm terminal resistance NA	NA	EMC-01	2022/9/27	2023/9/26
RF Coaxial Cable JYEBO	5D-FB	COCCAB-001	2022/8/24	2023/8/23
Fixed attenuator STI	STI02-2200-10	005	2022/8/24	2023/8/23
Software BVADT	BVADT_Conc_V7.3.7.4	NA	NA	NA

**Note:**

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Conduction 1.
- 3 Tested Date: 2023/3/21

#### 4.2.3 Test Procedures

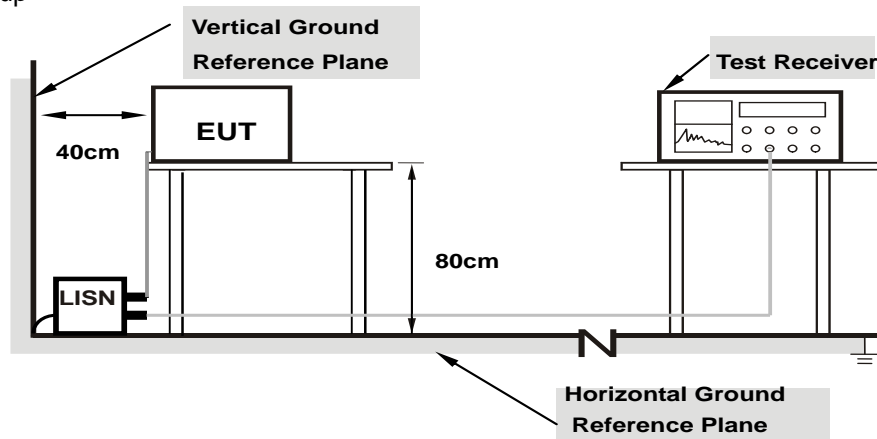
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance 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 4.1.6.

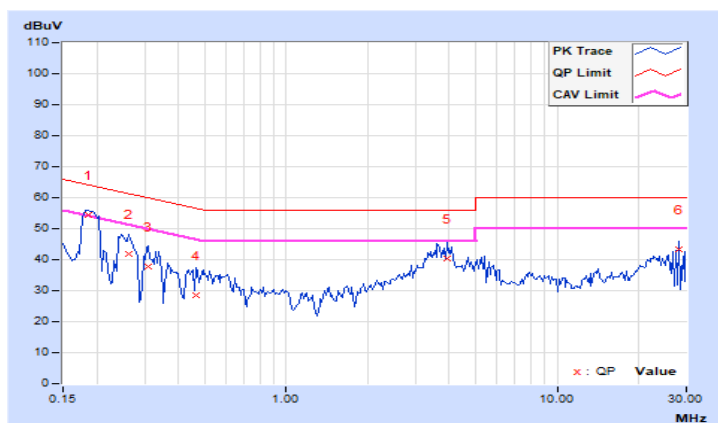
#### 4.2.7 Test Results

<b>Frequency Range</b>	150kHz ~ 30MHz	<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9kHz
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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	0.18516	9.96	44.53	30.73	54.49	40.69	64.25	54.25	-9.76	-13.56
2	0.26328	9.96	32.07	10.15	42.03	20.11	61.33	51.33	-19.30	-31.22
3	0.31016	9.97	27.88	13.54	37.85	23.51	59.97	49.97	-22.12	-26.46
4	0.46641	9.97	18.38	2.15	28.35	12.12	56.58	46.58	-28.23	-34.46
5	3.92969	10.15	30.10	21.76	40.25	31.91	56.00	46.00	-15.75	-14.09
6	28.31250	11.23	32.04	27.44	43.27	38.67	60.00	50.00	-16.73	-11.33

#### 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

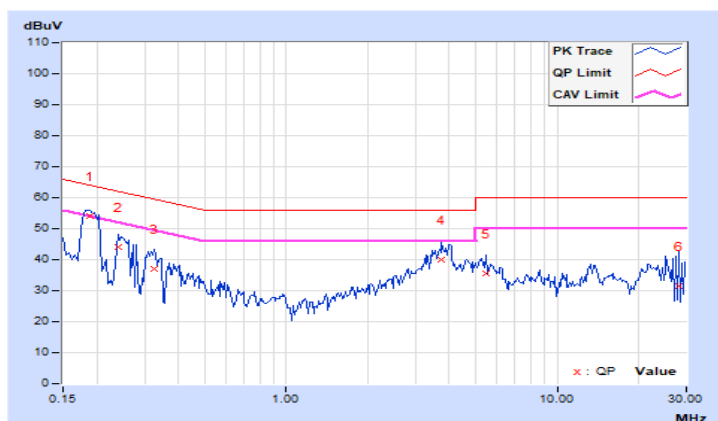


<b>Frequency Range</b>	150kHz ~ 30MHz	<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9kHz
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Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.18906	9.94	44.05	28.96	53.99	38.90	64.08	54.08	-10.09	-15.18
2	0.23984	9.94	34.31	15.51	44.25	25.45	62.10	52.10	-17.85	-26.65
3	0.32578	9.94	26.95	7.38	36.89	17.32	59.56	49.56	-22.67	-32.24
4	3.75391	10.09	29.89	21.92	39.98	32.01	56.00	46.00	-16.02	-13.99
5	5.50000	10.17	25.47	16.33	35.64	26.50	60.00	50.00	-24.36	-23.50
6	28.25391	10.87	20.71	19.97	31.58	30.84	60.00	50.00	-28.42	-19.16

**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



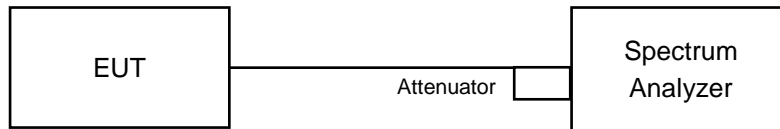


### 4.3 Conducted Out of Band Emission Measurement

#### 4.3.1 Limits of Conducted Out of Band Emission Measurement

Below 20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

#### 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

##### MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW  $\geq$  300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

##### MEASUREMENT PROCEDURE OOB

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

#### 4.3.5 Deviation from Test Standard

No deviation.

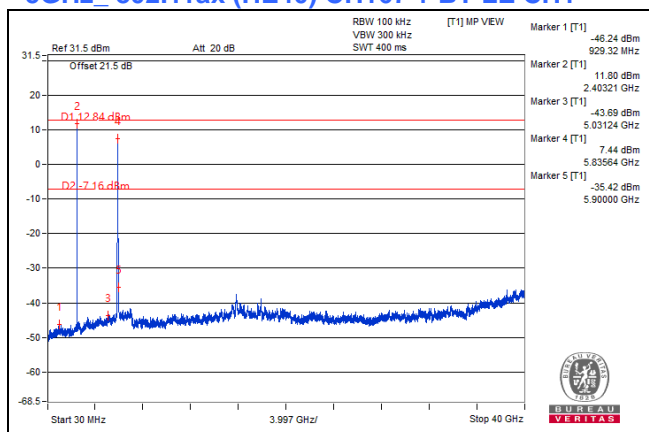
#### 4.3.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.

#### 4.3.7 Test Results

The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

## 5GHz\_ 802.11ax (HE40) CH167 + BT-LE CH1



## 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](mailto:service.adt@tw.bureauveritas.com)

**Web Site:** [www.bureauveritas-adt.com](http://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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