Supplemental “Transmit Simultaneously” Test Report

Report No.:	RFBBUI-WTW-P22031043-6
FCC ID:	TX2-RTL8852B
Test Model:	RTL8852B
Received Date:	2022/3/24
Test Date:	2022/6/11 ~ 2022/8/3
Issued Date:	2022/8/23
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, Taiwa.
Test Location:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan.
FCC Registration / Designation Number:	723255 / TW2022

Table of Contents

Release Control Record 3

1 Certificate of Conformity 4

2 Summary of Test Results 5

2.1 Measurement Uncertainty 5
2.2 Modification Record 5

3 General Information 6

3.1 General Description of EUT 6
3.1.1 Test Mode Applicability and Tested Channel Detail 9
3.2 Description of Support Units 12
3.2.1 Configuration of System under Test 13

4 Test Types and Results 18

4.1 Radiated Emission and Bandedge Measurement 18
4.1.1 Limits of Radiated Emission and Bandedge Measurement 18
4.1.2 Test Instruments 19
4.1.3 Test Procedures 21
4.1.4 Deviation from Test Standard 22
4.1.5 Test Setup 22
4.1.6 EUT Operating Conditions 23
4.1.7 Test Results (Mode 1) 24
4.1.8 Test Results (Mode 2) 30
4.1.9 Test Results (Mode 3) 36
4.2 Conducted Emission Measurement 42
4.2.1 Limits of Conducted Emission Measurement 42
4.2.2 Test Instruments 42
4.2.3 Test Procedures 43
4.2.4 Deviation from Test Standard 43
4.2.5 Test Setup 43
4.2.6 EUT Operating Conditions 43
4.2.7 Test Results (Mode 3) 44
4.3 Conducted Out of Band Emission Measurement 46
4.3.1 Limits of Conducted Out of Band Emission Measurement 46
4.3.2 Test Setup 46
4.3.3 Test Instruments 46
4.3.4 Test Procedures 46
4.3.5 Deviation from Test Standard 46
4.3.6 EUT Operating Conditions 46
4.3.7 Test Results 46

5 Pictures of Test Arrangements 48

Appendix – Information of the Testing Laboratories 49

Release Control Record

Issue No.	Description	Date Issued
RFBBUI-WTW-P22031043-6	Original release.	2022/8/23

1 Certificate of Conformity

Product:	11ax RTL8852B M.2 1216 Combo module
Brand:	REALTEK
Test Model:	RTL8852B
Sample Status:	Engineering sample
Applicant:	Realtek Semiconductor Corp.
Test Date:	2022/6/11 ~ 2022/8/3
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 : Vivian Huang , **Date:** 2022/8/23

Vivian Huang / Specialist

Approved by : , **Date:** 2022/8/23

May Chen / Manager

2 Summary of Test Results

FCC Part 15, Subpart C, E (SECTION 15.247, 15.407)			
FCC Clause	Test Item	Result	Remarks
15.207 15.407(b)(6)	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -13.79dB at 25.87109MHz.
15.205 / 15.209 / 15.247(d) 15.407(b) (1/2/3/4(i/ii)/6)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -3.1dB at 232.95MHz.

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) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.9 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.1 dB
	30MHz ~ 1GHz	5.1 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 RTL8852B M.2 1216 Combo module
Brand	REALTEK
Test Model	RTL8852B
Status of EUT	Engineering sample
Power Supply Rating	3.3Vdc from host equipment
Modulation Type	**WLAN**: CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode and VHT in 2.4GHz 1024QAM for OFDMA in 11ax mode **BT-EDR:** GFSK, π/4-DQPSK, 8DPSK **BT-LE:** GFSK
Modulation Technology	**WLAN**: DSSS, OFDM, OFDMA **BT-EDR:** FHSS **BT-LE:** DTS
Operating Frequency	**WLAN**: **2.4GHz:** 2.412 ~ 2.472GHz **5GHz:** 5.18 ~ 5.24GHz, 5.26 ~ 5.32GHz, 5.5 ~ 5.72GHz, 5.745 ~ 5.825GHz **5.9GHz:** 5.845 ~ 5.885 GHz **BT-EDR:** 2.402 ~ 2.480 GHz **BT-LE:** 2.402 ~ 2.480 GHz
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Data Cable Supplied	NA

Note:

1. The EUT has below HW SKU configuration, as below table:

SKU No.	Interface	Description
1	WLAN use PCIe, BT use USB	Dual antenna port
2	WLAN use PCIe, BT use UART	Dual antenna port

Note:
1. For radiated emissions (below 1GHz) & conducted emissions: From the above HW SKUs, the worse case was found in SKU No.: 2. Therefore only the test data of the SKU was recorded in this report.
2. For radiated emissions (above 1GHz): From the above HW SKUs, the worse case was found in SKU No.: 1. Therefore only the test data of the SKU was recorded in this report.

2. Simultaneously transmission condition.

Condition	Technology	
1	WLAN 5GHz	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:

Ant. Set	RF Chain No.	Brand	Model	Ant. Net Gain (dBi)	Frequency Range (GHz)	Ant. Type	Connector Type	Cable Length (mm)
1	Chain 0	ARISTOTLE	RFA-27-JP326-MHF4300	3.5	2.4~2.4835	PIFA	i-pex(MHF)	300
				5	5.15~5.85			
				5	5.875~7.125			
	Chain 1	ARISTOTLE	RFA-27-JP326-MHF4300	3.5	2.4~2.4835	PIFA	i-pex(MHF)	300
				5	5.15~5.85			
				5	5.875~7.125			
2	Chain 0	ARISTOTLE	RFA-27-C38H1-MHF4300	3	2.4~2.4835	Dipole	i-pex(MHF)	300
				5	5.15~5.85			
				5	5.875~7.125			
	Chain 1	ARISTOTLE	RFA-27-C38H1-MHF4300	3	2.4~2.4835	Dipole	i-pex(MHF)	300
				5	5.15~5.85			
				5	5.875~7.125			

Note:
1. From the above transmission chains, the worse case was found in transmission on Chain 0 for 1TX mode. Therefore only the test data of the mode was recorded in this report.
2. The Bluetooth technology will fix transmission on Chain 1.
3. Max. gain was selected for the final test, except for the radiated emissions test.

4. The EUT incorporates a MIMO function.

2.4GHz Band		
MODULATION MODE	**TX & RX CONFIGURATION**	
802.11b	2TX/1TX Diversity	2RX
802.11g	2TX/1TX Diversity	2RX
802.11n (HT20)	2TX/1TX Diversity	2RX
802.11n (HT40)	2TX/1TX Diversity	2RX
VHT20	2TX/1TX Diversity	2RX
VHT40	2TX/1TX Diversity	2RX
802.11ax (HE20)	2TX/1TX Diversity	2RX
802.11ax (HE40)	2TX/1TX Diversity	2RX
802.11ax (RU26/52/106/242/484)	2TX/1TX Diversity	2RX
5GHz Band		
MODULATION MODE	**TX & RX CONFIGURATION**	
802.11a	2TX/1TX Diversity	2RX
802.11n (HT20)	2TX/1TX Diversity	2RX
802.11n (HT40)	2TX/1TX Diversity	2RX
802.11ac (VHT20)	2TX/1TX Diversity	2RX
802.11ac (VHT40)	2TX/1TX Diversity	2RX
802.11ac (VHT80)	2TX/1TX Diversity	2RX
802.11ax (HE20)	2TX/1TX Diversity	2RX
802.11ax (HE40)	2TX/1TX Diversity	2RX
802.11ax (HE80)	2TX/1TX Diversity	2RX
802.11ax (RU26/52/106/242/484/996)	2TX/1TX Diversity	2RX
Note: All of modulation mode support beamforming function except 802.11a/b/g modulation mode.		

5. 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.
6. Detail antenna specification please refer to antenna datasheet and/or antenna measurement report.

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 **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 **X-plane**.

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.

Configure Mode	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
1	802.11ax (HE20) (S1, 1TX) + BT-EDR (S1, TX)	36 to 64 100 to 144 149 to 165	40	OFDMA	BPSK
		0 to 78	39	FHSS	GFSK
2	802.11ax (HE20) (S0, 1TX) + BT-EDR (S1, TX)	36 to 64 100 to 144 149 to 165	40	OFDMA	BPSK
		0 to 78	39	FHSS	GFSK
3	802.11ax (HE20) (S0&1, 2TX) + BT-EDR (S1, TX)	36 to 64 100 to 144 149 to 165	149	OFDMA	BPSK
		0 to 78	39	FHSS	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.

Configure Mode	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
1	802.11ax (HE20) (S1, 1TX) + BT-EDR (S1, TX)	36 to 64 100 to 144 149 to 165	40	OFDMA	BPSK
		0 to 78	39	FHSS	GFSK
2	802.11ax (HE20) (S0, 1TX) + BT-EDR (S1, TX)	36 to 64 100 to 144 149 to 165	40	OFDMA	BPSK
		0 to 78	39	FHSS	GFSK
3	802.11ax (HE20) (S0&1, 2TX) + BT-EDR (S1, TX)	36 to 64 100 to 144 149 to 165	149	OFDMA	BPSK
		0 to 78	39	FHSS	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.

Configure Mode	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
3	802.11ax (HE20) (S0&1, 2TX) + BT-EDR (S1, TX)	36 to 64 100 to 144 149 to 165	149	OFDMA	BPSK
		0 to 78	39	FHSS	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.

Configure Mode	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
1	802.11ax (HE20) (S1, 1TX) + BT-EDR (S1, TX)	36 to 64 100 to 144 149 to 165	40	OFDMA	BPSK
		0 to 78	39	FHSS	GFSK
3	802.11ax (HE20) (S0&1, 2TX) + BT-EDR (S1, TX)	36 to 64 100 to 144 149 to 165	149	OFDMA	BPSK
		0 to 78	39	FHSS	GFSK

Test Condition:

Applicable To	Environmental Conditions	Input Power (system)	Tested By
RE≥1G	25deg. C, 67%RH	120Vac, 60Hz	Sampson Chen
RE<1G	19deg. C, 64%RH	120Vac, 60Hz	Sampson Chen
PLC	22deg. C, 64%RH	120Vac, 60Hz	Sampson Chen
OB	24deg. C, 64%RH	120Vac, 60Hz	John Peng

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.

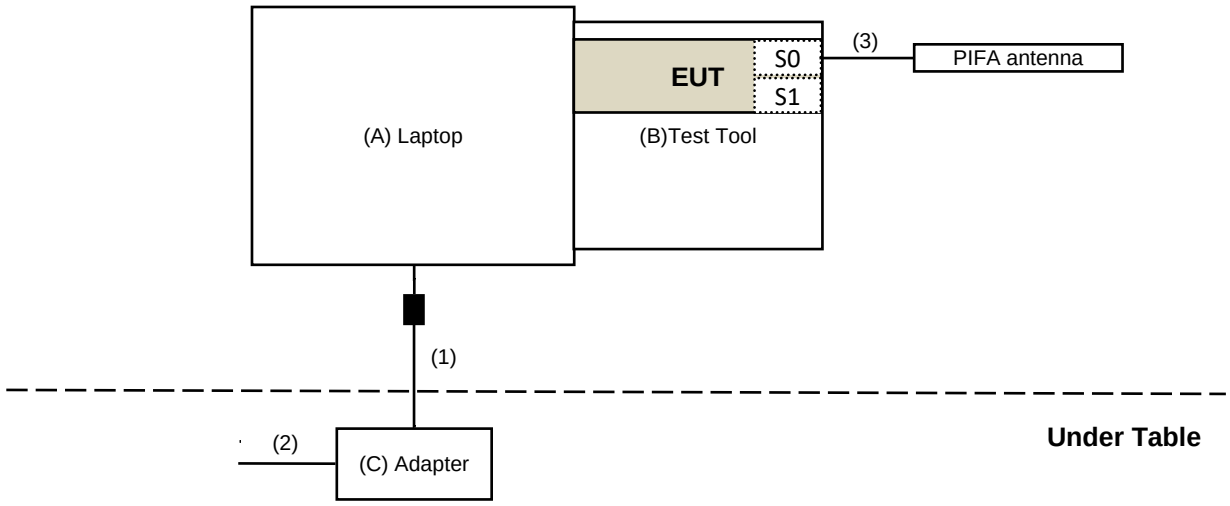
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Laptop	DELL	E6420	B92T3R1	FCC DoC	Provided by Lab
B	Test Tool	Realtek	N/A	N/A	N/A	Supplied by applicant
C	Adapter	DELL	LA65NS2-01	N/A	N/A	Provided by Lab
D	Test Tool	Realtek	N/A	N/A	N/A	Supplied by applicant
E	Test Tool	Realtek	N/A	N/A	N/A	Supplied by applicant

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	RF Cable	1	0.3	No	0	Supplied by applicant
4	RF Cable	1	0.3	No	0	Supplied by applicant
5	RF Cable	1	0.3	No	0	Supplied by applicant
6	RF Cable	1	0.3	No	0	Supplied by applicant
7	Data Cable	1	0.2	No	0	Supplied by applicant

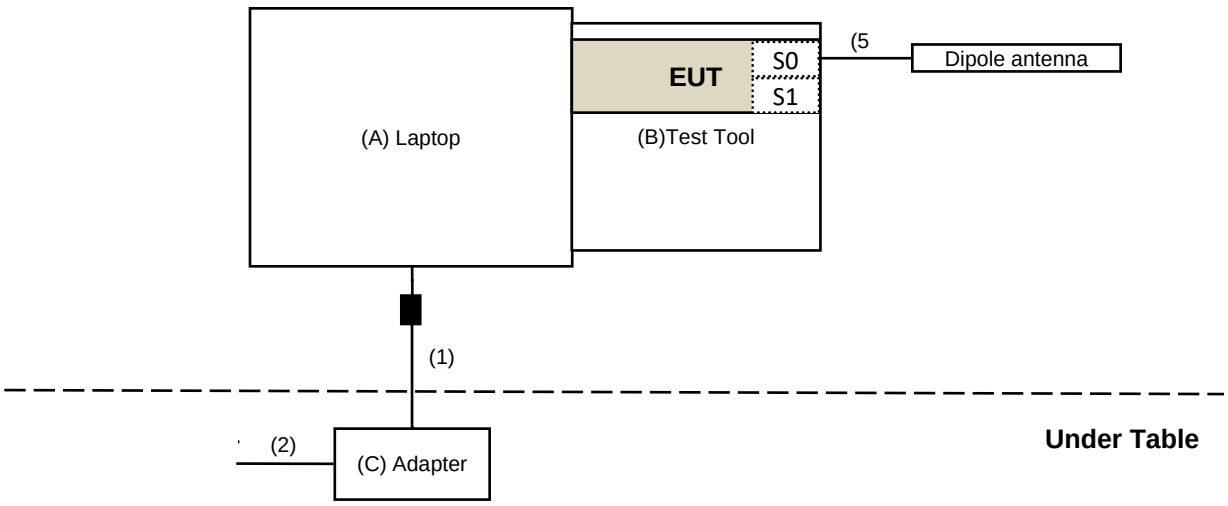
3.2.1 Configuration of System under Test

For Radiated Emission above 1 GHz test

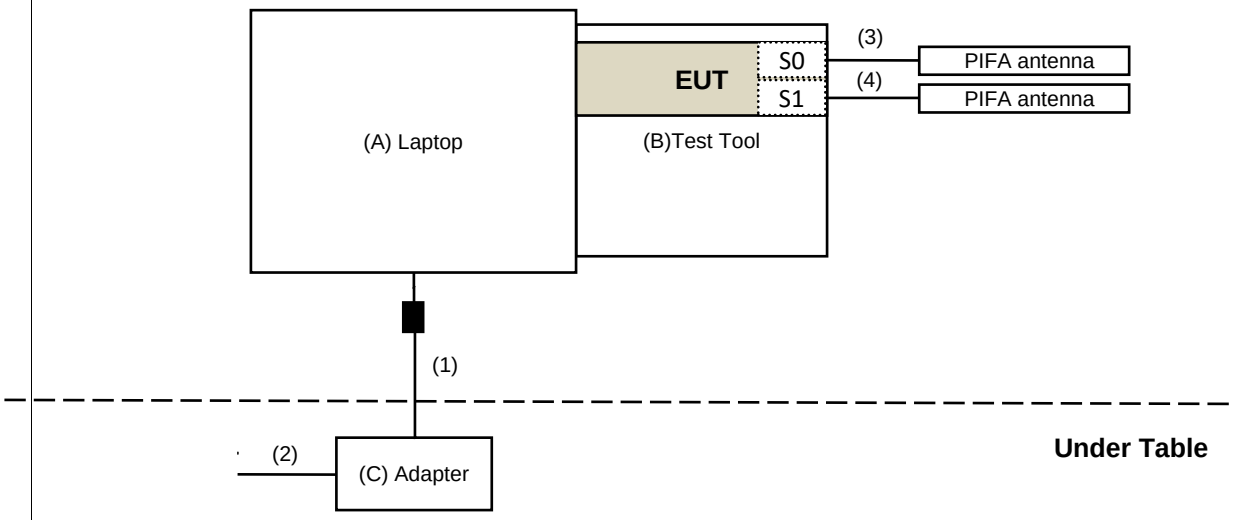
(PIFA antenna 1Tx 5G PCIe + USB interface + dual antenna port)



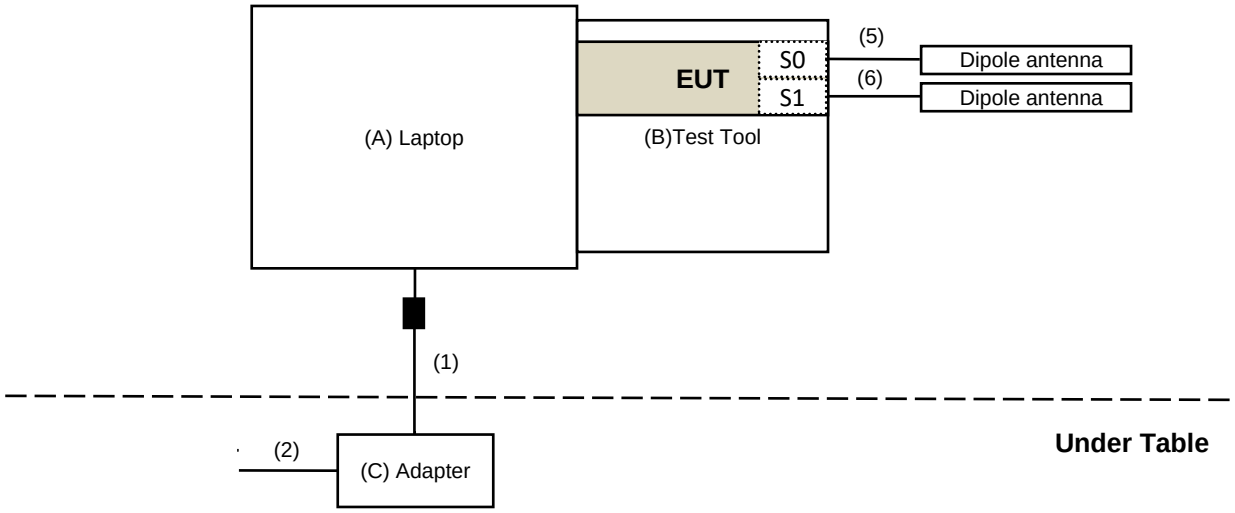
(Dipole antenna 1Tx 5G PCIe + USB interface + dual antenna port)



(PIFA antenna 2Tx PCIe + USB interface + dual antenna port)

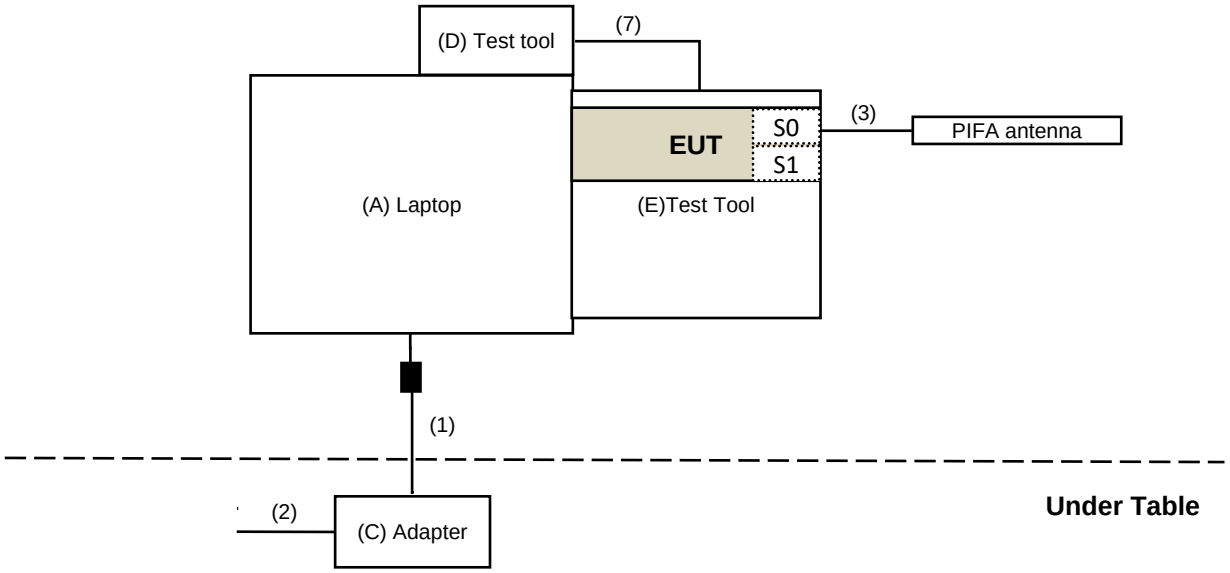


(Dipole antenna 2Tx PCIe + USB interface + dual antenna port)

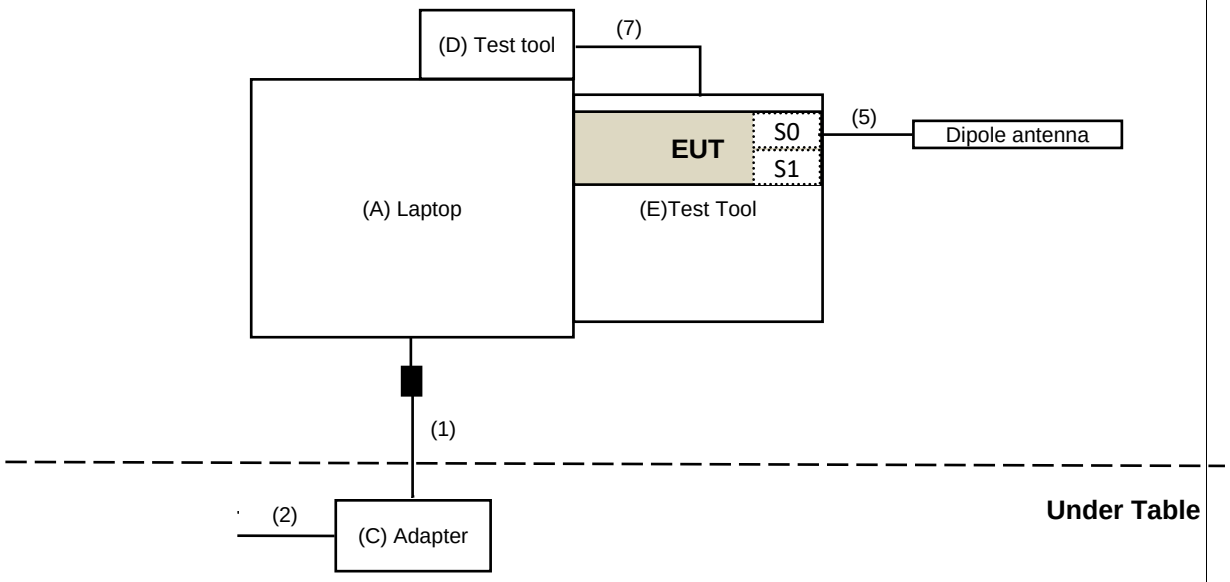


For Radiated Emission below 1 GHz test

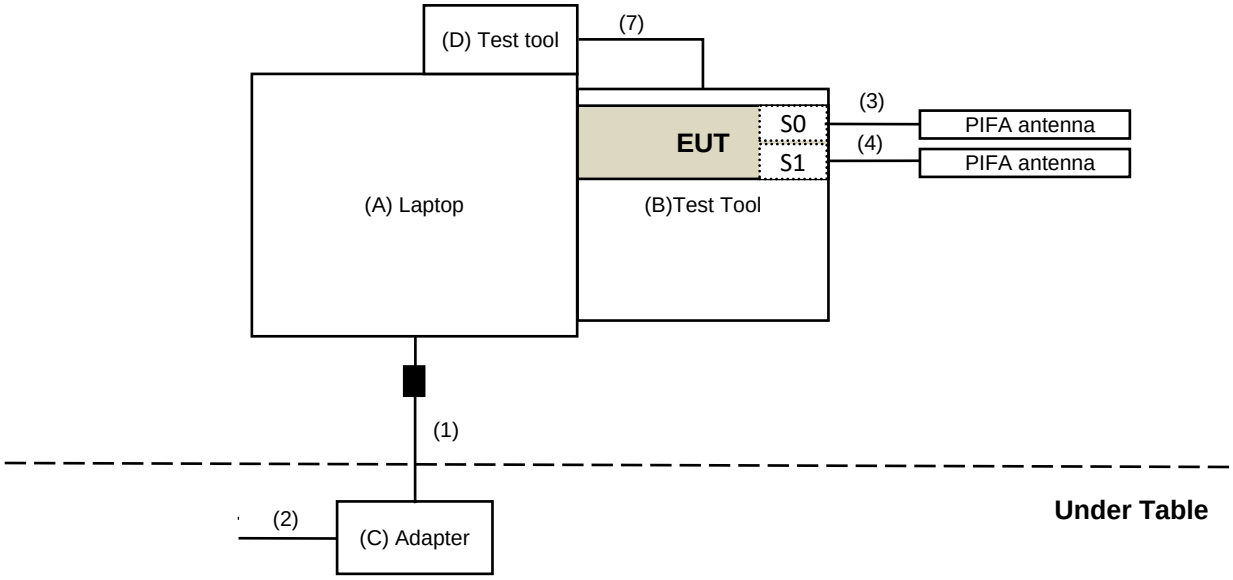
(PIFA antenna 1Tx 5G & 5.9G PCIe + UART interface + dual antenna port)



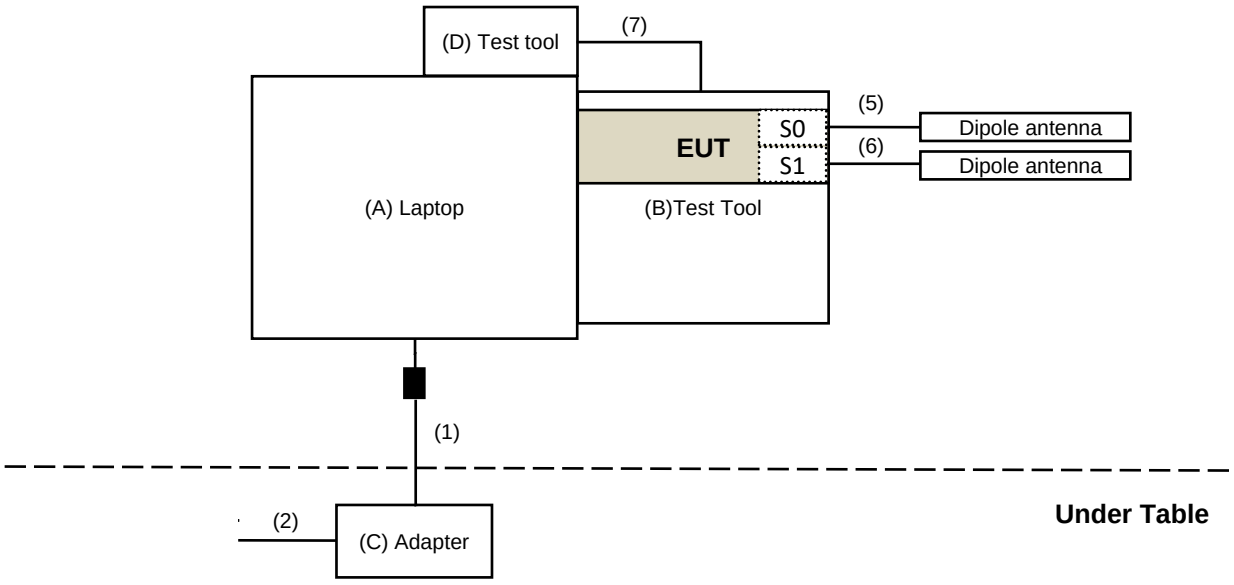
(Dipole antenna 1Tx 5G & 5.9G PCIe + UART interface + dual antenna port)



(PIFA antenna 2Tx PCIe + UART interface + dual antenna port)

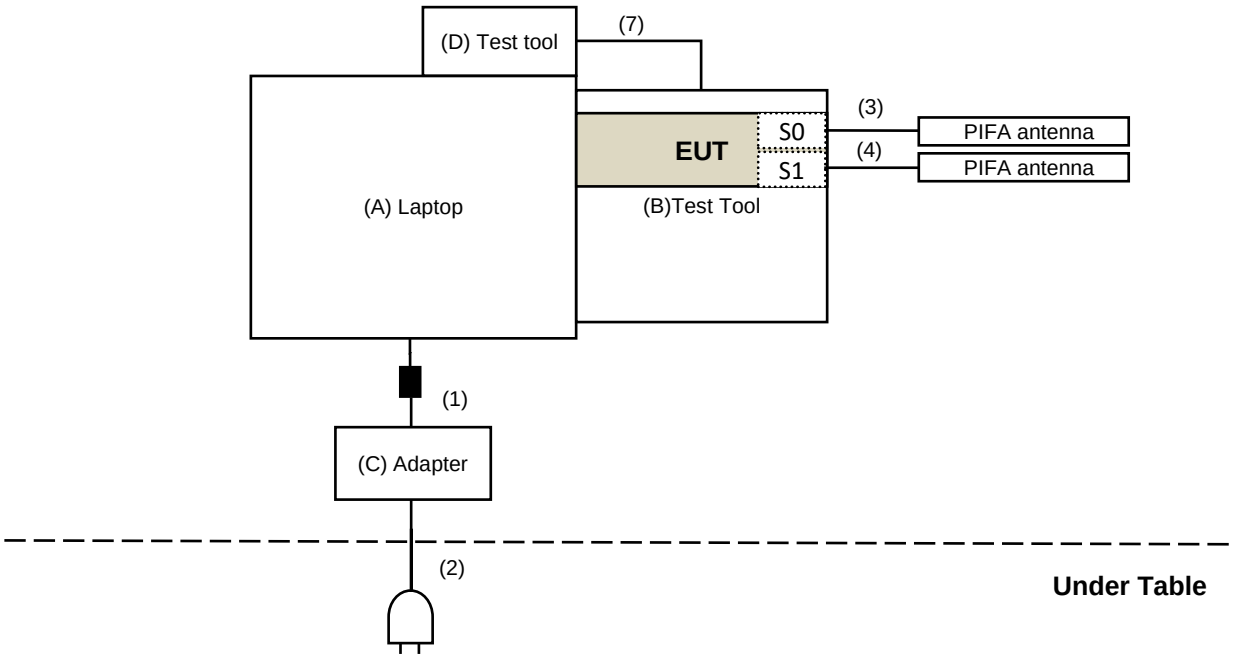


(Dipole antenna 2Tx PCIe + UART interface + dual antenna port)



For AC Power Conducted Emission test

(PIFA antenna 2Tx PCIe + UART interface + dual antenna port)



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) *1 PK:10 (dBm/MHz) *2 PK:15.6 (dBm/MHz) *3 PK:27 (dBm/MHz) *4	PK: 68.2(dBµV/m) *1 PK:105.2 (dBµV/m) *2 PK: 110.8(dBµV/m) *3 PK:122.2 (dBµV/m) *4

*1 beyond 75 MHz or more above of the band edge.

*2 below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above.

*3 below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above.

*4 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:

$$E = \frac{1000000\sqrt{30P}}{3}$$ µV/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
Test Receiver R&S	ESR3	102528	2022/2/25	2023/2/24
Spectrum Analyzer Keysight	N9020B	MY60112410	2022/3/13	2023/3/12
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	2022/3/19	2023/3/18
LOOP ANTENNA Electro-Metrics	EM-6879	264	2022/3/18	2023/3/17
RF Coaxial Cable JYEBO	5D-FB	LOOPCAB-001	2022/1/6	2023/1/5
RF Coaxial Cable JYEBO	5D-FB	LOOPCAB-002	2022/1/6	2023/1/5
Pre_Amplifier EMCI	EMC330N	980538	2022/4/25	2023/4/24
Bilog Antenna Schwarzbeck	VULB 9168	9168-0842	2021/10/26	2022/10/25
RF Coaxial Cable COMMATE/PEWC	8D	966-5-1	2022/4/25	2023/4/24
RF Coaxial Cable COMMATE/PEWC	8D	966-5-2	2022/4/25	2023/4/24
RF Coaxial Cable COMMATE/PEWC	8D	966-5-3	2022/4/25	2023/4/24
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-ATT5-02	2022/1/10	2023/1/9
Horn Antenna Schwarzbeck	BBHA 9120D	9120D-1819	2021/11/14	2022/11/13
Pre_Amplifier EMCI	EMC12630SE	980509	2022/4/25	2023/4/24
RF Coaxial Cable EMCI	EMC104-SM-SM-1500	180503	2022/4/25	2023/4/24
RF Coaxial Cable EMCI	EMC104-SM-SM-2000	180501	2022/4/25	2023/4/24
RF Coaxial Cable EMCI	EMC104-SM-SM-6000	180506	2022/4/25	2023/4/24
Pre_Amplifier EMCI	EMC184045SE	980387	2022/1/10	2023/1/9
Horn Antenna Schwarzbeck	BBHA 9170	9170-739	2021/11/14	2022/11/13
RF Cable-Frequency range: 1-40GHz EMCI	EMC102-KM-KM-1200	160924	2022/1/10	2023/1/9
RF Coaxial Cable EMCI	EMC-KM-KM-4000	200214	2022/3/8	2023/3/7

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: 2022/6/13 ~ 2022/8/3

For other test

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSV40	101516	2022/3/7	2023/3/6
Attenuator WOKEN	MDCS18N-10	MDCS18N-10-01	2022/4/5	2023/4/4

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: 2022/6/30

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 detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

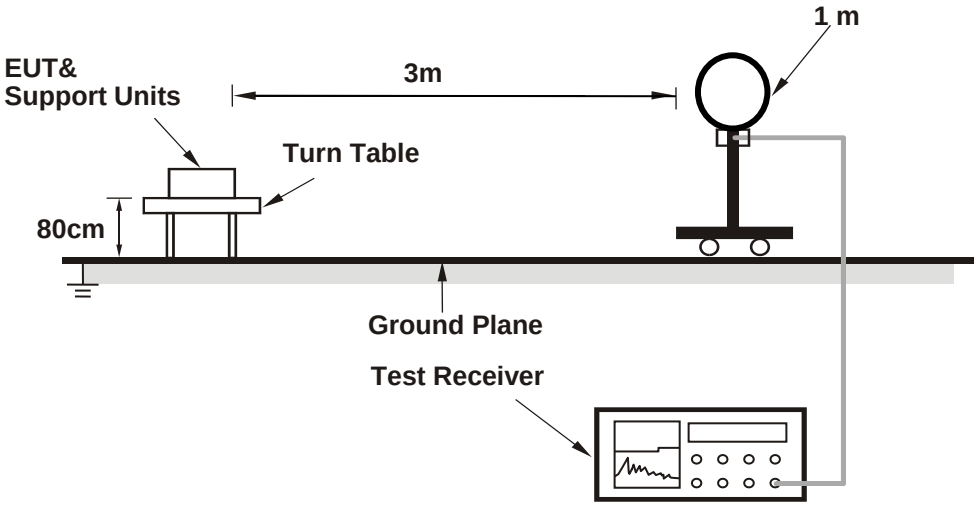
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 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

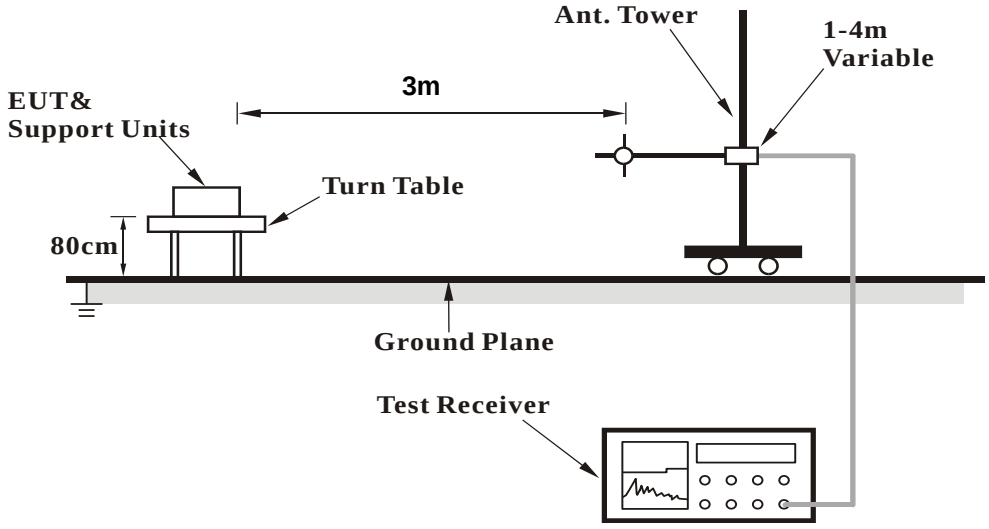
No deviation.

4.1.5 Test Setup

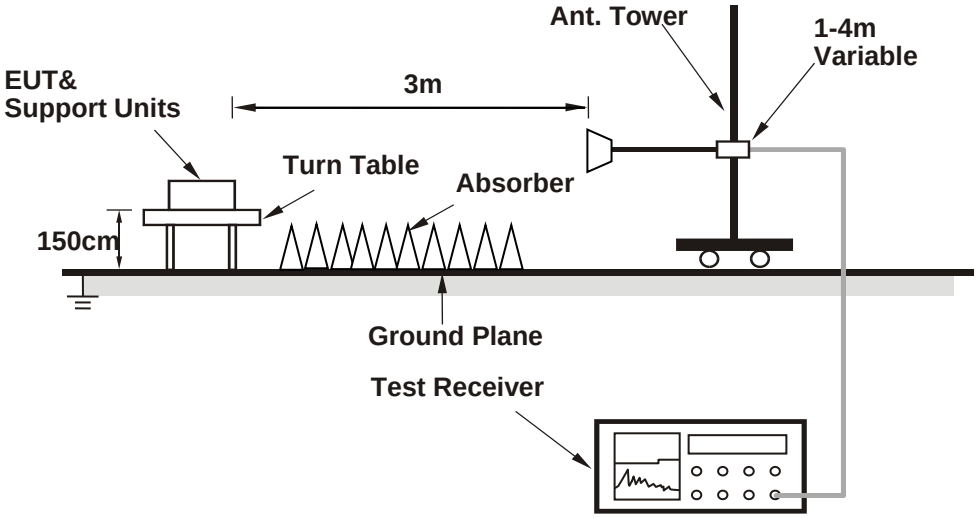
For Radiated emission below 30MHz



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

a. Placed the EUT on the testing table.
b. Controlling software (WLAN: RTL8852B_PCIE_MP_Package_ALPHA_v1.0.44, Buletooth: Bluetooth RF test tool (5.3.2.25)) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results (Mode 1)

Dipole Antenna

Above 1GHz Data:

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	4882.00	33.6 PK	74.0	-40.4	1.28 H	144	32.1	1.5
2	4882.00	7.6 AV	54.0	-46.4	1.28 H	144	6.1	1.5
3	7323.00	40.0 PK	74.0	-34.0	1.58 H	161	32.8	7.2
4	7323.00	14.0 AV	54.0	-40.0	1.58 H	161	6.8	7.2
5	#10400.00	48.0 PK	68.2	-20.2	1.52 H	269	36.1	11.9
6	15600.00	55.8 PK	74.0	-18.2	1.23 H	326	44.3	11.5
7	15600.00	43.9 AV	54.0	-10.1	1.23 H	326	32.4	11.5
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	4882.00	42.9 PK	74.0	-31.1	1.02 V	294	41.4	1.5
2	4882.00	16.9 AV	54.0	-37.1	1.02 V	294	15.4	1.5
3	7323.00	40.4 PK	74.0	-33.6	1.38 V	238	33.2	7.2
4	7323.00	14.4 AV	54.0	-39.6	1.38 V	238	7.2	7.2
5	#10400.00	51.7 PK	68.2	-16.5	1.51 V	171	39.8	11.9
6	15600.00	56.8 PK	74.0	-17.2	2.07 V	244	45.3	11.5
7	15600.00	44.9 AV	54.0	-9.1	2.07 V	244	33.4	11.5

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.
5. " # ": The radiated frequency is out of the restricted band.

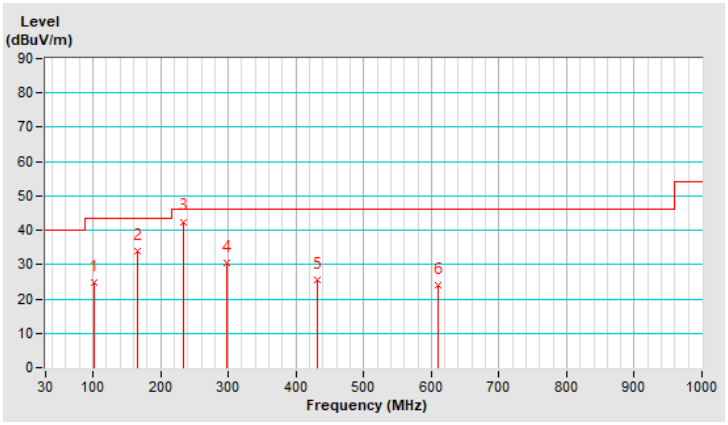
Below 1GHz Data:

FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)

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	100.97	24.9 QP	43.5	-18.6	3.00 H	100	42.1	-17.2
2	165.63	33.8 QP	43.5	-9.7	2.00 H	325	46.7	-12.9
3	233.22	42.5 QP	46.0	-3.5	1.50 H	85	57.5	-15.0
4	297.31	30.4 QP	46.0	-15.6	1.00 H	152	42.8	-12.4
5	431.25	25.6 QP	46.0	-20.4	3.00 H	88	34.4	-8.8
6	609.84	24.1 QP	46.0	-21.9	3.00 H	117	29.0	-4.9

Remarks:

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

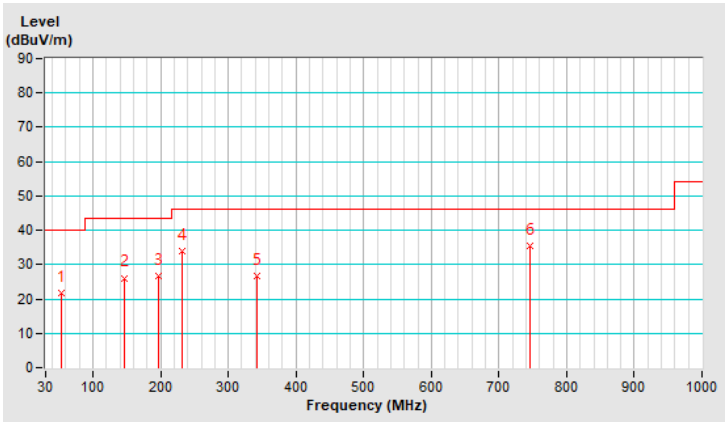


FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)

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	53.88	21.7 QP	40.0	-18.3	1.50 V	360	34.6	-12.9
2	145.69	26.1 QP	43.5	-17.4	1.00 V	125	38.9	-12.8
3	197.74	26.6 QP	43.5	-16.9	1.50 V	204	42.6	-16.0
4	231.68	33.9 QP	46.0	-12.1	2.00 V	69	49.1	-15.2
5	341.62	26.6 QP	46.0	-19.4	1.50 V	168	37.8	-11.2
6	746.39	35.6 QP	46.0	-10.4	3.00 V	341	38.5	-2.9

Remarks:

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

Above 1GHz Data:

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	4882.00	39.2 PK	74.0	-34.8	1.12 H	152	37.7	1.5
2	4882.00	13.2 AV	54.0	-40.8	1.12 H	152	11.7	1.5
3	7323.00	42.3 PK	74.0	-31.7	1.37 H	106	35.1	7.2
4	7323.00	16.3 AV	54.0	-37.7	1.37 H	106	9.1	7.2
5	#10400.00	57.7 PK	68.2	-10.5	1.58 H	269	45.8	11.9
6	15600.00	50.1 PK	74.0	-23.9	1.49 H	292	38.6	11.5
7	15600.00	38.6 AV	54.0	-15.4	1.49 H	292	27.1	11.5
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	4882.00	40.5 PK	74.0	-33.5	2.98 V	330	39.0	1.5
2	4882.00	14.5 AV	54.0	-39.5	2.98 V	330	13.0	1.5
3	7323.00	41.3 PK	74.0	-32.7	1.34 V	236	34.1	7.2
4	7323.00	15.3 AV	54.0	-38.7	1.34 V	236	8.1	7.2
5	#10400.00	50.0 PK	68.2	-18.2	1.53 V	269	38.1	11.9
6	15600.00	55.2 PK	74.0	-18.8	2.27 V	279	43.7	11.5
7	15600.00	44.9 AV	54.0	-9.1	2.27 V	279	33.4	11.5

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.
5. " # ": The radiated frequency is out of the restricted band.

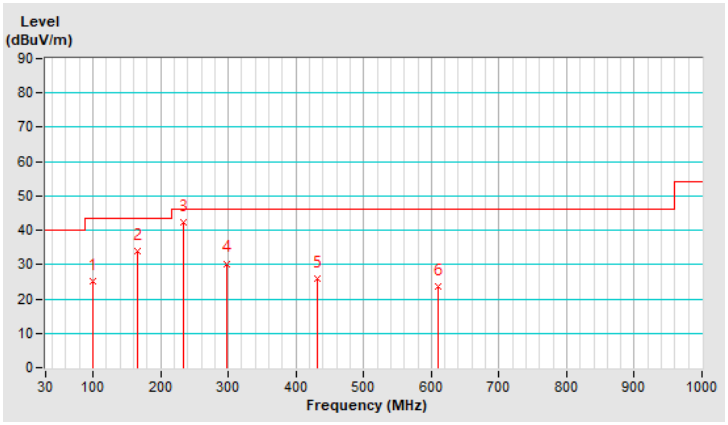
Below 1GHz Data:

FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)

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	99.85	25.0 QP	43.5	-18.5	3.00 H	113	42.3	-17.3
2	165.10	33.8 QP	43.5	-9.7	2.00 H	318	46.7	-12.9
3	233.89	42.3 QP	46.0	-3.7	1.50 H	76	57.2	-14.9
4	297.96	30.3 QP	46.0	-15.7	1.00 H	155	42.6	-12.3
5	430.98	26.0 QP	46.0	-20.0	3.00 H	76	34.8	-8.8
6	609.58	23.5 QP	46.0	-22.5	3.00 H	112	28.4	-4.9

Remarks:

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

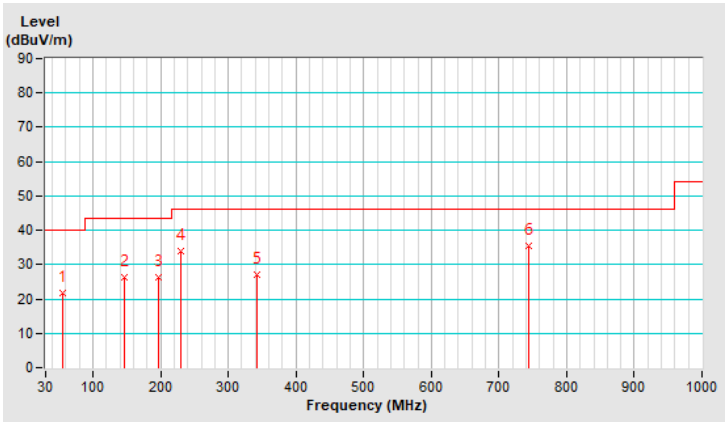


FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)

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	55.91	21.8 QP	40.0	-18.2	1.50 V	314	34.6	-12.8
2	147.01	26.3 QP	43.5	-17.2	1.00 V	140	38.9	-12.6
3	196.63	26.4 QP	43.5	-17.1	1.50 V	195	42.4	-16.0
4	230.26	33.9 QP	46.0	-12.1	2.00 V	75	49.3	-15.4
5	341.79	26.9 QP	46.0	-19.1	1.50 V	173	38.1	-11.2
6	744.75	35.5 QP	46.0	-10.5	3.00 V	334	38.5	-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 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.



4.1.8 Test Results (Mode 2)

Dipole Antenna

Above 1GHz Data:

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	4882.00	33.3 PK	74.0	-40.7	1.29 H	124	31.8	1.5
2	4882.00	7.3 AV	54.0	-46.7	1.29 H	124	5.8	1.5
3	7323.00	41.1 PK	74.0	-32.9	1.46 H	183	33.9	7.2
4	7323.00	15.1 AV	54.0	-38.9	1.46 H	183	7.9	7.2
5	#10400.00	48.1 PK	68.2	-20.1	1.34 H	281	36.2	11.9
6	15600.00	56.6 PK	74.0	-17.4	1.09 H	326	45.1	11.5
7	15600.00	45.0 AV	54.0	-9.0	1.09 H	326	33.5	11.5
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	4882.00	42.6 PK	74.0	-31.4	1.05 V	273	41.1	1.5
2	4882.00	16.6 AV	54.0	-37.4	1.05 V	273	15.1	1.5
3	7323.00	39.5 PK	74.0	-34.5	1.46 V	214	32.3	7.2
4	7323.00	13.5 AV	54.0	-40.5	1.46 V	214	6.3	7.2
5	#10400.00	50.7 PK	68.2	-17.5	1.57 V	193	38.8	11.9
6	15600.00	58.8 PK	74.0	-15.2	1.91 V	250	47.3	11.5
7	15600.00	46.5 AV	54.0	-7.5	1.91 V	250	35.0	11.5

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.
5. " # ": The radiated frequency is out of the restricted band.

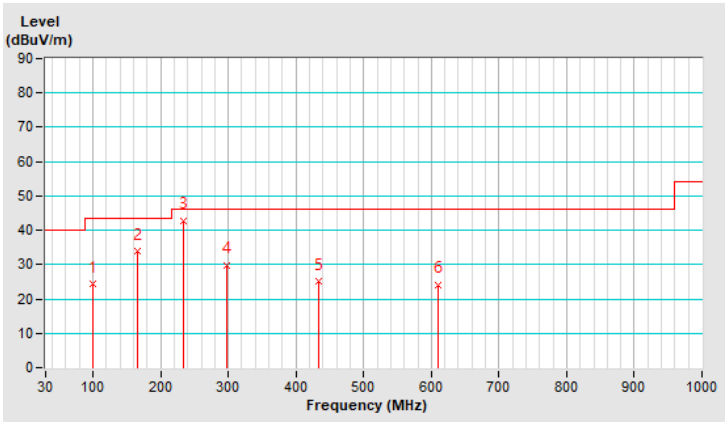
Below 1GHz Data:

FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)

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	99.77	24.5 QP	43.5	-19.0	3.00 H	105	41.8	-17.3
2	166.06	34.0 QP	43.5	-9.5	2.00 H	317	47.0	-13.0
3	**232.95**	**42.9 QP**	**46.0**	**-3.1**	**1.50 H**	**101**	**58.0**	**-15.1**
4	298.63	29.9 QP	46.0	-16.1	1.00 H	156	42.2	-12.3
5	432.60	25.1 QP	46.0	-20.9	3.00 H	82	33.8	-8.7
6	610.60	24.2 QP	46.0	-21.8	3.00 H	104	29.1	-4.9

Remarks:

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

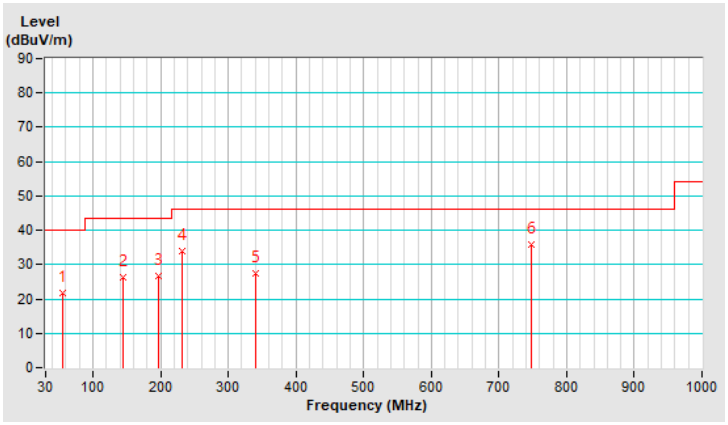


FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)

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	54.58	21.7 QP	40.0	-18.3	1.50 V	356	34.7	-13.0
2	145.17	26.2 QP	43.5	-17.3	1.00 V	140	39.0	-12.8
3	196.12	26.7 QP	43.5	-16.8	1.50 V	219	42.7	-16.0
4	231.14	33.8 QP	46.0	-12.2	2.00 V	57	49.1	-15.3
5	341.06	27.3 QP	46.0	-18.7	1.50 V	160	38.5	-11.2
6	747.08	35.7 QP	46.0	-10.3	3.00 V	327	38.5	-2.8

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 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 Antenna

Above 1GHz Data:

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	4882.00	38.3 PK	74.0	-35.7	1.30 H	120	36.8	1.5
2	4882.00	12.3 AV	54.0	-41.7	1.30 H	120	10.8	1.5
3	7323.00	42.3 PK	74.0	-31.7	1.44 H	114	35.1	7.2
4	7323.00	16.3 AV	54.0	-37.7	1.44 H	114	9.1	7.2
5	#10400.00	58.2 PK	68.2	-10.0	1.61 H	277	46.3	11.9
6	15600.00	49.1 PK	74.0	-24.9	1.49 H	297	37.6	11.5
7	15600.00	38.2 AV	54.0	-15.8	1.49 H	297	26.7	11.5
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	4882.00	39.4 PK	74.0	-34.6	3.06 V	298	37.9	1.5
2	4882.00	13.4 AV	54.0	-40.6	3.06 V	298	11.9	1.5
3	7323.00	41.4 PK	74.0	-32.6	1.27 V	208	34.2	7.2
4	7323.00	15.4 AV	54.0	-38.6	1.27 V	208	8.2	7.2
5	#10400.00	50.3 PK	68.2	-17.9	1.55 V	264	38.4	11.9
6	15600.00	54.0 PK	74.0	-20.0	2.37 V	243	42.5	11.5
7	15600.00	44.5 AV	54.0	-9.5	2.37 V	243	33.0	11.5

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.
5. " # ": The radiated frequency is out of the restricted band.

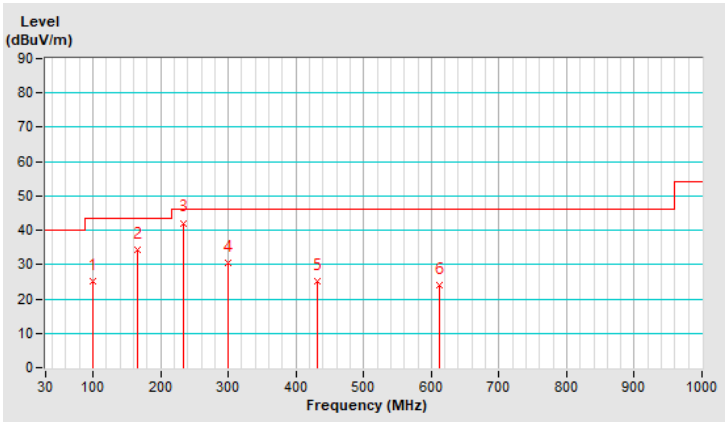
Below 1GHz Data:

FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)

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	99.36	25.2 QP	43.5	-18.3	3.00 H	98	42.6	-17.4
2	166.60	34.4 QP	43.5	-9.1	2.00 H	339	47.4	-13.0
3	233.59	42.1 QP	46.0	-3.9	1.50 H	71	57.1	-15.0
4	298.73	30.5 QP	46.0	-15.5	1.00 H	152	42.8	-12.3
5	432.16	25.2 QP	46.0	-20.8	3.00 H	82	33.9	-8.7
6	611.04	23.9 QP	46.0	-22.1	3.00 H	113	28.8	-4.9

Remarks:

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

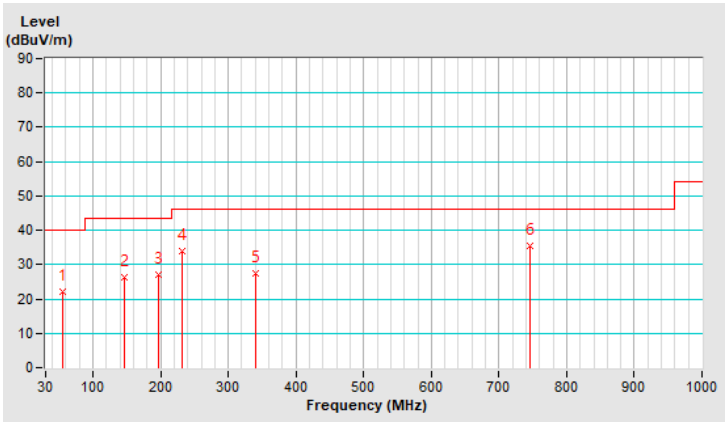


FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)

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	55.64	22.1 QP	40.0	-17.9	1.50 V	350	35.0	-12.9
2	146.01	26.2 QP	43.5	-17.3	1.00 V	119	38.9	-12.7
3	195.99	27.1 QP	43.5	-16.4	1.50 V	205	43.1	-16.0
4	231.03	34.0 QP	46.0	-12.0	2.00 V	77	49.3	-15.3
5	340.20	27.3 QP	46.0	-18.7	1.50 V	176	38.5	-11.2
6	745.18	35.6 QP	46.0	-10.4	3.00 V	329	38.5	-2.9

Remarks:

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



4.1.9 Test Results (Mode 3)

Dipole Antenna

Above 1GHz Data:

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	4882.00	34.7 PK	74.0	-39.3	1.32 H	124	33.2	1.5
2	4882.00	8.7 AV	54.0	-45.3	1.32 H	124	7.2	1.5
3	7323.00	40.3 PK	74.0	-33.7	1.53 H	153	33.1	7.2
4	7323.00	14.3 AV	54.0	-39.7	1.53 H	153	7.1	7.2
5	11490.00	58.5 PK	74.0	-15.5	1.14 H	305	46.1	12.4
6	11490.00	47.2 AV	54.0	-6.8	1.14 H	305	34.8	12.4
7	#17235.00	49.3 PK	68.2	-18.9	1.24 H	284	32.6	16.7
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	4882.00	43.1 PK	74.0	-30.9	1.04 V	283	41.6	1.5
2	4882.00	17.1 AV	54.0	-36.9	1.04 V	283	15.6	1.5
3	7323.00	40.3 PK	74.0	-33.7	1.42 V	231	33.1	7.2
4	7323.00	14.3 AV	54.0	-39.7	1.42 V	231	7.1	7.2
5	11490.00	60.2 PK	74.0	-13.8	2.13 V	262	47.8	12.4
6	11490.00	48.5 AV	54.0	-5.5	2.13 V	262	36.1	12.4
7	#17235.00	50.4 PK	68.2	-17.8	2.58 V	17	33.7	16.7

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.

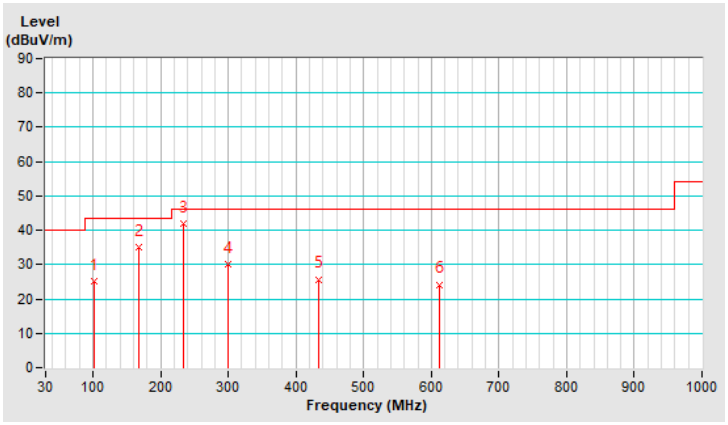
Below 1GHz Data:

FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)

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	101.52	25.2 QP	43.5	-18.3	3.00 H	101	42.3	-17.1
2	168.09	35.1 QP	43.5	-8.4	2.00 H	307	48.2	-13.1
3	234.60	41.9 QP	46.0	-4.1	1.50 H	100	56.7	-14.8
4	299.71	30.1 QP	46.0	-15.9	1.00 H	143	42.4	-12.3
5	433.62	25.7 QP	46.0	-20.3	3.00 H	70	34.3	-8.6
6	612.50	24.2 QP	46.0	-21.8	3.00 H	138	29.1	-4.9

Remarks:

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

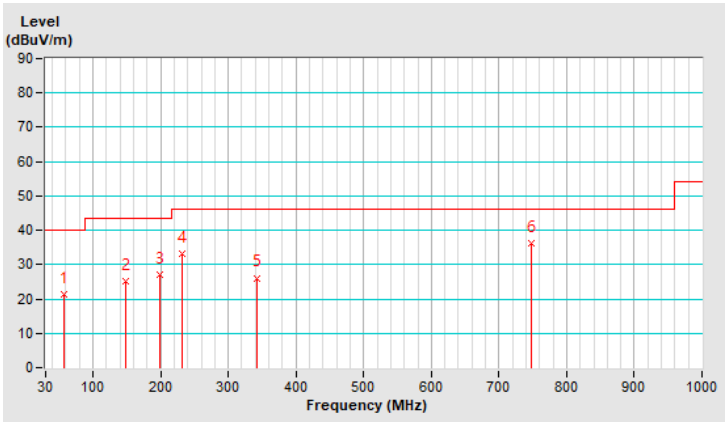


FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)

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	56.44	21.3 QP	40.0	-18.7	1.50 V	324	34.3	-13.0
2	148.17	25.0 QP	43.5	-18.5	1.00 V	128	37.7	-12.7
3	198.56	27.1 QP	43.5	-16.4	1.50 V	233	43.2	-16.1
4	232.57	33.2 QP	46.0	-12.8	2.00 V	58	48.3	-15.1
5	342.34	26.1 QP	46.0	-19.9	1.50 V	174	37.3	-11.2
6	747.61	36.2 QP	46.0	-9.8	3.00 V	311	39.0	-2.8

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 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 Antenna

Above 1GHz Data:

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	4882.00	39.0 PK	74.0	-35.0	1.17 H	137	37.5	1.5
2	4882.00	13.0 AV	54.0	-41.0	1.17 H	137	11.5	1.5
3	7323.00	41.6 PK	74.0	-32.4	1.40 H	98	34.4	7.2
4	7323.00	15.6 AV	54.0	-38.4	1.40 H	98	8.4	7.2
5	11490.00	51.9 PK	74.0	-22.1	1.84 H	309	39.5	12.4
6	11490.00	41.3 AV	54.0	-12.7	1.84 H	309	28.9	12.4
7	#17235.00	57.3 PK	68.2	-10.9	1.30 H	65	40.6	16.7
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	4882.00	39.9 PK	74.0	-34.1	3.01 V	326	38.4	1.5
2	4882.00	13.9 AV	54.0	-40.1	3.01 V	326	12.4	1.5
3	7323.00	41.4 PK	74.0	-32.6	1.19 V	206	34.2	7.2
4	7323.00	15.4 AV	54.0	-38.6	1.19 V	206	8.2	7.2
5	11490.00	47.7 PK	74.0	-26.3	1.74 V	279	35.3	12.4
6	11490.00	36.8 AV	54.0	-17.2	1.74 V	279	24.4	12.4
7	#17235.00	47.2 PK	68.2	-21.0	1.10 V	268	30.5	16.7

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.

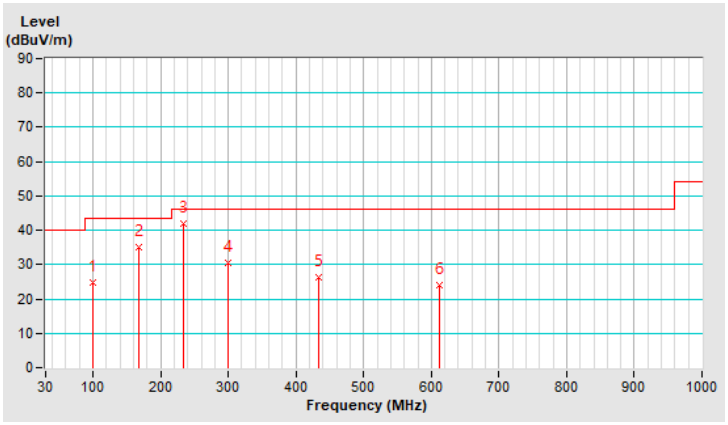
Below 1GHz Data:

FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)

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	100.63	24.8 QP	43.5	-18.7	3.00 H	110	42.0	-17.2
2	167.91	35.1 QP	43.5	-8.4	2.00 H	314	48.2	-13.1
3	**234.27**	**41.9 QP**	**46.0**	**-4.1**	**1.50 H**	**121**	**56.8**	**-14.9**
4	299.81	30.5 QP	46.0	-15.5	1.00 H	150	42.8	-12.3
5	434.20	26.4 QP	46.0	-19.6	3.00 H	94	35.0	-8.6
6	612.30	23.9 QP	46.0	-22.1	3.00 H	152	28.8	-4.9

Remarks:

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

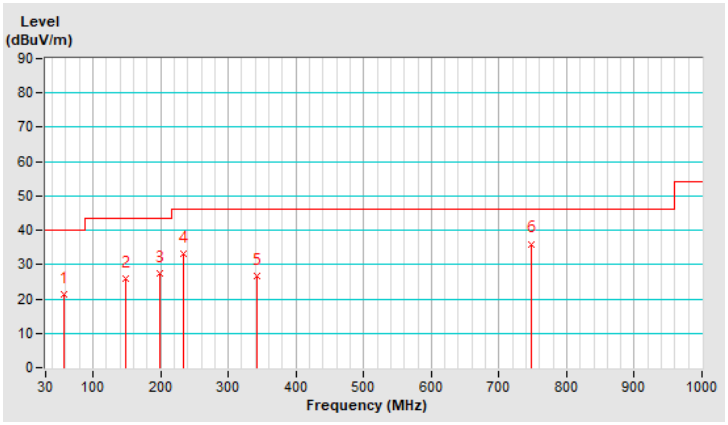


FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)

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	57.05	21.3 QP	40.0	-18.7	1.50 V	315	34.5	-13.2
2	148.72	25.8 QP	43.5	-17.7	1.00 V	129	38.5	-12.7
3	199.05	27.5 QP	43.5	-16.0	1.50 V	231	43.6	-16.1
4	232.83	33.2 QP	46.0	-12.8	2.00 V	59	48.3	-15.1
5	343.09	26.7 QP	46.0	-19.3	1.50 V	185	38.0	-11.3
6	747.69	36.0 QP	46.0	-10.0	3.00 V	288	38.8	-2.8

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 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	2021/10/13	2022/10/12
LISN R&S	ESH3-Z5	848773/004	2021/10/29	2022/10/28
50 ohms Terminator NA	50	3	2021/10/27	2022/10/26
RF Coaxial Cable JYEBO	5D-FB	COCCAB-001	2021/9/25	2022/9/24
Fixed attenuator STI	STI02-2200-10	005	2021/8/27	2022/8/26
Software BVADT	BVADT_Cond_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: 2022/6/11

4.2.3 Test Procedures

a. 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.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

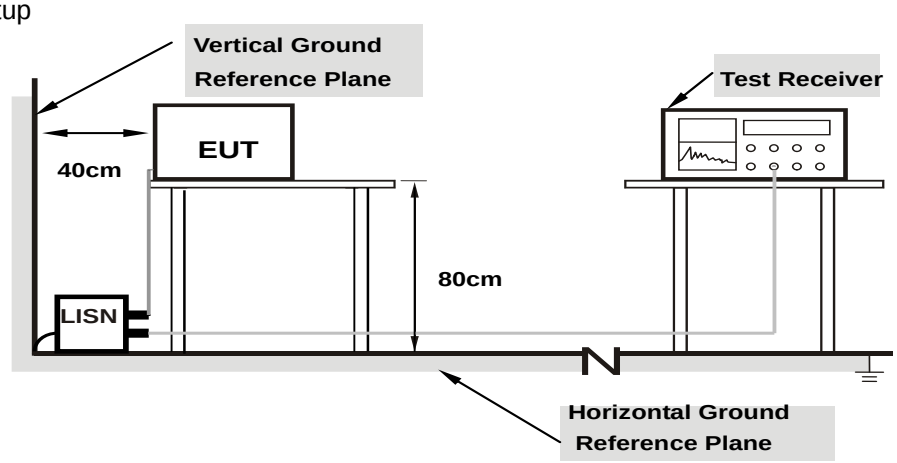
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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.

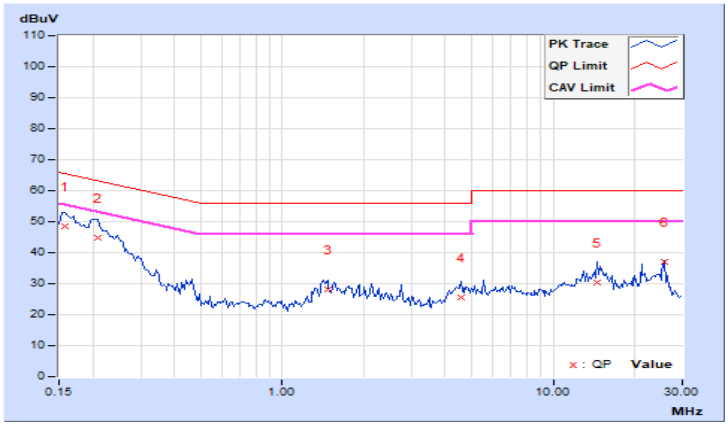
4.2.7 Test Results (Mode 3)

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)

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	0.15781	10.05	38.50	22.69	48.55	32.74	65.58	55.58	-17.03	-22.84
2	0.20859	10.05	34.85	19.72	44.90	29.77	63.26	53.26	-18.36	-23.49
3	1.46875	10.13	18.08	11.40	28.21	21.53	56.00	46.00	-27.79	-24.47
4	4.54688	10.29	15.29	10.14	25.58	20.43	56.00	46.00	-30.42	-25.57
5	14.51953	10.89	19.60	13.78	30.49	24.67	60.00	50.00	-29.51	-25.33
6	25.87500	11.31	25.90	24.83	37.21	36.14	60.00	50.00	-22.79	-13.86

Remarks:

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

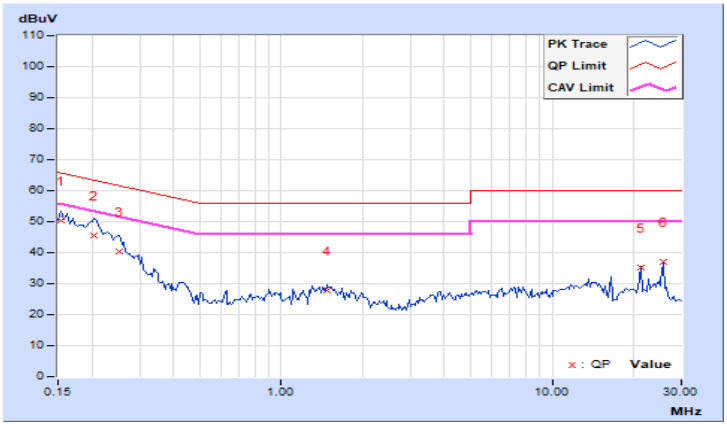


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

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	0.15391	10.02	40.19	24.08	50.21	34.10	65.79	55.79	-15.58	-21.69
2	0.20469	10.03	35.50	20.78	45.53	30.81	63.42	53.42	-17.89	-22.61
3	0.25156	10.03	30.24	15.49	40.27	25.52	61.71	51.71	-21.44	-26.19
4	1.46875	10.10	17.70	10.79	27.80	20.89	56.00	46.00	-28.20	-25.11
5	21.16797	10.96	24.33	23.70	35.29	34.66	60.00	50.00	-24.71	-15.34
6	**25.87109**	**10.98**	**25.88**	**25.23**	**36.86**	**36.21**	**60.00**	**50.00**	**-23.14**	**-13.79**

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

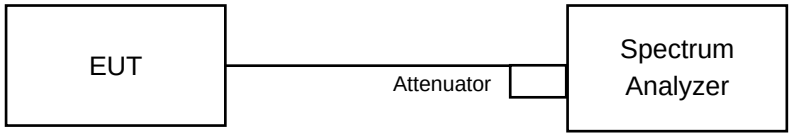


4.3 Conducted Out of Band Emission Measurement

4.3.1 Limits of Conducted Out of Band Emission Measurement

Below 30dB 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 ≥ 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 OOBE

1. Set RBW = 100 kHz.
2. Set VBW ≥ 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.

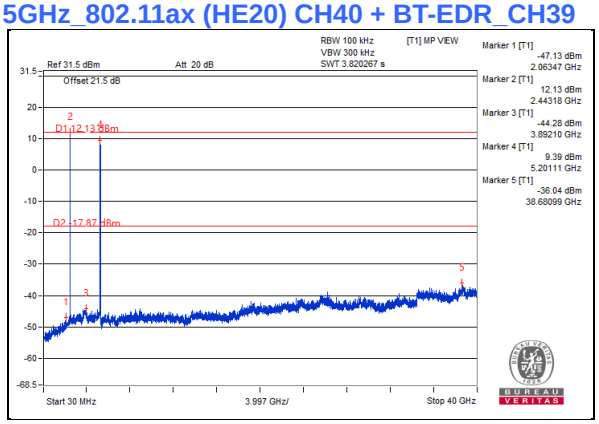
4.3.6 EUT Operating Conditions

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

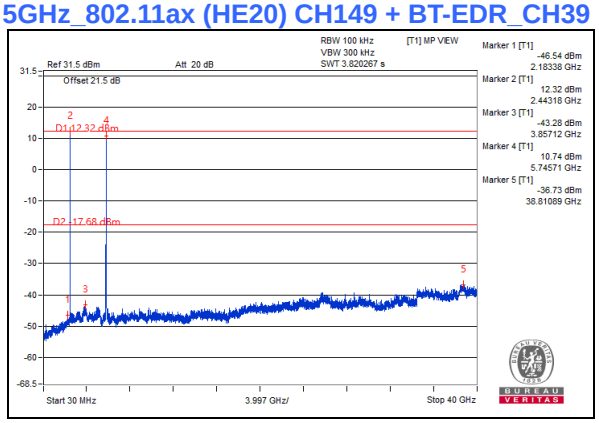
4.3.7 Test Results

The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.

For Mode 1
5GHz_802.11ax (HE20) CH40 + BT-EDR_CH39



For Mode 3
5GHz_802.11ax (HE20) CH149 + BT-EDR_CH39



5 Pictures of Test Arrangements

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

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Lin Kou EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

--- END ---