

Partial FCC Test Report

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FCC ID: O57AX200NGW

Test Model: AX200NGW

Received Date: Mar. 31, 2021

Test Date: Apr. 20 ~ Apr. 29, 2021

Issued Date: May 28, 2021

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**FCC Registration /
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Table of Contents

Release Control Record	3
1 Certificate of Conformity	4
2 Summary of Test Results.....	5
2.1 Measurement Uncertainty.....	6
2.2 Modification Record	6
3 General Information	7
3.1 General Description of EUT	7
3.2 Description of Test Modes.....	9
3.2.1 Test Mode Applicability and Tested Channel Detail.....	10
3.3 Description of Support Units	11
3.3.1 Configuration of System under Test	11
3.4 General Description of Applied Standards and References	12
4 Test Types and Results	13
4.1 Radiated Emission and Bandedge Measurement	13
4.1.1 Limits of Radiated Emission and Bandedge Measurement	13
4.1.2 Test Instruments	14
4.1.3 Test Procedures.....	15
4.1.4 Deviation from Test Standard	15
4.1.5 Test Set Up	16
4.1.6 EUT Operating Conditions.....	17
4.1.7 Test Results	18
4.2 Conducted Emission Measurement.....	26
4.2.1 Limits of Conducted Emission Measurement	26
4.2.2 Test Instruments	26
4.2.3 Test Procedures.....	27
4.2.4 Deviation from Test Standard	27
4.2.5 Test Setup.....	27
4.2.6 EUT Operating Condition	27
4.2.7 Test Results	28
5 Pictures of Test Arrangements.....	30
Annex A- Band Edge Measurement	31
Appendix – Information of the Testing Laboratories	33

Release Control Record

Issue No.	Description	Date Issued
RFBEDW-WTW-P21031097	Original Release	May 28, 2021

1 Certificate of Conformity

Product: WLAN and BT , 2x2 Pcle M.2 2230 adapter card

Brand: Intel® Wi-Fi 6 AX200

Test Model: AX200NGW

Sample Status: Engineering Sample

Applicant: Lenovo(Shanghai) Electronics Technology Co., Ltd.

Test Date: Apr. 20 ~ Apr. 29, 2021

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10:2013

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

Prepared by : Gina Liu , **Date:** May 28, 2021
Gina Liu / Specialist

Approved by : Dylan Chiou , **Date:** May 28, 2021
Dylan Chiou / Senior Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -25.25 dB at 0.42200 MHz.
15.247(a)(1)(iii)	Number of Hopping Frequency Used	N/A	Refer to Note 1
15.247(a)(1)(iii)	Dwell Time on Each Channel	N/A	Refer to Note 1
15.247(a)(1)	1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	N/A	Refer to Note 1
15.247(a)(1)	Maximum Peak Output Power	N/A	Refer to Note 2
---	Occupied Bandwidth Measurement	N/A	Refer to Note 1
15.205 & 209	Radiated Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -7.1 dB at 2390.00 MHz.
15.247(d)	Band Edge Measurement	N/A	Refer to Note 1
15.247(d)	Antenna Port Emission	N/A	Refer to Note 1
15.203	Antenna Requirement	Pass	Antenna connector is IPEX / MHF-B13-N-01 not a standard connector.

Note:

1. This report is a partial report, only test item of AC Power Conducted Emission and Radiated Emissions were performed for this report. Other testing data please refer to Intel report no.: 181210-03.TR05 for module (Brand: **Intel® Wi-Fi 6 AX200** , Model: AX200NGW).
2. The Maximum Peak Output Power data please refer to SPORTON report no.: FA140648 for SAR.
3. For 2.4G band compliance with rule 15.247(d) of the band-edge items, the test plots were recorded in Annex A. Test Procedures refer to report 4.1.3.
4. 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	150 kHz ~ 30 MHz	2.79 dB
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.04 dB
	30 MHz ~ 200 MHz	3.63 dB
	200 MHz ~ 1000 MHz	3.64 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.29 dB
	18 GHz ~ 40 GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	WLAN and BT , 2x2 PCIe M.2 2230 adapter card
Brand	Intel® Wi-Fi 6 AX200
Test Model	AX200NGW
Status of EUT	Engineering Sample
Power Supply Rating	3.3Vdc form host equipment
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8DPSK
Transfer Rate	1/2/3 Mbps
Operating Frequency	2402 ~ 2480 MHz
Number of Channel	79
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

1. The EUT is authorized for use in specific End-product. Please refer to below table for more details.

Product	Brand	Model
Notebook Computer	Lenovo	Lenovo 300e Chromebook Gen 3*****

Note: *=0~9, A~Z, a~z, "-" or blank, for marketing use only, with no impact on RF compliance of the product.

2. The End-product contains following accessory devices.

Product	Brand	Model	Description
Adapter 1	Lenovo	ADLX45YLC2D	I/P: 100-240Vac, 50-60Hz, 1.8A O/P: 20.0V===2.25A, 45.0W 1.75M / 0core
Adapter 2	Lenovo	ADLX65YCC3D	I/P: 100-240Vac, 50-60Hz, 1.8A O/P: 20.0V===3.25A, 65.0W 1.77M / 0core
Adapter 3	Lenovo	ADLX65NLC3A	I/P: 100-240Vac, 50-60Hz, 1.8A O/P: 20.0V ===3.25A 1.55M / 0core
Battery	Lenovo	L20M3PG0	11.52 Vdc, 3994 mAh, 46Wh

*After pretesting, the adapter 1 was the worst case and chose for final test.

3. The antenna information is listed as below.

Ant. Type	Brand	Ant.	Model	Antenna Peak Gain (dBi)					Connector
				BT	2400-2500MHz	5150-5350MHz	5470-5725MHz	5725-5850MHz	
PIFA	Pulse	Main	SZ1869W (DC33002JN40)	-	-6.68	-2.65	-3.04	-2.58	IPEX 20565 or compatible.
		Aux.	SZ18701 (DC33002JN50)	-2.20	-2.20	-3.52	-4.38	-3.81	
	South Star	Main	N12-7352-R0A (DC33002J040)	-	-4.70	-4.81	-3.26	-3.49	Kangshuo MHF-B13-N-01
		Aux.	N12-7353-R0A (DC33002J050)	-3.90	-3.90	-5.09	-6.35	-6.14	

* The Max antenna gain was chosen for final test.

4. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

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.

3.2 Description of Test Modes

79 channels are provided to this EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To			Description
	RE $\geq$ 1G	RE<1G	PLC	
-	√	√	√	-

Where **RE $\geq$ 1G**: Radiated Emission above 1 GHz **RE<1G**: Radiated Emission below 1 GHz
PLC: Power Line Conducted Emission

Note:

1. "-" means no effect.
2. For radiated emission (below 1GHz) and Power Line Conducted Emission test items chosen the worst maximum fundamental emission level channel

Radiated Emission Test (Above 1 GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	0, 39, 78	FHSS	GFSK	DH5
-	0 to 78	0, 39, 78	FHSS	8DPSK	3DH5

Radiated Emission Test (Below 1 GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	0	FHSS	GFSK	DH5

Power Line Conducted Emission Test:

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	0	FHSS	GFSK	DH5

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE $\geq$ 1G	23 deg. C, 67 % RH	120 Vac, 60 Hz	Luis Lee
RE<1G	23 deg. C, 68 % RH	120 Vac, 60 Hz	Adair Peng
PLC	25 deg. C, 75 % RH	120 Vac, 60 Hz	Edison Lee

3.3 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.

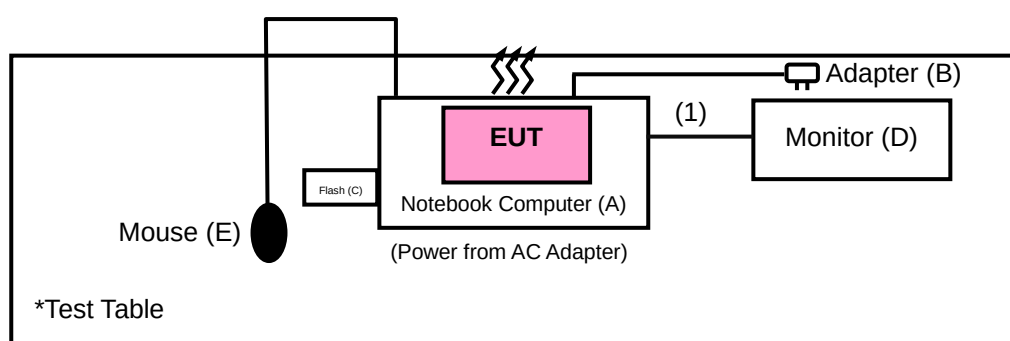
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Notebook Computer	Lenovo	Lenovo 300e Chromebook Gen 3*****	NA	NA	Provided by client
B	Adapter	Lenovo	ADLX45YLC2D	NA	NA	Provided by client
C	Flash	HP	v250W	09	NA	-
D	Monitor	DELL	U2410	CN-0J257M-72872-0A6-02YL	Doc	-
E	Mouse	Microsoft	1113	9170515897028	FCC DOC Approved	-

No.	Signal Cable Description Of The Above Support Units
1.	HDMI Cable: 1m

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Items A, C acted as communication partners to transfer data.

3.3.1 Configuration of System under Test



3.4 General Description of Applied Standards and References

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

Test Standard:

FCC Part 15, Subpart C (15.247)

ANSI C63.10-2013

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

References Test Guidance:

KDB 558074 D01 15.247 Meas Guidance v05r02

All test items have been performed as a reference to the above KDB test guidance.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

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

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

Note:

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

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Dec. 31, 2020	Dec. 30, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Sep. 16, 2020	Sep. 15, 2021
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Nov. 03, 2020	Nov. 02, 2021
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-1170	Nov. 22, 2020	Nov. 21, 2021
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 22, 2020	Nov. 21, 2021
Loop Antenna EMCI	EM-6879	269	Sep. 17, 2020	Sep. 16, 2021
Bluetooth Tester	CBT	100946	Aug. 06, 2020	Aug. 05, 2021
Preamplifier Agilent (Below 1GHz)	8447D	2944A10631	Jun. 08, 2020	Jun. 07, 2021
Preamplifier KEYSIGHT (Above 1GHz)	83017A	MY53270295	Jun. 08, 2020	Jun. 07, 2021
RF Coaxial Cable WOKEN With 5dB PAD	8D-FB	Cable-CH4-01	Aug. 16, 2020	Aug. 15, 2021
RF Coaxial Cable EMCI	EMC102-KM-KM-3000	150929	Aug. 16, 2020	Aug. 15, 2021
RF Coaxial Cable EMCI	EMC102-KM-KM-600	150928	Aug. 16, 2020	Aug. 15, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	MY 13380+295012/04	Jun. 08, 2020	Jun. 07, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH4-03 (250724)	Jun. 08, 2020	Jun. 07, 2021
Software BV ADT	ADT_Radiated_V7.6.15.9.5	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021703	NA	NA
Turn Table BV ADT	TT100	TT93021703	NA	NA
Turn Table Controller BV ADT	SC100	SC93021703	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Pre-amplifier (18GHz-40GHz) EMC	EMC184045B	980175	Sep. 04, 2020	Sep. 03, 2021
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY55190004/MY55190007/MY55210005	Jul. 13, 2020	Jul. 12, 2021

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 HwaYa Chamber 4.

4.1.3 Test Procedures

For Radiated Emission below 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 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 9 kHz at frequency below 30 MHz.

For Radiated Emission above 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 1 GHz) / 1.5 meters (for above 1 GHz) 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 detected 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:

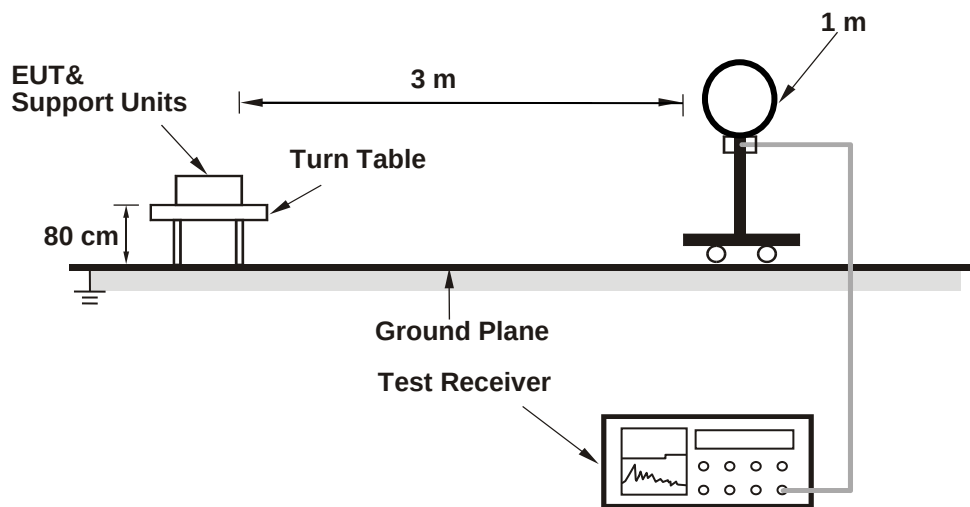
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK)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

4.1.4 Deviation from Test Standard

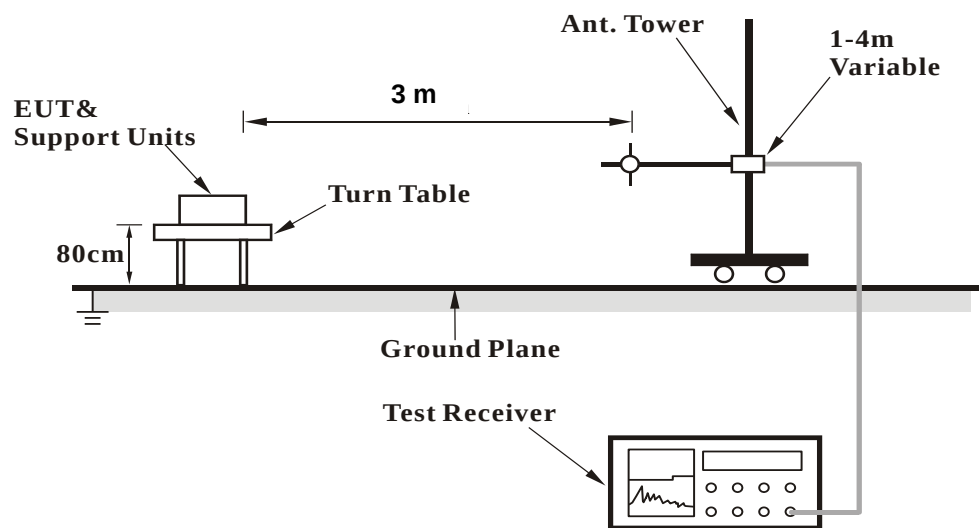
No deviation.

4.1.5 Test Set Up

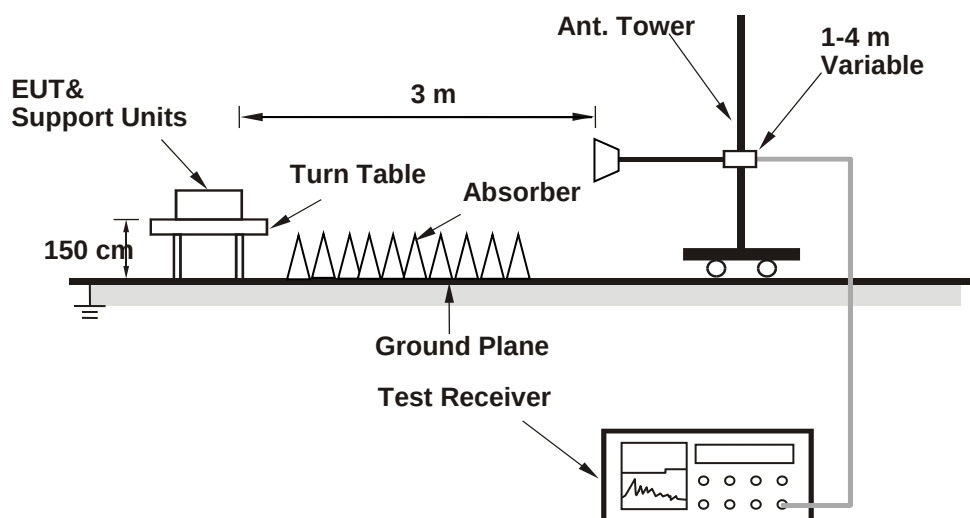
<Radiated Emission below 30 MHz>



<Radiated Emission 30 MHz to 1 GHz>



<Radiated Emission above 1 GHz>



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

4.1.6 EUT Operating Conditions

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

4.1.7 Test Results

ABOVE 1GHz DATA

RF Mode	TX BT_GFSK	Channel	CH 0 : 2402 MHz
Frequency Range	1GHz ~ 25GHz	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	2390.00	60.6 PK	74.0	-13.4	1.21 H	87	26.2	34.4
2	2390.00	46.9 AV	54.0	-7.1	1.21 H	87	12.5	34.4
3	*2402.00	101.5 PK			1.21 H	87	67.0	34.5
4	*2402.00	71.0 AV			1.21 H	87	36.5	34.5
5	4804.00	45.9 PK	74.0	-28.1	2.10 H	55	43.6	2.3
6	4804.00	15.4 AV	54.0	-38.6	2.10 H	55	13.1	2.3
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	59.7 PK	74.0	-14.3	1.67 V	166	25.3	34.4
2	2390.00	46.8 AV	54.0	-7.2	1.67 V	166	12.4	34.4
3	*2402.00	102.3 PK			1.67 V	166	67.8	34.5
4	*2402.00	71.8 AV			1.67 V	166	37.3	34.5
5	4804.00	45.9 PK	74.0	-28.1	1.50 V	88	43.6	2.3
6	4804.00	15.4 AV	54.0	-38.6	1.50 V	88	13.1	2.3

Remarks:

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

RF Mode	TX BT_GFSK	Channel	CH 39 : 2441 MHz
Frequency Range	1GHz ~ 25GHz	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	*2441.00	101.5 PK			1.25 H	82	67.2	34.3
2	*2441.00	71.0 AV			1.25 H	82	36.7	34.3
3	4882.00	46.0 PK	74.0	-28.0	2.16 H	30	43.4	2.6
4	4882.00	15.5 AV	54.0	-38.5	2.16 H	30	12.9	2.6
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	*2441.00	102.2 PK			1.69 V	162	67.9	34.3
2	*2441.00	71.7 AV			1.69 V	162	37.4	34.3
3	4882.00	46.4 PK	74.0	-27.6	1.43 V	90	43.8	2.6
4	4882.00	15.9 AV	54.0	-38.1	1.43 V	90	13.3	2.6

Remarks:

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

RF Mode	TX BT_GFSK	Channel	CH 78 : 2480 MHz
Frequency Range	1GHz ~ 25GHz	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	*2480.00	101.2 PK			1.22 H	87	66.9	34.3
2	*2480.00	70.7 AV			1.22 H	87	36.4	34.3
3	2483.50	52.4 PK	74.0	-21.6	1.22 H	87	54.3	-1.9
4	2483.50	21.9 AV	54.0	-32.1	1.22 H	87	23.8	-1.9
5	4960.00	46.0 PK	74.0	-28.0	2.14 H	63	43.2	2.8
6	4960.00	15.5 AV	54.0	-38.5	2.14 H	63	12.7	2.8
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	*2480.00	101.8 PK			1.84 V	139	67.5	34.3
2	*2480.00	71.3 AV			1.84 V	139	37.0	34.3
3	2483.50	52.8 PK	74.0	-21.2	1.84 V	139	54.7	-1.9
4	2483.50	22.3 AV	54.0	-31.7	1.84 V	139	24.2	-1.9
5	4960.00	46.6 PK	74.0	-27.4	1.61 V	83	43.8	2.8
6	4960.00	16.1 AV	54.0	-37.9	1.61 V	83	13.3	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.
5. " * ": Fundamental frequency.

RF Mode	TX BT_8DPSK	Channel	CH 0 : 2402 MHz
Frequency Range	1GHz ~ 25GHz	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	2390.00	59.6 PK	74.0	-14.4	1.01 H	85	25.2	34.4
2	2390.00	46.7 AV	54.0	-7.3	1.01 H	85	12.3	34.4
3	*2402.00	101.7 PK			1.01 H	85	67.2	34.5
4	*2402.00	71.2 AV			1.01 H	85	36.7	34.5
5	4804.00	45.7 PK	74.0	-28.3	2.23 H	102	43.4	2.3
6	4804.00	15.2 AV	54.0	-38.8	2.23 H	102	12.9	2.3
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	59.9 PK	74.0	-14.1	1.72 V	167	25.5	34.4
2	2390.00	46.8 AV	54.0	-7.2	1.72 V	167	12.4	34.4
3	*2402.00	101.5 PK			1.72 V	167	67.0	34.5
4	*2402.00	71.0 AV			1.72 V	167	36.5	34.5
5	4804.00	46.1 PK	74.0	-27.9	1.63 V	84	43.8	2.3
6	4804.00	15.6 AV	54.0	-38.4	1.63 V	84	13.3	2.3

Remarks:

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

RF Mode	TX BT_8DPSK	Channel	CH 39 : 2441 MHz
Frequency Range	1GHz ~ 25GHz	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	*2441.00	101.4 PK			1.05 H	88	67.1	34.3
2	*2441.00	70.9 AV			1.05 H	88	36.6	34.3
3	4882.00	45.8 PK	74.0	-28.2	1.98 H	110	43.2	2.6
4	4882.00	15.3 AV	54.0	-38.7	1.98 H	110	12.7	2.6
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	*2441.00	101.2 PK			1.70 V	169	66.9	34.3
2	*2441.00	70.7 AV			1.70 V	169	36.4	34.3
3	4882.00	46.1 PK	74.0	-27.9	1.68 V	82	43.5	2.6
4	4882.00	15.6 AV	54.0	-38.4	1.68 V	82	13.0	2.6

Remarks:

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

RF Mode	TX BT_8DPSK	Channel	CH 78 : 2480 MHz
Frequency Range	1GHz ~ 25GHz	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	*2480.00	102.2 PK			1.19 H	79	67.9	34.3
2	*2480.00	71.7 AV			1.19 H	79	37.4	34.3
3	2483.50	61.3 PK	74.0	-12.7	1.19 H	79	63.2	-1.9
4	2483.50	30.8 AV	54.0	-23.2	1.19 H	79	32.7	-1.9
5	4960.00	46.4 PK	74.0	-27.6	2.01 H	107	43.6	2.8
6	4960.00	15.9 AV	54.0	-38.1	2.01 H	107	13.1	2.8
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	*2480.00	100.6 PK			1.41 V	142	66.3	34.3
2	*2480.00	70.1 AV			1.41 V	142	35.8	34.3
3	2483.50	59.8 PK	74.0	-14.2	1.41 V	142	61.7	-1.9
4	2483.50	29.3 AV	54.0	-24.7	1.41 V	142	31.2	-1.9
5	4960.00	46.0 PK	74.0	-28.0	1.66 V	89	43.2	2.8
6	4960.00	15.5 AV	54.0	-38.5	1.66 V	89	12.7	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.
5. " * ": Fundamental frequency.

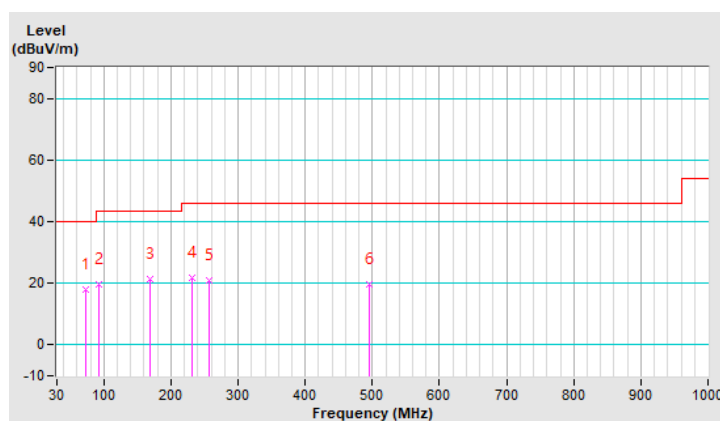
Below 1GHz Worst-Case Data:

RF Mode	TX BT_GFSK	Channel	CH 0 : 2402 MHz
Frequency Range	30MHz ~ 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	72.17	17.8 QP	40.0	-22.2	2.00 H	253	39.1	-21.3
2	93.26	19.8 QP	43.5	-23.7	2.00 H	336	43.6	-23.8
3	169.17	21.3 QP	43.5	-22.2	1.50 H	132	39.8	-18.5
4	231.03	21.8 QP	46.0	-24.2	1.50 H	77	42.5	-20.7
5	256.33	20.8 QP	46.0	-25.2	1.00 H	113	40.1	-19.3
6	495.32	19.7 QP	46.0	-26.3	1.50 H	170	32.6	-12.9

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 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

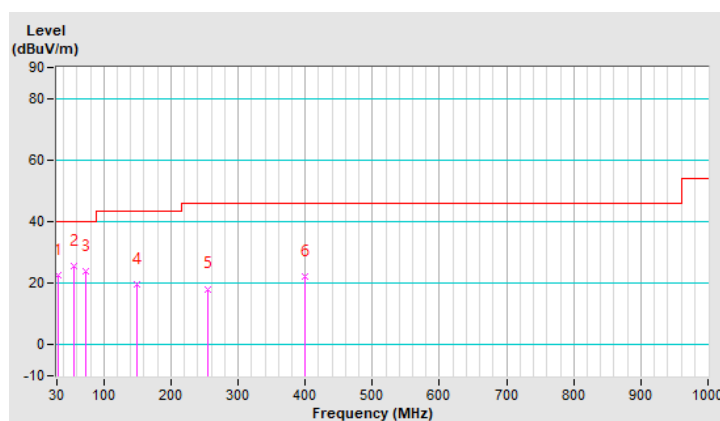


RF Mode	TX BT_GFSK	Channel	CH 0 : 2402 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

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	31.41	22.8 QP	40.0	-17.2	1.00 V	154	42.4	-19.6
2	55.30	25.4 QP	40.0	-14.6	1.50 V	195	43.8	-18.4
3	73.58	24.0 QP	40.0	-16.0	2.00 V	296	45.6	-21.6
4	149.49	19.5 QP	43.5	-24.0	1.50 V	11	37.5	-18.0
5	254.93	18.2 QP	46.0	-27.8	1.50 V	328	37.6	-19.4
6	399.72	22.0 QP	46.0	-24.0	2.00 V	165	37.3	-15.3

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBUV)	
	Quasi-Peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.
 2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Dec. 04, 2020	Dec. 03, 2021
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Jan. 16, 2021	Jan. 15, 2022
LISN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 25, 2021	Feb. 24, 2022
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 28, 2020	Aug. 27, 2021
Software ADT	BV ADT_Cond_ V7.3.7.4	NA	NA	NA

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 HwaYa Shielded Room 1 (Conduction 1).
 3. The VCCI Site Registration No. is C-12040.

4.2.3 Test Procedures

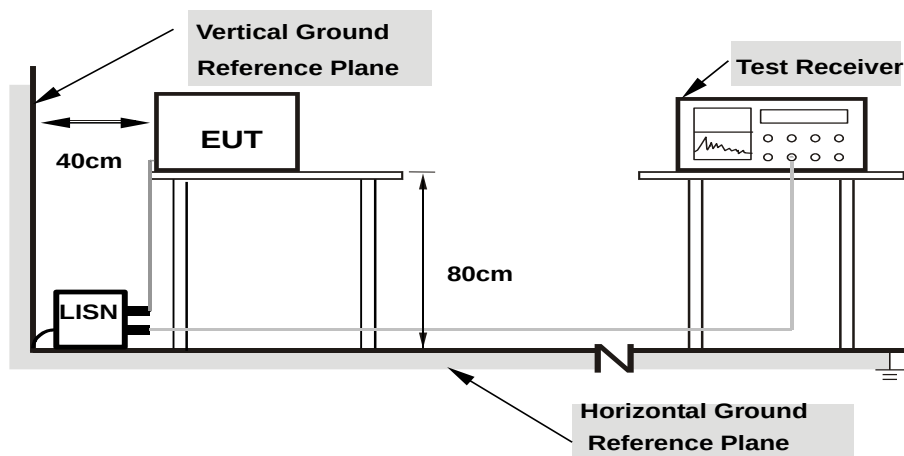
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50 uH of coupling 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 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20 dB) was not recorded.

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

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

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

4.2.6 EUT Operating Condition

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

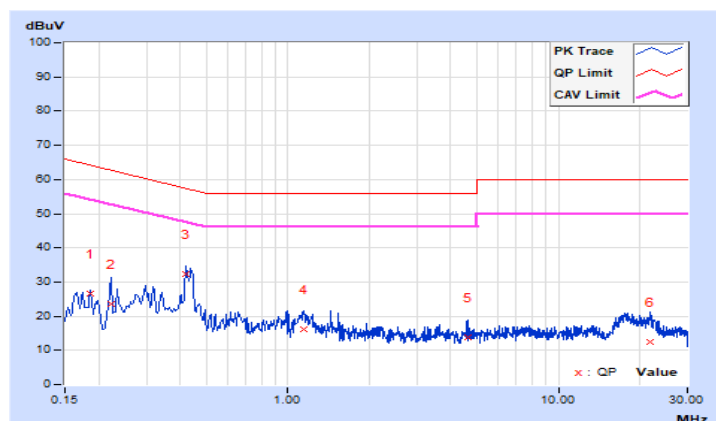
4.2.7 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 75%RH
Tested by	Edison Lee	Test Date	2021/4/29

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	0.18600	9.71	16.96	0.92	26.67	10.63	64.21	54.21	-37.54	-43.58
2	0.22200	9.71	13.91	0.72	23.62	10.43	62.74	52.74	-39.12	-42.31
3	0.42200	9.73	22.43	9.15	32.16	18.88	57.41	47.41	-25.25	-28.53
4	1.14600	9.76	6.28	0.31	16.04	10.07	56.00	46.00	-39.96	-35.93
5	4.66200	9.80	4.06	3.64	13.86	13.44	56.00	46.00	-42.14	-32.56
6	21.80600	9.81	2.51	1.11	12.32	10.92	60.00	50.00	-47.68	-39.08

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

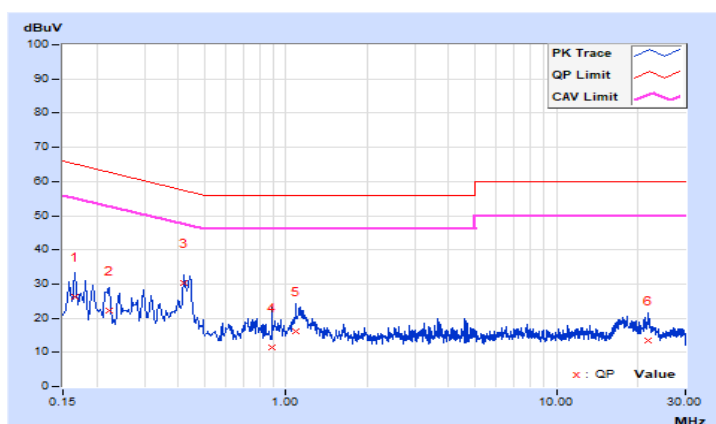


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 75%RH
Tested by	Edison Lee	Test Date	2021/4/29

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	0.16600	9.77	16.55	1.07	26.32	10.84	65.16	55.16	-38.84	-44.32
2	0.22152	9.77	12.49	0.07	22.26	9.84	62.76	52.76	-40.50	-42.92
3	0.42200	9.79	20.50	7.50	30.29	17.29	57.41	47.41	-27.12	-30.12
4	0.89000	9.81	1.49	0.41	11.30	10.22	56.00	46.00	-44.70	-35.78
5	1.08600	9.82	6.42	0.67	16.24	10.49	56.00	46.00	-39.76	-35.51
6	21.96600	9.99	3.63	1.66	13.62	11.65	60.00	50.00	-46.38	-38.35

Remarks:

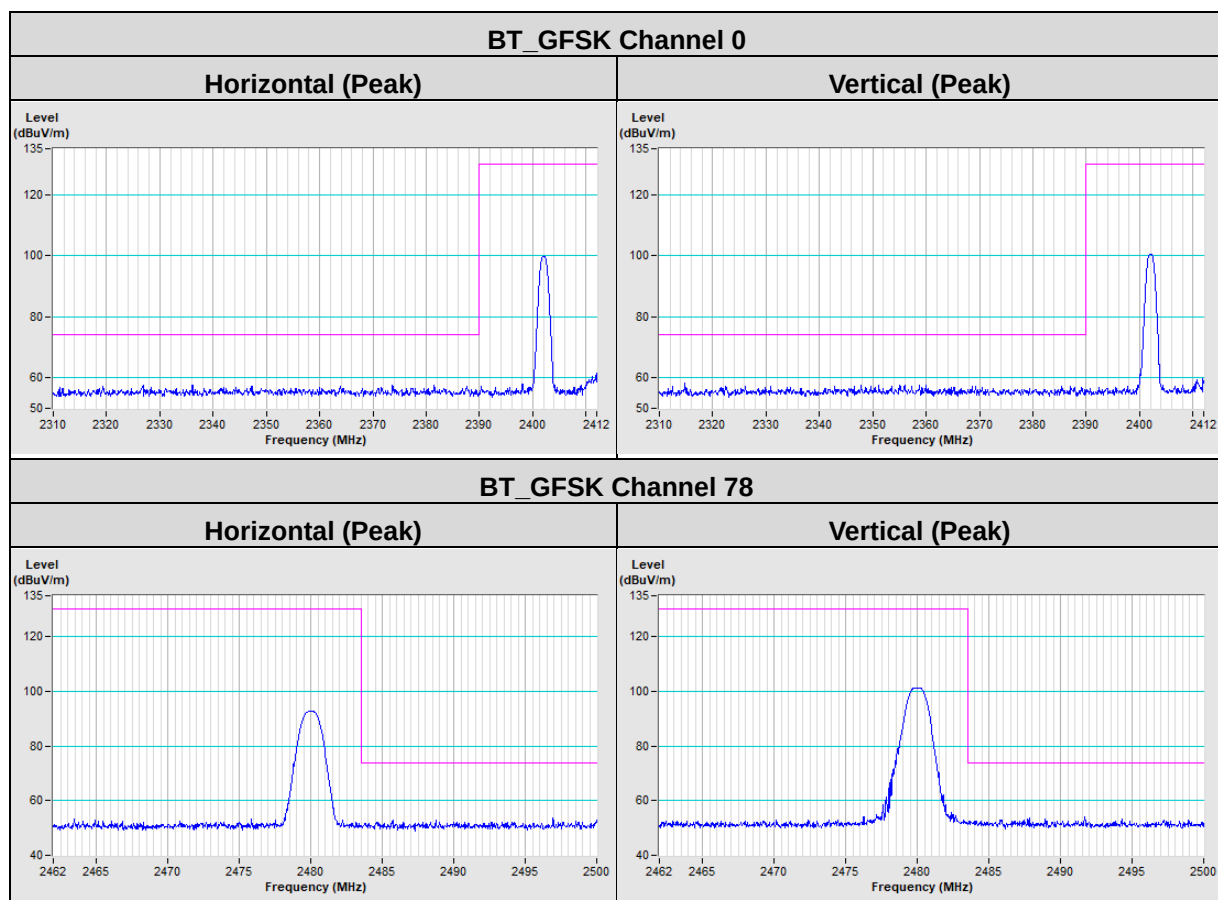
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

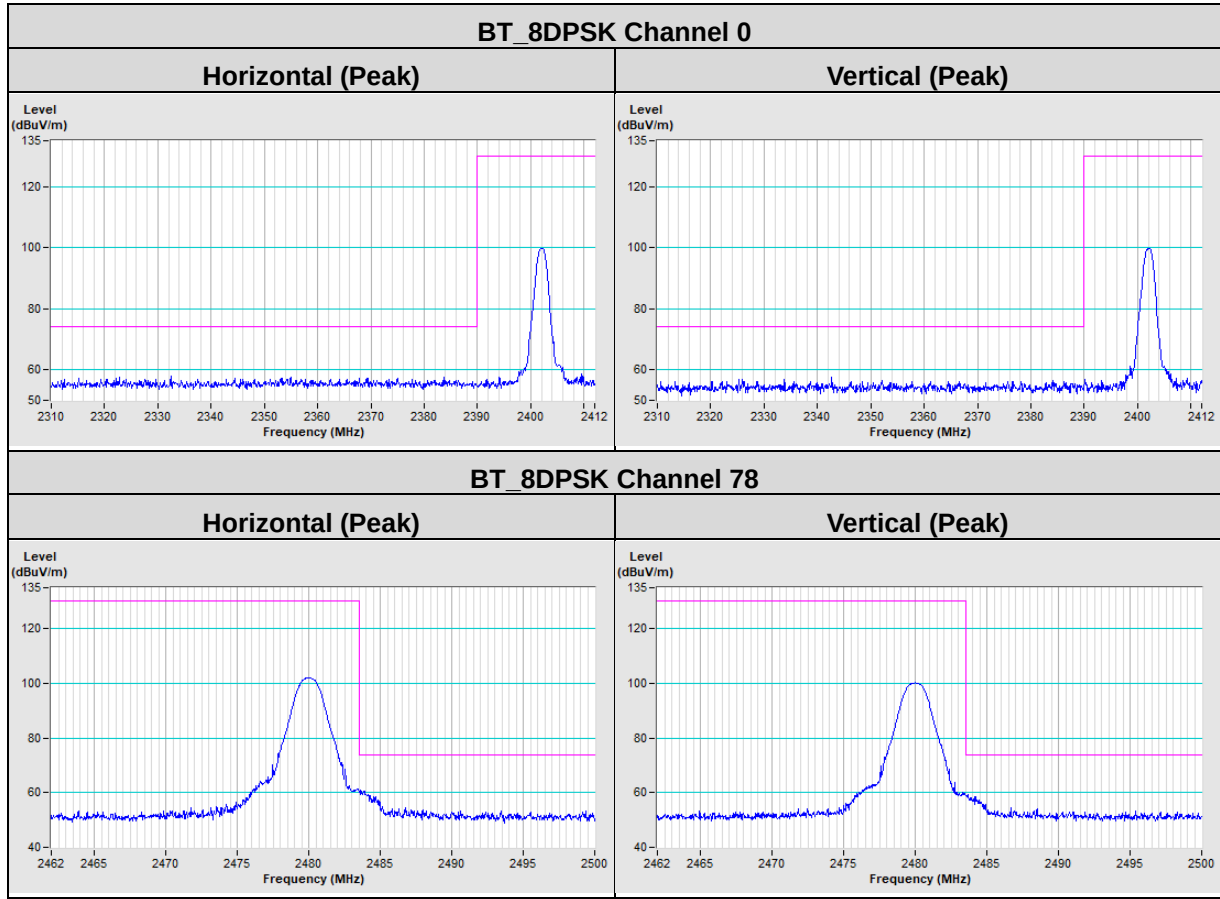


5 Pictures of Test Arrangements

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

Annex A- Band Edge Measurement





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:

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Web Site: www.bureauveritas-adt.com

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

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