Partial FCC Test Report

Report No.:	RFCDVB-WTW-P22100008-3
FCC ID:	QYLAX211NG
Test Model:	AX211NGW
Received Date:	Oct. 11, 2022
Test Date:	Nov. 08 ~ Dec. 08, 2022
Issued Date:	Dec. 26, 2022
Applicant:	Getac Technology Corporation.
Address:	5F., Building A, No. 209, Sec.1, Nangang Rd.,Nangang Dist., Taipei City 11568, Taiwan, R.O.C.
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location (1):	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, Taiwan
Test Location (2):	No. 70, Wenming Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)
FCC Registration / Designation Number (1):	788550 / TW0003
FCC Registration / Designation Number (2):	281270 / TW0032

Testing Laboratory
2021

Table of Contents

Release Control Record

Issue No.	Description	Date Issued
RFCDVB-WTW-P22100008-3	Original release	Dec. 26, 2022

1 Certificate of Conformity

Product:	Wireless Module
Brand:	Getac
Test Model:	AX211NGW
Sample Status:	Engineering sample
Applicant:	Getac Technology Corporation.
Test Date:	Nov. 08 ~ Dec. 08, 2022
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 : Polly Chien , **Date:** Dec. 26, 2022

Polly Chien / Specialist

Approved by : Jeremy Lin , **Date:** Dec. 26, 2022

Jeremy Lin / 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 -8.62dB at 0.41362MHz.
15.247(a)(1)(iii)	Number of Hopping Frequency Used	N/A	Refer to Note
15.247(a)(1)(iii)	Dwell Time on Each Channel	N/A	Refer to Note
15.247(a)(1)	1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	N/A	Refer to Note
15.247(b)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -4.0dB at 45.52MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is I-PEX not a standard connector.

Note:

1. This report is a partial report, only test item of Conducted Emission, Radiated Emissions and Maximum Peak Output Power were performed according to customer requirements. Other testing data please refer to Intel report no.: 200611-01.TR05 for module (Brand: Intel® Wi-Fi 6E AX211, Model: AX211NGW).
2. 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.
3. 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	2.79 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.00 dB
	30MHz ~ 200MHz	2.91 dB
	200MHz ~1000MHz	2.93 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	1.76 dB
	18GHz ~ 40GHz	1.77 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Wireless Module
Brand	Getac
Test Model	AX211NGW
Sample Status	Engineering sample
Power Supply Rating	End-product: 19Vdc (from adapter) 11.1Vdc (from battery)
Modulation Type	GFSK, π/4-DQPSK, 8DPSK
Modulation Technology	FHSS
Transfer Rate	1/2/3Mbps
Operating Frequency	2402~2480MHz
Number of Channel	79
Output Power	10.328mW
Antenna Type	Refer to note
Antenna Connector	Refer to note
Accessory Device	Refer to note
Cable Supplied	NA

Note:

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

Product	Brand	Model	Description
Notebook	Getac	V110	For marketing purpose.
		V110G7	
		V110Y (Y= 10 characters, Y can be 0 to 9, A to Z, a to z, "/", "\", "-", "_" or blank for marketing purpose)	

2. The End-product contains following accessory devices.

Product	Brand	Model	Description
Adapter 1	FSP	FSP065-RBBN3	I/P: 100-240 Vac, 50-60Hz, 1.5 A O/P: 19.0 Vdc, 3.42 A Power Line: 1.5m, with one core
Adapter 2	Getac	MTA190474W4	I/P: 100-240 Vac, 50-60Hz Hz, 1.6 A O/P: 19.0Vdc, 4.74A Power Line: 1.55m, with two cores
Battery	Getac	BP3S1P2100-S	Rating: 11.1Vdc, 2040mAh, 23Wh Typical name: 2100mAh, 24Wh

* After the pretesting, adapter 1 mode is found to be the worst case and therefore had been chosen for final test.

3. The EUT uses the following antennas.

Antenna Type		PIFA								
Antenna Connector		I-PEX								
Antenna Peak Gain (dBi)										
Ant.	BT	2400-2483.5MHz	5150-5250MHz	5250-5350MHz	5470-5725MHz	5725-5850MHz	5925-6425MHz	6425-6525MHz	6525-6875MHz	6875-7125MHz
Main	-	2.79	1.96	1.65	1.88	1.90	0.56	2.99	2.99	2.76
Aux.	2.31	2.31	1.76	1.31	2.07	2.90	2.92	1.48	2.29	2.29

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

4. The End-product configurations of all SKU are listed as below, and SKU2 was the worst case for final test

Part	Brand	Model	Specification	Configuration		
				SKU 1	SKU 2	SKU 3
CPU	Intel	Alder Lake	i5-1235U (Non Vpro)	V		V
			i7-1265U (Vpro)		V	
DDR	Kingston	---	16GB (8GB+8GB)	V		
		---	32GB (16GB+16GB)		V	
		---	64GB (32GB+32GB)			V
SSD	SSSTC	---	256GB	V		
		---	512GB		V	
		---	1TB			V
LCD Panel	AUO	G116HAN01	11.6"	V	V	V
Touchscreen	Getac	---	---	V	V	V
Finger Print	Egistec	---	---	V	V	V
WLAN Module	Intel	AX211NGW	---	V	V	V
GPS	GlobalSat	MC1010G	---	V	V	V
RFID Module	NXP	PN-7462	---		V	V
Digitizer Module	Getac	EMR116-UA00	---		V	V
Bottom Camera	FOXLINK	FN80AF-443H	---	V	V	V
	Chicony	CKAM816	---	V	V	V
Camera	FOXLINK	FN20FF-679H	---	V	V	V
IR Camera	FOXLINK	FN23FF-678H	---		V	V
Option Bay	Honeywell	N6703	Barcode	V		V
	Getac	---	SD Card reader		V	
	Getac	---	Smart Card		V	

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≥1G	RE<1G	PLC	Power	
-	√	√	√	√	-

Where RE≥1G: Radiated Emission above 1GHz & Bandedge Measurement RE<1G: Radiated Emission below 1GHz

PLC: Power Line Conducted Emission Power: Transmit Power Measurement

Note: For radiated emission (below 1GHz) and power line conducted emission test items chosen the worst maximum fundamental emission level channel.

Radiated Emission Test (Above 1GHz):

☒ 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	Pakcet Type
-	0 to 78	0, 39, 78	FHSS	GFSK	DH5
-	0 to 78	0, 39, 78	FHSS	8DPSK	3DH5

Radiated Emission Test (Below 1GHz):

☒ 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	Pakcet Type
-	0 to 78	78	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	Pakcet Type
-	0 to 78	78	FHSS	GFSK	DH5

Maximum Output Power Measurement:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

☒ 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.

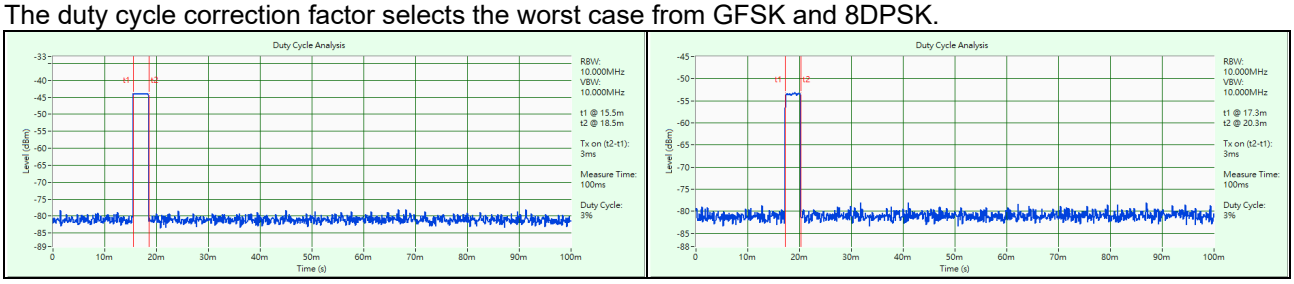
EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Pakcet Type
-	0 to 78	0, 39, 78	FHSS	GFSK	DH5
-	0 to 78	0, 39, 78	FHSS	8DPSK	3DH5

Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
RE≥1G	21 deg. C, 73% RH	120Vac, 60Hz	Adair Peng
RE<1G	23 deg. C, 67% RH	120Vac, 60Hz	Adair Peng
PLC	25 deg. C, 75% RH	120Vac, 60Hz	Rex Wang
Power	25 deg. C, 60% RH	120Vac, 60Hz	Vincent Huang

3.3 Duty Cycle of Test Signal

GFSK: Duty cycle = 3 ms / 100 ms x 100% = 3.0%
8DPSK: Duty cycle = 3 ms / 100 ms x 100% = 3.0%
The duty cycle correction factor selects the worst case from GFSK and 8DPSK.



3.4 Description of Support Units

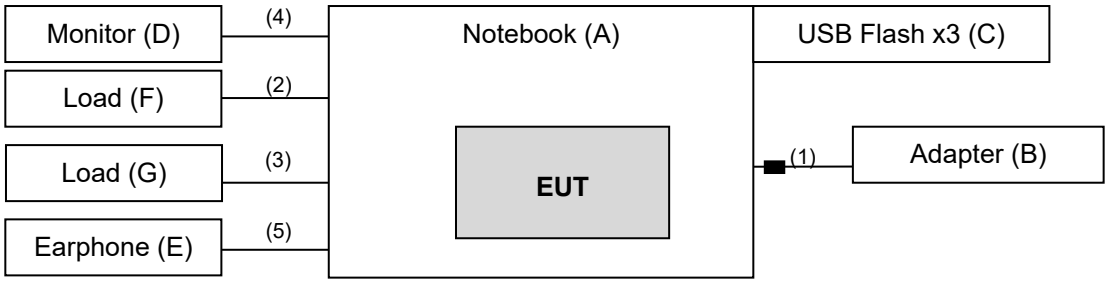
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	Getac	V110G7	N/A	N/A	Provided by Client
B.	Adapter	FSP	FSP065-RBBN3	N/A	N/A	Provided by Client
C.	USB Flash x3	SanDisk	SDDDC3-032G	N/A	N/A	Provided by Lab
D.	Monitor	ASUS	VA24EHE	LCLMTF243824	N/A	Provided by Lab
E.	Earphone	Apple	MB77PFEB	N/A	N/A	Provided by Lab
F.	Load	N/A	N/A	N/A	N/A	Provided by Lab
G.	Load	N/A	N/A	N/A	N/A	Provided by Lab

Note: All power cords of the above support units are non-shielded (1.8m).

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC Cable	1	1.5	N	1	Provided by Client
2.	RJ-45 Cable	1	1.5	N	0	Provided by Lab
3.	Console Cable	1	1	Y	0	Provided by Lab
4.	HDMI Cable	1	1	Y	0	Provided by Lab
5.	Earphone Cable	1	1.5	N	0	Provided by Lab

3.4.1 Configuration of System under Test



3.5 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 20dB 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:

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.

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver Rohde & Schwarz	ESR3	102783	Dec. 21, 2021	Dec. 20, 2022
Spectrum Analyzer KEYSIGHT	N9020B	MY60110513	Dec. 24, 2021	Dec. 23, 2022
BILOG Antenna SCHWARZBECK	VULB9168	9168-1214	Oct. 20, 2022	Oct. 19, 2023
HORN Antenna RF SPIN	DRH18-E	210101A18E	Nov. 14, 2021	Nov. 13, 2022
HORN Antenna SCHWARZBECK	BBHA 9170	9170-1048	Nov. 14, 2021	Nov. 13, 2022
Loop Antenna EMCI	EM-6879	269	Sep. 19, 2022	Sep. 18, 2023
Loop Antenna TESEQ	HLA 6121	45745	Jul. 27, 2022	Jul. 26, 2023
Preamplifier EMCI	EMC330N	980798	Jan. 17, 2022	Jan. 16, 2023
Preamplifier EMCI	EMC118A45SE	980809	Dec. 30, 2021	Dec. 29, 2022
Preamplifier EMCI	EMC184045SE	980786	Jan. 17, 2022	Jan. 16, 2023
RF signal cable EMCI	EMC104-SM-SM-(9000+3000+1000)	201244+ 201232+ 210103	Jan. 17, 2022	Jan. 16, 2023
RF signal cable EMCI	EMCCFD400-NM-NM-(9000+300+500)	201251+ 201249+ 201248	Jan. 17, 2022	Jan. 16, 2023
RF signal cable EMCI	EMC101G-KM-KM-(5000+3000+2000)	201261+201258+ 201255	Jan. 17, 2022	Jan. 16, 2023
Software BV ADT	ADT_Radiated_V7.6.15.9.5	NA	NA	NA
Antenna Tower Max-Full	MFA-515BSN	NA	NA	NA
Turn Table Max-Full	MFT-201SS	NA	NA	NA
Turn Table Controller Max-Full	MF-7802BS	MF780208676	NA	NA
Peak Power Analyzer KEYSIGHT	8990B	MY51000485	Jan. 18, 2022	Jan. 17, 2023
Wideband Power Sensor KEYSIGHT	N1923A	MY58020002	Jan. 17, 2022	Jan. 16, 2023

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 WM Chamber 9.
3. Tested date: Nov. 03 ~ Nov. 10, 2022

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. According to ANSI C63.10 section 7.5, the average value = peak value + duty cycle correction factor. The duty cycle correction factor refer to Chapter 3.2 of this report.

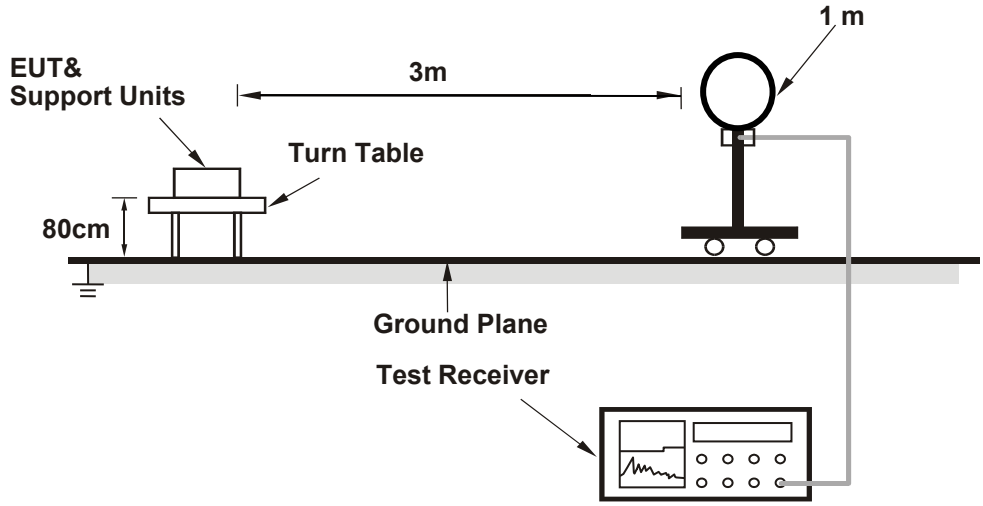
3. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

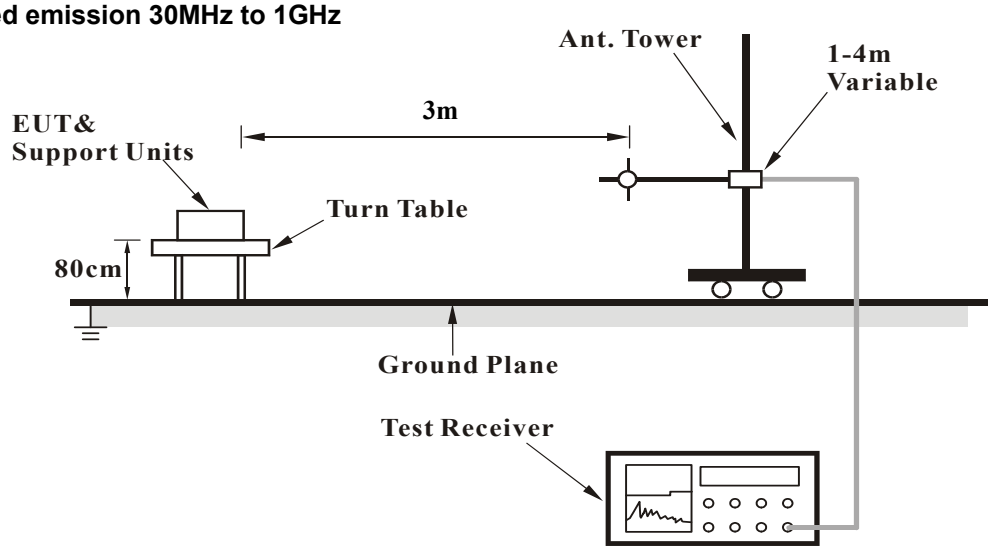
No deviation.

4.1.5 Test Setup

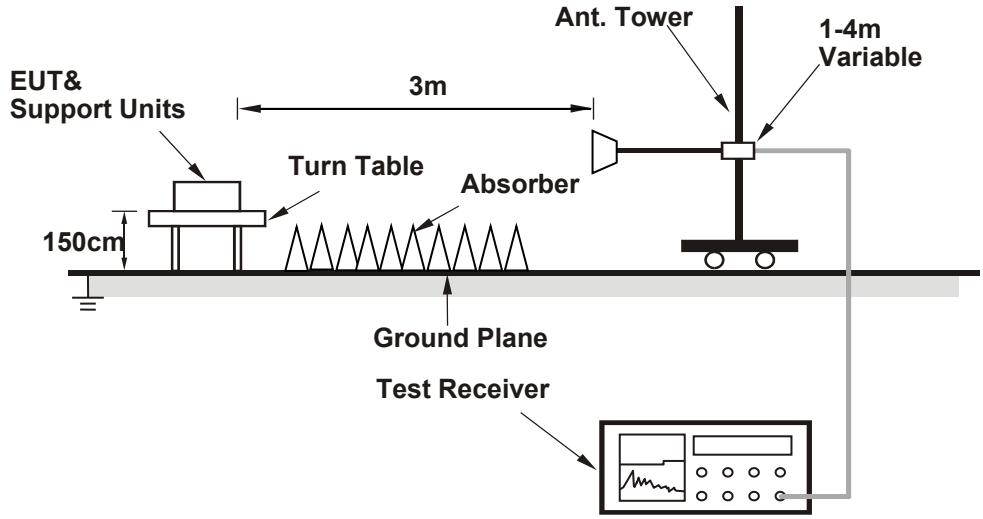
For Radiated emission below 30MHz



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. The EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1GHz data:

GFSK

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	58.4 PK	74.0	-15.6	1.37 H	241	24.5	33.9
2	2390.00	47.3 AV	54.0	-6.7	1.37 H	241	13.4	33.9
3	*2402.00	100.0 PK			1.37 H	241	66.2	33.8
4	*2402.00	69.5 AV			1.37 H	241	35.7	33.8
5	4804.00	50.8 PK	74.0	-23.2	3.03 H	57	40.0	10.8
6	4804.00	20.3 AV	54.0	-33.7	3.03 H	57	9.5	10.8
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	2390.00	58.3 PK	74.0	-15.7	2.12 V	165	24.4	33.9
2	2390.00	47.2 AV	54.0	-6.8	2.12 V	165	13.3	33.9
3	*2402.00	99.3 PK			2.12 V	165	65.5	33.8
4	*2402.00	68.8 AV			2.12 V	165	35.0	33.8
5	4804.00	51.3 PK	74.0	-22.7	3.11 V	5	40.5	10.8
6	4804.00	20.8 AV	54.0	-33.2	3.11 V	5	10.0	10.8

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. for Fundamental frequency and bandedge & harmonic:
   The average value of fundamental frequency is :average = peak value + 20log(Duty cycle)
   where the duty cycle correction factor is calculated from following formula:
   20Log(Duty cycle) = 20 log (3ms*1/100) = -30.5dB please refer to the plotted duty
   (see section 3.2)

CHANNEL	TX Channel 39	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	100.9 PK			1.75 H	240	67.0	33.9
2	*2441.00	70.4 AV			1.75 H	240	36.5	33.9
3	4882.00	51.4 PK	74.0	-22.6	2.97 H	61	40.2	11.2
4	4882.00	20.9 AV	54.0	-33.1	2.97 H	61	9.7	11.2
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	100.0 PK			2.15 V	160	66.1	33.9
2	*2441.00	69.5 AV			2.15 V	160	35.6	33.9
3	4882.00	52.0 PK	74.0	-22.0	3.21 V	10	40.8	11.2
4	4882.00	21.5 AV	54.0	-32.5	3.21 V	10	10.3	11.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. for Fundamental frequency and bandedge & harmonic:
   The average value of fundamental frequency is :average = peak value + 20log(Duty cycle)
   where the duty cycle correction factor is calculated from following formula:
   20Log(Duty cycle) = 20 log (3ms*1/100) = -30.5dB please refer to the plotted duty
   (see section 3.2)

CHANNEL	TX Channel 78	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	101.0 PK			1.72 H	239	67.2	33.8
2	*2480.00	70.5 AV			1.72 H	239	36.7	33.8
3	2483.50	53.1 PK	74.0	-20.9	1.72 H	239	40.9	12.2
4	2483.50	22.6 AV	54.0	-31.4	1.72 H	239	10.4	12.2
5	4960.00	51.3 PK	74.0	-22.7	2.88 H	54	40.3	11.0
6	4960.00	20.8 AV	54.0	-33.2	2.88 H	54	9.8	11.0
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	99.9 PK			2.15 V	167	66.1	33.8
2	*2480.00	69.4 AV			2.15 V	167	35.6	33.8
3	2483.50	52.9 PK	74.0	-21.1	2.15 V	167	40.7	12.2
4	2483.50	22.4 AV	54.0	-31.6	2.15 V	167	10.2	12.2
5	4960.00	51.9 PK	74.0	-22.1	3.17 V	8	40.9	11.0
6	4960.00	21.4 AV	54.0	-32.6	3.17 V	8	10.4	11.0

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. for Fundamental frequency and bandedge & harmonic:
   The average value of fundamental frequency is :average = peak value + 20log(Duty cycle)
   where the duty cycle correction factor is calculated from following formula:
   2 20Log(Duty cycle) = 20 log (3ms*1/100) = -30.5dB please refer to the plotted duty
   (see section 3.2)

8DPSK

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	58.9 PK	74.0	-15.1	1.70 H	243	25.0	33.9
2	2390.00	47.4 AV	54.0	-6.6	1.70 H	243	13.5	33.9
3	*2402.00	98.0 PK			1.70 H	243	64.2	33.8
4	*2402.00	67.5 AV			1.70 H	243	33.7	33.8
5	4804.00	50.8 PK	74.0	-23.2	2.90 H	55	40.0	10.8
6	4804.00	20.3 AV	54.0	-33.7	2.90 H	55	9.5	10.8
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	2390.00	58.7 PK	74.0	-15.3	2.08 V	161	24.8	33.9
2	2390.00	47.3 AV	54.0	-6.7	2.08 V	161	13.4	33.9
3	*2402.00	96.9 PK			2.08 V	161	63.1	33.8
4	*2402.00	66.4 AV			2.08 V	161	32.6	33.8
5	4804.00	47.4 PK	74.0	-26.6	3.17 V	12	40.8	6.6
6	4804.00	16.9 AV	54.0	-37.1	3.17 V	12	10.3	6.6

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. for Fundamental frequency and bandedge & harmonic:
   The average value of fundamental frequency is :average = peak value + 20log(Duty cycle)
   where the duty cycle correction factor is calculated from following formula:
   20Log(Duty cycle) = 20 log (3ms*1/100) = -30.5dB please refer to the plotted duty (see section 3.2)

CHANNEL	TX Channel 39	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	98.8 PK			1.85 H	245	64.9	33.9
2	*2441.00	68.3 AV			1.85 H	245	34.4	33.9
3	4882.00	51.5 PK	74.0	-22.5	2.87 H	54	40.3	11.2
4	4882.00	21.0 AV	54.0	-33.0	2.87 H	54	9.8	11.2
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	97.9 PK			2.20 V	168	64.0	33.9
2	*2441.00	67.4 AV			2.20 V	168	33.5	33.9
3	4882.00	52.3 PK	74.0	-21.7	3.09 V	12	41.1	11.2
4	4882.00	21.8 AV	54.0	-32.2	3.09 V	12	10.6	11.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. for Fundamental frequency and bandedge & harmonic:
   The average value of fundamental frequency is :average = peak value + 20log(Duty cycle)
   where the duty cycle correction factor is calculated from following formula:
   20Log(Duty cycle) = 20 log (3ms*1/100) = -30.5dB please refer to the plotted duty
   (see section 3.2)

CHANNEL	TX Channel 78	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	98.6 PK			1.91 H	246	64.8	33.8
2	*2480.00	68.1 AV			1.91 H	246	34.3	33.8
3	2483.50	54.5 PK	74.0	-19.5	1.91 H	246	42.3	12.2
4	2483.50	24.0 AV	54.0	-30.0	1.91 H	246	11.8	12.2
5	4960.00	51.3 PK	74.0	-22.7	2.93 H	57	40.3	11.0
6	4960.00	20.8 AV	54.0	-33.2	2.93 H	57	9.8	11.0
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	97.7 PK			2.02 V	163	63.9	33.8
2	*2480.00	67.2 AV			2.02 V	163	33.4	33.8
3	2483.50	54.2 PK	74.0	-19.8	2.02 V	163	42.0	12.2
4	2483.50	23.7 AV	54.0	-30.3	2.02 V	163	11.5	12.2
5	4960.00	52.0 PK	74.0	-22.0	3.22 V	18	41.0	11.0
6	4960.00	21.5 AV	54.0	-32.5	3.22 V	18	10.5	11.0

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. for Fundamental frequency and bandedge & harmonic:
   The average value of fundamental frequency is :average = peak value + 20log(Duty cycle)
   where the duty cycle correction factor is calculated from following formula:
   20Log(Duty cycle) = 20 log (3ms*1/100) = -30.5dB please refer to the plotted duty (see section 3.2)

Below 1GHz worst-case data:

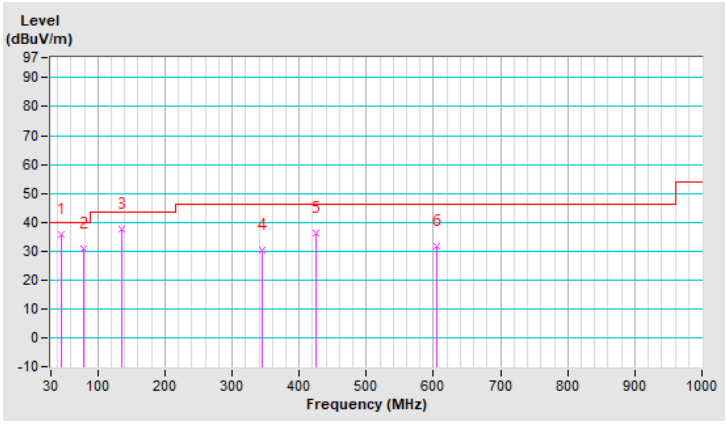
GFSK

CHANNEL	TX Channel 78	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	**45.52**	**36.0 QP**	**40.0**	**-4.0**	**1.01 H**	**348**	**45.2**	**-9.2**
2	79.47	30.7 QP	40.0	-9.3	1.01 H	322	44.1	-13.4
3	135.73	37.4 QP	43.5	-6.1	1.50 H	287	47.2	-9.8
4	345.25	30.5 QP	46.0	-15.5	2.00 H	243	36.6	-6.1
5	424.79	36.2 QP	46.0	-9.8	1.01 H	30	40.3	-4.1
6	604.24	31.7 QP	46.0	-14.3	1.50 H	9	32.1	-0.4

Remarks:

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

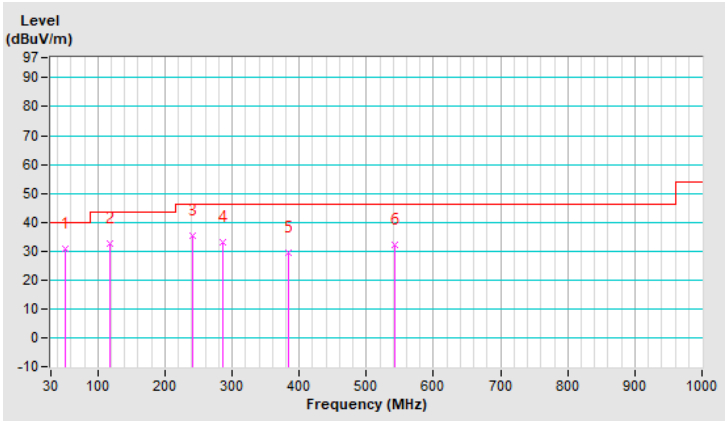


CHANNEL	TX Channel 78	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	52.31	30.6 QP	40.0	-9.4	1.49 V	36	39.7	-9.1
2	118.27	32.6 QP	43.5	-10.9	1.99 V	166	44.0	-11.4
3	240.49	35.3 QP	46.0	-10.7	1.00 V	105	44.7	-9.4
4	286.08	33.0 QP	46.0	-13.0	1.00 V	105	40.3	-7.3
5	383.08	29.6 QP	46.0	-16.4	1.00 V	118	34.8	-5.2
6	543.13	32.0 QP	46.0	-14.0	1.99 V	293	33.8	-1.8

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. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20dB 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

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESR3	102412	Jan. 22, 2022	Jan. 21, 2023
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond2-01	Sep. 03, 2022	Sep. 02, 2023
LISN/AMN ROHDE & SCHWARZ (EUT)	ESH2-Z5	100100	Feb. 17, 2022	Feb. 16, 2023
LISN/AMN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100312	Sep. 22, 2022	Sep. 21, 2023
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 2 (Conduction 2).
3. The VCCI Site Registration No. is C-12047.
4. Tested date: Nov. 17, 2022

4.2.3 Test Procedures

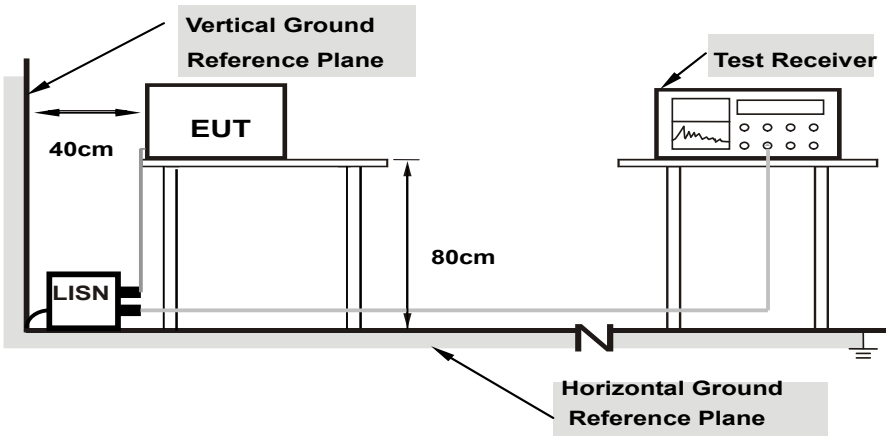
a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling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

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

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

Worst-case data:

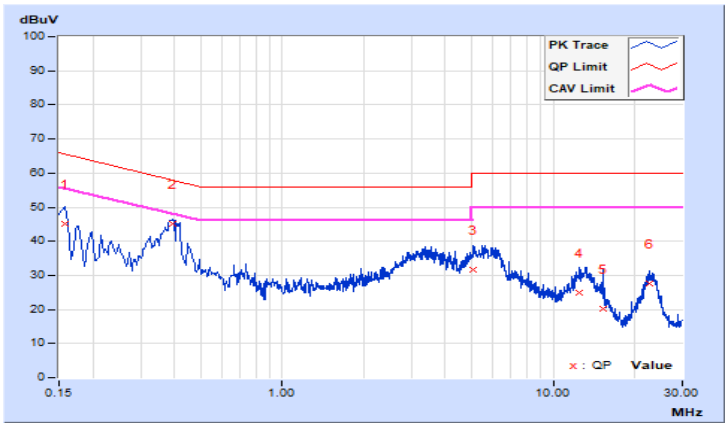
GFSK

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

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15800	10.12	35.12	23.25	45.24	33.37	65.57	55.57	-20.33	-22.20
2	0.39342	10.16	35.12	27.47	45.28	37.63	57.99	47.99	-12.71	-10.36
3	5.07000	10.27	21.33	4.23	31.60	14.50	60.00	50.00	-28.40	-35.50
4	12.46200	10.32	14.58	7.09	24.90	17.41	60.00	50.00	-35.10	-32.59
5	15.27000	10.36	9.71	4.10	20.07	14.46	60.00	50.00	-39.93	-35.54
6	22.57000	10.35	17.16	10.36	27.51	20.71	60.00	50.00	-32.49	-29.29

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.

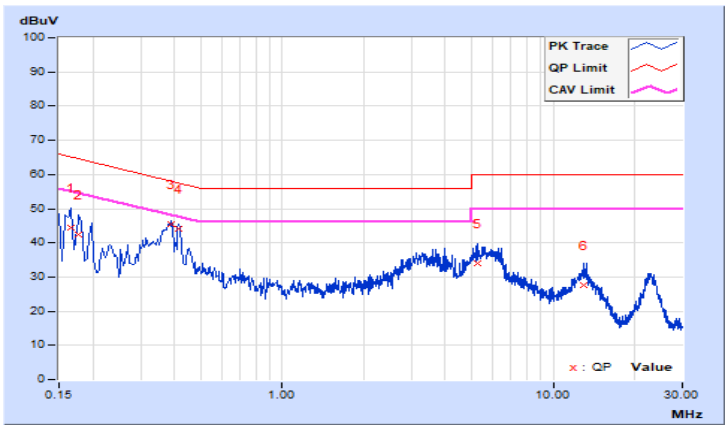


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16579	10.14	34.19	22.92	44.33	33.06	65.17	55.17	-20.84	-22.11
2	0.17800	10.14	32.22	22.30	42.36	32.44	64.58	54.58	-22.22	-22.14
3	0.39000	10.17	35.16	28.86	45.33	39.03	58.06	48.06	-12.73	-9.03
4	**0.41362**	**10.17**	**34.04**	**28.78**	**44.21**	**38.95**	**57.58**	**47.58**	**-13.37**	**-8.63**
5	5.23400	10.29	23.72	17.78	34.01	28.07	60.00	50.00	-25.99	-21.93
6	12.95000	10.42	17.14	10.91	27.56	21.33	60.00	50.00	-32.44	-28.67

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 Maximum Output Power

4.3.1 Limits of Maximum Output Power Measurement

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels: 1 watt.

For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

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 Procedure

For Peak Power
A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

For Average Power
Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

4.3.5 Deviation fromTest Standard

No deviation.

4.3.6 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.3.7 Test Results

For Peak Power

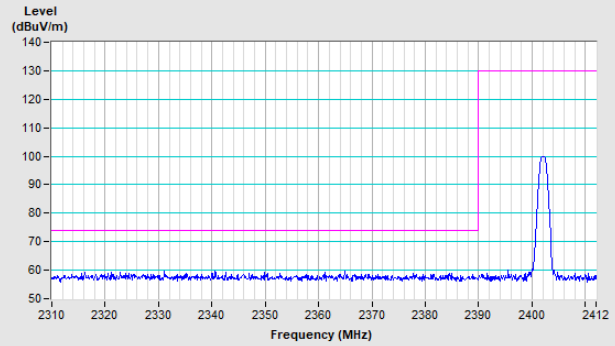
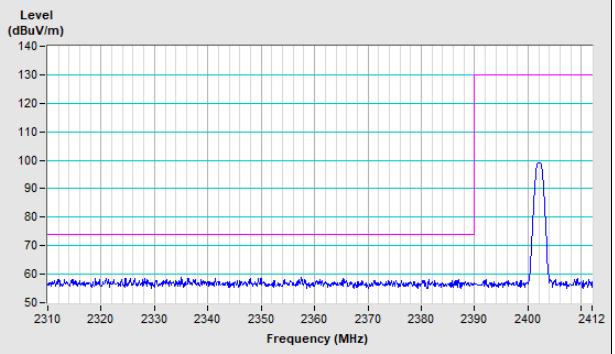
Channel	Frequency (MHz)	Peak Power (mW)		Peak Power (dBm)		Power Limit (mW)	Pass / Fail
		GFSK	8DPSK	GFSK	8DPSK		
0	2402	9.057	8.337	9.57	9.21	125 / 1000 Note	Pass
39	2441	9.795	8.710	9.91	9.40	125 / 1000 Note	Pass
78	2480	10.328	8.511	10.14	9.30	125 / 1000 Note	Pass

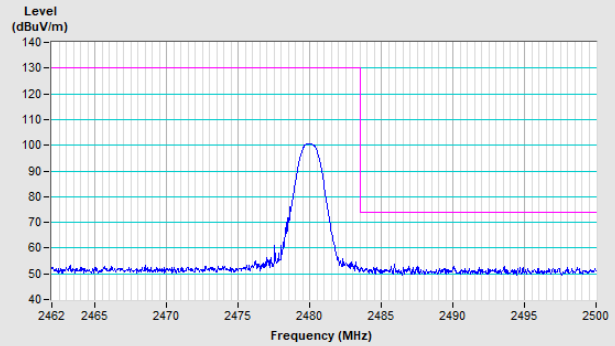
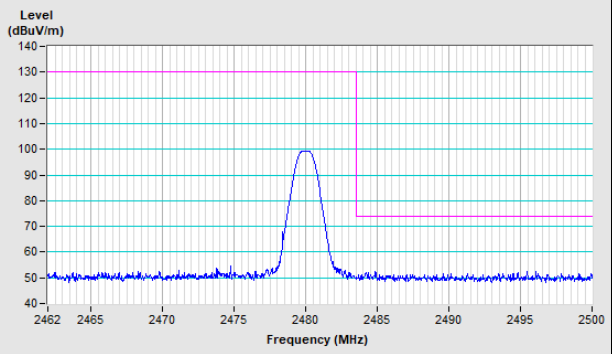
Note: RF Output Power limit depends on the operating channel numbers, please refer to section 3.2 of the results.

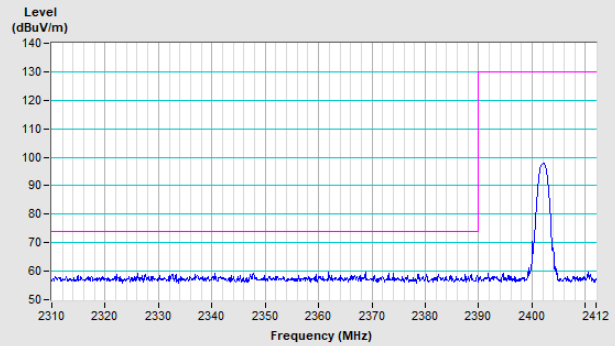
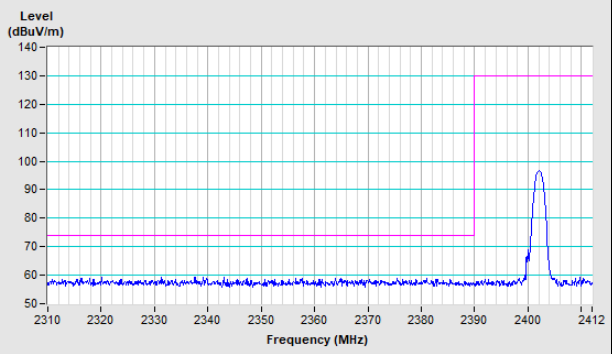
For Average Power

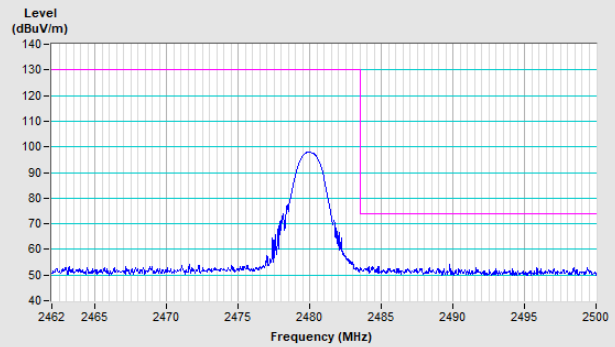
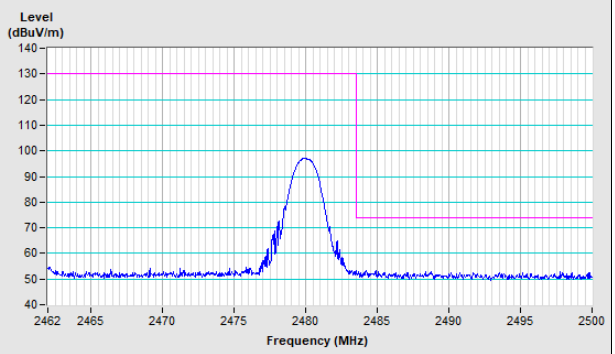
Channel	Frequency (MHz)	Average Power (mW)		Average Power (dBm)	
		GFSK	8DPSK	GFSK	8DPSK
0	2402	8.933	5.546	9.51	7.44
39	2441	9.638	5.420	9.84	7.34
78	2480	10.116	5.702	10.05	7.56

Annex A- Band Edge Measurement

BT_GFSK Channel 0	
Horizontal (Peak)	Vertical (Peak)
	

BT_GFSK Channel 78	
Horizontal (Peak)	Vertical (Peak)
	

BT_8DPSK Channel 0	
Horizontal (Peak)	Vertical (Peak)
	

BT_8DPSK Channel 78	
Horizontal (Peak)	Vertical (Peak)
	

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 and approved 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 ---