

TEST REPORT

CERTIFICATE OF CONFORMITY

Standard: 47 CFR FCC Part 15, Subpart C (Section 15.247)
Report No.: RFBENL-WTW-P24060724-5
FCC ID: RYK-WNFQ291BEBT
Product: WiFi 7/BT module
Brand: Sparklan
Model No.: WNFQ-291BEI(BT)
Series Model: WNFQ-291BE(BT)
Received Date: 2024/8/16
Test Date: 2024/10/26 ~ 2024/12/20
Issued Date: 2025/4/11

Applicant: SparkLAN Communications, Inc.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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FCC Registration / 723255 / TW2022

Designation Number:

Approved by: _____, **Date:** 2025/4/11
May Chen / Manager

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Prepared by : Phoenix Huang / Specialist

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Table of Contents

Release Control Record	3
1 Certificate.....	4
2 Summary of Test Results	5
2.1 Measurement Uncertainty	5
2.2 Supplementary Information	5
3 General Information	6
3.1 General Description.....	6
3.2 Antenna Description of EUT.....	7
3.3 Channel List.....	8
3.4 Test Mode Applicability and Tested Channel Detail.....	9
3.5 Duty Cycle of Test Signal.....	10
3.6 Test Program Used and Operation Descriptions	11
3.7 Connection Diagram of EUT and Peripheral Devices	11
3.8 Configuration of Peripheral Devices and Cable Connections	13
4 Test Instruments	14
4.1 RF Output Power.....	14
4.2 Unwanted Emissions below 1 GHz	14
4.3 Unwanted Emissions above 1 GHz.....	15
5 Limits of Test Items.....	16
5.1 RF Output Power.....	16
5.2 Unwanted Emissions below 1 GHz	16
5.3 Unwanted Emissions above 1 GHz.....	16
6 Test Arrangements.....	17
6.1 RF Output Power.....	17
6.1.1 Test Setup	17
6.1.2 Test Procedure.....	17
6.2 Unwanted Emissions below 1 GHz	18
6.2.1 Test Setup	18
6.2.2 Test Procedure.....	19
6.3 Unwanted Emissions above 1 GHz.....	21
6.3.1 Test Setup	21
6.3.2 Test Procedure.....	21
7 Test Results of Test Item	22
7.1 RF Output Power.....	22
7.2 Unwanted Emissions below 1 GHz	24
7.3 Unwanted Emissions above 1 GHz.....	27
8 Pictures of Test Arrangements	35
9 Information of the Testing Laboratories	36

Release Control Record

Issue No.	Description	Date Issued
RFBENL-WTW-P24060724-5	Original release.	2025/4/11

1 Certificate

Product: WiFi 7/BT module

Brand: Sparklan

Test Model: WNFQ-291BEI(BT)

Series Model: WNFQ-291BE(BT)

Sample Status: Engineering sample

Applicant: SparkLAN Communications, Inc.

Test Date: 2024/10/26 ~ 2024/12/20

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

Measurement procedure: ANSI C63.10-2013
KDB 558074 D01 15.247 Meas Guidance v05r02
KDB 662911 D01 Multiple Transmitter Output v02r01

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.

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
Standard / Clause	Test Item	Result	Remark
15.247 (a)(1)	RF Output Power	Pass	Meet the requirement of limit.
15.247(a)(1) (iii)	Number of Hopping Frequency Used	N/A	Refer to Note 1 below
15.247(a)(1) (iii)	Dwell Time on Each Channel	N/A	Refer to Note 1 below
15.247(a)(1)	Hopping Channel Separation	N/A	Refer to Note 1 below
15.247(a)(1)	20 dB Bandwidth	N/A	Refer to Note 1 below
15.247(d)	Conducted Out of Band Emissions	N/A	Refer to Note 1 below
15.207	AC Power Conducted Emissions	N/A	Refer to Note 1 below
15.205 / 15.209 / 15.247(d)	Unwanted Emissions below 1 GHz	Pass	Minimum passing margin is -1.5 dB at 199.28 MHz
15.205 / 15.209 / 15.247(d)	Unwanted Emissions above 1 GHz	Pass	Minimum passing margin is -17.2 dB at 7323.00 MHz
15.203	Antenna Requirement	Pass	Antenna connector is MHF 4L, I-PEX MHF4, RP-SMA (M), MHF4L to SMA-F not a standard connector.

Notes:

- Only RF Output Power and Unwanted Emissions test items were performed for this addendum. The others testing data refer to original test report (Original FCC ID: J9C-QCNCM865).
- 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	Specification	Expanded Uncertainty (k=2) (±)
RF Output Power	-	1.1 dB
Unwanted Emissions below 1 GHz	9 kHz ~ 30 MHz	3.1 dB
	30 MHz ~ 1 GHz	5.1 dB
Unwanted Emissions above 1 GHz	1 GHz ~ 18 GHz	5.1 dB
	18 GHz ~ 40 GHz	5.3 dB

The other instruments specified are routine verified to remain within the calibrated levels, no measurement uncertainty is required to be calculated.

2.2 Supplementary Information

There is not any deviation from the test standards for the test method, and no modifications required for compliance.

3 General Information

3.1 General Description

Product	WiFi 7/BT module
Brand	Sparklan
Test Model	WNFQ-291BEI(BT)
Series Model	WNFQ-291BE(BT)
Status of EUT	Engineering sample
Power Supply Rating	3.3 Vdc from host equipment
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8DPSK
Modulation Technology	FHSS
Transfer Rate	Up to 3 Mbps
Operating Frequency	2.402 GHz ~ 2.48 GHz
Number of Channel	79
Output Power	1Tx: 34.041 mW (15.32 dBm) 2Tx: 28.828 mW (14.60 dBm)

Note:

- This report is prepared for FCC class II permissive change. The difference compared with the original design is as the following:
 - ◆ Add Dipole antenna and Chip antenna (Refer to section 3.2)
 - ◆ Change shielding case and add thermal pad.
 - ◆ Change temperature operating range to -40 °C ~ 85 °C
- According to above conditions, there are RF Output Power and Unwanted Emissions test items need to be performed. All data for meeting the requirement is verified.
- All models are listed as below.

Brand	Model	Difference
Sparklan	WNFQ-291BEI(BT)	All models are electrically identical, different model names are for marketing purpose.
	WNFQ-291BE(BT)	

From the above models, model: WNFQ-291BEI(BT) was selected as representative model for the test and its data was recorded in this report.

- There are Bluetooth (EDR, BLE, QHS) and WLAN (2.4 GHz & 5 GHz & 5.9 GHz & 6 GHz) technology used for the EUT.
- Simultaneously transmission combination.

DBS			
Combination	Technology		
1	WLAN(2.4GHz) _Ant 0+1	WLAN(5GHz) _Ant 0+1	
2	WLAN(2.4GHz) _Ant 0+1	WLAN(6GHz) _Ant 0+1	
HBS+BT			
Combination	Technology		
3	Bluetooth _Ant 0+1	WLAN(5GHz) _Ant 0+1	
4	Bluetooth _Ant 0+1	WLAN(6GHz) _Ant 0+1	
5	WLAN(5GHz _U-NII-1, U-NII-2A) _Ant 0+1	WLAN(5GHz _U-NII-2C, U-NII-3, U-NII-4) _Ant 0+1	Bluetooth
6	WLAN(5GHz _U-NII-1, U-NII-2A) _Ant 0+1	WLAN(6GHz) _Ant 0+1	Bluetooth

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

- The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.2 Antenna Description of EUT

1. The antenna information is listed as below.

Original									
Antenna Set	RF Chain No.	Brand	Model	Antenna Net Gain (dBi)	Frequency Range (GHz)	Cable Loss (dB)	Antenna Type	Connector Type	Cable Length (mm)
1	Chain0/1	Hong-Bo	260-25094	3.53 3.06 3.07 4.81 4.2	2.4~2.4835 5.15~5.25 5.25~5.35 5.47~5.725 5.725~5.850	0.74 1.16 1.18 1.26 1.28	PIFA	MHF 4L	300
2	Chain0/1	Hong-Bo	260-25083	5.09 5.14 5.09 5.16 5.12	5.850~5.895 5.925~6.425 6.425~6.525 6.525~6.875 6.875~7.125	1.29 1.35 1.38 1.45 1.50	PIFA	MHF 4L	300
3	Chain0/1	Hong-Bo	260-25084	3.22 3.35 3.42 4.77 4.72 4.71 4.75 4.29 4.81 4.74	2.4~2.4835 5.150~5.250 5.250~5.350 5.470~5.725 5.725~5.850 5.850~5.895 5.925~6.425 6.425~6.525 6.525~6.875 6.875~7.125	0.49 0.76 0.77 0.80 0.84 0.84 0.86 0.91 0.96 0.98	Monopole	MHF 4L	200
Newly									
Antenna Set	RF Chain No.	Brand	Model	Antenna Net Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connector Type	Cable Length (mm)	
4	Chain0/1	SparkLAN	AD-513AX	3.11 4.46 4.07 4.53 4.06 4.04 3.97	2.4~2.4835 5.150~5.850 5.850~5.895 5.925~6.425 6.425~6.525 6.525~6.875 6.875~7.125	Dipole	I-PEX MHF4	150	
5	Chain0/1	SparkLAN	AD-510AX	2.27 2.88 2.6 3.23 3.34 3.52 3.52	2.4~2.4835 5.150~5.850 5.850~5.895 5.925~6.425 6.425~6.525 6.525~6.875 6.875~7.125	Dipole	RP-SMA (M)	150	
6	Chain0/1	SparkLAN	AD-512AX	2.35 3.00 2.80 2.87 3.02 3.02 2.61	2.4~2.4835 5.150~5.850 5.850~5.895 5.925~6.425 6.425~6.525 6.525~6.875 6.875~7.125	Dipole	RP-SMA (M)	150	
7	Chain0/1	SparkLAN	AD-516AX	1.65 4.3 3.98 4 4 3.91 3.78	2.4~2.4835 5.150~5.850 5.850~5.895 5.925~6.425 6.425~6.525 6.525~6.875 6.875~7.125	Dipole	I-PEX MHF4	250	
8	Chain0/1	Johanson	2450AD18A6050	2 1.5 2.7 2.7 2.7 2.7 2.7	2.4~2.4835 5.150~5.850 5.850~5.895 5.925~6.425 6.425~6.525 6.525~6.875 6.875~7.125	Chip	MHF4L to SMA-F	-	

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

3.3 Channel List

79 channels are provided for BT-EDR:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (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		

3.4 Test Mode Applicability and Tested Channel Detail

Pre-Scan:	1. The Dipole and Chip of antenna type in antennas can be used in the following ways: X / Y / Z axis. Pre-scan in these ways and find the worst case as a representative test condition. 2. Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates.
Worst Case:	1. Dipole antenna the worst case was found when positioned on (X / Y / Z axis): Y axis 2. Chip antenna the worst case was found when positioned on (X / Y / Z axis): Y axis

Following channel(s) was (were) selected for the final test as listed below:

Test Item	EUT Configure Mode	Tested Channel	Tx Antenna	Modulation	Data Rate Parameter
RF Output Power	-	0, 39, 78	1Tx / 2Tx	GFSK	DH5
				8DPSK	3DH5
Unwanted Emissions below 1 GHz	A, B	39	1Tx	GFSK	DH5
Unwanted Emissions above 1 GHz	C, D	39	1Tx / 2Tx	GFSK	DH5
EUT Configure Mode:	A	EUT only (remove 50 ohm terminator and Connect to the appropriate equipment)			
	B	EUT with 50 ohm terminator			
	C	EUT with Dipole antenna (Model: AD-513AX)			
	D	EUT with Chip antenna (Model: 2450AD18A6050)			

Note:

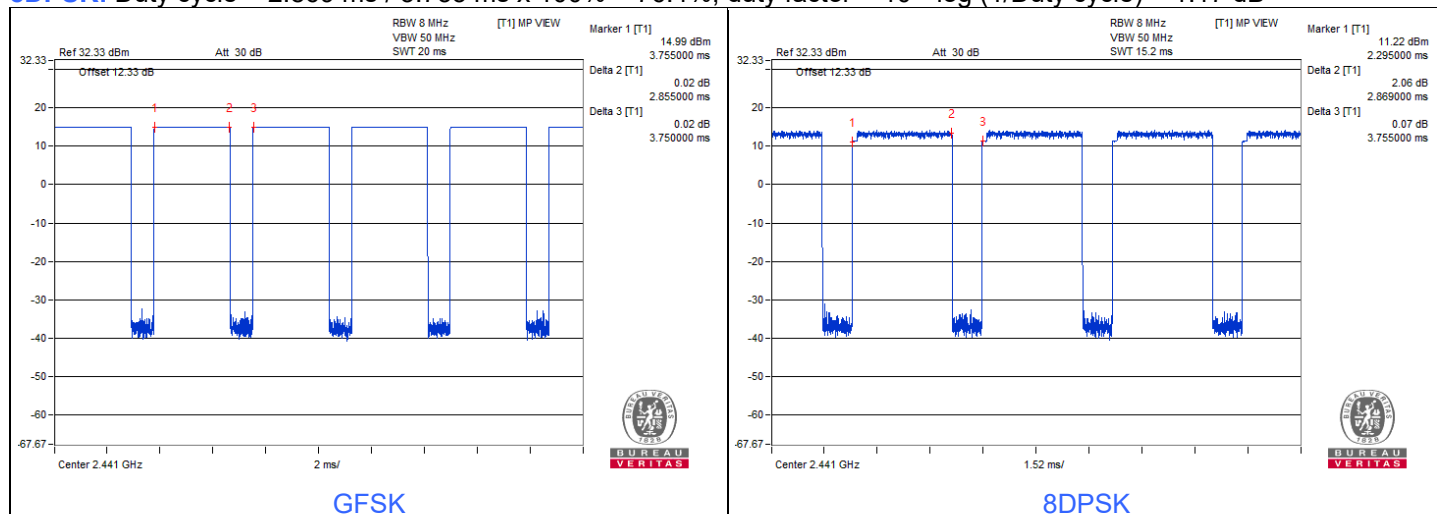
- For 1Tx diversity configuration the worst chain is: Chain 0.
- The unwanted emission above 1GHz were performed in radiated measurement with maximum antenna gain of dipole antenna.
- For unwanted emission test items, the tested channel was chosen the worst case as mode represent to report.

3.5 Duty Cycle of Test Signal

1Tx

GFSK: Duty cycle = $2.855 \text{ ms} / 3.75 \text{ ms} \times 100\% = 76.1\%$, duty factor = $10 * \log (1/\text{Duty cycle}) = 1.18 \text{ dB}$

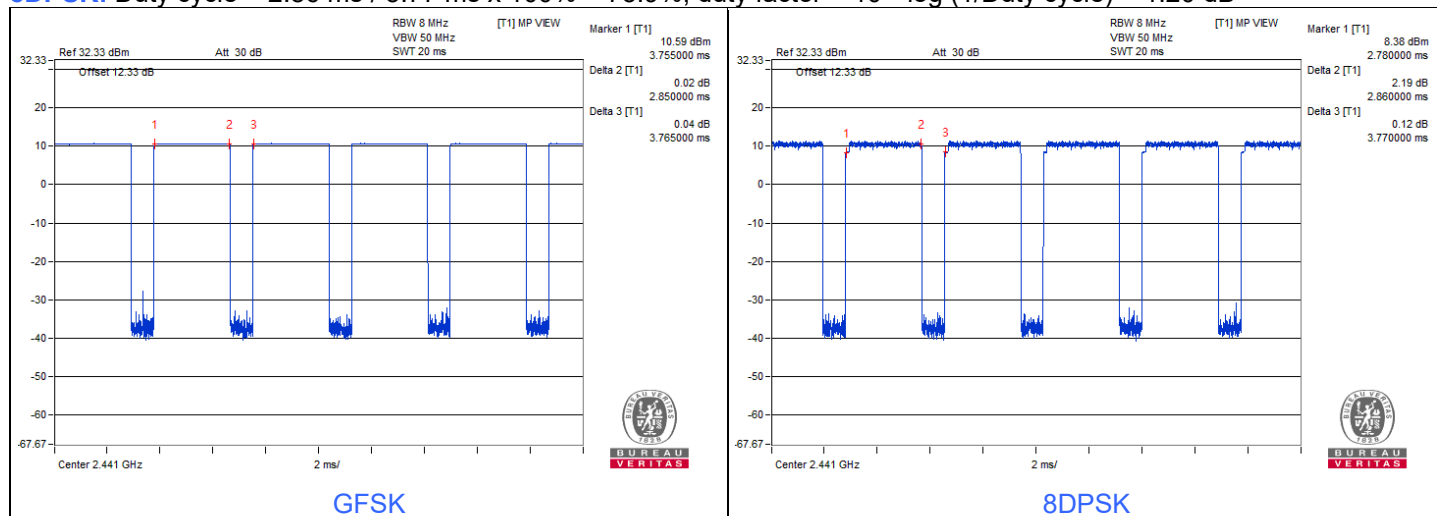
8DPSK: Duty cycle = $2.869 \text{ ms} / 3.755 \text{ ms} \times 100\% = 76.4\%$, duty factor = $10 * \log (1/\text{Duty cycle}) = 1.17 \text{ dB}$



2Tx

GFSK: Duty cycle = $2.85 \text{ ms} / 3.765 \text{ ms} \times 100\% = 75.7\%$, duty factor = $10 * \log (1/\text{Duty cycle}) = 1.21 \text{ dB}$

8DPSK: Duty cycle = $2.86 \text{ ms} / 3.77 \text{ ms} \times 100\% = 75.9\%$, duty factor = $10 * \log (1/\text{Duty cycle}) = 1.20 \text{ dB}$



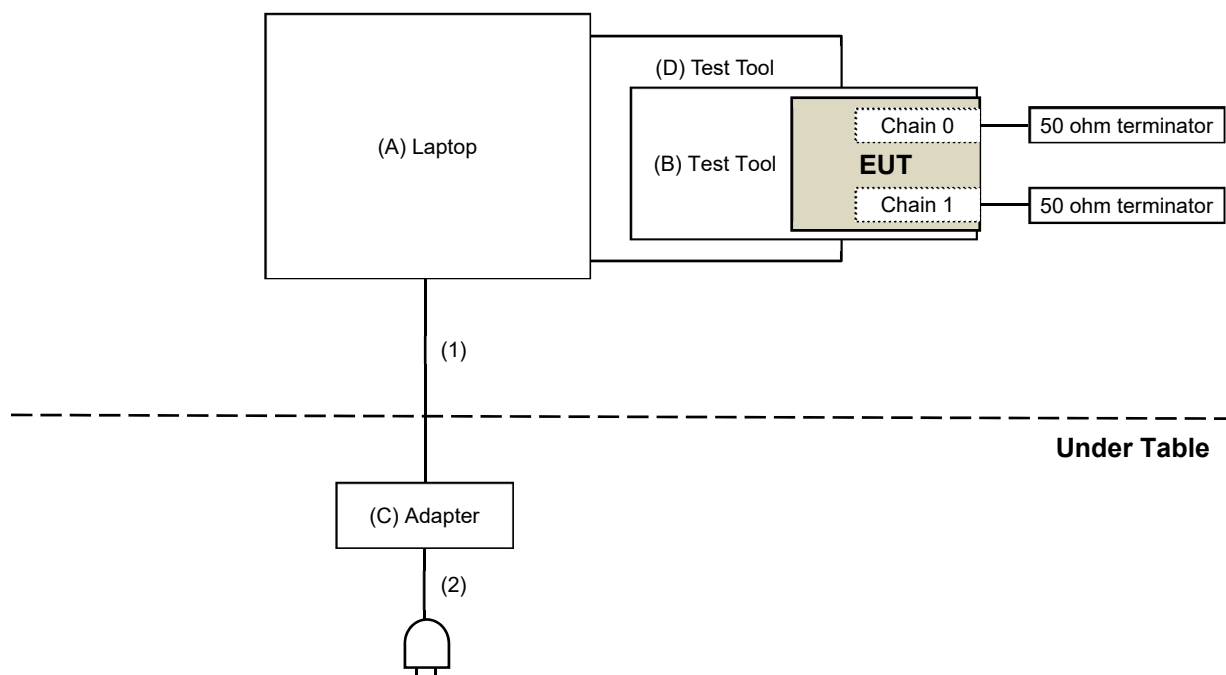
3.6 Test Program Used and Operation Descriptions

Controlling software (Bluetooth and ANT QRCT Module V4.0.00031.1) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

3.7 Connection Diagram of EUT and Peripheral Devices

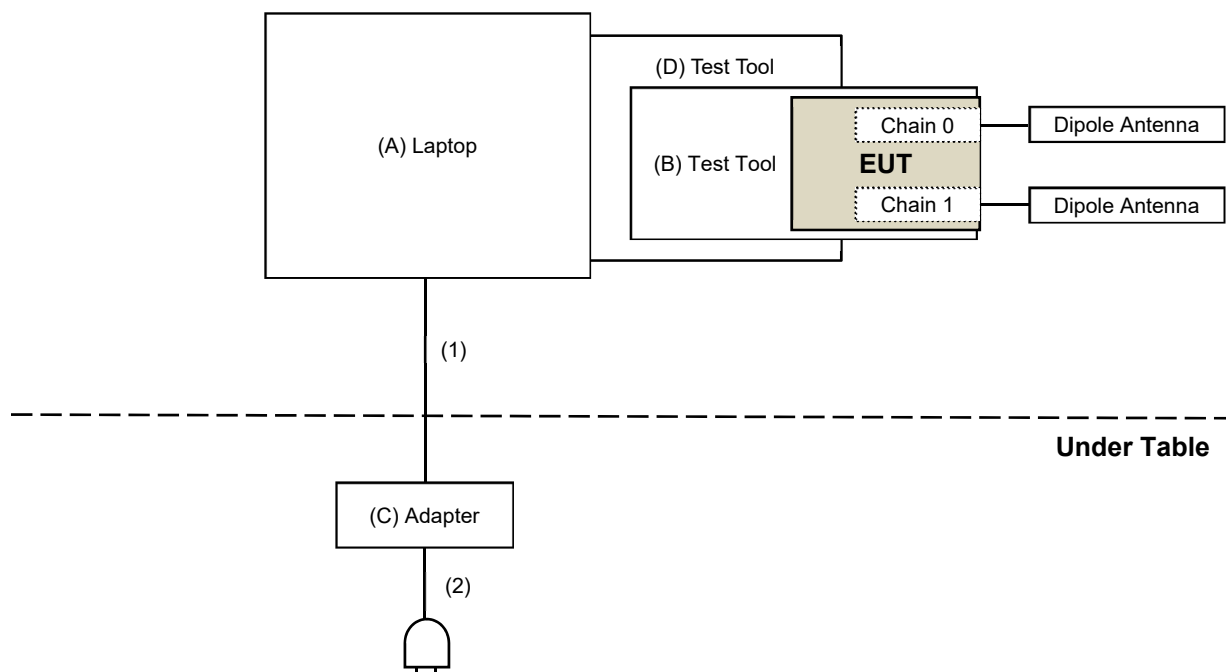
For Unwanted Emission test below 1G

Mode B

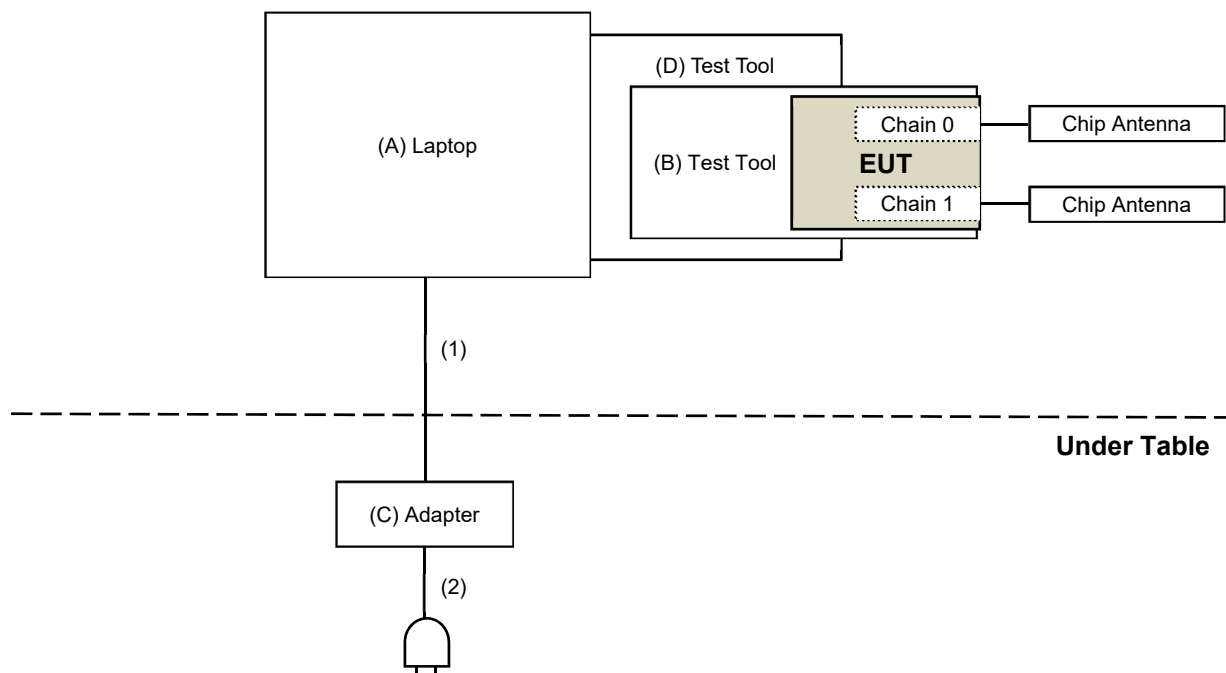


For Unwanted Emission test above 1G

Mode C



Mode D



3.8 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Laptop	Dell	E6430	N/A	N/A	Supplied by applicant
B	Test Tool	Qualcomm	N/A	N/A	N/A	Supplied by applicant
C	Adapter	Dell	LA65NM130	N/A	N/A	Supplied by applicant
D	Test Tool	Qualcomm	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	0	Supplied by applicant
2	AC Cable	1	1.5	No	0	Supplied by applicant

4 Test Instruments

The calibration interval of the all test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.1 RF Output Power

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Pulse Power Sensor Anritsu	MA2411B	1726434	2024/6/7	2025/6/6
RF Power Meter Anritsu	ML2495A	1529002	2024/6/7	2025/6/6

Notes:

1. The test was performed in Oven room 2.
2. Tested Date: 2024/10/26

4.2 Unwanted Emissions below 1 GHz

Mode A

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
MXA Signal Analyzer Keysight	N9020B	MY60112408	2024/3/7	2025/3/6
Software	ADT_RF Test Software V7.6.5.4	N/A	N/A	N/A

Notes:

1. The test was performed in Oven room 2.
2. Tested Date: 2024/10/26

Mode B

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Bi_Log Antenna Schwarzbeck	VULB 9168	9168-0842	2024/10/8	2025/10/7
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	N/A	N/A
EMI Test Receiver R&S	ESR7	102026	2024/3/25	2025/3/24
Fixed Attenuator Mini-Circuits	UNAT-5+	PAD-ATT5-02	2024/3/30	2025/3/29
Loop Antenna TESEQ	HLA 6121	63620	2024/10/17	2025/10/16
Preamplifier EMCI	EMC330N	980538	2024/3/30	2025/3/29
	EMC001340	980142	2024/2/19	2025/2/18
PXA Signal Analyzer Keysight	N9030B	MY57141948	2024/5/20	2025/5/19
RF Coaxial Cable JYBAO	5D-FB	LOOPCAB-001	2024/2/19	2025/2/18
		LOOPCAB-002	2024/2/19	2025/2/18
RF Coaxial Cable PEWC	8D	966-5-1	2024/3/30	2025/3/29
		966-5-2	2024/3/30	2025/3/29
		966-5-3	2024/3/30	2025/3/29
Software	ADT_Radiated_V8.7.08	N/A	N/A	N/A

Notes:

1. The test was performed in 966 Chamber No. 5.
2. Tested Date: 2024/10/29

4.3 Unwanted Emissions above 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	N/A	N/A
EMI Test Receiver R&S	ESR7	102026	2024/3/25	2025/3/24
Horn Antenna Schwarzbeck	BBHA 9120D	9120D-1819	2023/11/12 2024/11/10	2024/11/11 2025/11/9
	BBHA 9170	9170-739	2023/11/12 2024/11/10	2024/11/11 2025/11/9
Preamplifier EMCI	EMC12630SE	980509	2024/1/29	2025/1/28
	EMC184045SE	980387	2024/8/8	2025/8/7
PXA Signal Analyzer Keysight	N9030B	MY57141948	2024/5/20	2025/5/19
RF Coaxial Cable EMCI	EMC102-KM-KM-1200	160924	2024/1/29	2025/1/28
	EMC102-KM-KM-4000	200214	2024/1/29	2025/1/28
	EMC104-SM-SM-1500	180503	2024/3/16	2025/3/15
	EMC104-SM-SM-2000	180501	2024/3/16	2025/3/15
	EMC104-SM-SM-6000	180506	2024/3/16	2025/3/15
Software	ADT_Radiated_V8.7.08	N/A	N/A	N/A

Notes:

1. The test was performed in 966 Chamber No. 5.
2. Tested Date: 2024/10/30 ~ 2024/12/20

5 Limits of Test Items

5.1 RF Output Power

The Maximum Output Power Measurement is 125 mW (21 dBm).

Per KDB 662911 D01 Multiple Transmitter Output Method of conducted output power measurement on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT} ;

Array Gain = $5 \log(N_{ANT}/N_{SS})$ dB or 3 dB, whichever is less, for 20-MHz channel widths with $N_{ANT} \geq 5$.

For power measurements on all other devices: Array Gain = $10 \log(N_{ANT}/N_{SS})$ dB.

5.2 Unwanted Emissions below 1 GHz

Radiated emissions up to 1 GHz 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

Notes:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = $20 \log$ Emission level (uV/m).

5.3 Unwanted Emissions above 1 GHz

Radiated emissions above 1 GHz 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)
Above 960	500	3

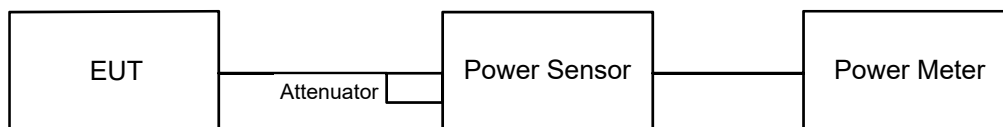
Notes:

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 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.

6 Test Arrangements

6.1 RF Output Power

6.1.1 Test Setup



6.1.2 Test Procedure

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.

Average Power:

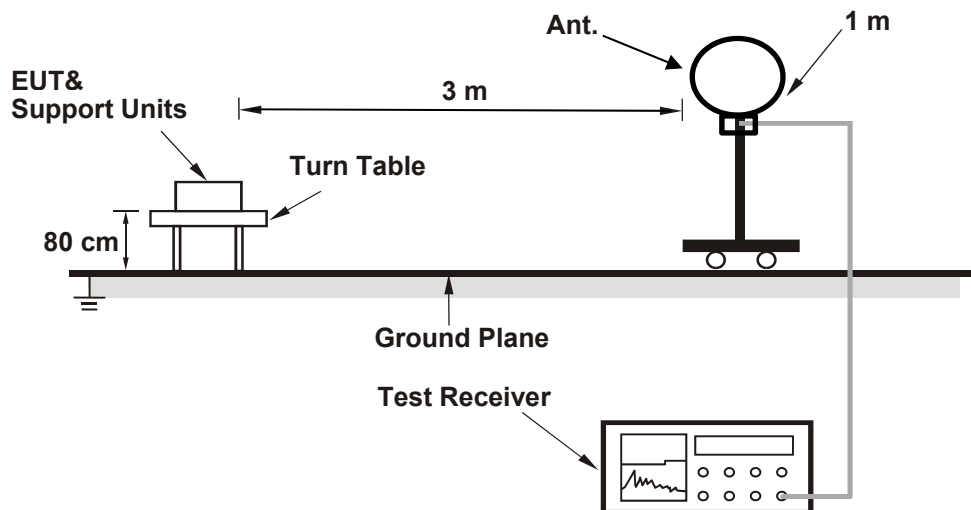
Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

6.2 Unwanted Emissions below 1 GHz

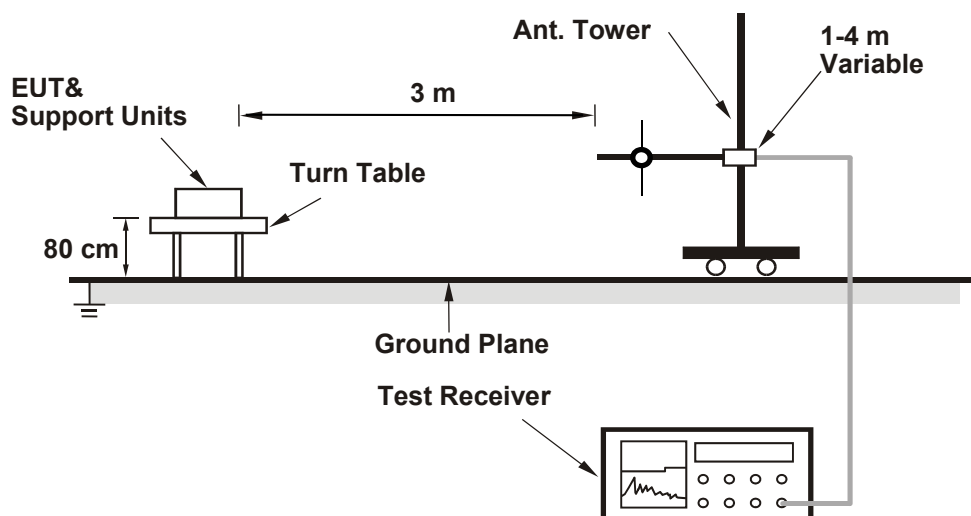
6.2.1 Test Setup

For Radiated Configuration:

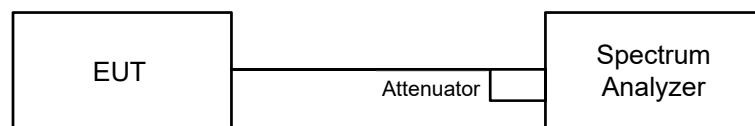
For Radiated emission below 30 MHz



For Radiated emission above 30 MHz



For Conducted Configuration:



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

6.2.2 Test Procedure

Radiated versus Conducted Measurement.

The unwanted emission limits in both the restricted and non-restricted bands are based on antenna-port conducted measurements in conjunction with cabinet emissions tests are permitted to demonstrate compliance.

The following steps was performed:

- a. Cabinet emissions measurements. Radiated measurement was performed to ensure that cabinet emissions are below the emission limits. For the cabinet-emission measurements the antenna was replaced by a termination matching the nominal impedance of the antenna.
- b. Conducted tests was performed using equipment that matches the nominal impedance of the antenna assembly used with the EUT.
- c. EIRP calculation. A value representative of an upper bound on out-of-band antenna gain (in dBi) shall be added to the measured antenna-port conducted emission power to compute EIRP within the specified measurement bandwidth. (For emissions in the restricted bands, additional calculations are required to convert EIRP to field strength at the specified distance.) The upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands or 2 dBi, whichever is greater.
- d. EIRP adjustments for multiple outputs. (Follow the procedures specified in FCC KDB Publication 662911)
- e. For all of Radiation emission test

For Radiated emission below 30 MHz

- e-1.1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- e-1.2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- e-1.3. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- e-1.4. 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-1.5. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode, except for the frequency band (9 kHz to 90 kHz and 110 kHz to 490 kHz) set to average detect function and peak detect function.

Notes:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 200 Hz at frequency below 150 kHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz or 10 kHz at frequency (150 kHz to 30 MHz).
3. All modes of operation were investigated and the worst-case emissions are reported.

For Radiated emission above 30 MHz

- e-2.1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- e-2.2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- e-2.3. 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.
- e-2.4. 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-2.5. 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.

Notes:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. All modes of operation were investigated and the worst-case emissions are reported.

Radiated versus Conducted Measurement

For Radiated measurement:

The level of unwanted emissions was measured when radiated by the cabinet or structure of the equipment with the antenna connector(s) terminated by a specified load (cabinet radiation).

For Conducted measurement:

The level of unwanted emissions was measured as their power in a specified load (conducted spurious emissions).

Conducted Unwanted Emission Convert Formula

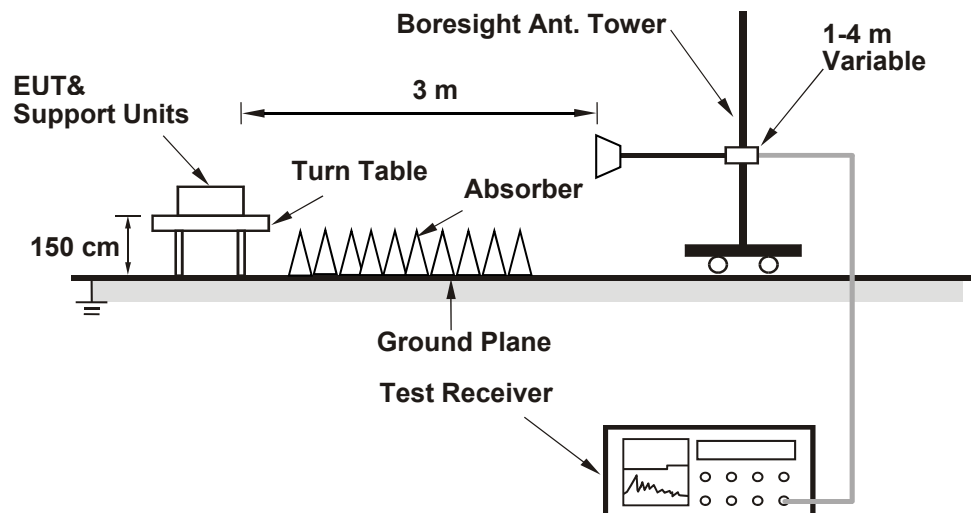
- a. $\text{Emission Level (dBuV/m)} = \text{EIRP Level (dBm)} - 20\log(d) + 104.8$
 $d = \text{measurement distance in 3 meters.}$
- b. $\text{EIRP Level (dBm)} = \text{Raw Value(dBm)} + \text{Correction Factor(dB)}$
- c. Correction Factor is directional gain, and the composite gain will be used when signal support the correlated signal.
 For the out of band spurious the gain for the specific band may have been used rather than the highest gain across all bands.
 For the band edge the gain for the specific band may have been used.

Notes:

1. In restricted bands below 1000 MHz, add upper bound on ground plane reflection:
 For frequencies between 30 MHz and 1000 MHz, add 4.7 dB.
2. The conducted emission test was considered some factor to compute test result.

6.3 Unwanted Emissions above 1 GHz

6.3.1 Test Setup



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

6.3.2 Test Procedure

- The EUT was placed on the top of a rotating table 1.5 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- 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.
- The test-receiver/spectrum analyzer 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.

Notes:

- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) and Average detection (AV) at frequency above 1 GHz.
- For fundamental and harmonic signal measurement, 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.
- All modes of operation were investigated and the worst-case emissions are reported.

7 Test Results of Test Item

7.1 RF Output Power

Input Power:	3.3 Vdc	Environmental Conditions:	25°C, 60% RH	Tested By:	Kevin Ko
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1Tx

For Peak Power

GFSK

Chan.	Chan. Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Power Limit (dBm)	Test Result
0	2402	30.832	14.89	21	Pass
39	2441	34.041	15.32	21	Pass
78	2480	26.062	14.16	21	Pass

Note: The antenna gain is 3.53 dBi < 6 dBi, so the output power limit shall not be reduced.

8DPSK

Chan.	Chan. Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Power Limit (dBm)	Test Result
0	2402	25.645	14.09	21	Pass
39	2441	27.669	14.42	21	Pass
78	2480	22.856	13.59	21	Pass

Note: The antenna gain is 3.53 dBi < 6 dBi, so the output power limit shall not be reduced.

For Average Power

GFSK

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	28.973	14.62
39	2441	33.266	15.22
78	2480	25.351	14.04

8DPSK

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	13.032	11.15
39	2441	13.932	11.44
78	2480	11.668	10.67

Input Power:	3.3 Vdc	Environmental Conditions:	25°C, 60% RH	Tested By:	Kevin Ko
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2Tx

For Peak Power

GFSK

Chan.	Chan. Freq. (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Test Result
		Chain 0	Chain 1				
0	2402	11.34	10.56	24.991	13.98	21	Pass
39	2441	11.84	11.32	28.828	14.60	21	Pass
78	2480	10.73	10.14	22.158	13.46	21	Pass

Note: The directional gain is 3.53 dBi < 6 dBi, so the output power limit shall not be reduced.

8DPSK

Chan.	Chan. Freq. (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Test Result
		Chain 0	Chain 1				
0	2402	10.08	8.94	18.02	12.56	21	Pass
39	2441	10.51	9.95	21.132	13.25	21	Pass
78	2480	9.58	8.71	16.508	12.18	21	Pass

Note: The directional gain is 3.53 dBi < 6 dBi, so the output power limit shall not be reduced.

For Average Power

GFSK

Chan.	Chan. Freq. (MHz)	Average Power (dBm)		Total Average Power (mW)	Total Average Power (dBm)
		Chain 0	Chain 1		
0	2402	11.29	10.31	24.198	13.84
39	2441	11.68	11.21	27.936	14.46
78	2480	10.59	9.91	21.25	13.27

8DPSK

Chan.	Chan. Freq. (MHz)	Average Power (dBm)		Total Average Power (mW)	Total Average Power (dBm)
		Chain 0	Chain 1		
0	2402	6.99	6.11	9.084	9.58
39	2441	7.35	7.16	10.632	10.27
78	2480	6.46	5.91	8.325	9.20

7.2 Unwanted Emissions below 1 GHz

Mode A

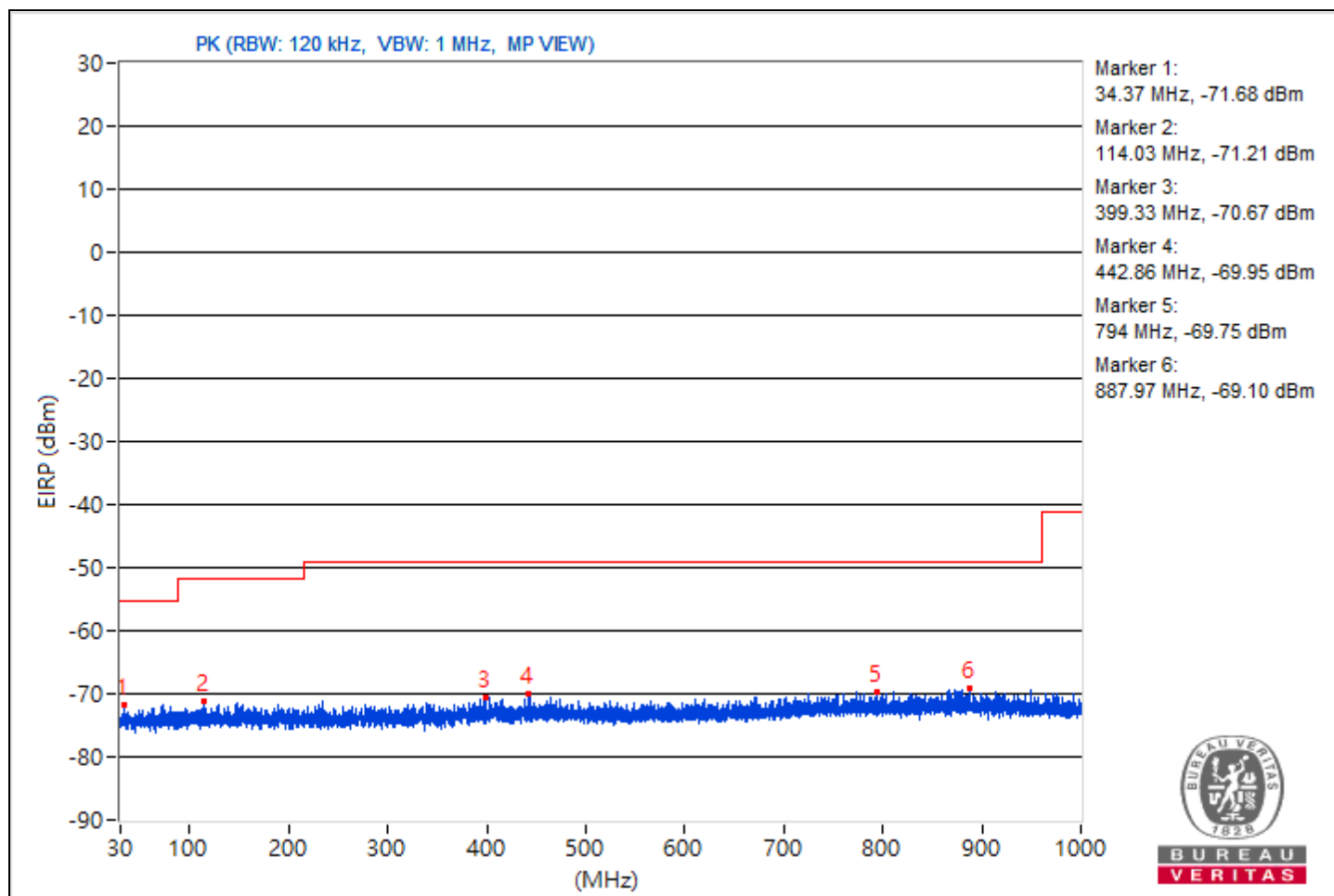
1Tx

RF Mode	GFSK	Channel	CH 39 : 2441 MHz
Frequency Range	30 MHz ~ 1 GHz	Environmental Conditions	22°C, 11% RH
Tested By	Kevin Ko		

Conducted Unwanted Emissions							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw Value Chain 0 (dBm)	Correction Factor (dB)	EIRP Level (dBm)
1	34.37	23.58 PK	40	-16.42	-81.54	9.86	-71.68
2	114.03	24.05 PK	43.5	-19.45	-81.07	9.86	-71.21
3	399.33	24.59 PK	46	-21.41	-80.53	9.86	-70.67
4	442.86	25.31 PK	46	-20.69	-79.81	9.86	-69.95
5	794	25.51 PK	46	-20.49	-79.61	9.86	-69.75
6	887.97	26.16 PK	46	-19.84	-78.96	9.86	-69.1

Notes:

1. Margin value = Emission Level - Limit value
2. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.



Mode B

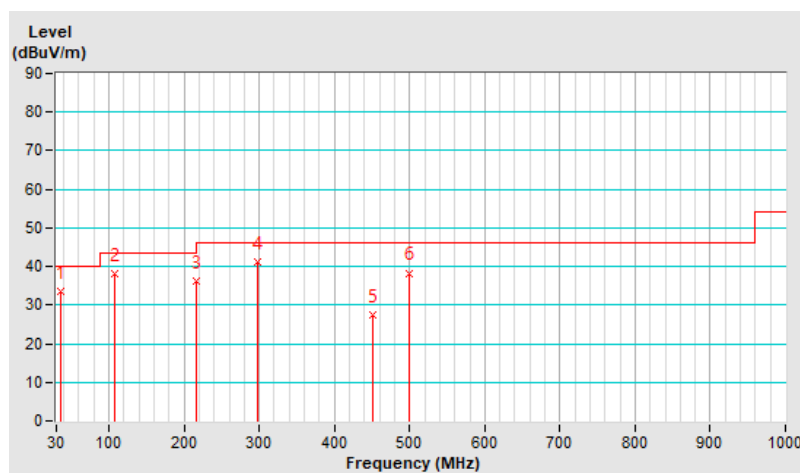
1Tx

RF Mode	BT GFSK	Channel	CH 39 : 2441 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak
Input Power (System)	120 Vac, 60 Hz	Environmental Conditions	24 °C, 65 % RH
Tested By	Willy Lin		

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	35.25	33.4 QP	40.0	-6.6	3.00 H	282	51.7	-18.3
2	108.19	38.0 QP	43.5	-5.5	2.00 H	326	58.7	-20.7
3	216.67	36.3 QP	46.0	-9.7	1.00 H	146	57.1	-20.8
4	297.63	41.2 QP	46.0	-4.8	1.00 H	184	58.2	-17.0
5	451.05	27.5 QP	46.0	-18.5	2.00 H	308	40.3	-12.8
6	499.09	38.3 QP	46.0	-7.7	1.50 H	192	50.3	-12.0

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 frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.

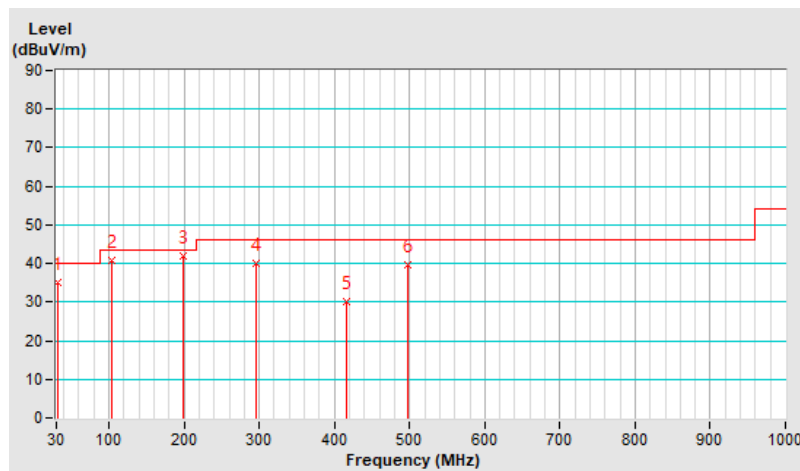


RF Mode	BT GFSK	Channel	CH 39 : 2441 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak
Input Power (System)	120 Vac, 60 Hz	Environmental Conditions	24 °C, 65 % RH
Tested By	Willy Lin		

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	32.48	35.1 QP	40.0	-4.9	3.00 V	268	53.8	-18.7
2	103.41	40.7 QP	43.5	-2.8	2.00 V	301	62.2	-21.5
3	199.28	42.0 QP	43.5	-1.5	1.50 V	154	62.9	-20.9
4	296.64	40.1 QP	46.0	-5.9	1.00 V	186	57.1	-17.0
5	416.71	30.0 QP	46.0	-16.0	2.00 V	204	43.8	-13.8
6	497.81	39.6 QP	46.0	-6.4	1.50 V	323	51.6	-12.0

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 frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.



7.3 Unwanted Emissions above 1 GHz

Mode C

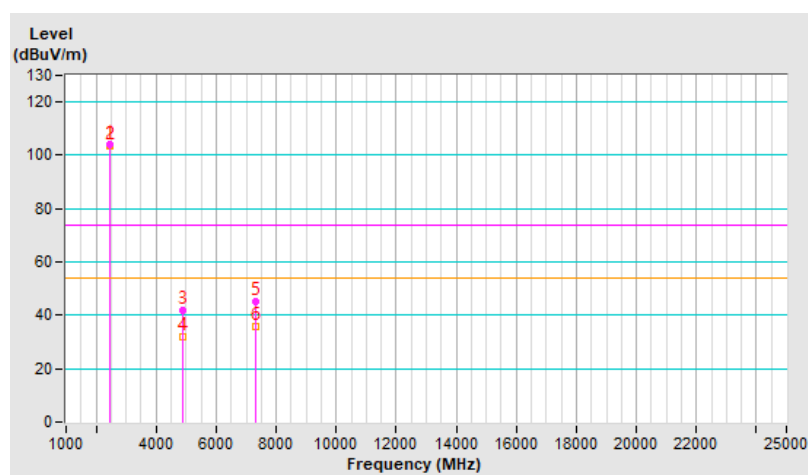
1Tx

RF Mode	BT GFSK	Channel	CH 39 : 2441 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=510 Hz, DET=Peak
Input Power (System)	120 Vac, 60 Hz	Environmental Conditions	21 °C, 64 % RH
Tested By	Willy Lin		

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	104.3 PK			1.03 H	116	107.7	-3.4
2	*2441.00	103.5 AV			1.03 H	116	106.9	-3.4
3	4882.00	42.0 PK	74.0	-32.0	1.64 H	153	40.5	1.5
4	4882.00	31.9 AV	54.0	-22.1	1.64 H	153	30.4	1.5
5	7323.00	44.9 PK	74.0	-29.1	1.87 H	264	37.3	7.6
6	7323.00	35.7 AV	54.0	-18.3	1.87 H	264	28.1	7.6

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, the limit was restricted at the RF Output Power.

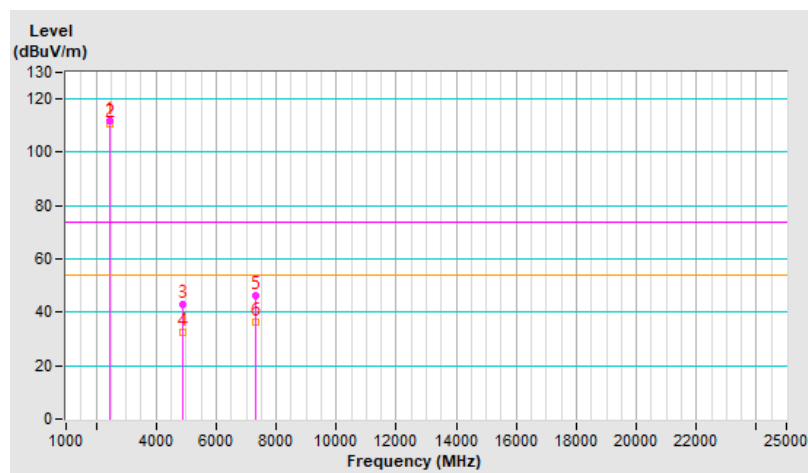


RF Mode	BT GFSK	Channel	CH 39 : 2441 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=510 Hz, DET=Peak
Input Power (System)	120 Vac, 60 Hz	Environmental Conditions	21 °C, 64 % RH
Tested By	Willy Lin		

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	111.9 PK			1.50 V	275	115.3	-3.4
2	*2441.00	110.9 AV			1.50 V	275	114.3	-3.4
3	4882.00	42.8 PK	74.0	-31.2	1.66 V	147	41.3	1.5
4	4882.00	32.3 AV	54.0	-21.7	1.66 V	147	30.8	1.5
5	7323.00	46.3 PK	74.0	-27.7	1.96 V	297	38.7	7.6
6	7323.00	36.3 AV	54.0	-17.7	1.96 V	297	28.7	7.6

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, the limit was restricted at the RF Output Power.



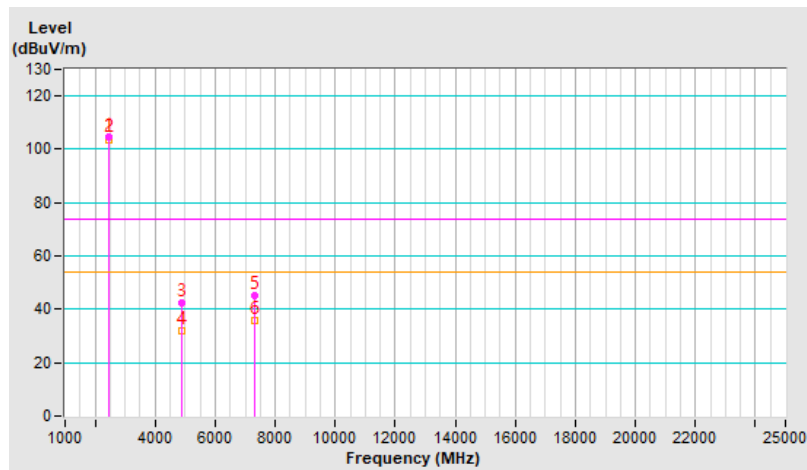
2Tx

RF Mode	BT GFSK	Channel	CH 39 : 2441 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=510 Hz, DET=Peak
Input Power (System)	120 Vac, 60 Hz	Environmental Conditions	21 °C, 64 % RH
Tested By	Willy Lin		

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	104.8 PK			1.05 H	115	108.2	-3.4
2	*2441.00	103.8 AV			1.05 H	115	107.2	-3.4
3	4882.00	42.2 PK	74.0	-31.8	1.65 H	148	40.7	1.5
4	4882.00	32.0 AV	54.0	-22.0	1.65 H	148	30.5	1.5
5	7323.00	45.2 PK	74.0	-28.8	1.84 H	252	37.6	7.6
6	7323.00	36.0 AV	54.0	-18.0	1.84 H	252	28.4	7.6

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, the limit was restricted at the RF Output Power.

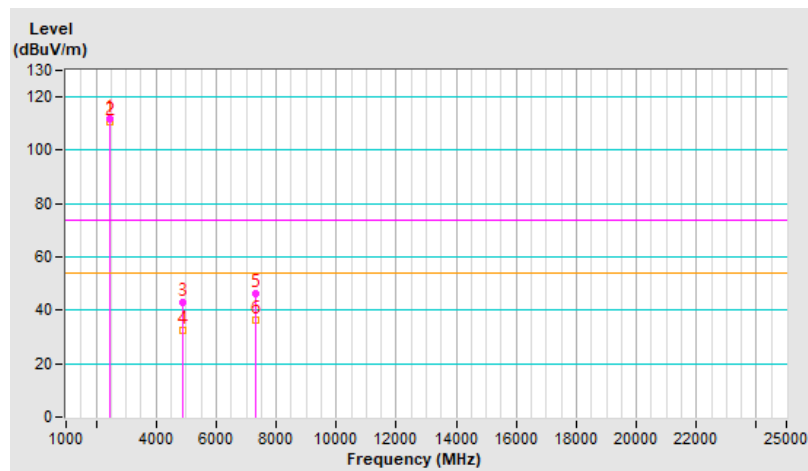


RF Mode	BT GFSK	Channel	CH 39 : 2441 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=510 Hz, DET=Peak
Input Power (System)	120 Vac, 60 Hz	Environmental Conditions	21 °C, 64 % RH
Tested By	Willy Lin		

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	111.6 PK			1.47 V	281	115.0	-3.4
2	*2441.00	110.6 AV			1.47 V	281	114.0	-3.4
3	4882.00	42.8 PK	74.0	-31.2	1.65 V	142	41.3	1.5
4	4882.00	32.5 AV	54.0	-21.5	1.65 V	142	31.0	1.5
5	7323.00	46.0 PK	74.0	-28.0	1.95 V	284	38.4	7.6
6	7323.00	36.1 AV	54.0	-17.9	1.95 V	284	28.5	7.6

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, the limit was restricted at the RF Output Power.



Mode D

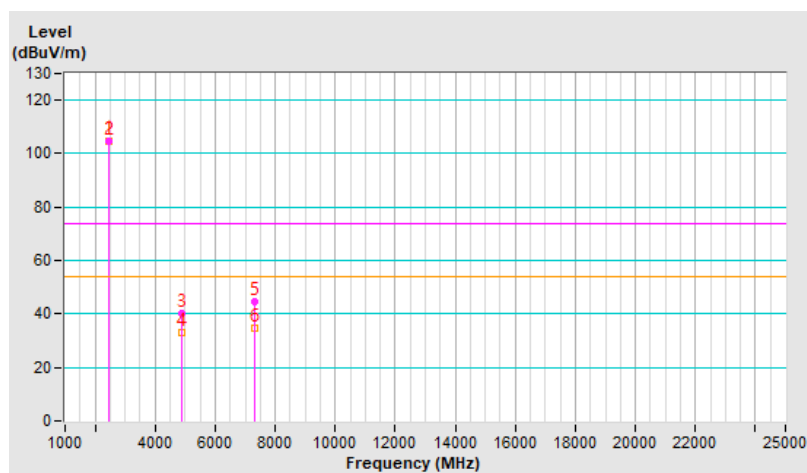
1Tx

RF Mode	BT GFSK	Channel	CH 39 : 2441 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=510 Hz, DET=Peak
Input Power (System)	120 Vac, 60 Hz	Environmental Conditions	25 °C, 75 % RH
Tested By	Tank Wu		

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	104.9 PK			2.90 H	211	108.6	-3.7
2	*2441.00	104.5 AV			2.90 H	211	108.2	-3.7
3	4882.00	40.2 PK	74.0	-33.8	2.35 H	249	38.8	1.4
4	4882.00	33.1 AV	54.0	-20.9	2.35 H	249	31.7	1.4
5	7323.00	44.6 PK	74.0	-29.4	1.26 H	338	37.4	7.2
6	7323.00	34.8 AV	54.0	-19.2	1.26 H	338	27.6	7.2

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * " : Fundamental frequency, the limit was restricted at the RF Output Power.

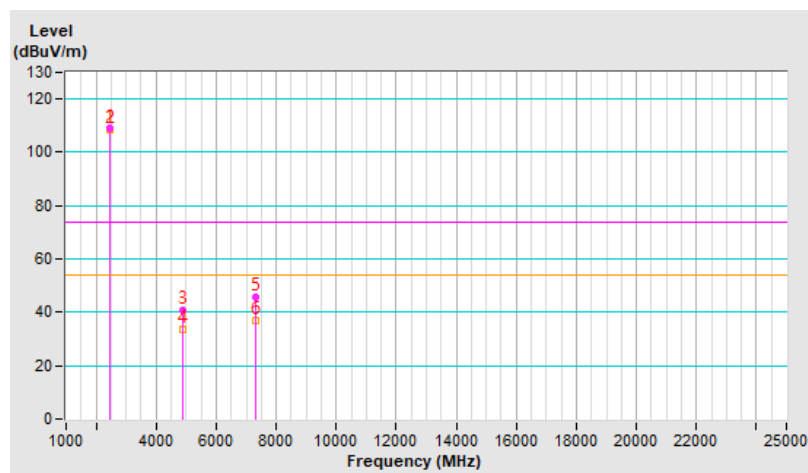


RF Mode	BT GFSK	Channel	CH 39 : 2441 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=510 Hz, DET=Peak
Input Power (System)	120 Vac, 60 Hz	Environmental Conditions	25 °C, 75 % RH
Tested By	Tank Wu		

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	108.9 PK			1.01 V	6	112.6	-3.7
2	*2441.00	108.6 AV			1.01 V	6	112.3	-3.7
3	4882.00	40.6 PK	74.0	-33.4	1.56 V	120	39.2	1.4
4	4882.00	33.4 AV	54.0	-20.6	1.56 V	120	32.0	1.4
5	7323.00	45.6 PK	74.0	-28.4	1.63 V	297	38.4	7.2
6	7323.00	36.8 AV	54.0	-17.2	1.63 V	297	29.6	7.2

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * " : Fundamental frequency, the limit was restricted at the RF Output Power.



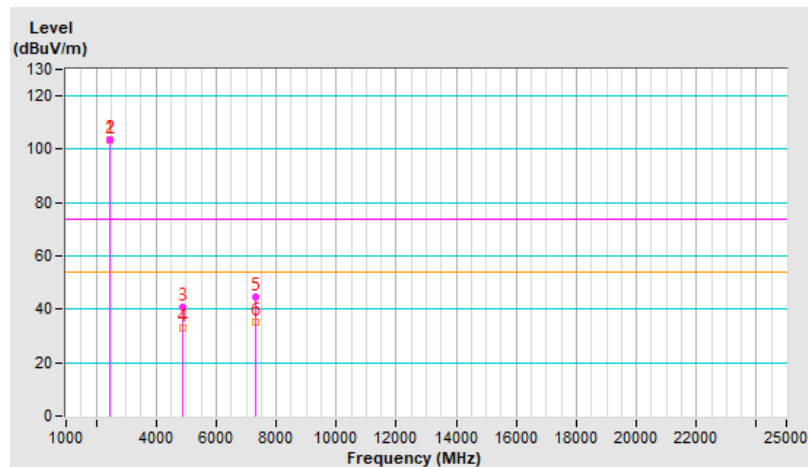
2Tx

RF Mode	BT GFSK	Channel	CH 39 : 2441 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=510 Hz, DET=Peak
Input Power (System)	120 Vac, 60 Hz	Environmental Conditions	25 °C, 75 % RH
Tested By	Tank Wu		

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	103.7 PK			1.11 H	312	107.4	-3.7
2	*2441.00	103.4 AV			1.11 H	312	107.1	-3.7
3	4882.00	40.9 PK	74.0	-33.1	2.33 H	254	39.5	1.4
4	4882.00	33.2 AV	54.0	-20.8	2.33 H	254	31.8	1.4
5	7323.00	44.7 PK	74.0	-29.3	1.04 H	275	37.5	7.2
6	7323.00	35.1 AV	54.0	-18.9	1.04 H	275	27.9	7.2

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * " : Fundamental frequency, the limit was restricted at the RF Output Power.

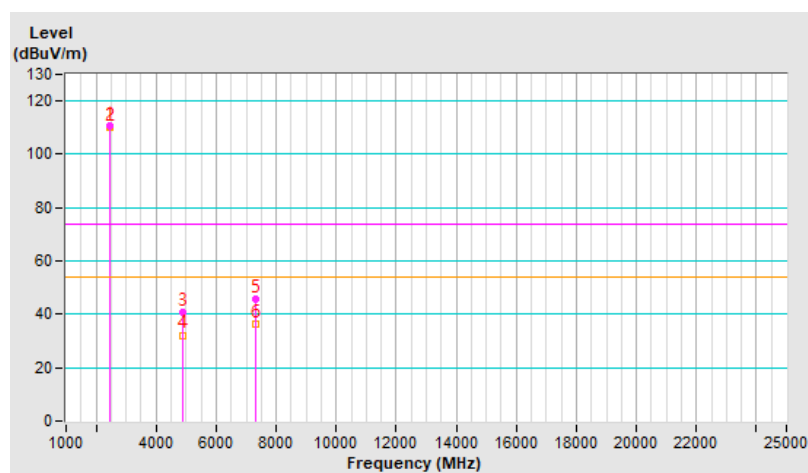


RF Mode	BT GFSK	Channel	CH 39 : 2441 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=510 Hz, DET=Peak
Input Power (System)	120 Vac, 60 Hz	Environmental Conditions	25 °C, 75 % RH
Tested By	Tank Wu		

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	110.6 PK			2.62 V	93	114.3	-3.7
2	*2441.00	110.2 AV			2.62 V	93	113.9	-3.7
3	4882.00	40.6 PK	74.0	-33.4	2.23 V	106	39.2	1.4
4	4882.00	32.2 AV	54.0	-21.8	2.23 V	106	30.8	1.4
5	7323.00	45.9 PK	74.0	-28.1	1.34 V	299	38.7	7.2
6	7323.00	36.2 AV	54.0	-17.8	1.34 V	299	29.0	7.2

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * " : Fundamental frequency, the limit was restricted at the RF Output Power.



8 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo)

9 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.

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

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