

# TEST REPORT

## CERTIFICATE OF CONFORMITY

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

**Report No.:** RFBFOK-WTW-P23050750-2

**FCC ID:** RI7SE250B4

**Product:** Module

**Brand:** Telit Cinterion

**Model No.:** SE250B4-NA

**Received Date:** 2023/9/6

**Test Date:** 2023/9/27 ~ 2023/10/5

**Issued Date:** 2023/12/14

**Applicant:** Telit Communications S.p.A.

**Address:** Via Stazione Prosecco 5/b 34010 Sgonico (Trieste), Italy

**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
Lin Kou Laboratories

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**Test Location:** No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kewi Shan Dist., Taoyuan City 33383, Taiwan

**FCC Registration /** 788550 / TW0003

**Designation Number:**

Approved by: \_\_\_\_\_

*Jeremy Lin*

, Date: \_\_\_\_\_

2023/12/14

Jeremy Lin / Project Engineer

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Prepared by : Polly Chien / Specialist

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## Release Control Record

Issue No.	Description	Date Issued
RFBFOK-WTW-P23050750-2	Original release.	2023/12/14

## 1 Certificate

**Product:** Module  
**Brand:** Telit Cinterion  
**Test Model:** SE250B4-NA  
**Sample Status:** Engineering sample  
**Applicant:** Telit Communications S.p.A.  
**Test Date:** 2023/9/27 ~ 2023/10/5  
**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

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	Pass	Meet the requirement of limit.
15.247(a)(1) (iii)	Dwell Time on Each Channel	Pass	Meet the requirement of limit.
15.247(a)(1)	Hopping Channel Separation	Pass	Meet the requirement of limit.
15.247(a)(1)	20 dB Bandwidth	-	Refer to Note 1
15.247(d)	Conducted Out of Band Emissions	Pass	Meet the requirement of limit.
15.207	AC Power Conducted Emissions	Pass	Minimum passing margin is -26.73 dB at 2.38800 MHz
15.205 / 15.209 / 15.247(d)	Unwanted Emissions below 1 GHz	Pass	Minimum passing margin is -6.1 dB at 134.76 MHz
15.205 / 15.209 / 15.247(d)	Unwanted Emissions above 1 GHz	Pass	Minimum passing margin is -6.1 dB at 2390.00 MHz
15.203	Antenna Requirement	Pass	Antenna connector is RP SMA not a standard connector.

### Notes:

1. If the Frequency Hopping System operating in 2400-2483.5 MHz band and the output power less than 125 mW. The hopping channel carrier frequencies separated by a minimum of 25 kHz or two-thirds of the 20 dB bandwidth of hopping channel whichever is greater.
2. 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) (±)
AC Power Conducted Emissions	9 kHz ~ 30 MHz	2.88 dB
Unwanted Emissions below 1 GHz	9 kHz ~ 30 MHz	3.59 dB
	30 MHz ~ 1 GHz	3.60 dB
Unwanted Emissions above 1 GHz	1 GHz ~ 18 GHz	2.29 dB
	18 GHz ~ 40 GHz	2.29 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	Module
Brand	Telit Cinterion
Test Model	SE250B4-NA
Status of EUT	Engineering sample
Power Supply Rating	3.8 Vdc (from DC Power Supply) 5 Vdc (from adapter)
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	13.836 mW (11.41 dBm)
Technology Type	Bluetooth® BR/EDR
HW Version	1.0
SW Version	MON.100001

Note:

1. The EUT uses following support unit.

AC Adapter	Brand	Shenzhen Aoda Technology Co., Ltd
	Model	A938-055200W-US1
	AC Input	100-240V~50/60Hz, 0.35A
	DC Output	5V, 2A
	Power cord	1m, w/o core

2. There are Bluetooth, WLAN (2.4 GHz & 5 GHz), GPS and WWAN technology used for the EUT.

3. Simultaneously transmission condition.

Condition	Technology		
1	WWAN	WLAN (2.4 GHz)	Bluetooth
2	WWAN	WLAN (5 GHz)	Bluetooth

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

4. 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.

ANT. No.	Type	Connector	Frequency Range	Gain (dBi)
2.4G	Monopole	RP SMA	2400~2483.5MHz	3.757
5G	Monopole	RP SMA	5150~5250MHz	2.475
			5250~5350MHz	1.879
			5470~5725MHz	2.122
			5725~5850MHz	1.672

\*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. EUT can be used in the following ways: X-axis/ Y-axis/ Z-axis. Pre-scan these ways and find the worst case as a representative test condition.
Worst Case:	1. Worst Condition: Z-axis (for antenna)

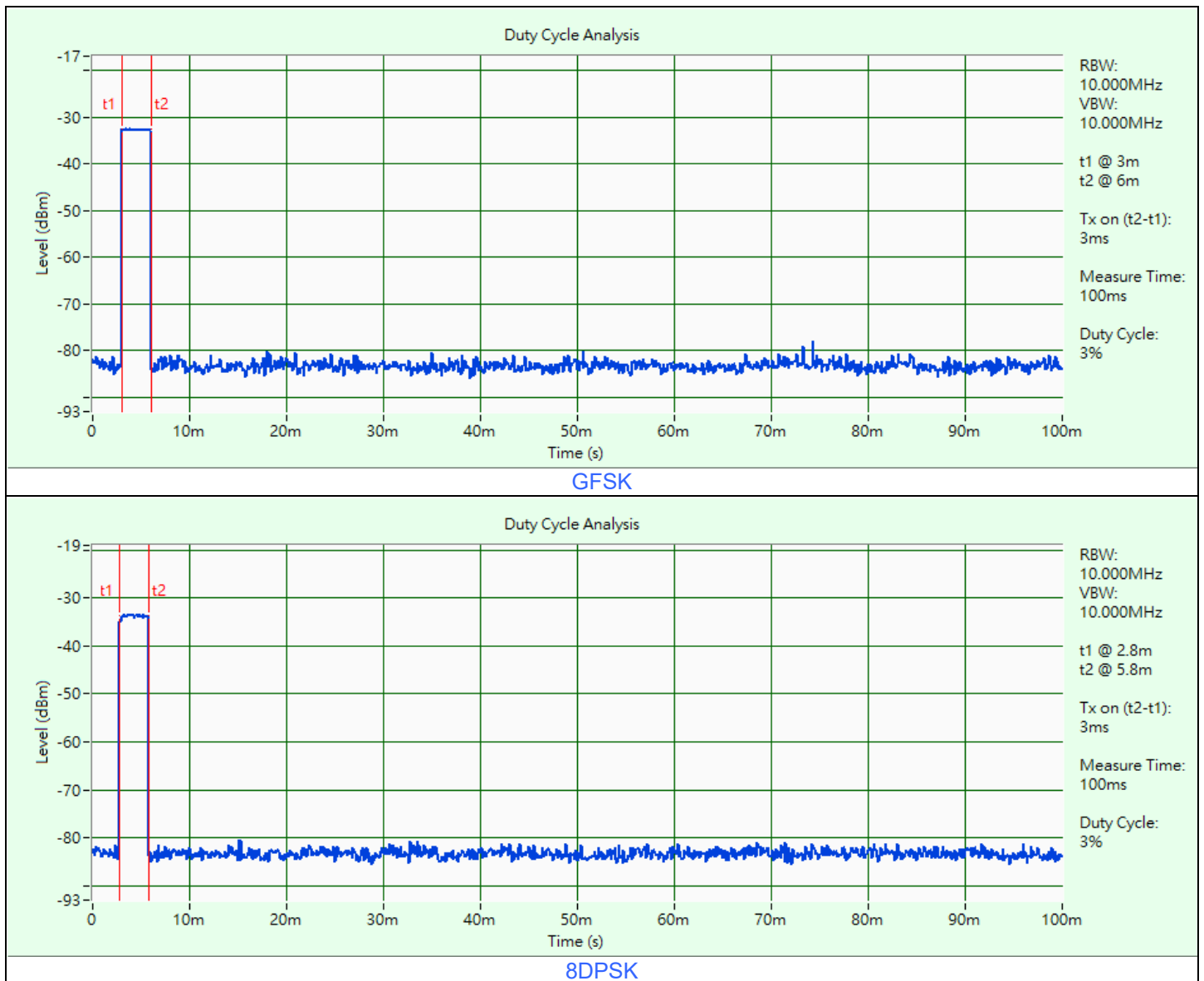
Following channel(s) was (were) selected for the final test as listed below:

Test Item	Tested Channel	Modulation	Data Rate Parameter
RF Output Power	0, 39, 78	GFSK	DH5
		8DPSK	3DH5
Number of Hopping Frequency Used	Hopping	GFSK	DH5
		8DPSK	3DH5
Dwell Time on Each Channel	Hopping	GFSK	DH1/DH3/DH5
		8DPSK	3DH1/3DH3/3DH5
Hopping Channel Separation / 20 dB Bandwidth	0, 39, 78	GFSK	DH5
		8DPSK	3DH5
Conducted Out of Band Emissions	Hopping 0, 78	GFSK	DH5
		8DPSK	3DH5
AC Power Conducted Emissions	39	GFSK	DH5
Unwanted Emissions below 1 GHz	39	GFSK	DH5
Unwanted Emissions above 1 GHz	0, 39, 78	GFSK	DH5
		8DPSK	3DH5

### 3.5 Duty Cycle of Test Signal

**GFSK:** Duty cycle = 3 ms / 100 ms x 100% = 3.0%

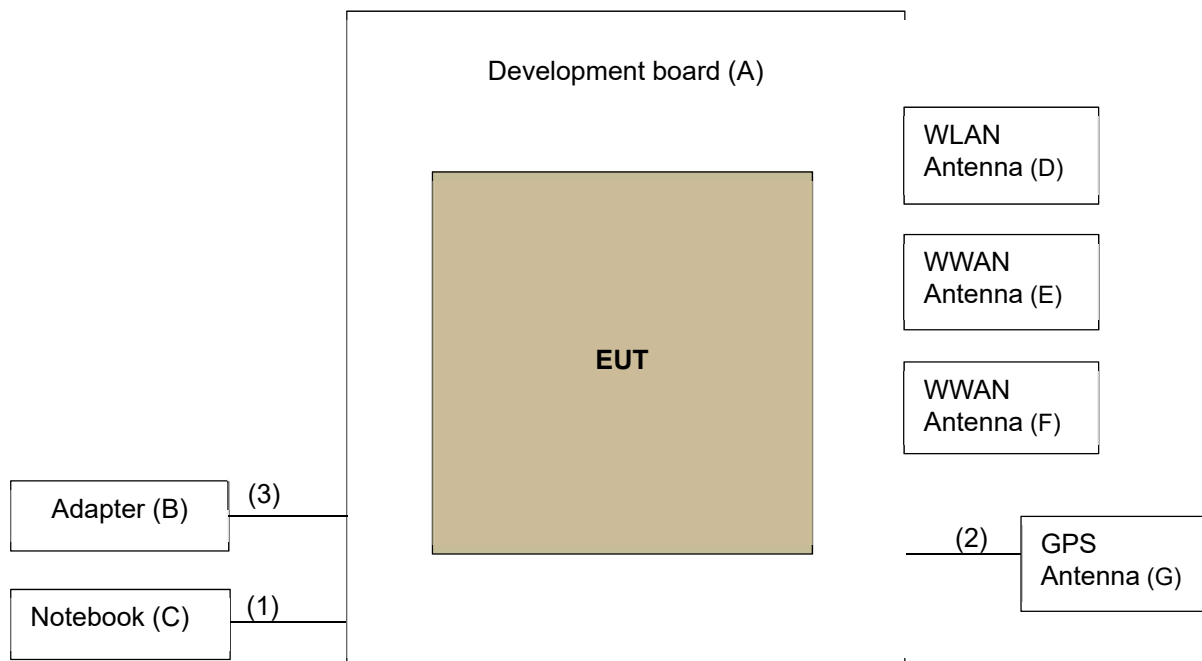
**8DPSK:** Duty cycle = 3 ms / 100 ms x 100% = 3.0%



### 3.6 Test Program Used and Operation Descriptions

Controlling software QRCT Version 4.0.00195.0 has been activated to set the EUT under transmission condition continuously at specific channel frequency.

### 3.7 Connection Diagram of EUT and Peripheral Devices



### 3.8 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Development board	NA	NA	NA	NA	Supplied by applicant
B	Adapter	AODA	A938-055200W-US1	NA	NA	Supplied by applicant
C	Notebook	Lenovo	X250ALT5	PC06HPSE	NA	Provided by Lab
D	WLAN Antenna	ZTX	1.22.00648	NA	NA	Supplied by applicant
E	WWAN Antenna	ZTX	1.22.00573	NA	NA	Supplied by applicant
F	WWAN Antenna	ZTX	1.22.00573	NA	NA	Supplied by applicant
G	GPS Antenna	HUIZHOU SPEED WIRELESS TECHNOLOGY CO., LTD.	L500MM	NA	NA	Supplied by applicant

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	Type-c cable	1	1	No	0	Provided by Lab
2	RF cable	1	1	No	0	Supplied by applicant
3	DC power cable	1	1	-	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
Peak Power Analyzer Keysight	8990B	MY51000485	2023/1/19	2024/1/18
Wideband Power Sensor Keysight	N1923A	MY58020002	2023/1/18	2024/1/17
		MY58140009	2023/1/18	2024/1/17

Notes:

1. The test was performed in Oven room.
2. Tested Date: 2023/10/2

### 4.2 Number of Hopping Frequency Used

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Signal & Spectrum Analyzer R&S	FSV3044	101504	2023/6/5	2024/6/4
Software BV	ADT_RF Test Software V7.6.5.4	N/A	N/A	N/A

Notes:

1. The test was performed in Oven room.
2. Tested Date: 2023/10/2

### 4.3 Dwell Time on Each Channel

Refer to section 4.2 to get information of the instruments.

### 4.4 Hopping Channel Separation

Refer to section 4.2 to get information of the instruments.

### 4.5 20 dB Bandwidth

Refer to section 4.2 to get information of the instruments.

### 4.6 Conducted Out of Band Emissions

Refer to section 4.2 to get information of the instruments.

#### 4.7 AC Power Conducted Emissions

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
50 ohm terminal resistance HUBER+SUHNER	E1-011315	13	2022/11/17	2023/11/16
50 ohm terminal resistance	E1-011280	05	2022/11/21	2023/11/20
	E1-011311	09	2022/11/17	2023/11/16
DC-LISN Schwarzbeck	NNBM 8126G	8126G-069	2022/11/9	2023/11/8
EMI Test Receiver R&S	ESR3	102783	2022/12/21	2023/12/20
Fixed Attenuator SGH	BNC10W10dB	PAD-COND2-01	2023/9/2	2024/9/1
LISN R&S	ESH2-Z5	100100	2023/3/7	2024/3/6
	ESH3-Z5	100312	2023/9/12	2024/9/11
RF Coaxial Cable Woken	5D-FB	Cable-cond2-01	2023/9/2	2024/9/1
Software BVADT	BVADT_Cond_ V7.3.7.4	N/A	N/A	N/A
V-LISN Schwarzbeck	NNBL 8226-2	8226-142	2023/8/31	2024/8/30

Notes:

1. The test was performed in HY - Conduction 2.
2. Tested Date: 2023/10/5

#### 4.8 Unwanted Emissions below 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower & Turn BV ADT	AT100	AT93021705	N/A	N/A
Bi_Log Antenna Schwarzbeck	VULB 9168	9168-160	2022/10/20	2023/10/19
Loop Antenna Electro-Metrics	EM-6879	269	2023/9/23	2024/9/22
Loop Antenna TESEQ	HLA 6121	45745	2023/8/8	2024/8/7
MXE EMI Receiver Keysight	N9038A	MY55420137	2023/5/3	2024/5/2
Preamplifier Agilent	8447D	2944A10638	2023/5/7	2024/5/6
Preamplifier EMCI	EMC001340	980201	2023/9/27	2024/9/26
RF Coaxial Cable EMCI	5D-NM-BM	140903+140902	2023/1/7	2024/1/6
RF Coaxial Cable Woken	8D-FB	Cable-CH9-01	2023/5/7	2024/5/6
Signal & Spectrum Analyzer R&S	FSW43	101867	2022/12/30	2023/12/29
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	N/A	N/A	N/A
Turn Table BV ADT	TT100	TT93021705	N/A	N/A
Turn Table Controller BV ADT	SC100	SC93021705	N/A	N/A

Notes:

1. The test was performed in HY - 966 chamber 4.
2. Tested Date: 2023/9/27

#### 4.9 Unwanted Emissions above 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower & Turn BV ADT	AT100	AT93021705	N/A	N/A
Boresight antenna tower fixture BV	BAF-02	5	N/A	N/A
Horn Antenna Schwarzbeck	BBHA 9120D	9120D-1169	2022/11/13	2023/11/12
	BBHA 9170	9170-480	2022/11/13	2023/11/12
		BBHA9170243	2022/11/13	2023/11/12
MXE EMI Receiver Keysight	N9038A	MY55420137	2023/5/3	2024/5/2
Notch Filter Micro-Tronics	BRM17690	004	2023/1/11	2024/1/10
	BRM50716	060	2023/1/11	2024/1/10
Preamplifier Agilent	8449B	3008A02367	2023/2/15	2024/2/14
Preamplifier EMCI	EMC 184045	980116	2023/9/27	2024/9/26
RF Coaxial Cable EMCI	EMC102-KM-KM-600	150928	2023/7/8	2024/7/7
	EMC102-KM-KM-3000	150929	2023/7/8	2024/7/7
RF Coaxial Cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	2023/1/7	2024/1/6
RF Coaxial Cable HUBER+SUHNER&EMCI	SUCOFLEX 104& EMC104-SM-SM8000	CABLE-CH9-02 (248780+171006)	2023/1/7	2024/1/6
Signal & Spectrum Analyzer R&S	FSW43	101867	2022/12/30	2023/12/29
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	N/A	N/A	N/A
Turn Table BV ADT	TT100	TT93021705	N/A	N/A
Turn Table Controller BV ADT	SC100	SC93021705	N/A	N/A

Notes:

1. The test was performed in HY - 966 chamber 4.
2. Tested Date: 2023/9/27

## 5 Limits of Test Items

### 5.1 RF Output Power

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

### 5.2 Number of Hopping Frequency Used

At least 15 channels frequencies, and should be equally spaced.

### 5.3 Dwell Time on Each Channel

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

### 5.4 Hopping Channel Separation

At least 25 kHz or two-third of 20 dB hopping channel bandwidth (whichever is greater).

### 5.5 20 dB Bandwidth

Maximum bandwidth is not specified.

### 5.6 Conducted Out of Band Emissions

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

### 5.7 AC Power Conducted Emissions

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

Notes:

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.



## 5.8 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).

## 5.9 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

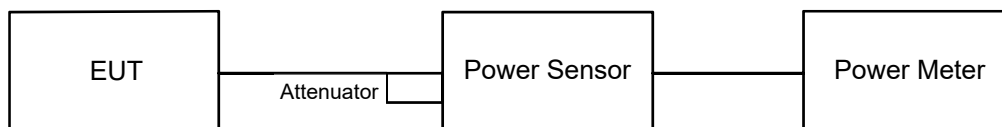
Notes:

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:

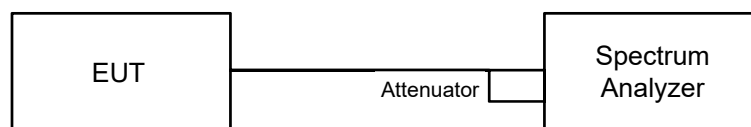
A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

##### 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 Number of Hopping Frequency Used

#### 6.2.1 Test Setup

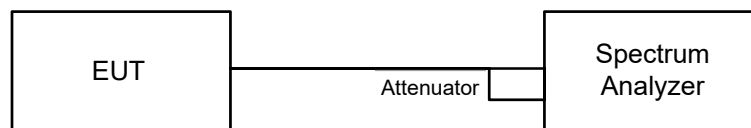


#### 6.2.2 Test Procedure

- a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
- c. Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
- d. Set the SA on View mode and then plot the result on SA screen.
- e. Repeat above procedures until all frequencies measured were complete.

## 6.3 Dwell Time on Each Channel

### 6.3.1 Test Setup

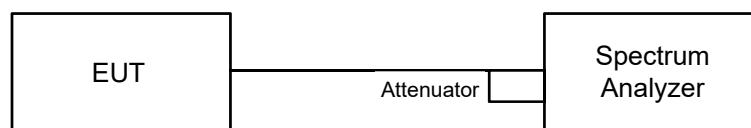


### 6.3.2 Test Procedure

- Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
- Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
- Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
- Repeat above procedures until all different time-slot modes have been completed.

## 6.4 Hopping Channel Separation

### 6.4.1 Test Setup

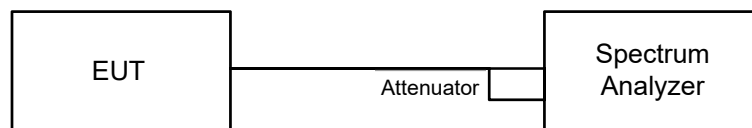


### 6.4.2 Test Procedure

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
- By using the MaxHold function record the separation of two adjacent channels.
- Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.
- Repeat above procedures until all frequencies measured were complete.

## 6.5 20 dB Bandwidth

### 6.5.1 Test Setup

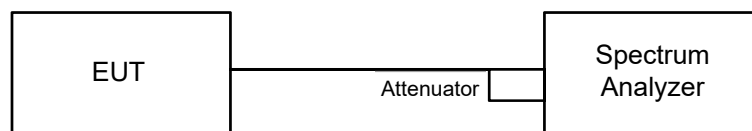


### 6.5.2 Test Procedure

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
- Repeat above procedures until all frequencies measured were complete.

## 6.6 Conducted Out of Band Emissions

### 6.6.1 Test Setup



### 6.6.2 Test Procedure

#### MEASUREMENT PROCEDURE REF

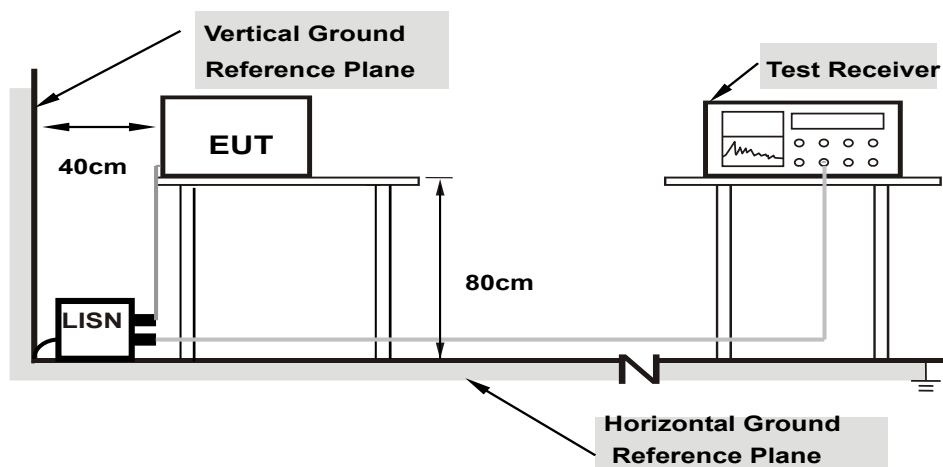
- Set the RBW = 100 kHz.
- Set the VBW  $\geq$  300 kHz.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

#### MEASUREMENT PROCEDURE OOB

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

## 6.7 AC Power Conducted Emissions

### 6.7.1 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).

### 6.7.2 Test Procedure

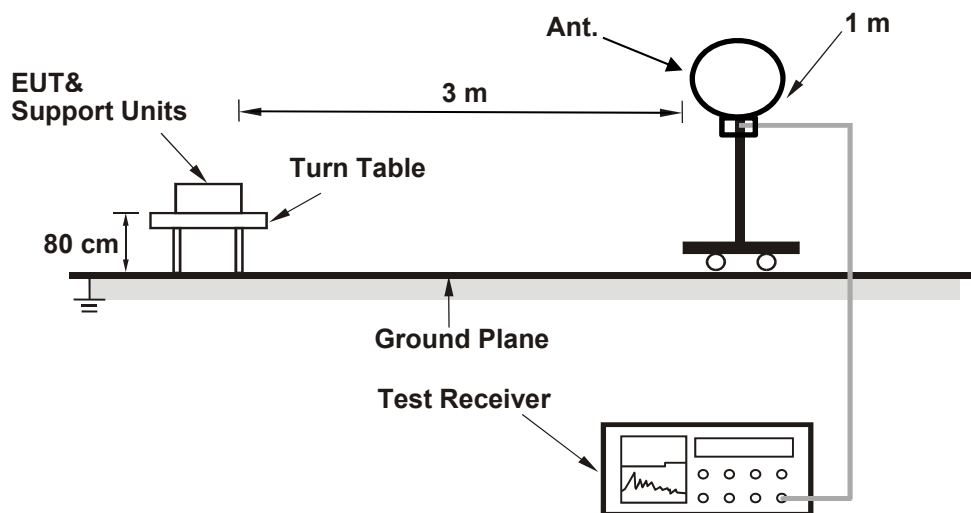
- The EUT was placed on a 0.8 meter to the top of table and placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The 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.

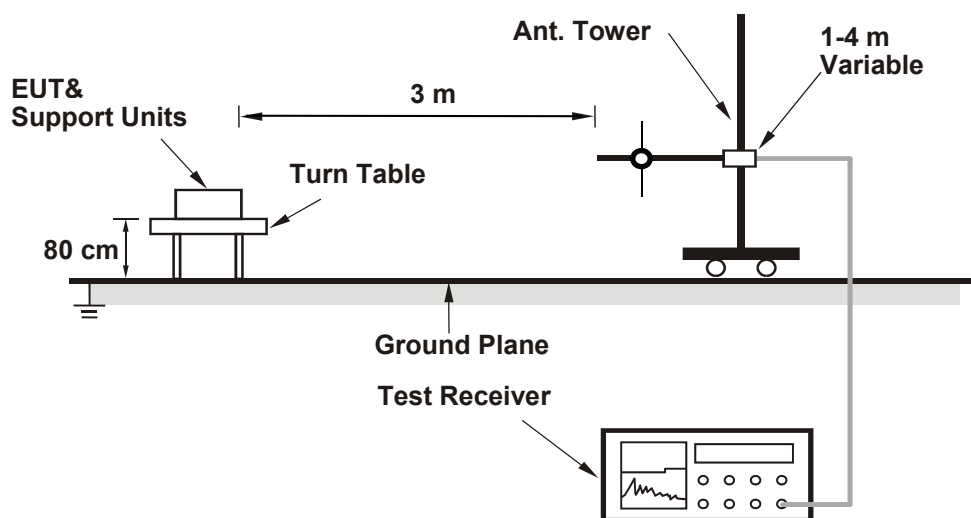
## 6.8 Unwanted Emissions below 1 GHz

### 6.8.1 Test Setup

#### For Radiated emission below 30 MHz



#### For Radiated emission above 30 MHz



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

## 6.8.2 Test Procedure

### 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 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. 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, 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

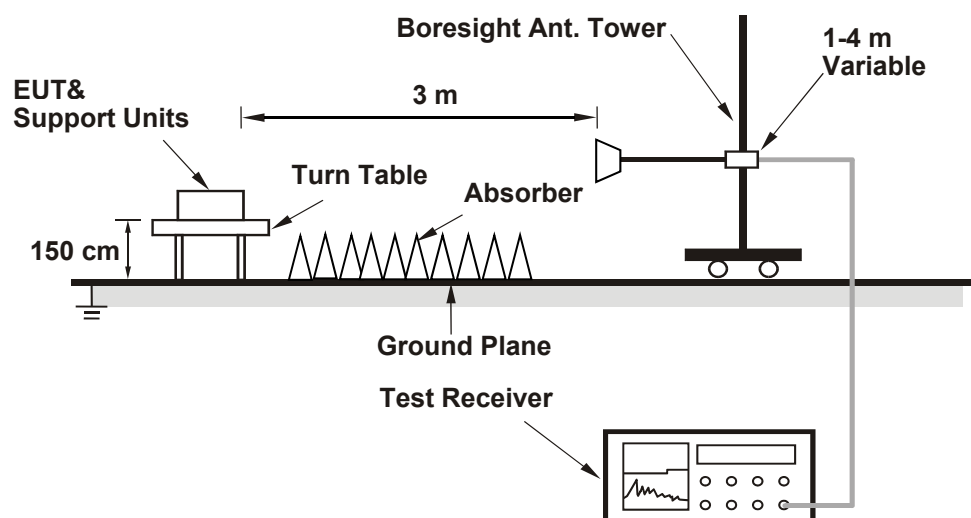
- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the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

#### 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.

## 6.9 Unwanted Emissions above 1 GHz

### 6.9.1 Test Setup



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

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

#### 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.
- According to ANSI C63.10 section 6.6.4 and 4.1.4.2.2. For fundamental and harmonic signal measurement, according to ANSI C63.10 section 7.5, the average value = peak value + duty cycle correction factor. For duty cycle correction factor values, see the Test Signal Duty Cycle section in this report.
- 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:	3.8 Vdc	Environmental Conditions:	25°C, 60% RH	Tested By:	Ivan Tseng
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#### For Peak Power

##### GFSK

Chan.	Chan. Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Power Limit (dBm)	Test Result
0	2402	12.303	10.90	21	Pass
39	2441	13.836	11.41	21	Pass
78	2480	10.74	10.31	21	Pass

Note: The antenna gain is 3.757 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	6.745	8.29	21	Pass
39	2441	6.902	8.39	21	Pass
78	2480	5.333	7.27	21	Pass

Note: The antenna gain is 3.757 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	11.967	10.78
39	2441	13.397	11.27
78	2480	10.351	10.15

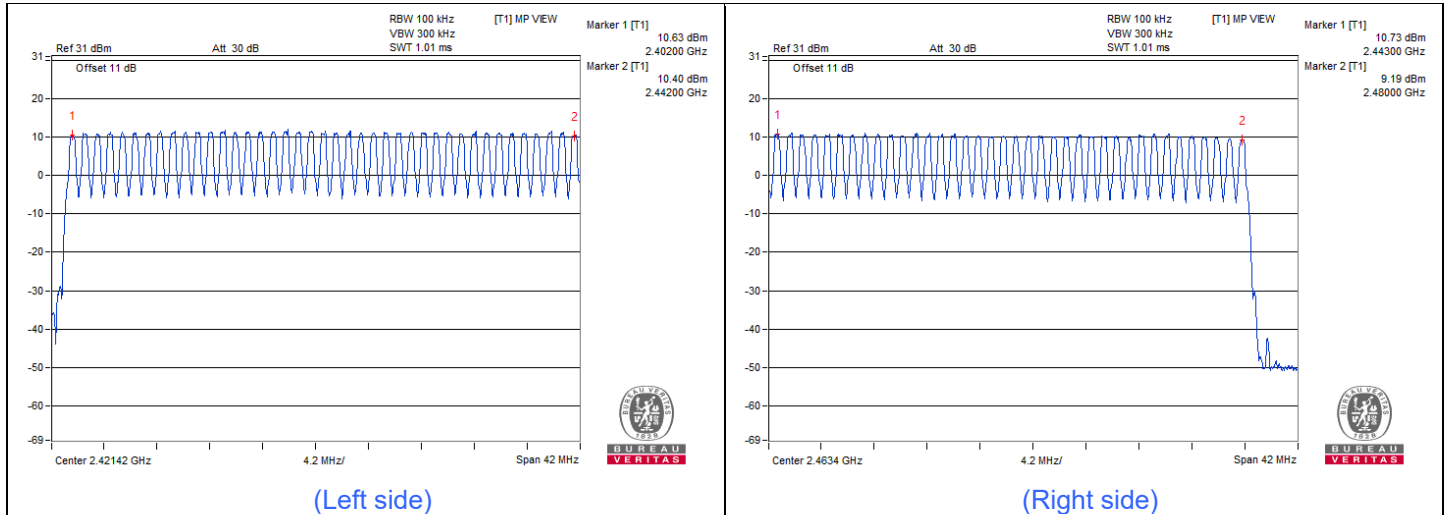
##### 8DPSK

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	6.471	8.11
39	2441	6.577	8.18
78	2480	5.07	7.05

## 7.2 Number of Hopping Frequency Used

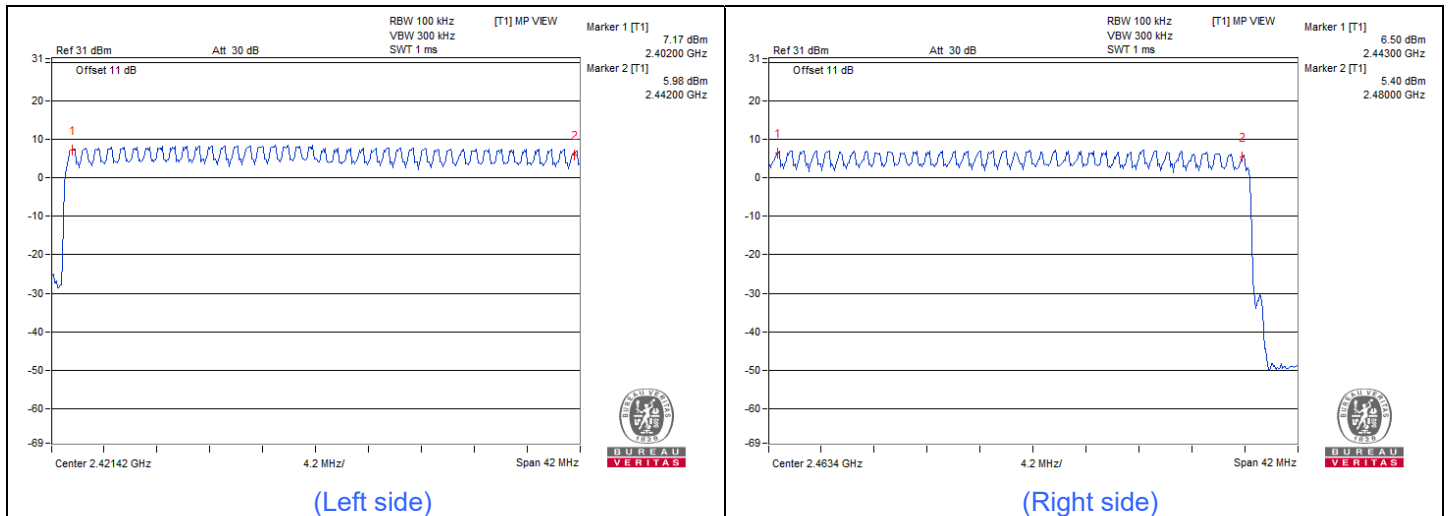
Input Power:	3.8 Vdc	Environmental Conditions:	25°C, 60% RH	Tested By:	Ivan Tseng
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### GFSK



Note: There are 79 hopping frequencies in the hopping mode. On the plots, it shows that the hopping frequencies are equally spaced.

### 8DPSK



Note: There are 79 hopping frequencies in the hopping mode. On the plots, it shows that the hopping frequencies are equally spaced.

### 7.3 Dwell Time on Each Channel

Input Power:	3.8 Vdc	Environmental Conditions:	25°C, 60% RH	Tested By:	Ivan Tseng
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#### GFSK

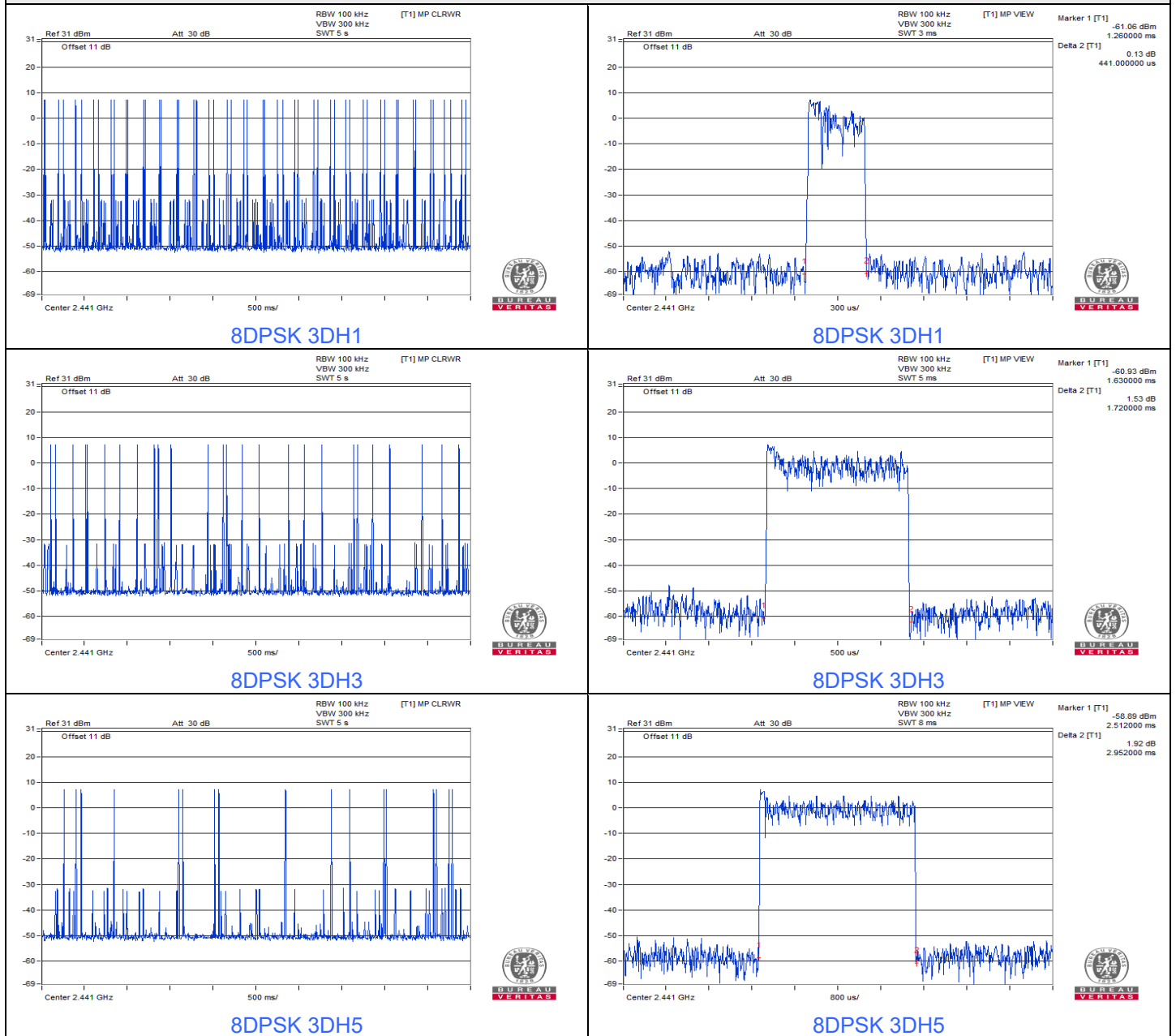
Mode	Number of transmission in 31.6 sec	Length of transmission time (msec)	Result (msec)	Limit (msec)	Test Result
DH1	50 (times / 5 sec) * 6.32 = 316 times	0.438	138.41	400	Pass
DH3	27 (times / 5 sec) * 6.32 = 171 times	1.675	286.43	400	Pass
DH5	16 (times / 5 sec) * 6.32 = 102 times	2.960	301.92	400	Pass



**8DPSK**

Mode	Number of transmission in 31.6 sec	Length of transmission time (msec)	Result (msec)	Limit (msec)	Test Result
3DH1	52 (times / 5 sec) * 6.32 = 329 times	0.441	145.09	400	Pass
3DH3	26 (times / 5 sec) * 6.32 = 165 times	1.720	283.8	400	Pass
3DH5	17 (times / 5 sec) * 6.32 = 108 times	2.952	318.82	400	Pass

**Spectrum plots of Dwell Time**



### 7.4 Hopping Channel Separation

Input Power:	3.8 Vdc	Environmental Conditions:	25°C, 60% RH	Tested By:	Ivan Tseng
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#### GFSK

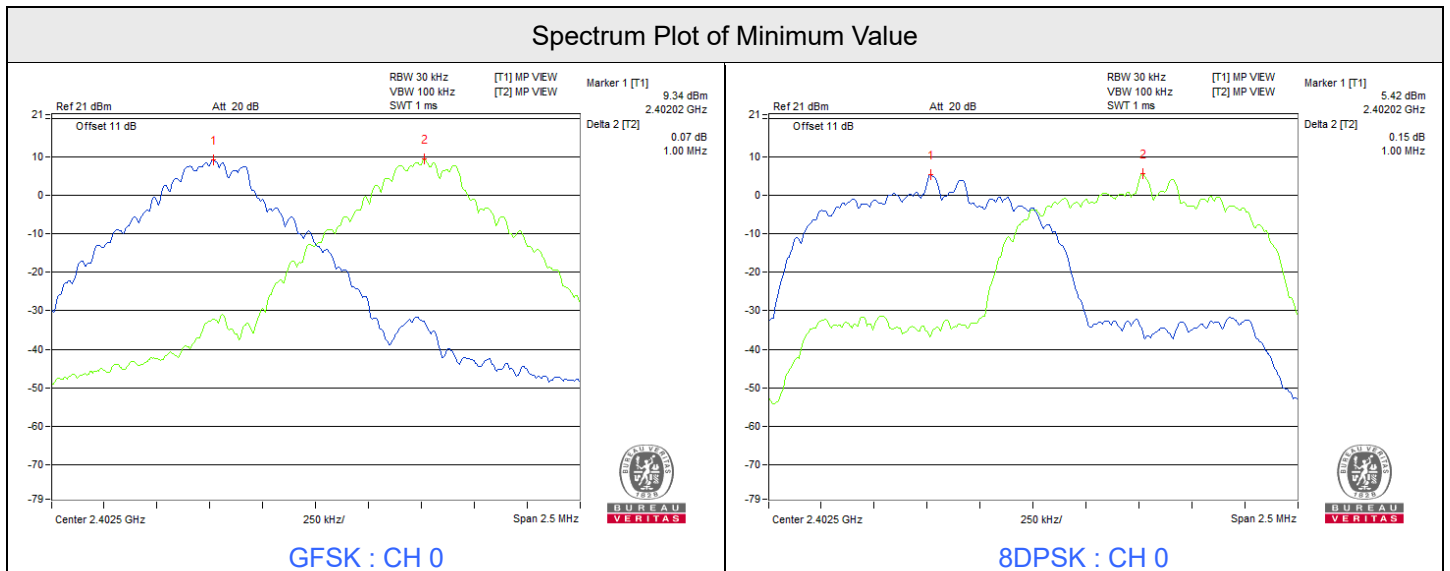
Channel	Frequency (MHz)	Hopping Channel Separation (MHz)	Minimum Limit (MHz)	Test Result
0	2402	1.00	0.63	Pass
39	2441	1.00	0.64	Pass
78	2480	1.01	0.64	Pass

Note: The minimum limit is two-third 20dB bandwidth.

#### 8DPSK

Channel	Frequency (MHz)	Hopping Channel Separation (MHz)	Minimum Limit (MHz)	Test Result
0	2402	1.00	0.87	Pass
39	2441	1.00	0.87	Pass
78	2480	1.00	0.87	Pass

Note: The minimum limit is two-third 20dB bandwidth.



### 7.5 20 dB Bandwidth

Input Power:	3.8 Vdc	Environmental Conditions:	25°C, 60% RH	Tested By:	Ivan Tseng
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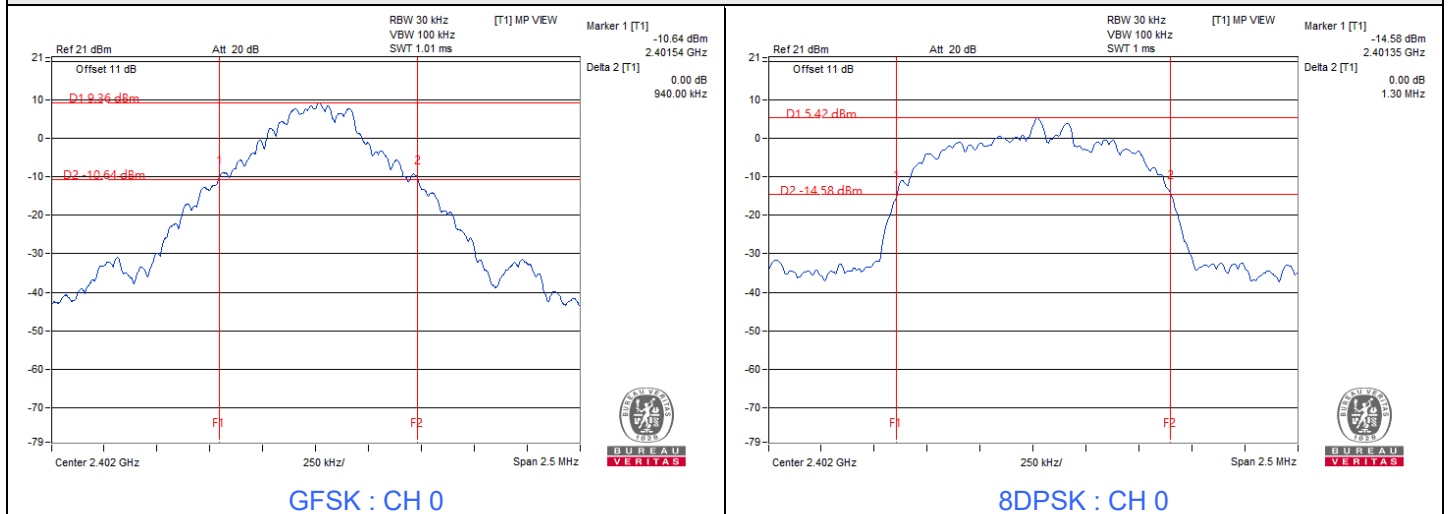
#### GFSK

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
0	2402	0.94
39	2441	0.95
78	2480	0.95

#### 8DPSK

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
0	2402	1.3
39	2441	1.3
78	2480	1.3

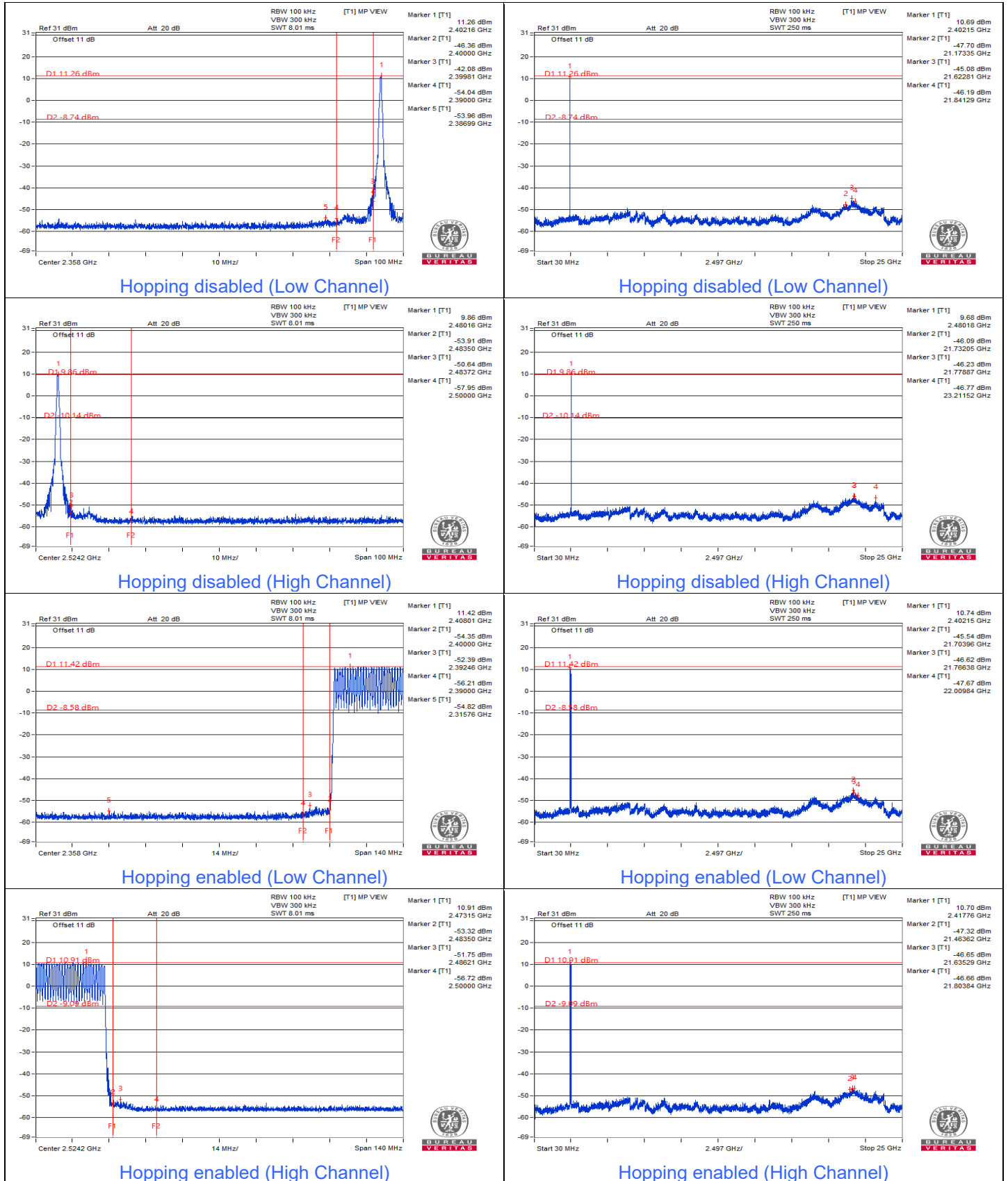
Spectrum Plot of Minimum Value



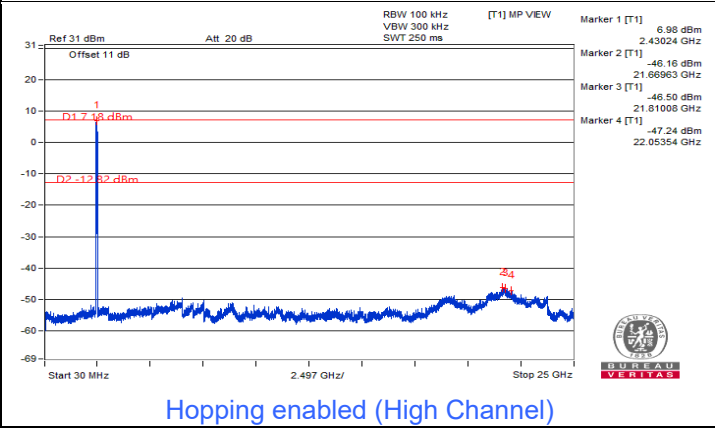
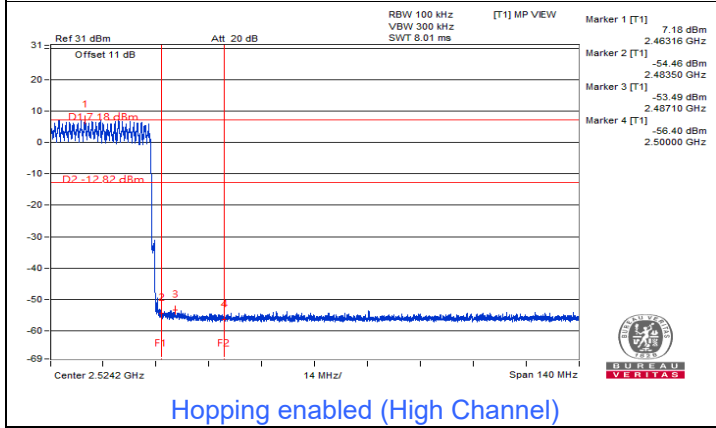
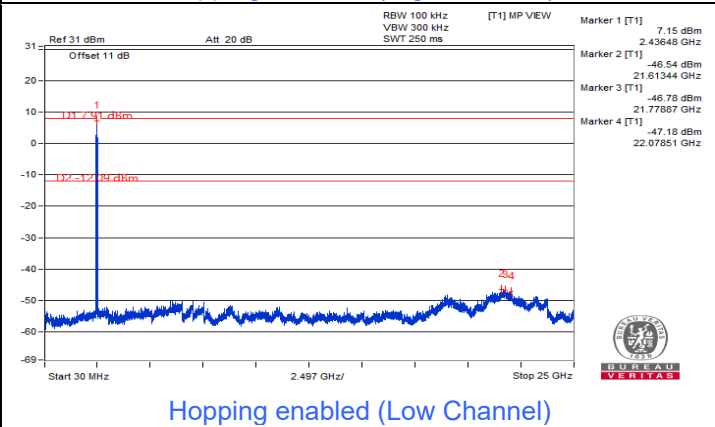
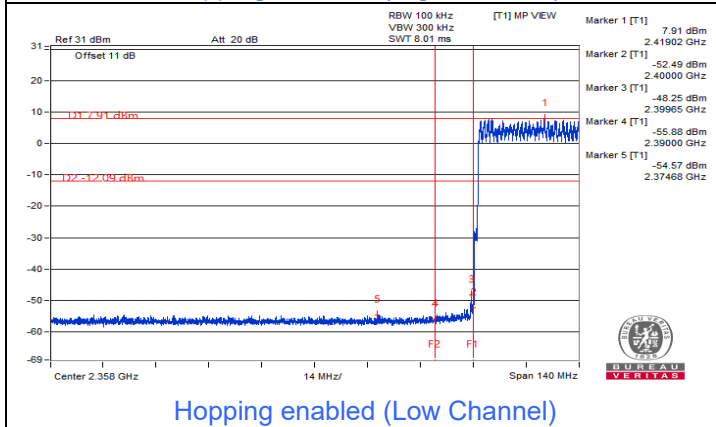
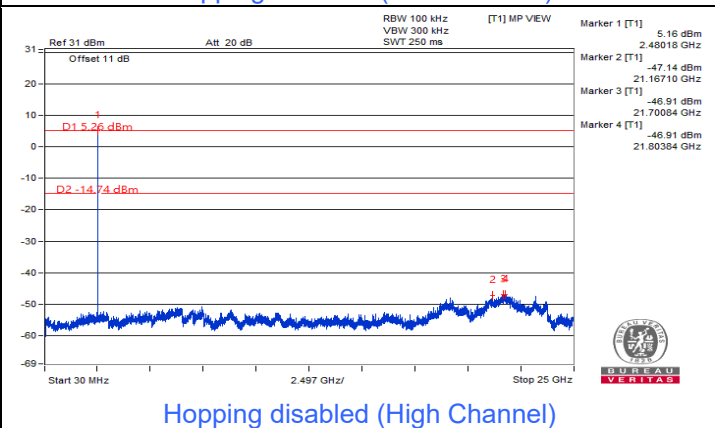
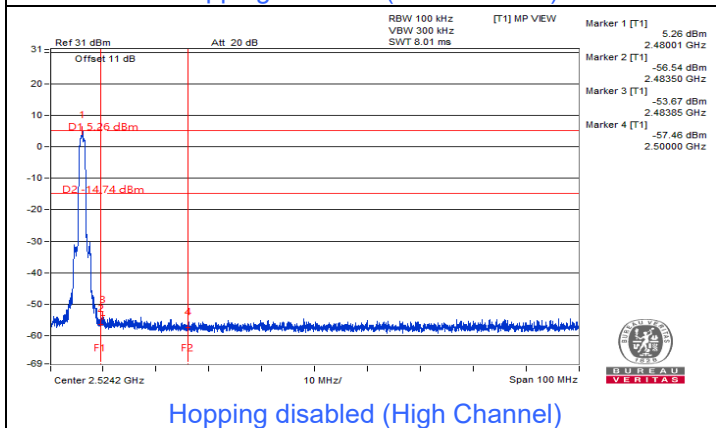
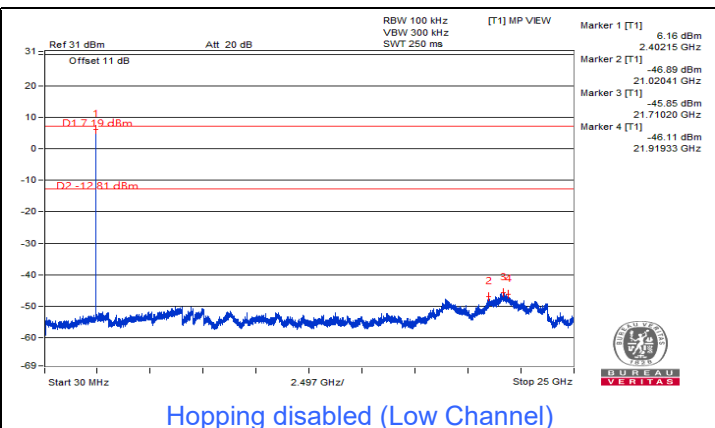
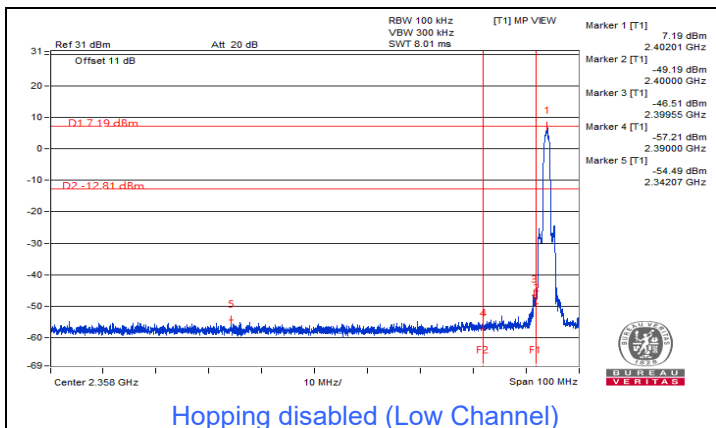
## 7.6 Conducted Out of Band Emissions

Input Power:	3.8 Vdc	Environmental Conditions:	25°C, 60% RH	Tested By:	Ivan Tseng
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### GFSK



8DPSK





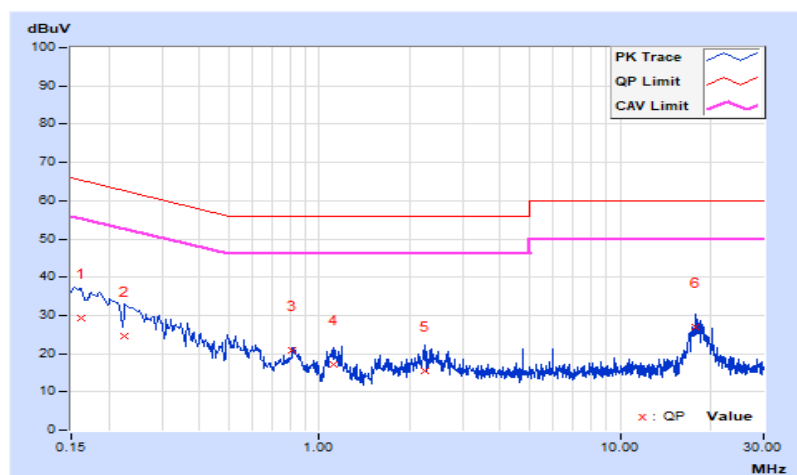
## 7.7 AC Power Conducted Emissions

<b>RF Mode</b>	BT GFSK	<b>Channel</b>	CH 39 : 2441 MHz
<b>Frequency Range</b>	150 kHz ~ 30 MHz	<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9 kHz
<b>Input Power</b>	3.8 Vdc	<b>Environmental Conditions</b>	25°C, 75% RH
<b>Tested By</b>	Rex Wang		

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	0.16105	10.38	19.08	7.75	29.46	18.13	65.41	55.41	-35.95	-37.28
2	0.22600	10.41	14.33	4.33	24.74	14.74	62.60	52.60	-37.86	-37.86
3	0.81400	10.52	10.32	3.25	20.84	13.77	56.00	46.00	-35.16	-32.23
4	1.12000	10.54	6.52	0.44	17.06	10.98	56.00	46.00	-38.94	-35.02
5	2.24400	10.56	5.02	2.65	15.58	13.21	56.00	46.00	-40.42	-32.79
6	17.91200	10.90	16.13	8.41	27.03	19.31	60.00	50.00	-32.97	-30.69

### 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

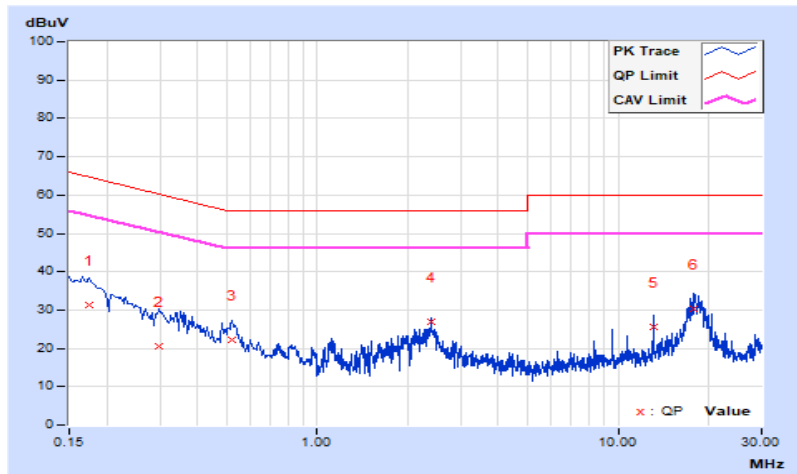


RF Mode	BT GFSK	Channel	CH 39 : 2441 MHz
Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	3.8 Vdc	Environmental Conditions	25°C, 75% RH
Tested By	Rex Wang		

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	0.17384	10.42	20.75	13.26	31.17	23.68	64.77	54.77	-33.60	-31.09
2	0.29800	10.48	10.02	1.63	20.50	12.11	60.30	50.30	-39.80	-38.19
3	0.52152	10.54	11.80	3.07	22.34	13.61	56.00	46.00	-33.66	-32.39
<b>4</b>	<b>2.38800</b>	<b>10.61</b>	<b>16.30</b>	<b>8.66</b>	<b>26.91</b>	<b>19.27</b>	<b>56.00</b>	<b>46.00</b>	<b>-29.09</b>	<b>-26.73</b>
5	13.13200	10.94	14.58	7.84	25.52	18.78	60.00	50.00	-34.48	-31.22
6	17.88000	11.08	19.27	11.27	30.35	22.35	60.00	50.00	-29.65	-27.65

**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



## 7.8 Unwanted Emissions below 1 GHz

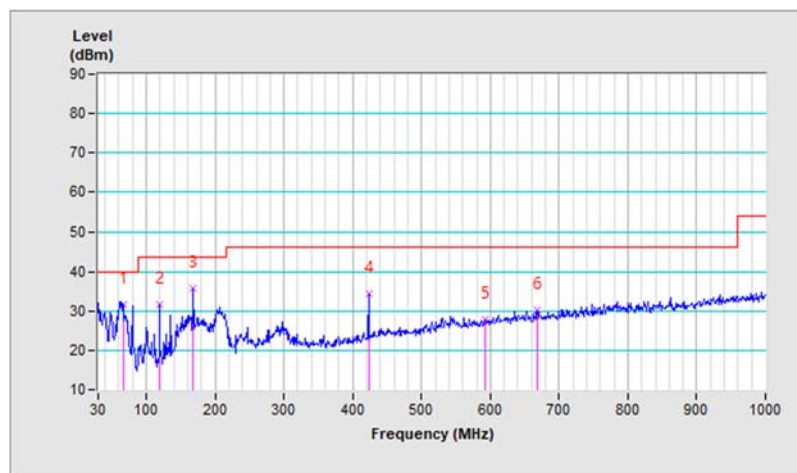
<b>RF Mode</b>	BT GFSK	<b>Channel</b>	CH 39 : 2441 MHz
<b>Frequency Range</b>	30 MHz ~ 1 GHz	<b>Detector Function &amp; Bandwidth</b>	QP: RB=120kHz, DET=Quasi-Peak
<b>Input Power</b>	3.8 Vdc	<b>Environmental Conditions</b>	23°C, 67% RH
<b>Tested By</b>	Adair Peng		

### 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	65.89	31.6 QP	40.0	-8.4	1.00 H	319	42.3	-10.7
2	119.24	31.6 QP	43.5	-11.9	1.00 H	218	43.1	-11.5
3	167.74	35.7 QP	43.5	-7.8	1.50 H	238	44.9	-9.2
4	422.85	34.4 QP	46.0	-11.6	1.00 H	195	39.9	-5.5
5	592.60	27.9 QP	46.0	-18.1	2.00 H	142	30.0	-2.1
6	668.26	30.1 QP	46.0	-15.9	1.00 H	11	30.6	-0.5

### Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.

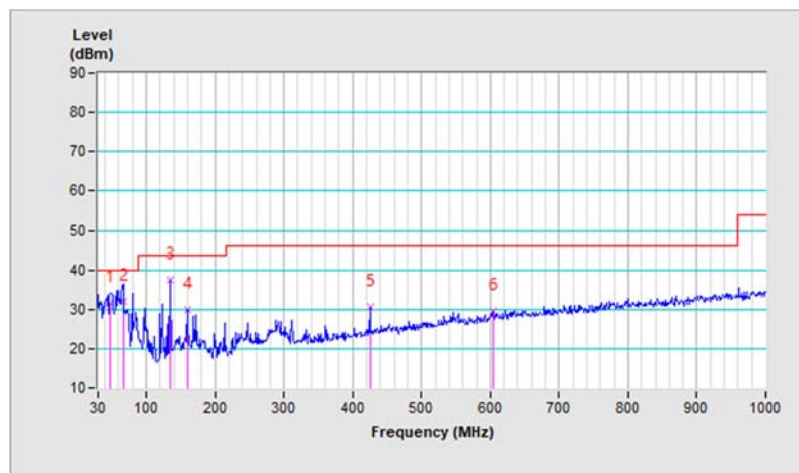


<b>RF Mode</b>	BT GFSK	<b>Channel</b>	CH 39 : 2441 MHz
<b>Frequency Range</b>	30 MHz ~ 1 GHz	<b>Detector Function &amp; Bandwidth</b>	QP: RB=120kHz, DET=Quasi-Peak
<b>Input Power</b>	3.8 Vdc	<b>Environmental Conditions</b>	23°C, 67% RH
<b>Tested By</b>	Adair Peng		

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	47.46	31.8 QP	40.0	-8.2	1.49 V	293	41.3	-9.5
2	65.89	31.9 QP	40.0	-8.1	1.49 V	72	42.6	-10.7
<b>3</b>	<b>134.76</b>	<b>37.4 QP</b>	<b>43.5</b>	<b>-6.1</b>	<b>1.00 V</b>	<b>147</b>	<b>47.4</b>	<b>-10.0</b>
4	159.01	30.0 QP	43.5	-13.5	1.00 V	147	38.9	-8.9
5	424.79	30.6 QP	46.0	-15.4	1.00 V	340	36.0	-5.4
6	604.24	29.4 QP	46.0	-16.6	1.00 V	31	31.1	-1.7

**Remarks:**

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



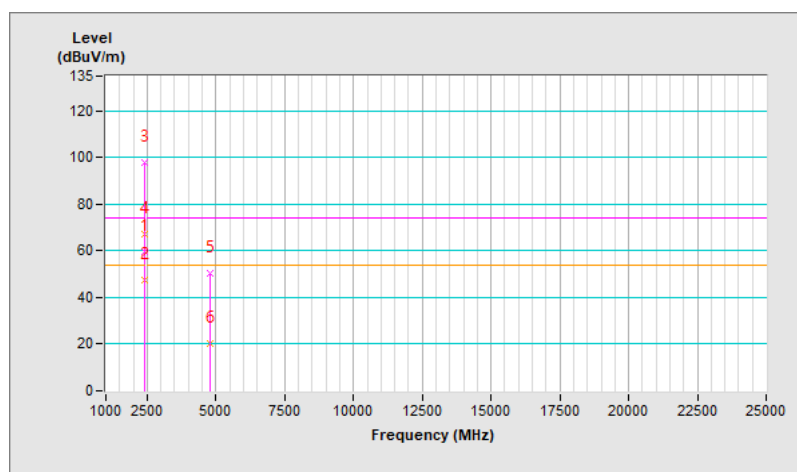
## 7.9 Unwanted Emissions above 1 GHz

<b>RF Mode</b>	BT GFSK	<b>Channel</b>	CH 0 : 2402 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	23°C, 67% RH
<b>Tested By</b>	Rex Wang		

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	59.4 PK	74.0	-14.6	1.42 H	107	25.8	33.6
2	2390.00	47.5 AV	54.0	-6.5	1.42 H	107	13.9	33.6
3	*2402.00	97.7 PK			1.42 H	107	64.1	33.6
4	*2402.00	67.2 AV			1.42 H	107	33.6	33.6
5	4804.00	50.6 PK	74.0	-23.4	2.33 H	120	40.6	10.0
6	4804.00	20.1 AV	54.0	-33.9	2.33 H	120	10.1	10.0

### Remarks:

- Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
- Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
- Margin value = Emission Level – Limit value
- The other emission levels were very low against the limit.
- " \* ": Fundamental frequency, the limit was restricted at the RF Output Power.
- The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:  
 $20 \log(\text{Duty cycle}) = 20 \log(3 \text{ ms} / 100 \text{ ms}) = -30.5 \text{ dB}$

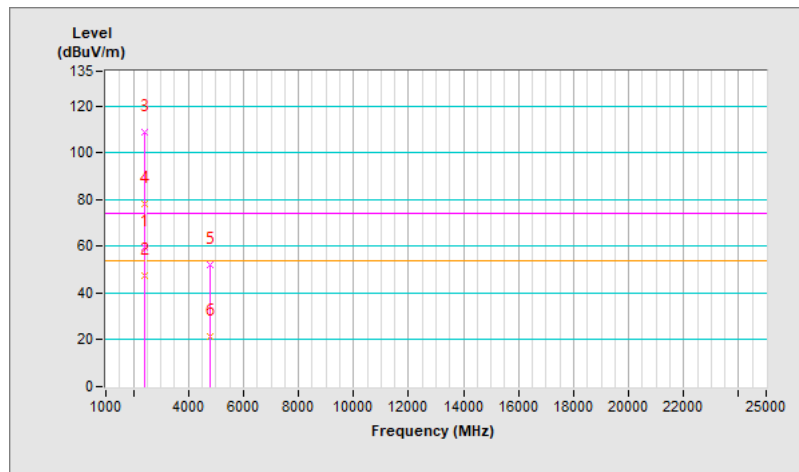


<b>RF Mode</b>	BT GFSK	<b>Channel</b>	CH 0 : 2402 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	23°C, 67% RH
<b>Tested By</b>	Adair Peng		

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	59.8 PK	74.0	-14.2	1.45 V	270	26.2	33.6
2	2390.00	47.7 AV	54.0	-6.3	1.45 V	270	14.1	33.6
3	*2402.00	108.7 PK			1.45 V	270	75.1	33.6
4	*2402.00	78.2 AV			1.45 V	270	44.6	33.6
5	4804.00	52.1 PK	74.0	-21.9	1.91 V	332	42.1	10.0
6	4804.00	21.6 AV	54.0	-32.4	1.91 V	332	11.6	10.0

**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.
5. " \* " : Fundamental frequency, the limit was restricted at the RF Output Power.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:  
 $20 \log(\text{Duty cycle}) = 20 \log(3 \text{ ms} / 100 \text{ ms}) = -30.5 \text{ dB}$

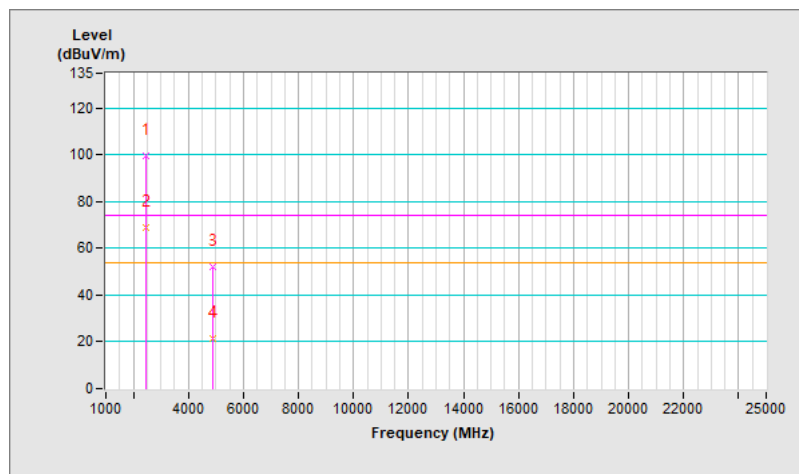


<b>RF Mode</b>	BT GFSK	<b>Channel</b>	CH 39 : 2441 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	23°C, 67% RH
<b>Tested By</b>	Adair Peng		

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	99.5 PK			1.40 H	101	65.8	33.7
2	*2441.00	69.0 AV			1.40 H	101	35.3	33.7
3	4882.00	52.0 PK	74.0	-22.0	2.42 H	115	41.8	10.2
4	4882.00	21.5 AV	54.0	-32.5	2.42 H	115	11.3	10.2

**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.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:  
 $20 \log(\text{Duty cycle}) = 20 \log(3 \text{ ms} / 100 \text{ ms}) = -30.5 \text{ dB}$

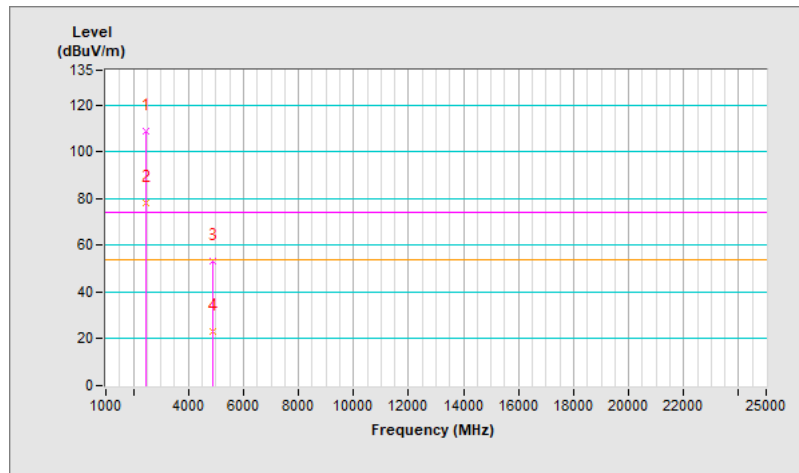


<b>RF Mode</b>	BT GFSK	<b>Channel</b>	CH 39 : 2441 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	23°C, 67% RH
<b>Tested By</b>	Adair Peng		

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	109.0 PK			1.26 V	330	75.3	33.7
2	*2441.00	78.5 AV			1.26 V	330	44.8	33.7
3	4882.00	53.5 PK	74.0	-20.5	1.85 V	328	43.3	10.2
4	4882.00	23.0 AV	54.0	-31.0	1.85 V	328	12.8	10.2

**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.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:  
 $20 \log(\text{Duty cycle}) = 20 \log(3 \text{ ms} / 100 \text{ ms}) = -30.5 \text{ dB}$



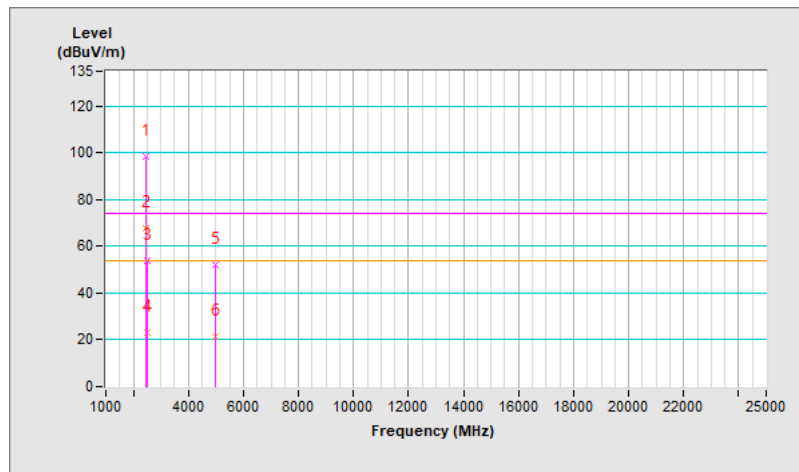


<b>RF Mode</b>	BT GFSK	<b>Channel</b>	CH 78 : 2480 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	23°C, 67% RH
<b>Tested By</b>	Adair Peng		

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	98.3 PK			1.50 H	109	64.6	33.7
2	*2480.00	67.8 AV			1.50 H	109	34.1	33.7
3	2483.50	53.9 PK	74.0	-20.1	1.50 H	109	42.0	11.9
4	2483.50	23.4 AV	54.0	-30.6	1.50 H	109	11.5	11.9
5	4960.00	52.2 PK	74.0	-21.8	2.25 H	124	41.9	10.3
6	4960.00	21.7 AV	54.0	-32.3	2.25 H	124	11.4	10.3

**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, the limit was restricted at the RF Output Power.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:  
 $20 \log(\text{Duty cycle}) = 20 \log(3 \text{ ms} / 100 \text{ ms}) = -30.5 \text{ dB}$

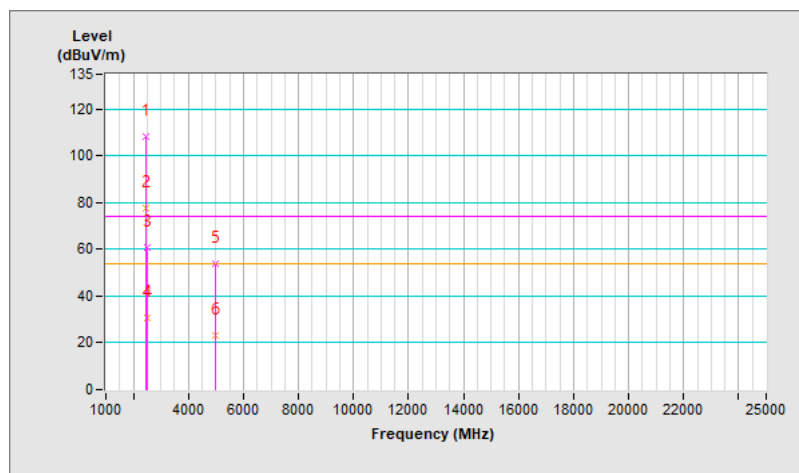


<b>RF Mode</b>	BT GFSK	<b>Channel</b>	CH 78 : 2480 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	23°C, 67% RH
<b>Tested By</b>	Adair Peng		

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	108.1 PK			1.31 V	327	74.4	33.7
2	*2480.00	77.6 AV			1.31 V	327	43.9	33.7
3	2483.50	61.0 PK	74.0	-13.0	1.31 V	327	49.1	11.9
4	2483.50	30.5 AV	54.0	-23.5	1.31 V	327	18.6	11.9
5	4960.00	53.8 PK	74.0	-20.2	2.27 V	322	43.5	10.3
6	4960.00	23.3 AV	54.0	-30.7	2.27 V	322	13.0	10.3

**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, the limit was restricted at the RF Output Power.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:  
 $20 \log(\text{Duty cycle}) = 20 \log(3 \text{ ms} / 100 \text{ ms}) = -30.5 \text{ dB}$

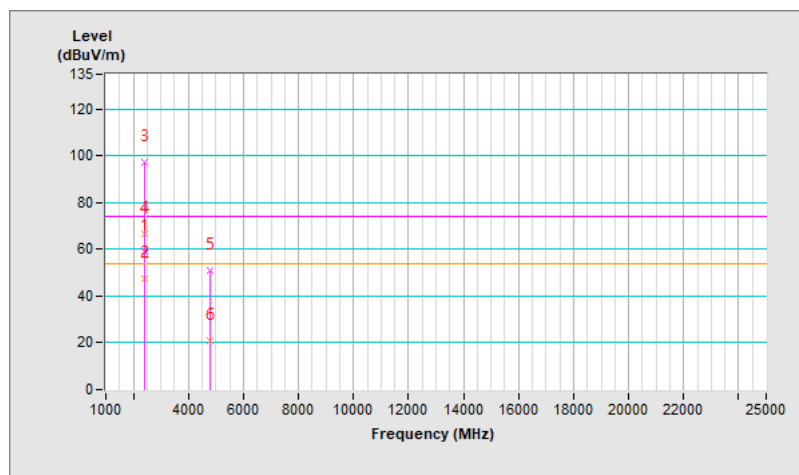


<b>RF Mode</b>	BT 8DPSK	<b>Channel</b>	CH 0 : 2402 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	23°C, 67% RH
<b>Tested By</b>	Adair Peng		

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	59.3 PK	74.0	-14.7	1.41 H	102	25.7	33.6
2	2390.00	47.7 AV	54.0	-6.3	1.41 H	102	14.1	33.6
3	*2402.00	97.2 PK			1.41 H	102	63.6	33.6
4	*2402.00	66.7 AV			1.41 H	102	33.1	33.6
5	4804.00	51.2 PK	74.0	-22.8	2.37 H	129	41.2	10.0
6	4804.00	20.7 AV	54.0	-33.3	2.37 H	129	10.7	10.0

**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.
5. " \* " : Fundamental frequency, the limit was restricted at the RF Output Power.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:  
 $20 \log(\text{Duty cycle}) = 20 \log(3 \text{ ms} / 100 \text{ ms}) = -30.5 \text{ dB}$

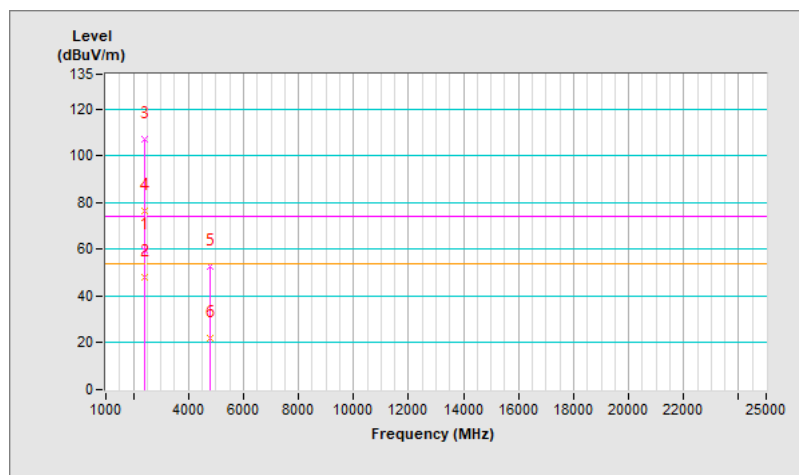


<b>RF Mode</b>	BT 8DPSK	<b>Channel</b>	CH 0 : 2402 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	23°C, 67% RH
<b>Tested By</b>	Adair Peng		

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	59.4 PK	74.0	-14.6	1.46 V	275	25.8	33.6
2	<b>2390.00</b>	<b>47.9 AV</b>	<b>54.0</b>	<b>-6.1</b>	<b>1.46 V</b>	<b>275</b>	<b>14.3</b>	<b>33.6</b>
3	*2402.00	107.0 PK			1.46 V	275	73.4	33.6
4	*2402.00	76.5 AV			1.46 V	275	42.9	33.6
5	4804.00	52.8 PK	74.0	-21.2	2.09 V	321	42.8	10.0
6	4804.00	22.3 AV	54.0	-31.7	2.09 V	321	12.3	10.0

**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.
5. " \* " : Fundamental frequency, the limit was restricted at the RF Output Power.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:  
 $20 \log(\text{Duty cycle}) = 20 \log(3 \text{ ms} / 100 \text{ ms}) = -30.5 \text{ dB}$



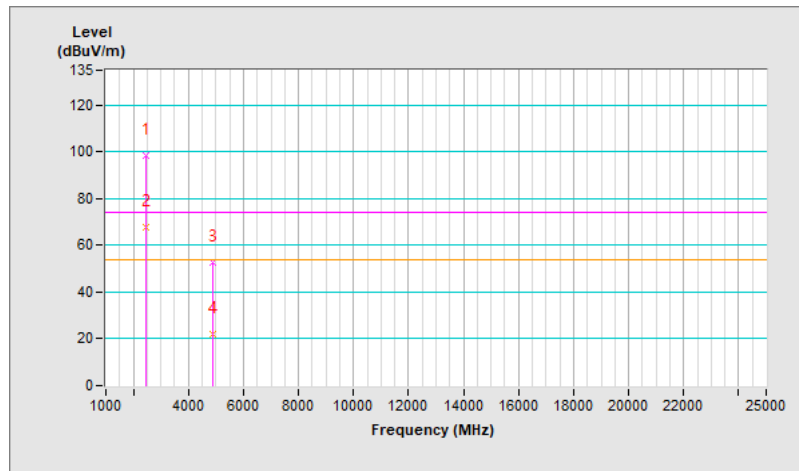
<b>RF Mode</b>	BT 8DPSK	<b>Channel</b>	CH 39 : 2441 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	23°C, 67% RH
<b>Tested By</b>	Adair Peng		

**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	98.4 PK			1.52 H	106	64.7	33.7
2	*2441.00	67.9 AV			1.52 H	106	34.2	33.7
3	4882.00	52.5 PK	74.0	-21.5	2.46 H	131	42.3	10.2
4	4882.00	22.0 AV	54.0	-32.0	2.46 H	131	11.8	10.2

**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.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:  
 $20 \log(\text{Duty cycle}) = 20 \log(3 \text{ ms} / 100 \text{ ms}) = -30.5 \text{ dB}$



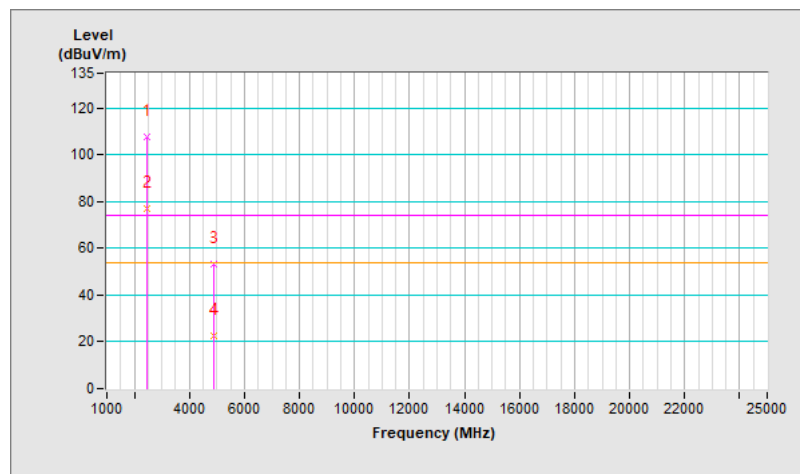
<b>RF Mode</b>	BT 8DPSK	<b>Channel</b>	CH 39 : 2441 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	23°C, 67% RH
<b>Tested By</b>	Adair Peng		

**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	107.8 PK			1.39 V	277	74.1	33.7
2	*2441.00	77.3 AV			1.39 V	277	43.6	33.7
3	4882.00	53.2 PK	74.0	-20.8	1.95 V	333	43.0	10.2
4	4882.00	22.7 AV	54.0	-31.3	1.95 V	333	12.5	10.2

**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.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:  
 $20 \log(\text{Duty cycle}) = 20 \log(3 \text{ ms} / 100 \text{ ms}) = -30.5 \text{ dB}$



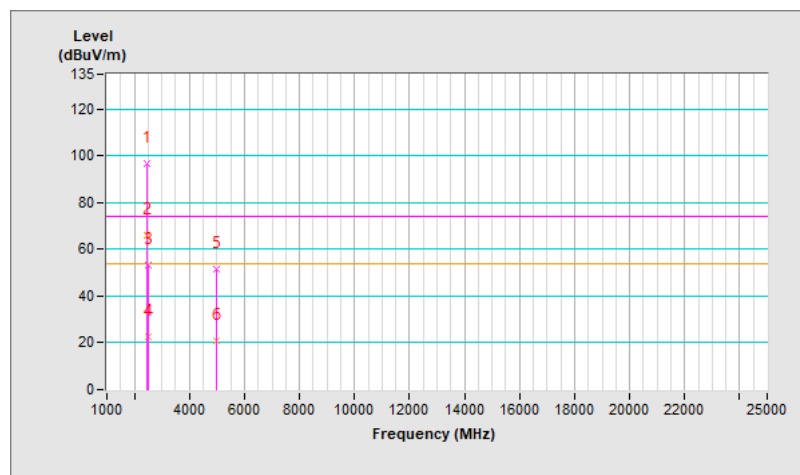
<b>RF Mode</b>	BT 8DPSK	<b>Channel</b>	CH 78 : 2480 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	23°C, 67% RH
<b>Tested By</b>	Adair Peng		

**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	96.5 PK			1.47 H	101	62.8	33.7
2	*2480.00	66.0 AV			1.47 H	101	32.3	33.7
3	2483.50	53.3 PK	74.0	-20.7	1.47 H	101	41.4	11.9
4	2483.50	22.8 AV	54.0	-31.2	1.47 H	101	10.9	11.9
5	4960.00	51.6 PK	74.0	-22.4	2.26 H	127	41.3	10.3
6	4960.00	21.1 AV	54.0	-32.9	2.26 H	127	10.8	10.3

**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, the limit was restricted at the RF Output Power.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:  
 $20 \log(\text{Duty cycle}) = 20 \log(3 \text{ ms} / 100 \text{ ms}) = -30.5 \text{ dB}$

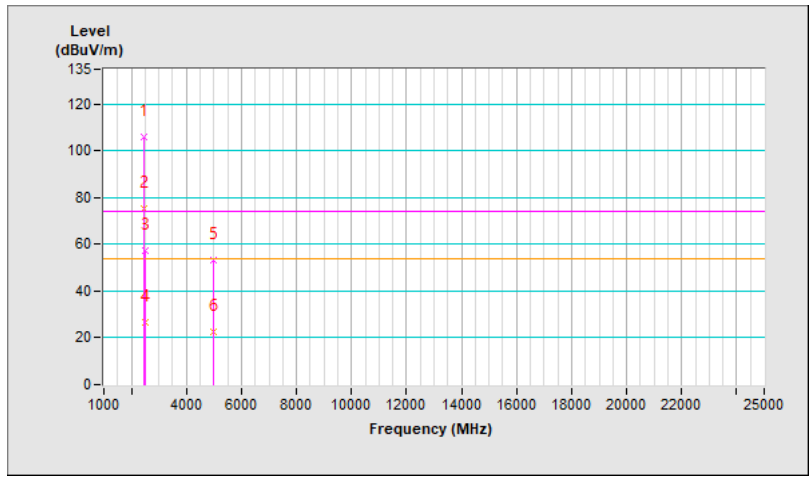


<b>RF Mode</b>	BT 8DPSK	<b>Channel</b>	CH 78 : 2480 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
<b>Input Power</b>	120 Vac, 60 Hz	<b>Environmental Conditions</b>	23°C, 67% RH
<b>Tested By</b>	Adair Peng		

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	106.1 PK			1.36 V	323	72.4	33.7
2	*2480.00	75.6 AV			1.36 V	323	41.9	33.7
3	2483.50	57.2 PK	74.0	-16.8	1.36 V	323	45.3	11.9
4	2483.50	26.7 AV	54.0	-27.3	1.36 V	323	14.8	11.9
5	4960.00	53.2 PK	74.0	-20.8	2.16 V	321	42.9	10.3
6	4960.00	22.7 AV	54.0	-31.3	2.16 V	321	12.4	10.3

**Remarks:**

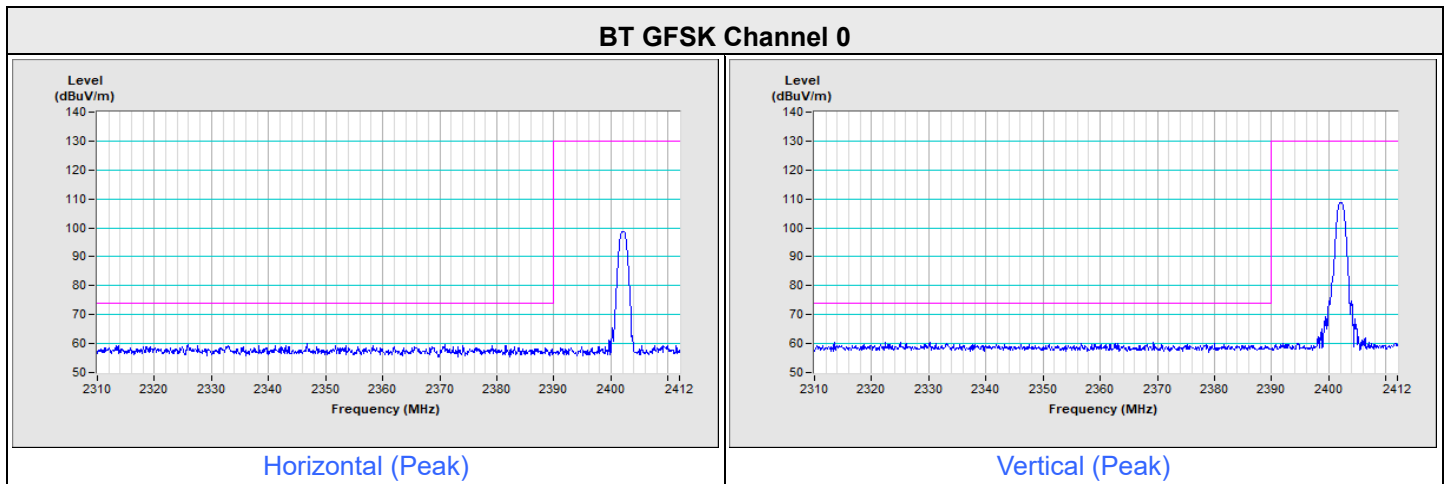
1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " \* " : Fundamental frequency, the limit was restricted at the RF Output Power.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:  
 $20 \log(\text{Duty cycle}) = 20 \log(3 \text{ ms} / 100 \text{ ms}) = -30.5 \text{ dB}$



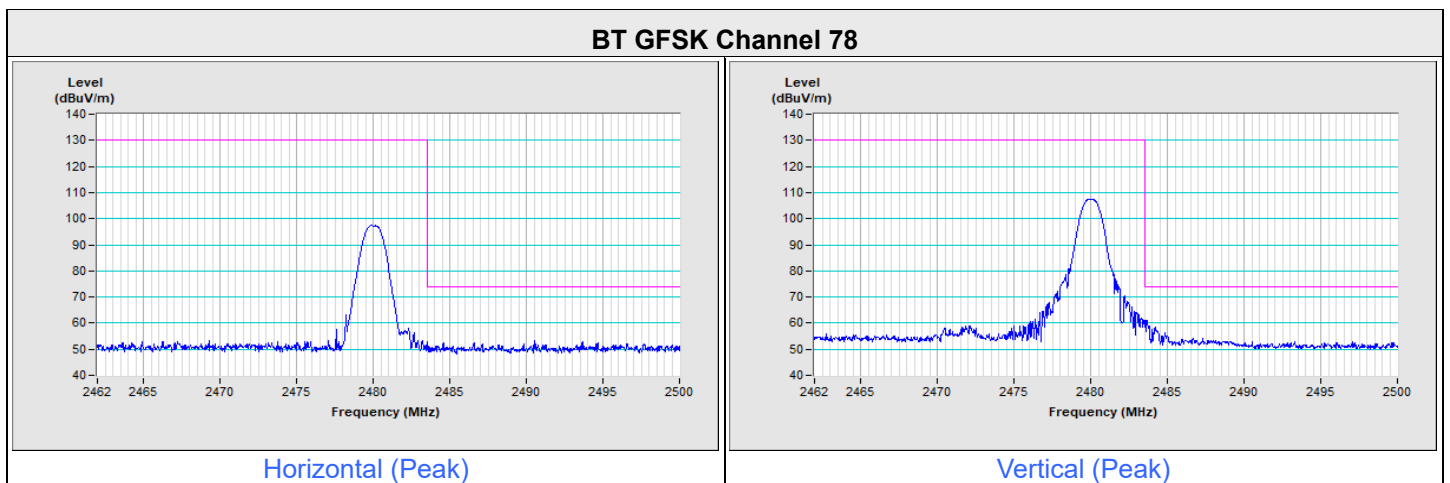


### Plot of Band Edge

Frequency Range	2.31 GHz ~ 2.412 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak
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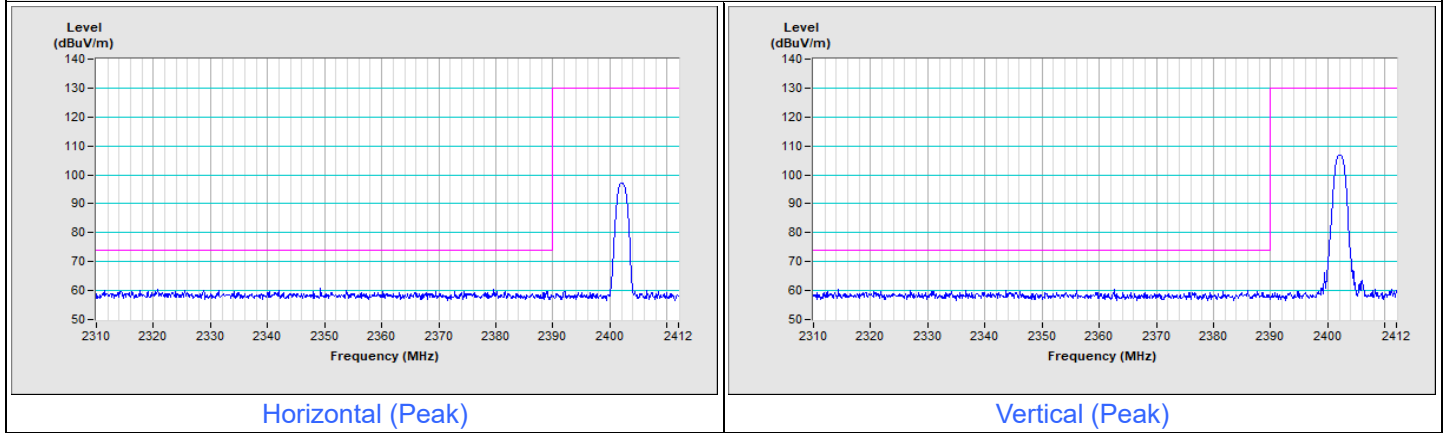


Frequency Range	2.462 GHz ~ 2.5 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak
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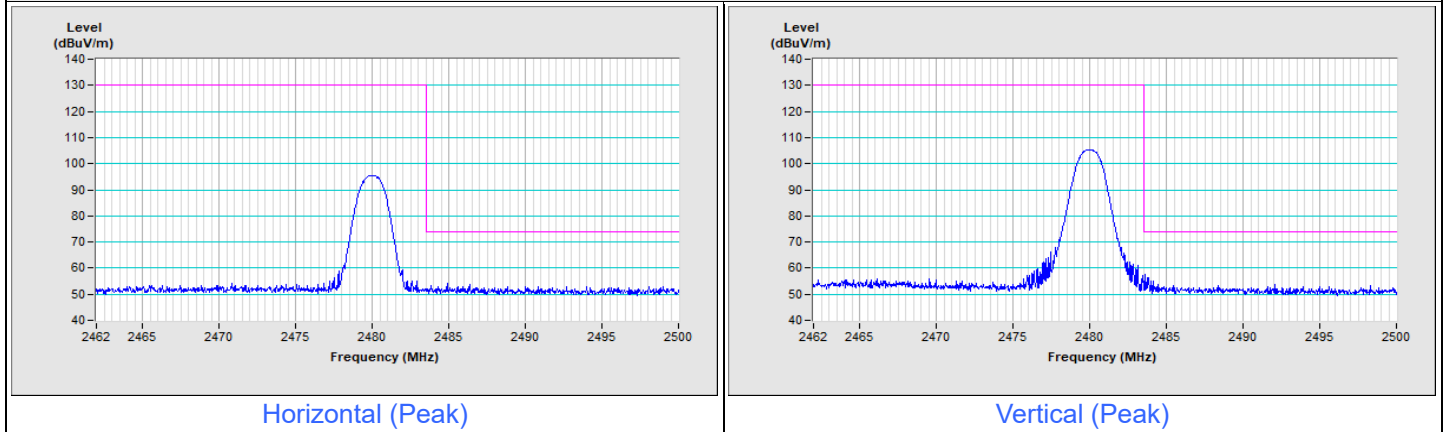
Frequency Range	2.31 GHz ~ 2.412 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak
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**BT 8DPSK Channel 0**



Frequency Range	2.462 GHz ~ 2.5 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak
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**BT 8DPSK Channel 78**



## 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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