

## FCC Test Report

**Report No.:** RFBEKK-WTW-P20100584

**FCC ID:** YJ7DCR006A

**Test Model:** DCR006A

**Received Date:** Oct. 23, 2020

**Test Date:** Nov. 30, 2020 ~ Dec. 01, 2020

**Issued Date:** Dec. 14, 2020

**Applicant:** Stanley Black & Decker

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**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
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33383, Taiwan

**FCC Registration /  
Designation Number:** 788550 / TW0003



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### Release Control Record

Issue No.	Description	Date Issued
RFBEEKK-WTW-P20100584	Original Release	Dec. 14, 2020

## 1 Certificate of Conformity

**Product:** BLUETOOTH SPEAKER

**Brand:** Dewalt

**Test Model:** DCR006A

**Sample Status:** Engineering Sample

**Applicant:** Stanley Black & Decker

**Test Date:** Nov. 30, 2020 ~ Dec. 01, 2020

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

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

**Prepared by :** Shelly Hsueh, **Date:** Dec. 14, 2020  
Shelly Hsueh / Specialist

**Approved by :** Dylan Chiou, **Date:** Dec. 14, 2020  
Dylan Chiou / Senior Project Engineer

## 2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -15.55 dB at 0.56418 MHz.
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)	1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	Pass	Meet the requirement of limit.
15.247(a)(1)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
---	Occupied Bandwidth Measurement	Pass	Reference only
15.205 & 209	Radiated Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -4.0 dB at 37.03 MHz.
15.247(d)	Band Edge Measurement	Pass	Meet the requirement of limit.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	No antenna connector is used.

### Note:

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. For 2.4G band compliance with rule 15.247(d) of the band-edge items, the test plots were recorded in Annex A. Test Procedures refer to report 4.1.3.
3. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

### 2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.79 dB
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.04 dB
	30 MHz ~ 200 MHz	2.93 dB
	200 MHz ~ 1000 MHz	2.95 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

<b>Product</b>	BLUETOOTH SPEAKER
<b>Brand</b>	Dewalt
<b>Test Model</b>	DCR006A
<b>Status of EUT</b>	Engineering Sample
<b>Power Supply Rating</b>	12 Vdc (adapter) 14.4, 20 Vdc (Li-ion battery)
<b>Modulation Type</b>	GFSK, $\pi/4$ -DQPSK, 8DPSK
<b>Transfer Rate</b>	1/2/3 Mbps
<b>Operating Frequency</b>	2402 ~ 2480 MHz
<b>Number of Channel</b>	79
<b>Output Power</b>	3.945 mW
<b>Antenna Type</b>	Refer to Note as below
<b>Antenna Connector</b>	N/A
<b>Accessory Device</b>	Refer to Note as below
<b>Data Cable Supplied</b>	Refer to Note as below

Note:

1. The EUT contains following accessory devices.

Product	Brand	Model	Description
Adapter	PHIHONG	PSM12A-120L6	I/P: 100-240 Vac, 50/60 Hz O/P: 12 Vdc, 1 A 1.45m, 0 core
Battery 1	DEWALT	DCB143	14.4V, 29Wh
Battery 2	DEWALT	DCB204	20V, 80Wh

2. The antenna information is listed as below.

Product	Brand	Model	Antenna Gain	Antenna type	Connector Type
PCB antenna	NA	NA	0 dBi	PCB antenna	NA

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

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

### 3.2 Description of Test Modes

79 channels are provided to this EUT:

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



### 3.2.1 Test Mode Applicability and Tested Channel Detail

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

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

**Note:**

1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.
2. "-" means no effect.

**Radiated Emission Test (Above 1 GHz):**

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

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

**Radiated Emission Test (Below 1 GHz):**

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

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

**Power Line Conducted Emission Test:**

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

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

**Antenna Port Conducted Measurement:**

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

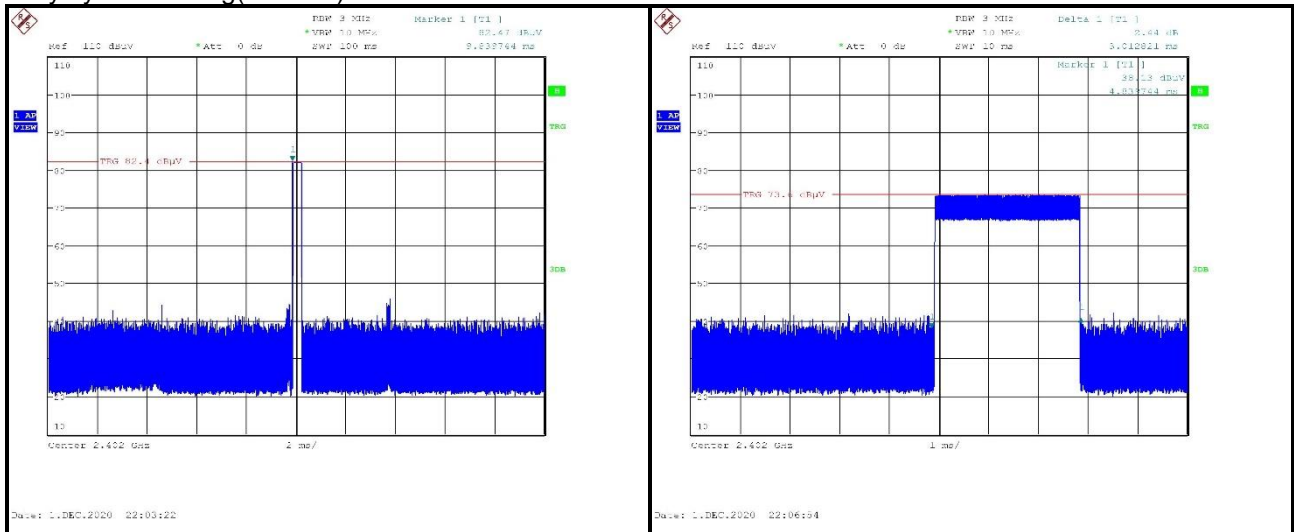
EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	0, 39, 78	FHSS	GFSK	DH5
-	0 to 78	0, 39, 78	FHSS	8DPSK	3DH5

**Test Condition:**

Applicable To	Environmental Conditions	Input Power	Tested by
RE≥1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Adair Peng
RE<1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Adair Peng
PLC	25 deg. C, 65 % RH	120 Vac, 60 Hz	Adair Peng
APCM	25 deg. C, 65 % RH	12 Vdc	Iven Tseng

**3.3 Duty**

Duty cycle =  $20 \cdot \log(3.012 \cdot 1) / 100\text{ms} = -30.42$



### 3.4 Description of Support Units

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

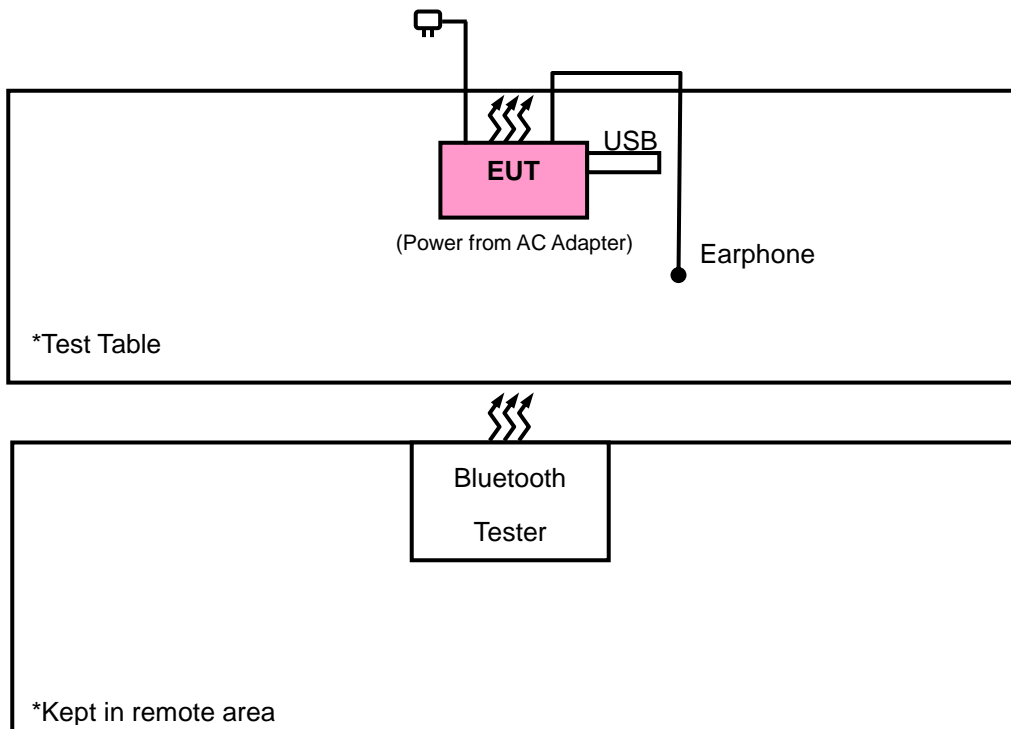
No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Bluetooth Tester	R&S	CBT	100980	N/A
2.	USB 2.0 FLASH	HP	v250W	03	N/A
3.	Earphone	Apple	N/A	N/A	N/A
4.	Adapter	PHIHONG	PSM12A-120L6	N/A	N/A

No.	Signal Cable Description Of The Above Support Units
1.	N/A
2.	N/A
3.	N/A
4.	1.45m

Note:

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

#### 3.4.1 Configuration of System under Test



### 3.5 General Description of Applied Standards and References

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

#### Test Standard:

##### **FCC Part 15, Subpart C (15.247)**

ANSI C63.10-2013

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

#### References Test Guidance:

##### **KDB 558074 D01 15.247 Meas Guidance v05r02**

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

## 4 Test Types and Results

### 4.1 Radiated Emission and Bandedge Measurement

#### 4.1.1 Limits of Radiated Emission and Bandedge Measurement

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

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

**Note:**

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

#### 4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver ROHDE & SCHWARZ	ESR3	102579	Jul. 07, 2020	Jul. 06, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Jun. 09, 2020	Jun. 08, 2021
BILOG Antenna SCHWARZBECK	VULB9168	9168-171	Nov. 04, 2020	Nov. 03, 2021
HORN Antenna SCHWARZBECK	9120D	209	Nov. 22, 2020	Nov. 21, 2021
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 22, 2020	Nov. 21, 2021
Loop Antenna EMCI	EM-6879	269	Sep. 17, 2020	Sep. 16, 2021
Preamplifier Agilent (Below 1GHz)	8447D	2944A10738	Aug. 16, 2020	Aug. 15, 2021
Preamplifier Agilent (Above 1GHz)	8449B	3008A02465	Mar. 23, 2020	Mar. 22, 2021
RF Coaxial Cable WOKEN With 5dB PAD	8D-FB	Cable-CH3-01	Aug. 16, 2020	Aug. 15, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH3-03 (223653/4)	Aug. 16, 2020	Aug. 15, 2021
RF signal cable HUBER+SUHNER& EMCI	SUCOFLEX 104&EMC104-SM- SM-8000	Cable-CH3-03 (309224+170907)	Aug. 16, 2020	Aug. 15, 2021
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Turn Table Controller BV ADT	SC100	SC93021702	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY55 190004/MY551900 07/MY55210005	Jul. 13, 2020	Jul. 12, 2021

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
2. The test was performed in HwaYa Chamber 3.

#### 4.1.3 Test Procedures

##### **For Radiated Emission below 30 MHz**

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

##### **Note:**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz at frequency below 30 MHz.

##### **For Radiated Emission above 30 MHz**

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 1 GHz) / 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

##### **Note:**

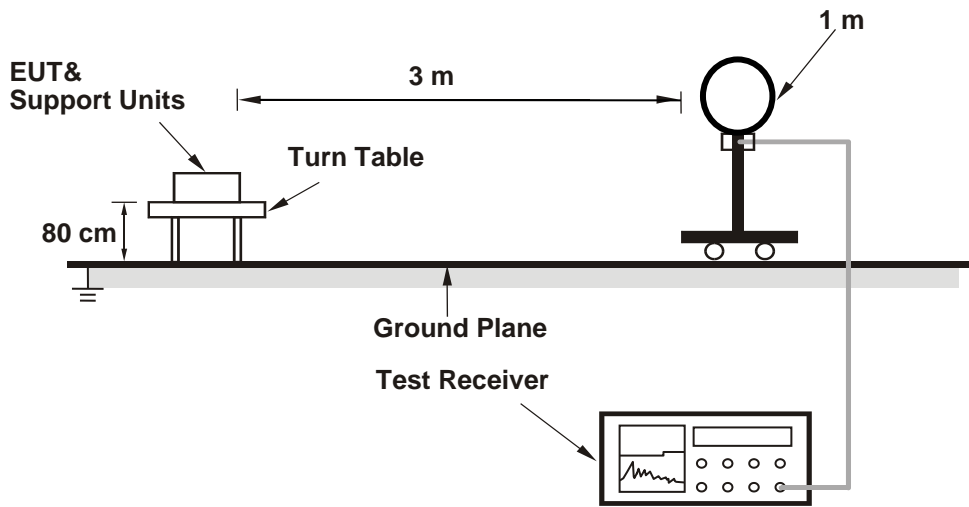
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) and Average detection (AV) at frequency above 1 GHz. For fundamental and harmonic signal measurement, according to ANSI C63.10 section 7.5, the average value = peak value + duty cycle correction factor. The duty cycle correction factor refer to Chapter 3.3 of this report.
3. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.1.4 Deviation from Test Standard

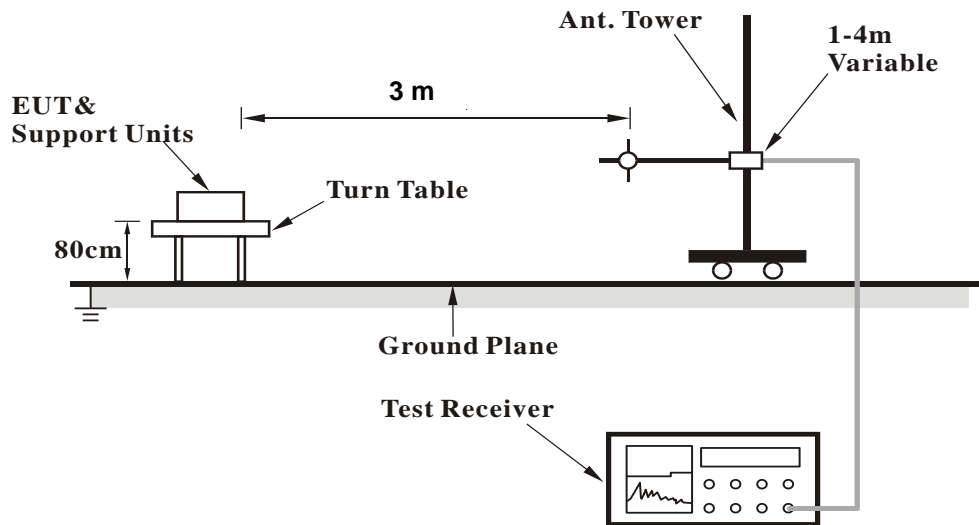
No deviation.

4.1.5 Test Set Up

<Radiated Emission below 30 MHz>

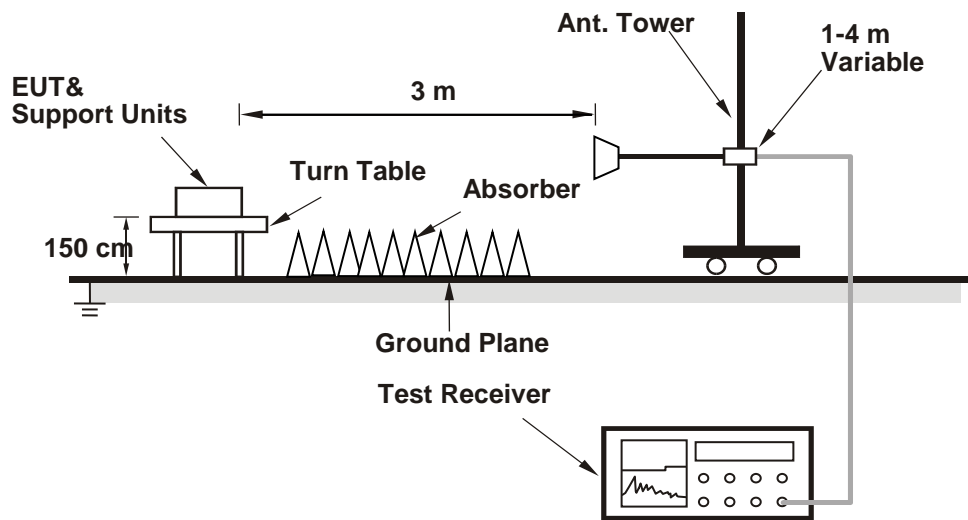


<Radiated Emission 30 MHz to 1 GHz>





### <Radiated Emission above 1 GHz>



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

#### 4.1.6 EUT Operating Conditions

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

#### 4.1.7 Test Results

#### Above 1 GHz Data:

#### ABOVE 1GHz DATA

<b>RF Mode</b>	TX BT_GFSK	<b>Channel</b>	CH 0 : 2402 MHz
<b>Frequency Range</b>	1GHz ~ 25GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

#### Antenna Polarity & Test Distance : Horizontal at 3 m

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	60.8 PK	74.0	-13.2	1.89 H	198	26.4	34.4
2	2390.00	49.5 AV	54.0	-4.5	1.89 H	198	15.1	34.4
3	*2402.00	96.5 PK			1.89 H	198	62.2	34.3
4	*2402.00	66.1 AV			1.89 H	198	31.8	34.3
5	4804.00	61.5 PK	74.0	-12.5	1.25 H	167	55.4	6.1
6	4804.00	31.1 AV	54.0	-22.9	1.25 H	167	25.0	6.1

#### 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	61.1 PK	74.0	-12.9	3.38 V	208	26.7	34.4
2	<b>2390.00</b>	<b>49.6 AV</b>	<b>54.0</b>	<b>-4.4</b>	<b>3.38 V</b>	<b>208</b>	<b>15.2</b>	<b>34.4</b>
3	*2402.00	99.5 PK			3.38 V	208	65.2	34.3
4	*2402.00	69.1 AV			3.38 V	208	34.8	34.3
5	4804.00	59.9 PK	74.0	-14.1	1.22 V	150	53.8	6.1
6	4804.00	29.5 AV	54.0	-24.5	1.22 V	150	23.4	6.1

#### 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.
6. The average value of fundamental frequency is :average = peak value + 20log(Duty cycle) where the duty factor is calculated from following formula:  
 $20\text{Log}(\text{Duty cycle}) = 20 \log (3.012\text{ms} \times 1/100) = -30.42 \text{ dB}$  please refer to the plotted duty(see 3.3 duty)

<b>RF Mode</b>	TX BT_GFSK	<b>Channel</b>	CH 39 : 2441 MHz
<b>Frequency Range</b>	1GHz ~ 25GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2441.00	93.5 PK			1.93 H	201	59.1	34.4
2	*2441.00	63.1 AV			1.93 H	201	28.7	34.4
3	4882.00	61.6 PK	74.0	-12.4	1.31 H	171	55.6	6.0
4	4882.00	31.2 AV	54.0	-22.8	1.31 H	171	25.2	6.0

**Antenna Polarity & Test Distance : Vertical at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2441.00	96.4 PK			3.31 V	204	62.0	34.4
2	*2441.00	66.0 AV			3.31 V	204	31.6	34.4
3	4882.00	59.9 PK	74.0	-14.1	1.18 V	159	53.9	6.0
4	4882.00	29.5 AV	54.0	-24.5	1.18 V	159	23.5	6.0

**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.
6. The average value of fundamental frequency is :average = peak value + 20log(Duty cycle) where the duty factor is calculated from following formula:  
 $20\text{Log}(\text{Duty cycle}) = 20 \log (3.012\text{ms} \cdot 1/100) = -30.42 \text{ dB}$  please refer to the plotted duty(see 3.3 duty)

<b>RF Mode</b>	TX BT_GFSK	<b>Channel</b>	CH 78 : 2480 MHz
<b>Frequency Range</b>	1GHz ~ 25GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	91.9 PK			1.97 H	195	57.5	34.4
2	*2480.00	61.5 AV			1.97 H	195	27.1	34.4
3	2483.50	51.2 PK	74.0	-22.8	1.97 H	195	53.2	-2.0
4	2483.50	20.8 AV	54.0	-33.2	1.97 H	195	22.8	-2.0
5	4960.00	62.6 PK	74.0	-11.4	1.33 H	169	56.2	6.4
6	4960.00	32.2 AV	54.0	-21.8	1.33 H	169	25.8	6.4

**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	95.1 PK			3.59 V	203	60.7	34.4
2	*2480.00	64.7 AV			3.59 V	203	30.3	34.4
3	2483.50	51.6 PK	74.0	-22.4	3.59 V	203	53.6	-2.0
4	2483.50	21.2 AV	54.0	-32.8	3.59 V	203	23.2	-2.0
5	4960.00	60.6 PK	74.0	-13.4	1.18 V	152	54.2	6.4
6	4960.00	30.2 AV	54.0	-23.8	1.18 V	152	23.8	6.4

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " \* ": Fundamental frequency.
6. The average value of fundamental frequency is :average = peak value + 20log(Duty cycle) where the duty factor is calculated from following formula:  
 $20\text{Log}(\text{Duty cycle}) = 20 \log (3.012\text{ms} \cdot 1/100) = -30.42 \text{ dB}$  please refer to the plotted duty(see 3.3 duty)

<b>RF Mode</b>	TX BT_8DPSK	<b>Channel</b>	CH 0 : 2402 MHz
<b>Frequency Range</b>	1GHz ~ 25GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	60.9 PK	74.0	-13.1	1.85 H	199	26.5	34.4
2	2390.00	49.5 AV	54.0	-4.5	1.85 H	199	15.1	34.4
3	*2402.00	95.7 PK			1.85 H	199	61.4	34.3
4	*2402.00	65.3 AV			1.85 H	199	31.0	34.3
5	4804.00	61.1 PK	74.0	-12.9	1.35 H	177	55.0	6.1
6	4804.00	30.7 AV	54.0	-23.3	1.35 H	177	24.6	6.1

**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	61.0 PK	74.0	-13.0	3.40 V	205	26.6	34.4
2	2390.00	49.6 AV	54.0	-4.4	3.40 V	205	15.2	34.4
3	*2402.00	98.7 PK			3.40 V	205	64.4	34.3
4	*2402.00	68.3 AV			3.40 V	205	34.0	34.3
5	4804.00	59.4 PK	74.0	-14.6	1.12 V	153	53.3	6.1
6	4804.00	29.0 AV	54.0	-25.0	1.12 V	153	22.9	6.1

**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.
6. The average value of fundamental frequency is :average = peak value + 20log(Duty cycle) where the duty factor is calculated from following formula:  
 $20\text{Log}(\text{Duty cycle}) = 20 \log (3.012\text{ms} \cdot 1/100) = -30.42 \text{ dB}$  please refer to the plotted duty(see 3.3 duty)

<b>RF Mode</b>	TX BT_8DPSK	<b>Channel</b>	CH 39 : 2441 MHz
<b>Frequency Range</b>	1GHz ~ 25GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2441.00	93.6 PK			1.82 H	203	59.2	34.4
2	*2441.00	63.2 AV			1.82 H	203	28.8	34.4
3	4882.00	62.0 PK	74.0	-12.0	1.35 H	172	56.0	6.0
4	4882.00	31.6 AV	54.0	-22.4	1.35 H	172	25.6	6.0

**Antenna Polarity & Test Distance : Vertical at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2441.00	96.8 PK			3.30 V	201	62.4	34.4
2	*2441.00	66.4 AV			3.30 V	201	32.0	34.4
3	4882.00	60.1 PK	74.0	-13.9	1.14 V	157	54.1	6.0
4	4882.00	29.7 AV	54.0	-24.3	1.14 V	157	23.7	6.0

**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.
6. The average value of fundamental frequency is :average = peak value + 20log(Duty cycle) where the duty factor is calculated from following formula:  
 $20\text{Log}(\text{Duty cycle}) = 20 \log (3.012\text{ms} \cdot 1/100) = -30.42 \text{ dB}$  please refer to the plotted duty(see 3.3 duty)

<b>RF Mode</b>	TX BT_8DPSK	<b>Channel</b>	CH 78 : 2480 MHz
<b>Frequency Range</b>	1GHz ~ 25GHz	<b>Detector Function</b>	Peak (PK) Average (AV)

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	93.9 PK			1.93 H	199	59.5	34.4
2	*2480.00	63.5 AV			1.93 H	199	29.1	34.4
3	2483.50	49.2 PK	74.0	-24.8	1.93 H	199	51.2	-2.0
4	2483.50	18.8 AV	54.0	-35.2	1.93 H	199	20.8	-2.0
5	4960.00	62.4 PK	74.0	-11.6	1.30 H	174	56.0	6.4
6	4960.00	32.0 AV	54.0	-22.0	1.30 H	174	25.6	6.4

**Antenna Polarity & Test Distance : Vertical at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	97.1 PK			3.58 V	208	62.7	34.4
2	*2480.00	66.7 AV			3.58 V	208	32.3	34.4
3	2483.50	49.6 PK	74.0	-24.4	3.58 V	208	51.6	-2.0
4	2483.50	19.2 AV	54.0	-34.8	3.58 V	208	21.2	-2.0
5	4960.00	60.6 PK	74.0	-13.4	1.18 V	145	54.2	6.4
6	4960.00	30.2 AV	54.0	-23.8	1.18 V	145	23.8	6.4

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " \* ": Fundamental frequency.
6. The average value of fundamental frequency is :average = peak value + 20log(Duty cycle) where the duty factor is calculated from following formula:  
 $20\text{Log}(\text{Duty cycle}) = 20 \log (3.012\text{ms} \cdot 1/100) = -30.42 \text{ dB}$  please refer to the plotted duty(see 3.3 duty)

**9 kHz ~ 30 MHz Data:**

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

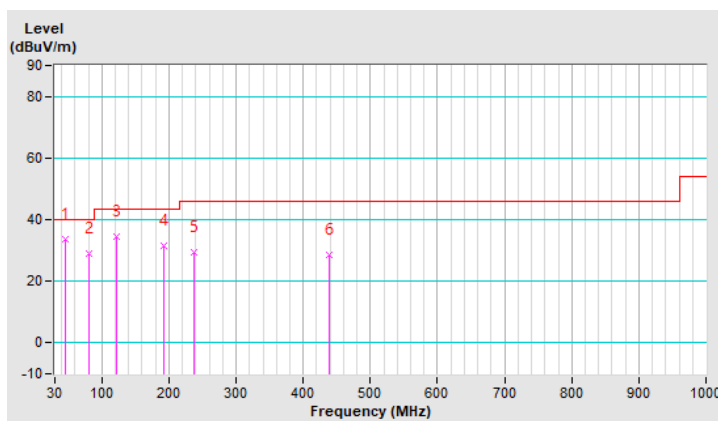
**30 MHz ~ 1 GHz Worst-Case Data:**

<b>RF Mode</b>	TX BT_8DPSK	<b>Channel</b>	CH 0 : 2402 MHz
<b>Frequency Range</b>	30MHz ~ 1GHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	45.46	33.7 QP	40.0	-6.3	1.51 H	116	42.8	-9.1
2	80.61	28.9 QP	40.0	-11.1	2.00 H	139	42.4	-13.5
3	122.78	34.5 QP	43.5	-9.0	1.51 H	290	45.1	-10.6
4	193.07	31.6 QP	43.5	-11.9	1.01 H	235	42.7	-11.1
5	238.06	29.4 QP	46.0	-16.6	1.01 H	154	38.8	-9.4
6	439.09	28.7 QP	46.0	-17.3	1.01 H	18	32.2	-3.5

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



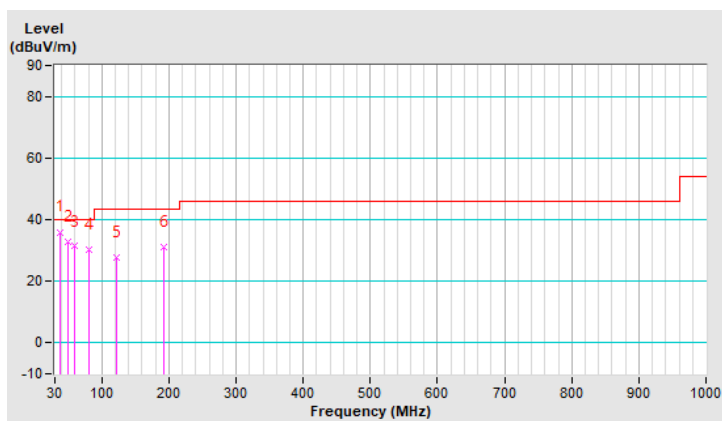


<b>RF Mode</b>	TX BT_8DPSK	<b>Channel</b>	CH 0 : 2402 MHz
<b>Frequency Range</b>	30MHz ~ 1GHz	<b>Detector Function</b>	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	37.03	36.0 QP	40.0	-4.0	1.99 V	112	46.0	-10.0
2	49.68	32.7 QP	40.0	-7.3	1.00 V	147	41.8	-9.1
3	59.52	31.3 QP	40.0	-8.7	1.00 V	37	40.7	-9.4
4	80.61	30.4 QP	40.0	-9.6	1.00 V	142	43.9	-13.5
5	121.38	27.8 QP	43.5	-15.7	1.99 V	253	38.5	-10.7
6	191.67	31.0 QP	43.5	-12.5	1.00 V	83	42.0	-11.0

**Remarks:**

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



## 4.2 Conducted Emission Measurement

### 4.2.1 Limits of Conducted Emission Measurement

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

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

### 4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Dec. 11, 2019	Dec. 10, 2020
RF signal cable Woken	5D-FB	Cable-cond1-01	Sep. 04, 2020	Sep. 03, 2021
LISN/AMN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 20, 2020	Feb. 19, 2021
LISN/AMN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 28, 2020	Aug. 27, 2021
Software ADT	BV ADT_Cond_ V7.3.7.4	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
 2. The test was performed in HwaYa Shielded Room 1.  
 3. The VCCI Site Registration No. is C-12040.

#### 4.2.3 Test Procedures

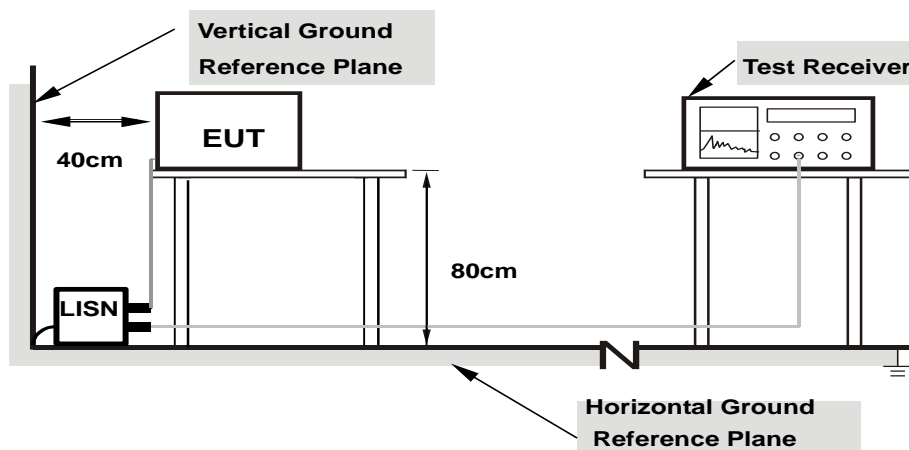
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50 uH of coupling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

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

#### 4.2.4 Deviation from Test Standard

No deviation.

#### 4.2.5 Test Setup



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

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

#### 4.2.6 EUT Operating Condition

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

#### 4.2.7 Test Results

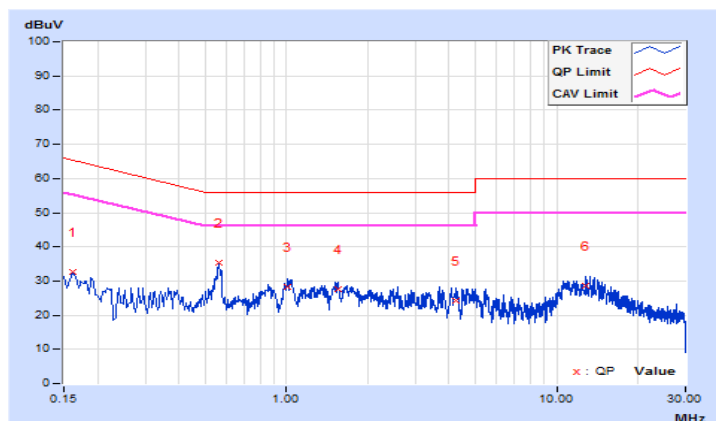
#### CONDUCTED WORST-CASE DATA : 8DPSK

PHASE	Line	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor (dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
	[dB]	[dB (uV)]	[dB (uV)]	[dB (uV)]	[dB (uV)]	[dB (uV)]	[dB (uV)]	[dB (uV)]	(dB)	(dB)
1	0.16139	9.65	23.14	18.22	32.79	27.87	65.39	55.39	-32.60	-27.52
<b>2</b>	<b>0.56418</b>	<b>9.66</b>	<b>25.64</b>	<b>20.79</b>	<b>35.30</b>	<b>30.45</b>	<b>56.00</b>	<b>46.00</b>	<b>-20.70</b>	<b>-15.55</b>
3	1.00629	9.67	18.75	16.78	28.42	26.45	56.00	46.00	-27.58	-19.55
4	1.55369	9.69	18.02	15.19	27.71	24.88	56.00	46.00	-28.29	-21.12
5	4.23986	9.74	14.37	7.64	24.11	17.38	56.00	46.00	-31.89	-28.62
6	12.86923	9.82	18.91	12.96	28.73	22.78	60.00	50.00	-31.27	-27.22

#### REMARKS:

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

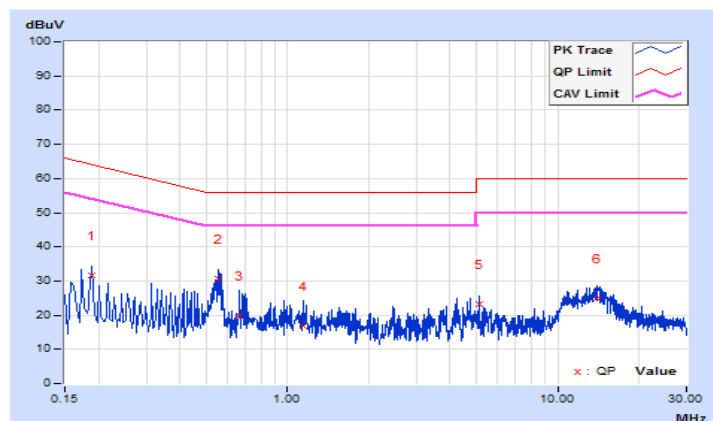


PHASE	Neutral	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.18903	9.68	21.95	9.47	31.63	19.15	64.08	54.08	-32.45	-34.93
2	0.55273	9.68	21.11	12.60	30.79	22.28	56.00	46.00	-25.21	-23.72
3	0.66605	9.68	10.16	2.04	19.84	11.72	56.00	46.00	-36.16	-34.28
4	1.14312	9.70	7.00	1.63	16.70	11.33	56.00	46.00	-39.30	-34.67
5	5.15089	9.78	13.31	3.95	23.09	13.73	60.00	50.00	-36.91	-36.27
6	14.06178	9.91	15.05	8.04	24.96	17.95	60.00	50.00	-35.04	-32.05

**REMARKS:**

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

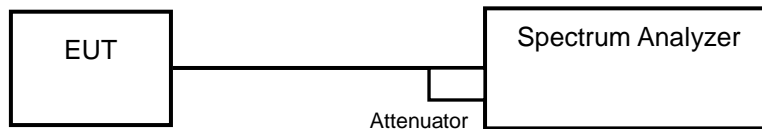


### 4.3 Number of Hopping Frequency Used

#### 4.3.1 Limits of Hopping Frequency Used Measurement

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

#### 4.3.2 Test Setup



#### 4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

#### 4.3.4 Test Procedure

- 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.

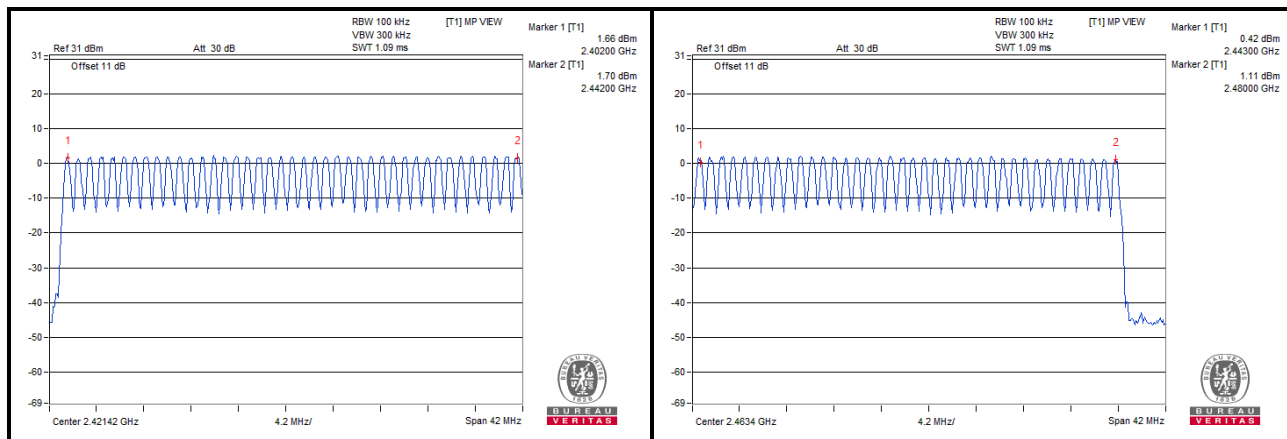
#### 4.3.5 Deviation from Test Standard

No deviation.

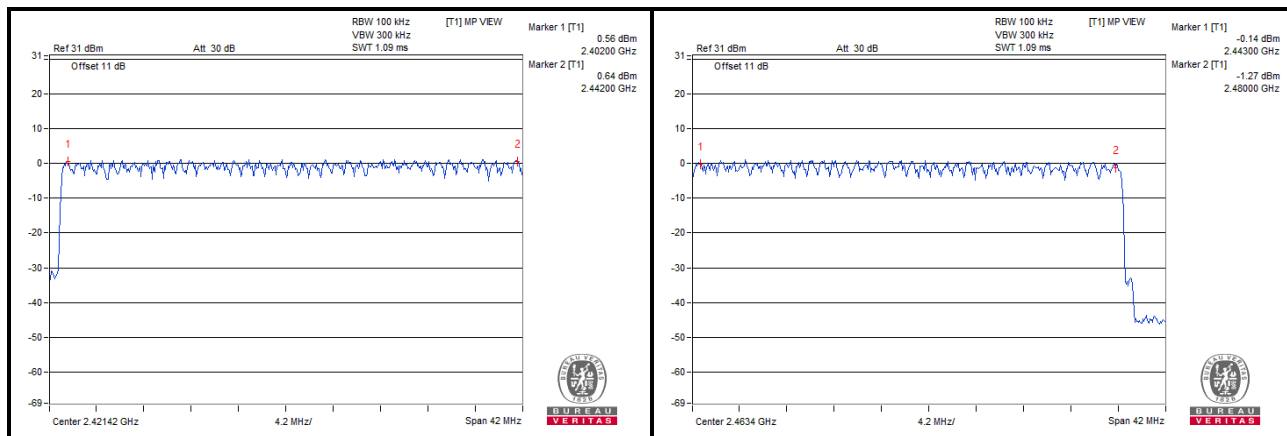
### 4.3.6 Test Results

There are 79 hopping frequencies in the hopping mode. Please refer to next page for the test result. On the plots, it shows that the hopping frequencies are equally spaced.

#### <GFSK>



#### <8DPSK>

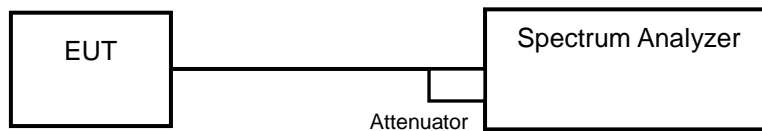


#### 4.4 Dwell Time on Each Channel

##### 4.4.1 Limits of Dwell Time on Each Channel Measurement

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.

##### 4.4.2 Test Setup



##### 4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

##### 4.4.4 Test Procedures

- 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. 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.
- d. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
- e. Repeat above procedures until all different time-slot modes have been completed.

##### 4.4.5 Deviation from Test Standard

No deviation.

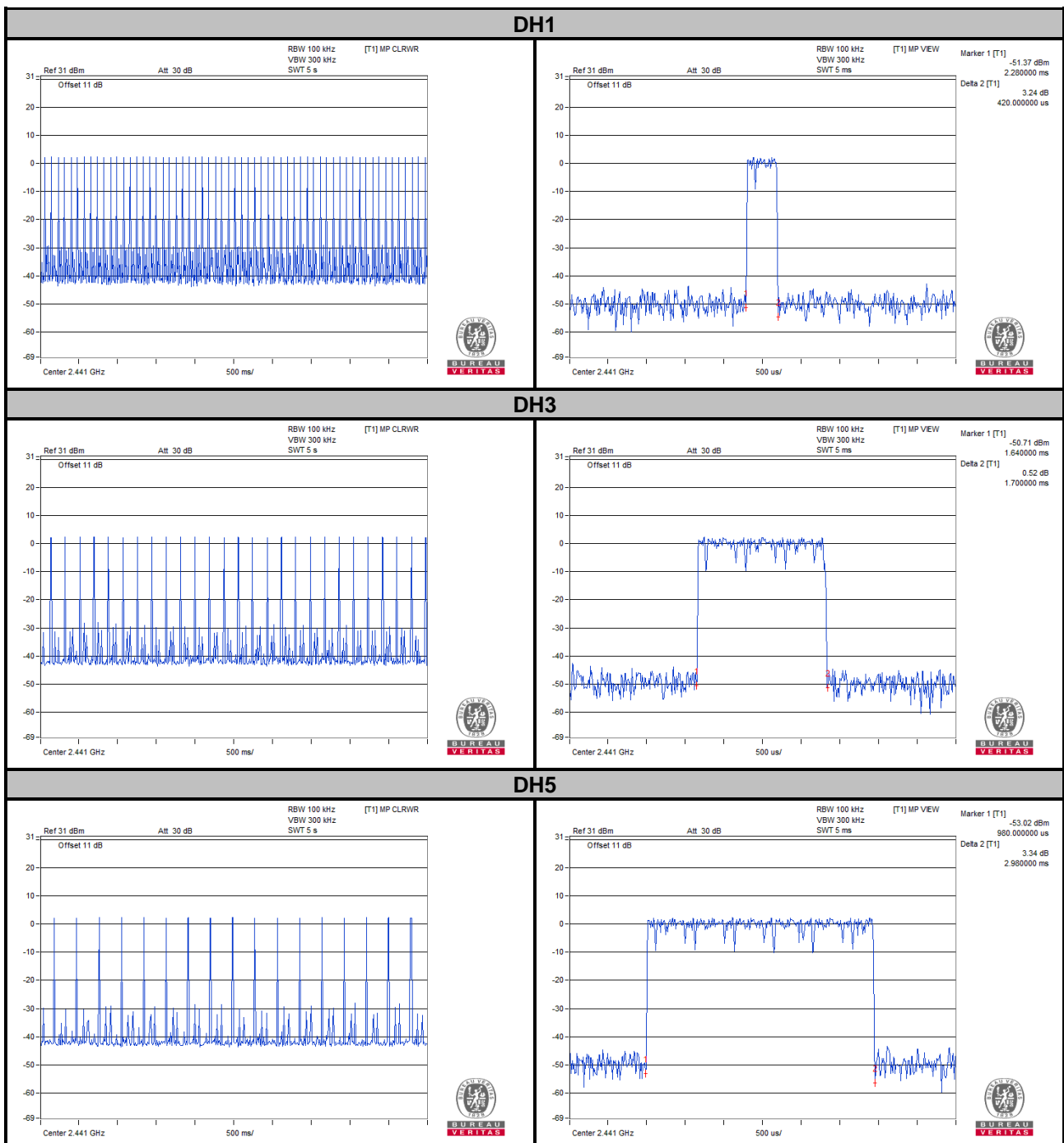


#### 4.4.6 Test Results

#### GFSK

Mode	Number of Transmission in a 31.6 (79 Hopping*0.4)	Length of Transmission Time (msec)	Result (msec)	Limit (msec)
DH1	52 (times / 5 sec) * 6.32 = 329 times	0.42	138.18	400
DH3	27 (times / 5 sec) * 6.32 = 171 times	1.7	290.7	400
DH5	17 (times / 5 sec) * 6.32 = 108 times	2.98	321.84	400

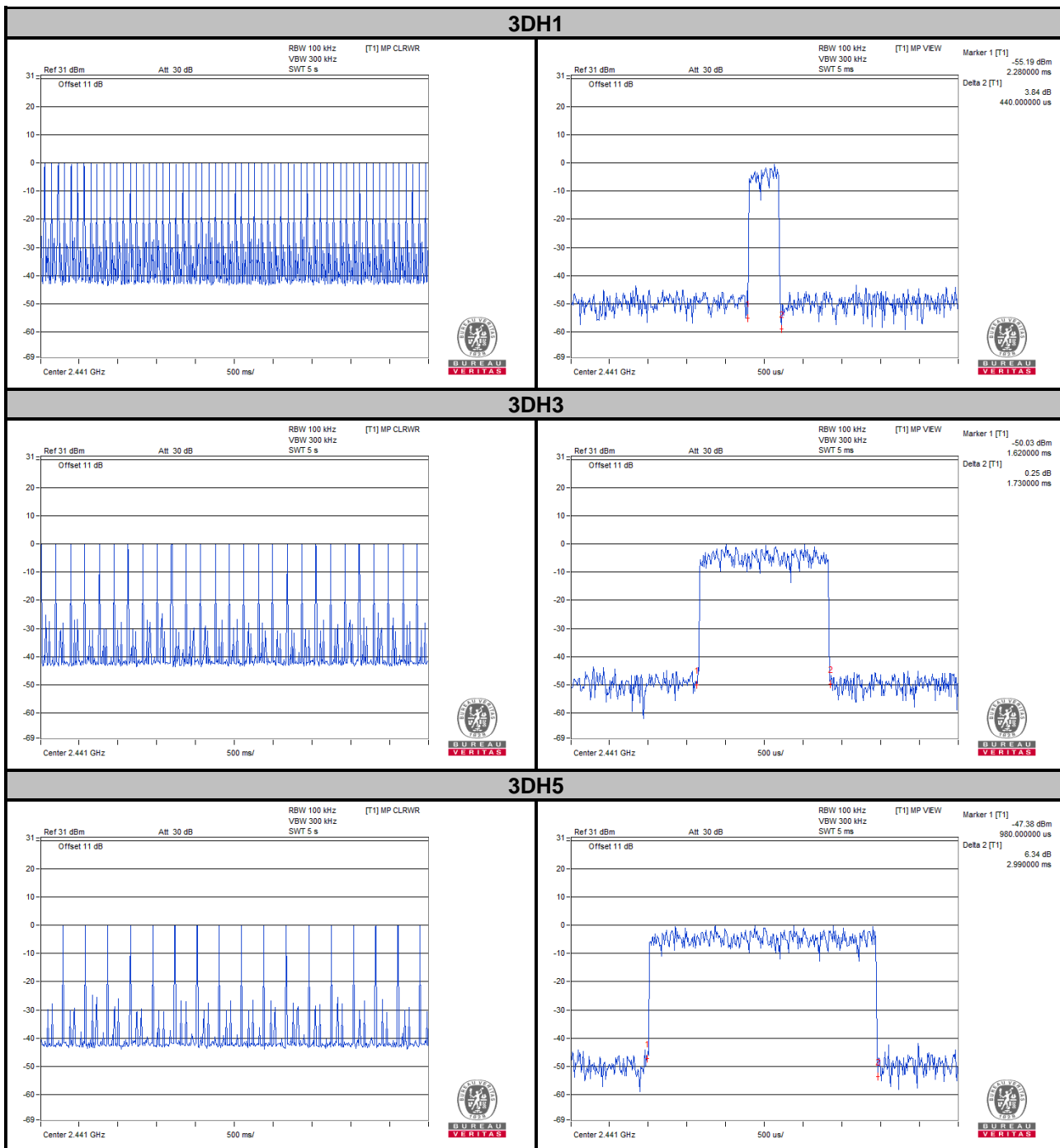
**Note:** Test plots of the transmitting time slot are shown as below.



### 8DPSK

Mode	Number of Transmission in a 31.6 (79 Hopping*0.4)	Length of Transmission Time (msec)	Result (msec)	Limit (msec)
3DH1	52 (times / 5 sec) * 6.32 = 329 times	0.44	144.76	400
3DH3	26 (times / 5 sec) * 6.32 = 165 times	1.73	285.45	400
3DH5	17 (times / 5 sec) * 6.32 = 108 times	2.99	322.92	400

**Note:** Test plots of the transmitting time slot are shown as below.



## 4.5 Channel Bandwidth

### 4.5.1 Limits of Channel Bandwidth Measurement

For frequency hopping system operating in the 2400-2483.5 MHz, if the 20 dB bandwidth of hopping channel is greater than 25 kHz, two-thirds 20 dB bandwidth of hopping channel shall be a minimum limit for the hopping channel separation.

### 4.5.2 Test Setup



### 4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.5.4 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.

### 4.5.5 Deviation from Test Standard

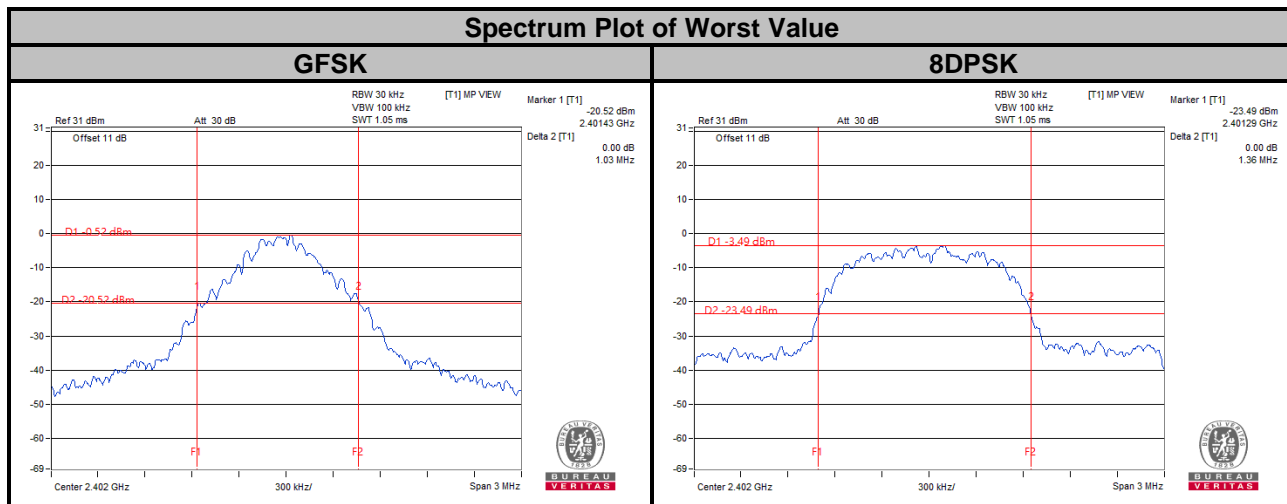
No deviation.

### 4.5.6 EUT Operating Condition

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

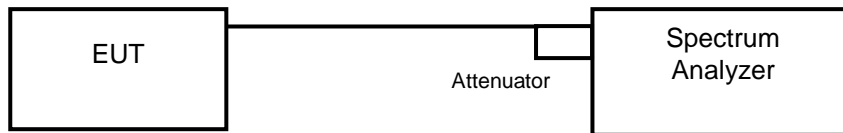
### 4.5.7 Test Results

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	
		GFSK	8DPSK
0	2402	1.03	1.36
39	2441	0.99	1.36
78	2480	1.03	1.35



## 4.6 Occupied Bandwidth Measurement

### 4.6.1 Test Setup



### 4.6.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument

### 4.6.3 Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1 % to 5 % of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to sampling. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

### 4.6.4 Deviation from Test Standard

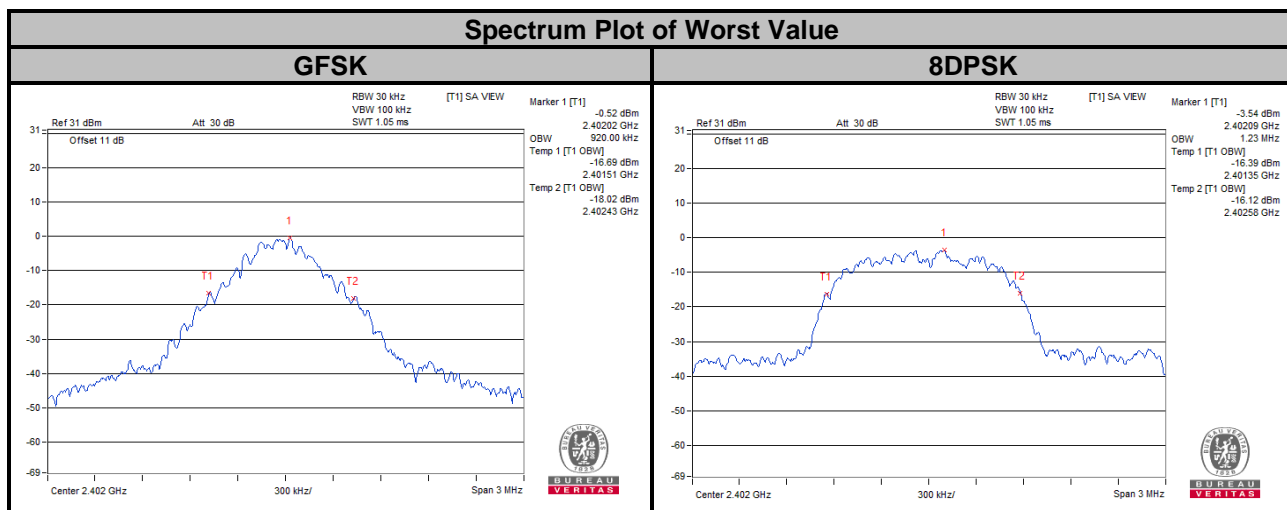
No deviation.

### 4.6.5 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

#### 4.6.6 Test Results

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	
		GFSK	8DPSK
0	2402	0.92	1.23
39	2441	0.92	1.23
78	2480	0.92	1.21

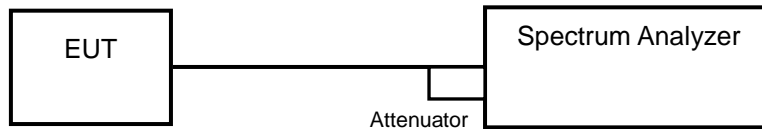


## 4.7 Hopping Channel Separation

### 4.7.1 Limits of Hopping Channel Separation Measurement

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

### 4.7.2 Test Setup



### 4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.7.4 Test Procedure

#### Measurement Procedure REF

- 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.

### 4.7.5 Deviation from Test Standard

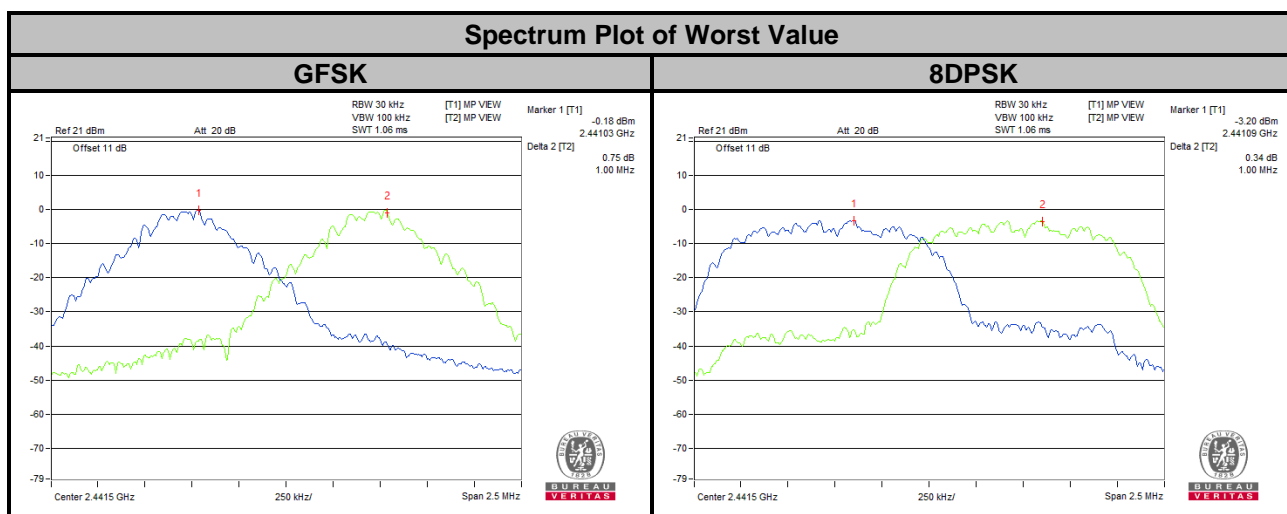
No deviation.

#### 4.7.6 Test Results

Channel	Freq. (MHz)	Adjacent Channel Separation (MHz)		20 dB Bandwidth (MHz)		Minimum Limit (MHz)		Pass / Fail
		GFSK	8DPSK	GFSK	8DPSK	GFSK	8DPSK	
0	2402	1.00	1.00	1.03	1.36	0.69	0.91	Pass
39	2441	1.00	1.00	0.99	1.36	0.66	0.91	Pass
78	2480	1.00	1.00	1.03	1.35	0.69	0.9	Pass

**Note:**

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





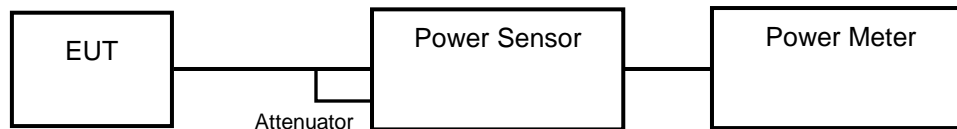
## 4.8 Maximum Output Power

### 4.8.1 Limits of Maximum Output Power Measurement

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

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

### 4.8.2 Test Setup



### 4.8.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.8.4 Test Procedure

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

### 4.8.5 Deviation from Test Standard

No deviation.

### 4.8.6 EUT Operating Condition

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

#### 4.8.7 Test Results

##### <GFSK>

Channel	Freq. (MHz)	Peak Power		Average Power		Power Limit (mW)	Pass / Fail
		(mW)	(dBm)	(mW)	(dBm)		
0	2402	2.57	4.10	2.489	3.96	125 / 1000 <sup>Note</sup>	Pass
39	2441	2.729	4.36	2.63	4.20	125 / 1000 <sup>Note</sup>	Pass
78	2480	2.317	3.65	2.228	3.48	125 / 1000 <sup>Note</sup>	Pass

Note: RF Output Power limit depends on the operating channel numbers, please refer to section 4.3 of the results.

##### <8DPSK>

Channel	Freq. (MHz)	Peak Power		Average Power		Power Limit (mW)	Pass / Fail
		(mW)	(dBm)	(mW)	(dBm)		
0	2402	3.648	5.62	2.438	3.87	125 / 1000 <sup>Note</sup>	Pass
39	2441	3.945	5.96	2.588	4.13	125 / 1000 <sup>Note</sup>	Pass
78	2480	3.556	5.51	2.193	3.41	125 / 1000 <sup>Note</sup>	Pass

Note: RF Output Power limit depends on the operating channel numbers, please refer to section 4.3 of the results.

## 4.9 Conducted Out of Band Emission Measurement

### 4.9.1 Limits Of Conducted Out of Band Emission Measurement

Below  $-20$  dB of the highest emission level of operating band (in 100 kHz RBW).

### 4.9.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.9.3 Test Procedure

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100 kHz and 300 kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

### 4.9.4 Deviation from Test Standard

No deviation.

### 4.9.5 EUT Operating Condition

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

### 4.9.6 Test Results

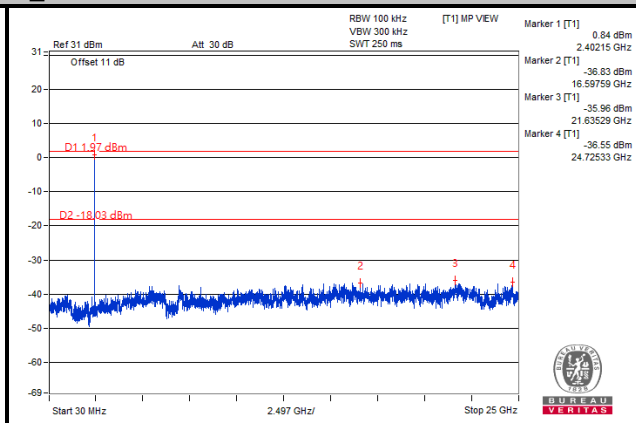
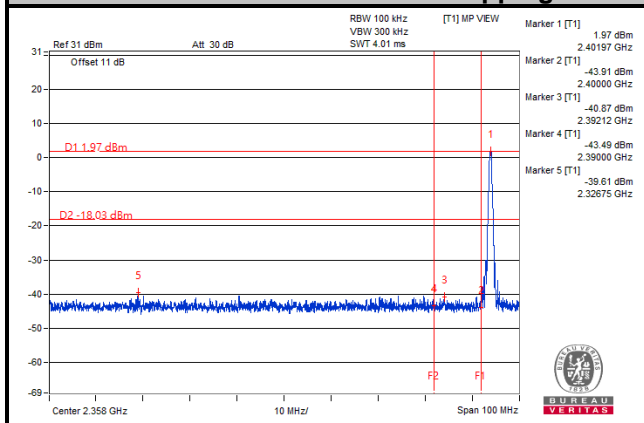
The spectrum plots are attached on the following images. D1 line indicates the highest level, D2 line indicates the 20 dB offset below D1. It shows compliance with the requirement.



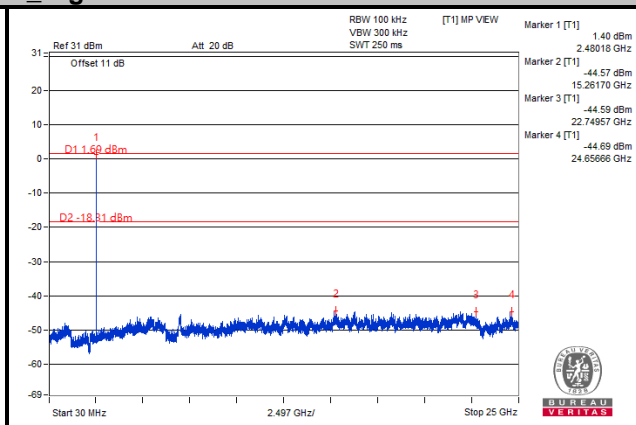
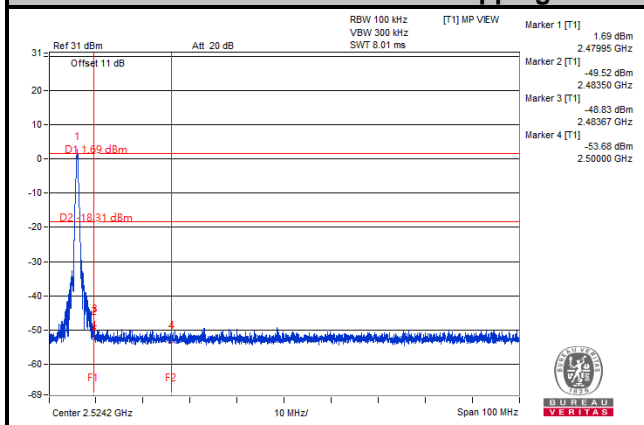
BUREAU VERITAS

GFSK

### Hopping Disabled\_Low Channel



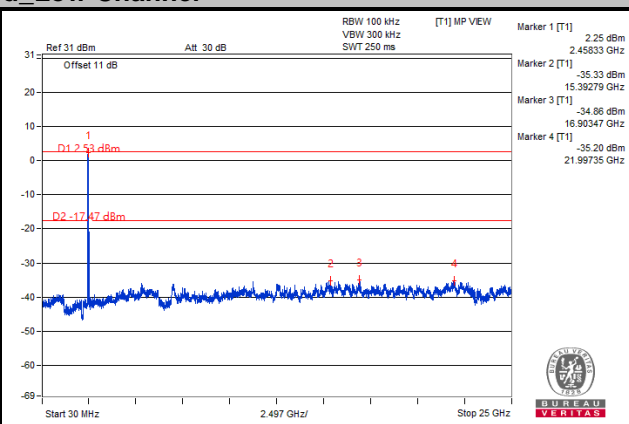
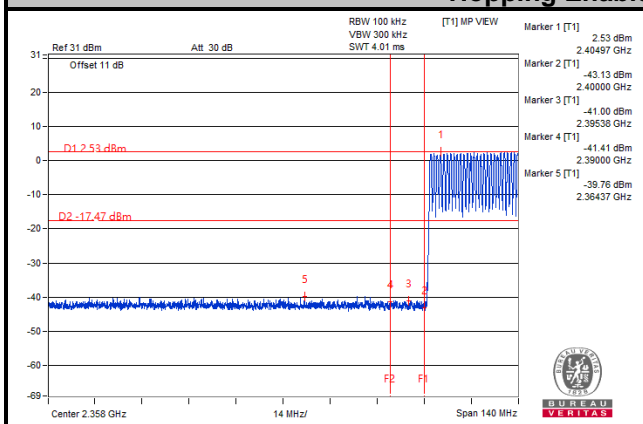
### Hopping Disabled\_High Channel



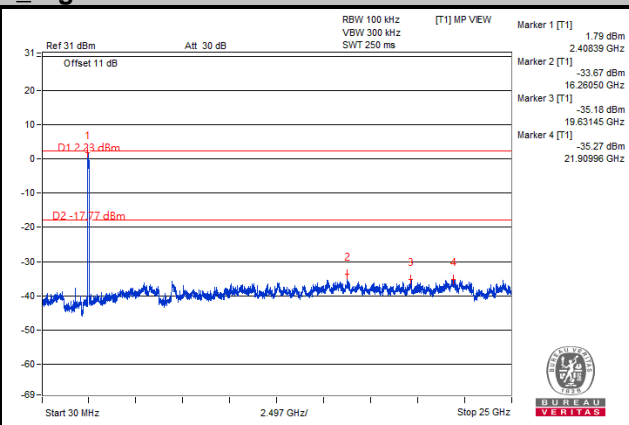
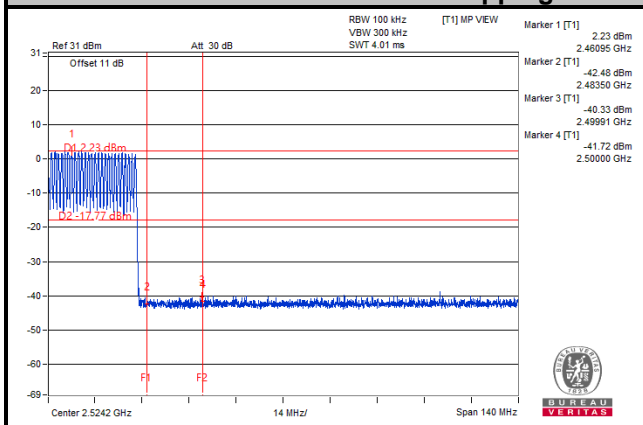


BUREAU VERITAS

### Hopping Enabled\_Low Channel



### Hopping Enabled\_High Channel

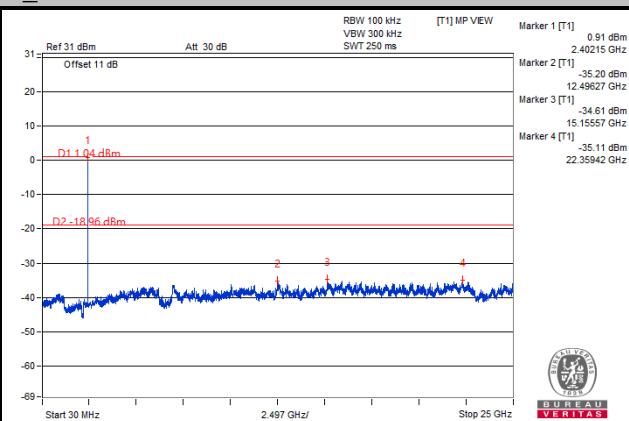
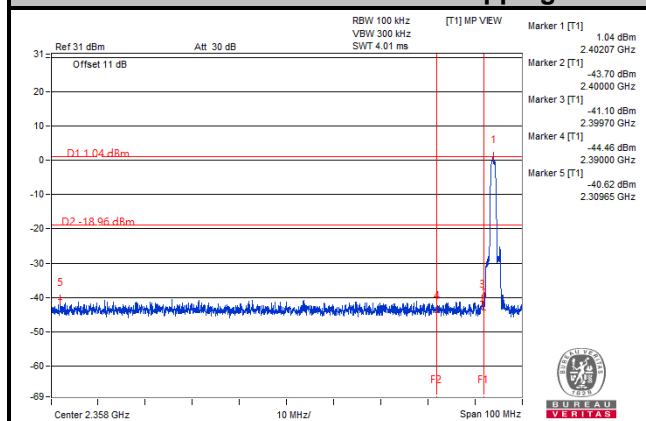




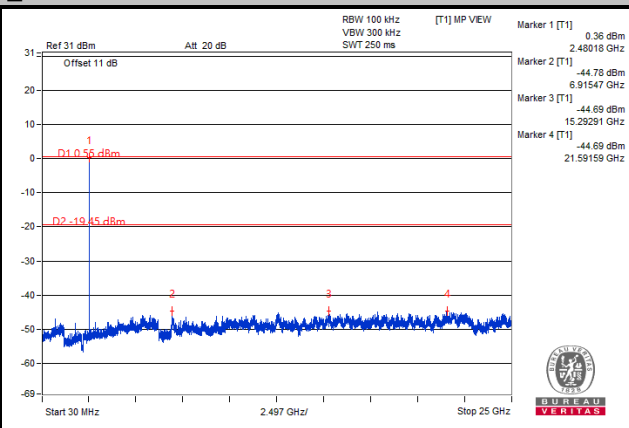
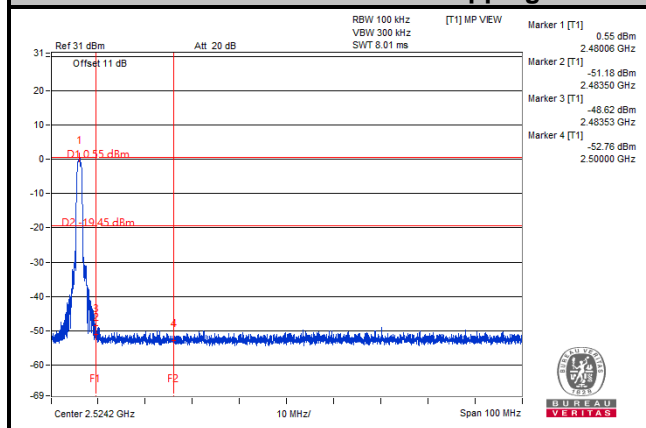
BUREAU VERITAS

# 8DPSK

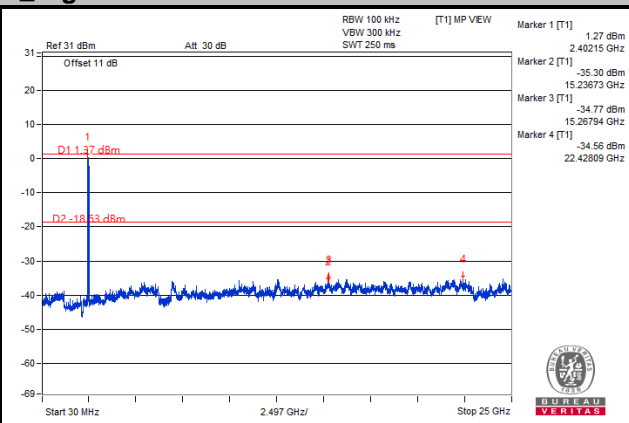
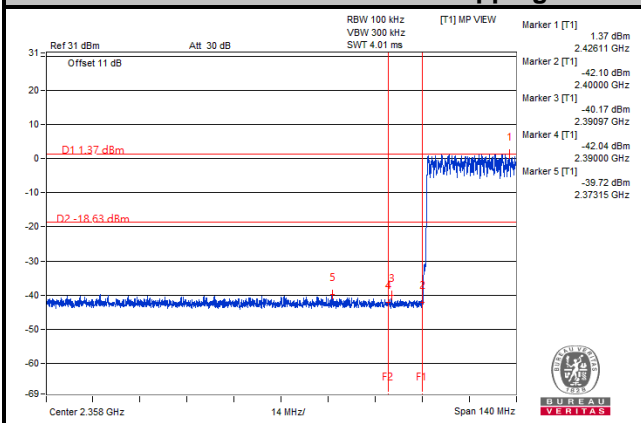
## Hopping Disabled\_Low Channel



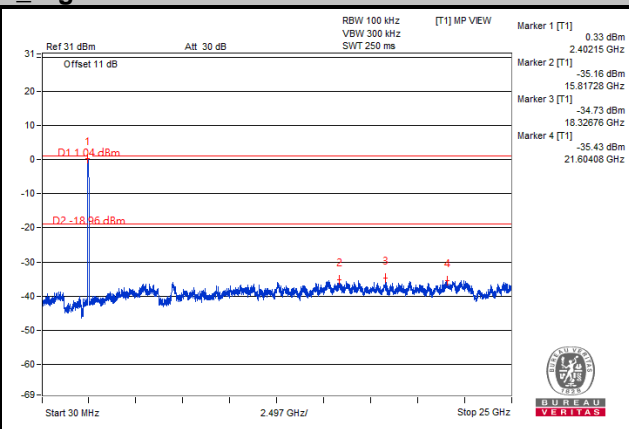
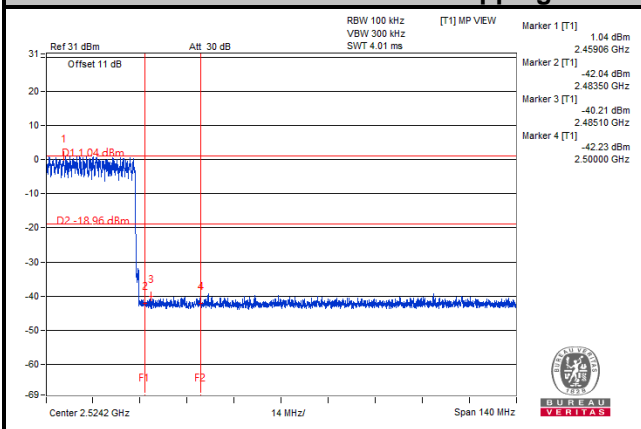
## Hopping Disabled\_Middle Channel



### Hopping Disabled\_High Channel



### Hopping Enabled\_High Channel

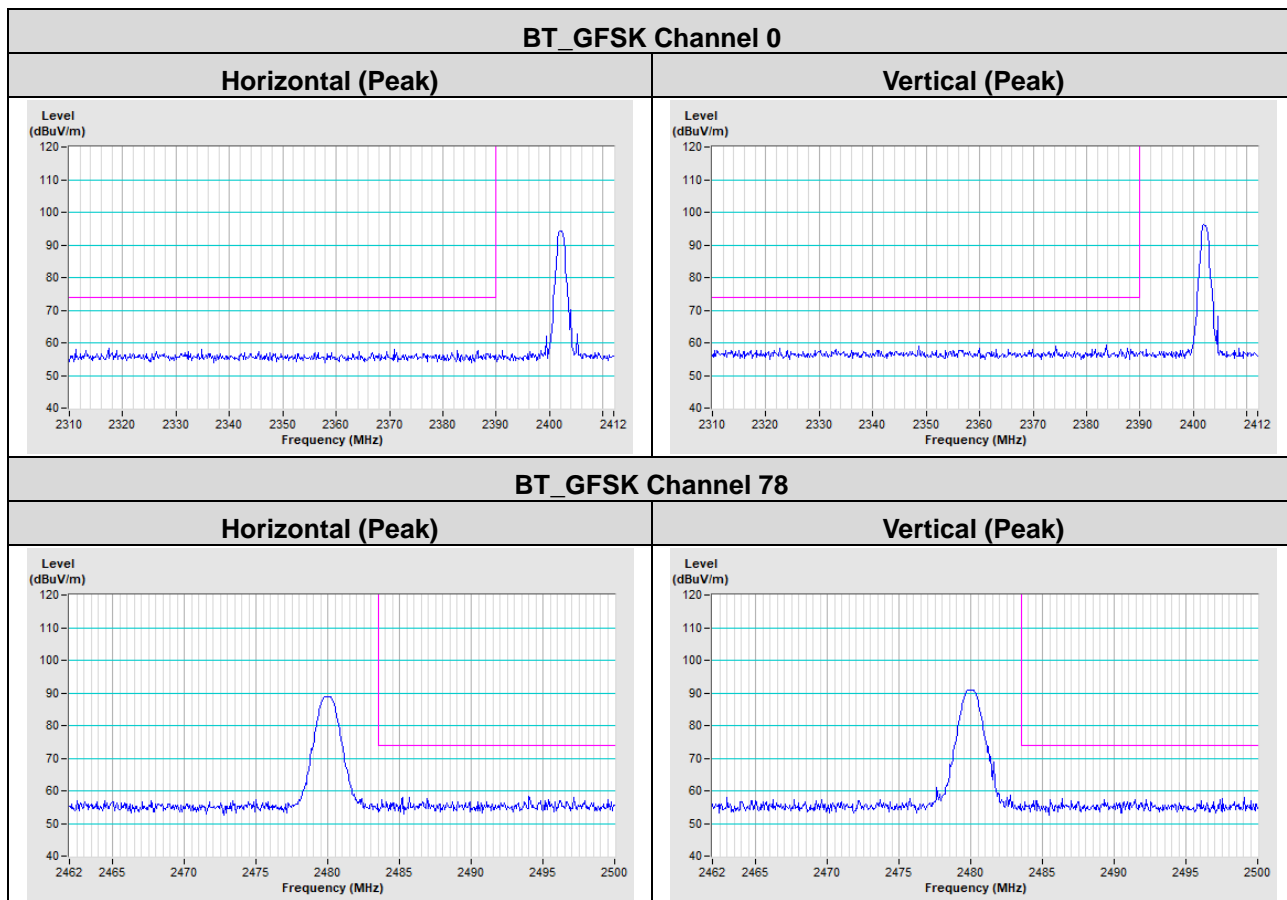


## 5 Pictures of Test Arrangements

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

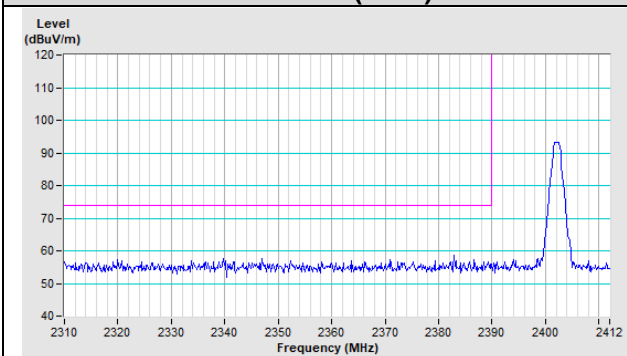


### Annex A- Band Edge Measurement

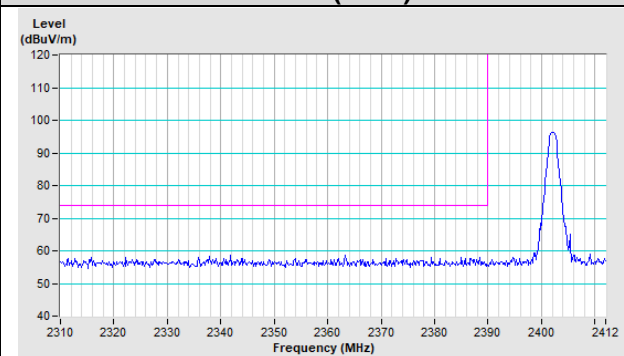


### BT\_8DPSK Channel 0

**Horizontal (Peak)**

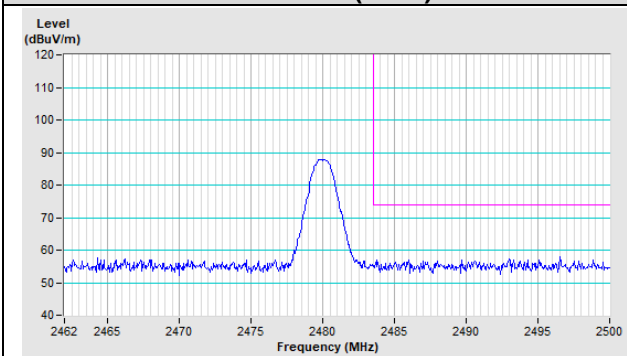


**Vertical (Peak)**

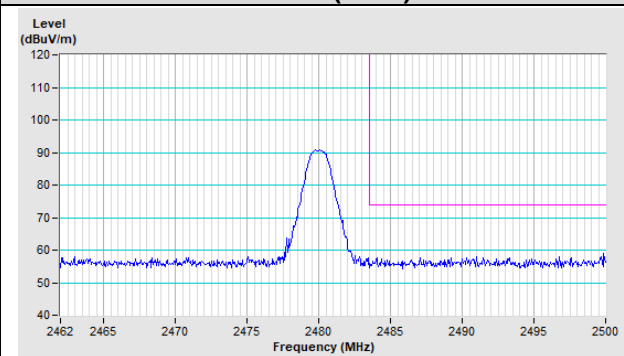


### BT\_8DPSK Channel 78

**Horizontal (Peak)**



**Vertical (Peak)**



## Appendix – Information of the Testing Laboratories

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

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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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