

## FCC Test Report (BT-EDR)

**Report No.:** RF181001C30-6

**FCC ID:** PANCL8822BUV2

**Test Model:** CL-8822BU-V2

**Received Date:** Oct. 1, 2018

**Test Date:** Nov. 8 ~ Dec. 10, 2018

**Issued Date:** Dec. 26, 2018

**Applicant:** CC&C Technologies, Inc.

**Address:** 8F, No. 150, Jian Yi Rd, Zhonghe District, New Taipei City, 235, Taiwan

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

**Lab Address:** No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan, R.O.C.

**Test Location:** No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)

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



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## Table of Contents

<b>Release Control Record</b>	<b>4</b>
<b>1 Certificate of Conformity</b>	<b>5</b>
<b>2 Summary of Test Results</b>	<b>6</b>
2.1 Measurement Uncertainty	6
2.2 Modification Record	6
<b>3 General Information</b>	<b>7</b>
3.1 General Description of EUT (BT-EDR)	7
3.2 Description of Test Modes	8
3.2.1 Test Mode Applicability and Tested Channel Detail	9
3.3 Description of Support Units	11
3.3.1 Configuration of System under Test	11
3.4 General Description of Applied Standards	11
<b>4 Test Types and Results</b>	<b>12</b>
4.1 Radiated Emission and Bandedge Measurement	12
4.1.1 Limits of Radiated Emission and Bandedge Measurement	12
4.1.2 Test Instruments	13
4.1.3 Test Procedures	14
4.1.4 Deviation from Test Standard	14
4.1.5 Test Setup	15
4.1.6 EUT Operating Conditions	16
4.1.7 Test Results	17
4.2 Conducted Emission Measurement	25
4.2.1 Limits of Conducted Emission Measurement	25
4.2.2 Test Instruments	25
4.2.3 Test Procedures	26
4.2.4 Deviation From Test Standard	26
4.2.5 Test Setup	26
4.2.6 EUT Operating Condition	26
4.2.7 Test Results	27
4.3 Number of Hopping Frequency Used	29
4.3.1 Limits of Hopping Frequency Used Measurement	29
4.3.2 Test Setup	29
4.3.3 Test Instruments	29
4.3.4 Test Procedure	29
4.3.5 Deviation from Test Standard	29
4.3.6 Test Results	30
4.4 Dwell Time on Each Channel	31
4.4.1 Limits of Dwell Time on Each Channel Measurement	31
4.4.2 Test Setup	31
4.4.3 Test Instruments	31
4.4.4 Test Procedures	31
4.4.5 Deviation from Test Standard	31
4.4.6 Test Results	32
4.5 Channel Bandwidth	34
4.5.1 Limits of Channel Bandwidth Measurement	34
4.5.2 Test Setup	34
4.5.3 Test Instruments	34
4.5.4 Test Procedure	34
4.5.5 Deviation from Test Standard	34
4.5.6 EUT Operating Condition	34
4.5.7 Test Results	35

4.6	Hopping Channel Separation .....	36
4.6.1	Limits of Hopping Channel Separation Measurement.....	36
4.6.2	Test Setup.....	36
4.6.3	Test Instruments .....	36
4.6.4	Test Procedure .....	36
4.6.5	Deviation from Test Standard .....	36
4.6.6	Test Results .....	37
4.7	Maximum Output Power.....	38
4.7.1	Limits of Maximum Output Power Measurement .....	38
4.7.2	Test Setup.....	38
4.7.3	Test Instruments .....	38
4.7.4	Test Procedure .....	38
4.7.5	Deviation from Test Standard .....	38
4.7.6	EUT Operating Condition .....	38
4.7.7	Test Results .....	39
4.8	Conducted Out of Band Emission Measurement.....	40
4.8.1	Limits of Conducted Out of Band Emission Measurement .....	40
4.8.2	Test Instruments .....	40
4.8.3	Test Procedure .....	40
4.8.4	Deviation from Test Standard .....	40
4.8.5	EUT Operating Condition .....	40
4.8.6	Test Results .....	40
<b>5</b>	<b>Pictures of Test Arrangements.....</b>	<b>43</b>
	<b>Appendix – Information of the Testing Laboratories .....</b>	<b>44</b>

### Release Control Record

Issue No.	Description	Date Issued
RF181001C30-6	Original release.	Dec. 26, 2018

## 1 Certificate of Conformity

**Product:** 11ac 2T2R+BT dongle  
**Brand:** CC&C  
**Test Model:** CL-8822BU-V2  
**Sample Status:** Mass product  
**Applicant:** CC&C Technologies, Inc.  
**Test Date:** Nov. 8 ~ Dec. 10, 2018  
**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 :



, Date: Dec. 26, 2018

Celia Chen / Supervisor

Approved by :



, Date: Dec. 26, 2018

Rex Lai / Associate Technical Manager

## 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 -19.84dB at 0.65439MHz.
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(b)	Maximum Peak Output Power	PASS	Meet the requirement of limit.
15.205 & 209 & 15.247(d)	Radiated Emissions & Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -4.4dB at 7440.00MHz.
15.247(d)	Antenna Port Emission	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used.

**NOTE:** If The Frequency Hopping System operating in 2400-2483.5MHz band and the output power less than 125mW. The hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of hopping channel whichever is greater.

### 2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.94 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.86 dB
	200MHz ~ 1000MHz	3.87 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT (BT-EDR)

Product	11ac 2T2R+BT dongle
Brand	CC&C
Test Model	CL-8822BU-V2
Status of EUT	Mass product
Power Supply Rating	5Vdc
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8DPSK
Modulation Technology	FHSS
Transfer Rate	Up to 3Mbps
Operating Frequency	2402MHz ~ 2480MHz
Number of Channel	79
Output Power	16.52mW
Antenna Type	Refer to Note as below
Antenna Connector	Refer to Note as below
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

1. The EUT uses following antenna.

Transmitter Circuit	Brand	Model	Antenna Type	2.4G gain (dBi)	5G gain (dBi)	Connector Type
Chain(0)	CC&C Technologies, INC.	N65-Ant-0	Print	2.91	B1: 3.36 B2: 3.29 B3: 3.23 B4: 2.4	NA
Chain(1)	CC&C Technologies, INC.	N65-Ant-1	Print	2.05	B1: 3.13 B2: 2.72 B3: 2.15 B4: 2.64	

2. 2.4GHz & 5GHz technologies cannot transmit at same time.

WLAN & BT technologies cannot transmit at same time.

3. The operation of the EUT:

- When power on, the EUT will scan the whole frequency until a Connection command from the other BT device.
- When receiving the signal from the other BT devices, The EUT transmit are sponse signal.
- The other devices receive the response signal and recognize it, then send a connection command to establish the connection.
- After the connection establish successfully, the data transmission is beginning. At the same time, the both devices will shift frequencies in synchronization per a same pseudo randomly ordered list of hopping frequencies, the hopping rate is 1600 times per second. This device conforms to the criteria in FCC 15.247(a)(1).

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 Description of Test Modes

79 channels are provided for BT-EDR mode:

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	
-	√	√	√	√	

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

**NOTE:** The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.

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

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

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

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

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

EUT Configure Mode	Available Channel	Tested Channel	modulation Technology	Modulation Type	Packet Type
-	0 to 78	39	FHSS	GFSK	DH5

#### Power Line Conducted Emission Test:

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

EUT Configure Mode	Available Channel	Tested Channel	modulation Technology	Modulation Type	Packet Type
-	0 to 78	39	FHSS	GFSK	DH5

### **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 (System)	Tested By
RE $\geq$ 1G	25deg. C, 67%RH	120Vac, 60Hz	Adair Peng
RE<1G	22deg. C, 66%RH	120Vac, 60Hz	Adair Peng
PLC	23deg. C, 66%RH	120Vac, 60Hz	Adair Peng
APCM	25deg. C, 60%RH	120Vac, 60Hz	Frank Chiu

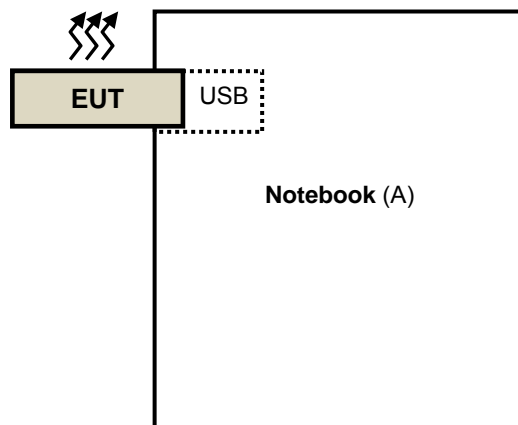
### 3.3 Description of Support Units

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

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	Inspiron 14R	6LRKKW1	FCC DoC Approved	Provided by Lab

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

#### 3.3.1 Configuration of System under Test



### 3.4 General Description of Applied Standards

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

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

**KDB 558074 D01 15.247 Meas Guidance v05**

ANSI C63.10-2013

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

## 4 Test Types and Results

### 4.1 Radiated Emission and Bandedge Measurement

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

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

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

#### NOTE:

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

#### 4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESIB7	100187	May 29, 2018	May 28, 2019
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100041	Dec. 12, 2017	Dec. 11, 2018
BILOG Antenna SCHWARZBECK	VULB9168	9168-171	Nov. 22, 2017	Nov. 21, 2018
			Nov. 22, 2018	Nov. 21, 2019
HORN Antenna SCHWARZBECK	9120D	209	Dec. 13, 2017	Dec. 12, 2018
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Dec. 01, 2017	Nov. 30, 2018
			Dec. 01, 2018	Nov. 30, 2019
Loop Antenna EMCI	EM-6879	269	Sep. 07, 2018	Sep. 06, 2019
Loop Antenna TESEQ	HLA 6121	45745	Jun. 14, 2018	Jun. 13, 2019
Preamplifier Agilent (Below 1GHz)	8447D	2944A10738	Aug. 21, 2018	Aug. 20, 2019
Preamplifier Agilent (Above 1GHz)	8449B	3008A02465	Apr. 03, 2018	Apr. 02, 2019
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH3-03 (223653/4)	Aug. 21, 2018	Aug. 20, 2019
RF signal cable HUBER+SUHNER& EMCI	SUCOFLEX 104&EMC104-SM- SM-8000	Cable-CH3-03 (309224+170907)	Aug. 21, 2018	Aug. 20, 2019
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/MY5519 0004/MY55190007/MY 55210005	Jul. 17, 2018	Jul. 16, 2019

- 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.
3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Designation Number is TW0003. The number will be varied with the Lab location and scope as attached.
5. The IC Site Registration No. is 7450F-3.

#### 4.1.3 Test Procedures

##### **For Radiated emission below 30MHz**

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

##### **NOTE:**

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

##### **For Radiated emission above 30MHz**

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

##### **Note:**

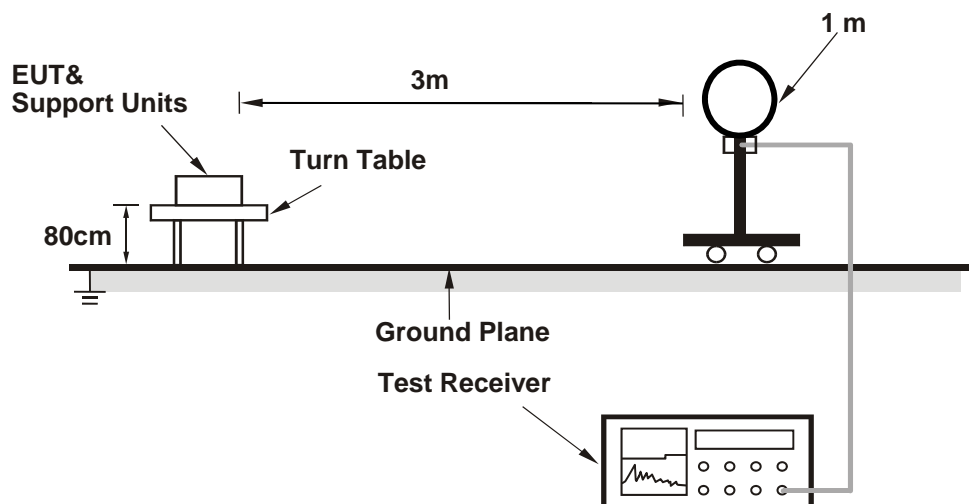
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

#### 4.1.4 Deviation from Test Standard

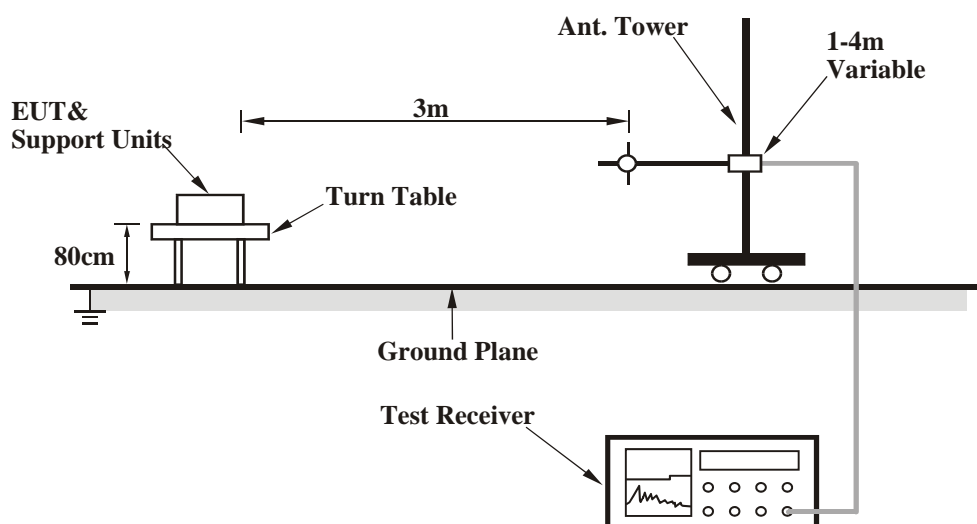
No deviation.

#### 4.1.5 Test Setup

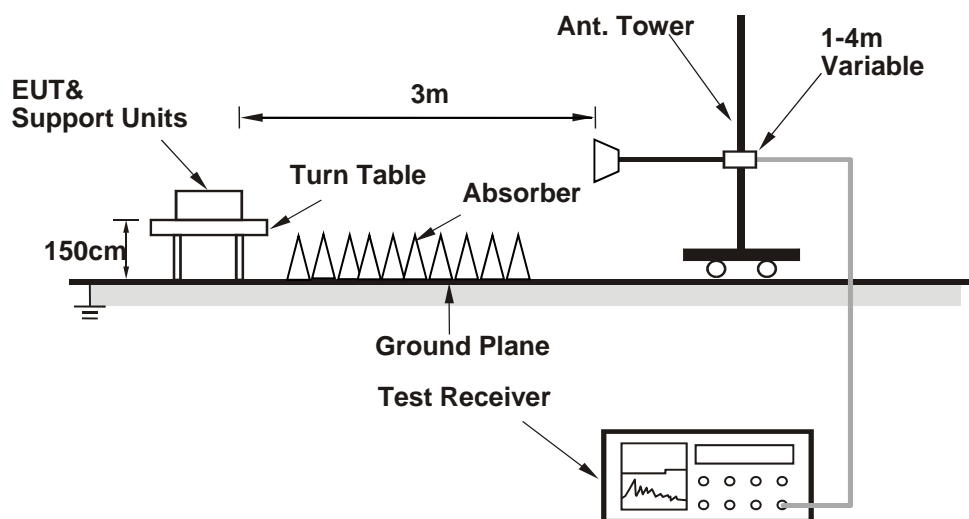
##### For Radiated emission below 30MHz



##### For Radiated emission 30MHz to 1GHz



#### For Radiated emission above 1GHz



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

#### 4.1.6 EUT Operating Conditions

- Plugged the EUT into notebook and placed them on the testing table.
- The notebook system ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.



#### 4.1.7 Test Results

Above 1GHz Data:

BT\_GFSK

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	59.2 PK	74.0	-14.8	1.51 H	66	26.2	33.0
2	2390.00	47.4 AV	54.0	-6.6	1.51 H	66	14.4	33.0
3	*2402.00	105.8 PK			1.42 H	71	72.9	32.9
4	*2402.00	75.7 AV			1.42 H	71	42.8	32.9
5	4804.00	65.4 PK	74.0	-8.6	2.47 H	210	61.9	3.5
6	4804.00	35.3 AV	54.0	-18.7	2.47 H	210	31.8	3.5
7	#7206.00	68.5 PK	74.0	-5.5	2.35 H	246	58.8	9.7
8	#7206.00	38.4 AV	54.0	-15.6	2.35 H	246	28.7	9.7
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	59.0 PK	74.0	-15.0	2.73 V	69	26.0	33.0
2	2390.00	47.3 AV	54.0	-6.7	2.73 V	69	14.3	33.0
3	*2402.00	104.7 PK			2.66 V	67	71.8	32.9
4	*2402.00	74.6 AV			2.66 V	67	41.7	32.9
5	4804.00	60.3 PK	74.0	-13.7	3.86 V	259	56.8	3.5
6	4804.00	30.2 AV	54.0	-23.8	3.86 V	259	26.7	3.5
7	#7206.00	62.5 PK	74.0	-11.5	3.91 V	293	52.8	9.7
8	#7206.00	32.4 AV	54.0	-21.6	3.91 V	293	22.7	9.7

#### 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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.
7. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on  $0.625 * 5$  per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to:  $20\log(3.125 / 100) = -30.1$  dB
8. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2441.00	106.2 PK			1.47 H	60	73.3	32.9
2	*2441.00	76.1 AV			1.47 H	60	43.2	32.9
3	4882.00	64.7 PK	74.0	-9.3	1.27 H	188	61.5	3.2
4	4882.00	34.6 AV	54.0	-19.4	1.27 H	188	31.4	3.2
5	7323.00	67.2 PK	74.0	-6.8	1.36 H	235	57.6	9.6
6	7323.00	37.1 AV	54.0	-16.9	1.36 H	235	27.5	9.6
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2441.00	105.1 PK			2.63 V	70	72.2	32.9
2	*2441.00	75.0 AV			2.63 V	70	42.1	32.9
3	4882.00	59.7 PK	74.0	-14.3	3.86 V	263	56.5	3.2
4	4882.00	29.6 AV	54.0	-24.4	3.86 V	263	26.4	3.2
5	7323.00	61.3 PK	74.0	-12.7	3.76 V	299	51.7	9.6
6	7323.00	31.2 AV	54.0	-22.8	3.76 V	299	21.6	9.6

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on  $0.625 * 5$  per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to:  $20\log(3.125 / 100) = -30.1$  dB
7. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	105.5 PK			1.34 H	64	72.8	32.7
2	*2480.00	75.4 AV			1.34 H	64	42.7	32.7
3	2483.50	47.2 PK	74.0	-26.8	1.51 H	55	50.7	-3.5
4	2483.50	17.1 AV	54.0	-36.9	1.51 H	55	20.6	-3.5
5	4960.00	62.0 PK	74.0	-12.0	1.11 H	201	58.6	3.4
6	4960.00	31.9 AV	54.0	-22.1	1.11 H	201	28.5	3.4
7	7440.00	68.3 PK	74.0	-5.7	1.27 H	223	58.1	10.2
8	7440.00	38.2 AV	54.0	-15.8	1.27 H	223	28.0	10.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	104.6 PK			2.45 V	75	71.9	32.7
2	*2480.00	74.5 AV			2.45 V	75	41.8	32.7
3	2483.50	43.1 PK	74.0	-30.9	2.53 V	71	46.6	-3.5
4	2483.50	13.0 AV	54.0	-41.0	2.53 V	71	16.5	-3.5
5	4960.00	55.5 PK	74.0	-18.5	3.87 V	263	52.1	3.4
6	4960.00	25.4 AV	54.0	-28.6	3.87 V	263	22.0	3.4
7	7440.00	62.5 PK	74.0	-11.5	3.83 V	291	52.3	10.2
8	7440.00	32.4 AV	54.0	-21.6	3.83 V	291	22.2	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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on  $0.625 * 5$  per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to:  $20\log(3.125 / 100) = -30.1$  dB
7. The average value of fundamental and harmonic frequency is: Average = Peak value +  $20 \log(\text{Duty cycle})$

# BT\_8DPSK

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	59.1 PK	74.0	-14.9	1.41 H	65	26.1	33.0
2	2390.00	47.3 AV	54.0	-6.7	1.41 H	65	14.3	33.0
3	*2402.00	105.7 PK			1.34 H	61	72.8	32.9
4	*2402.00	75.6 AV			1.34 H	61	42.7	32.9
5	4804.00	64.4 PK	74.0	-9.6	1.30 H	188	60.9	3.5
6	4804.00	34.3 AV	54.0	-19.7	1.30 H	188	30.8	3.5
7	#7206.00	68.3 PK	74.0	-5.7	1.28 H	231	58.6	9.7
8	#7206.00	38.2 AV	54.0	-15.8	1.28 H	231	28.5	9.7
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	59.0 PK	74.0	-15.0	2.53 V	71	26.0	33.0
2	2390.00	47.2 AV	54.0	-6.8	2.53 V	71	14.2	33.0
3	*2402.00	105.0 PK			2.69 V	69	72.1	32.9
4	*2402.00	74.9 AV			2.69 V	69	42.0	32.9
5	4804.00	58.3 PK	74.0	-15.7	3.91 V	266	54.8	3.5
6	4804.00	28.2 AV	54.0	-25.8	3.91 V	266	24.7	3.5
7	#7206.00	62.2 PK	74.0	-11.8	3.88 V	299	52.5	9.7
8	#7206.00	32.1 AV	54.0	-21.9	3.88 V	299	22.4	9.7

## 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)
- The other emission levels were very low against the limit.
- Margin value = Emission Level – Limit value
- " \* ": Fundamental frequency.
- " # ": The radiated frequency is out of the restricted band.
- The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 \* 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to:  $20\log(3.125 / 100) = -30.1$  dB
- The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2441.00	106.3 PK			1.33 H	62	73.4	32.9
2	*2441.00	76.2 AV			1.33 H	62	43.3	32.9
3	4882.00	65.1 PK	74.0	-8.9	1.26 H	189	61.9	3.2
4	4882.00	35.0 AV	54.0	-19.0	1.26 H	189	31.8	3.2
5	7323.00	67.7 PK	74.0	-6.3	1.25 H	233	58.1	9.6
6	7323.00	37.6 AV	54.0	-16.4	1.25 H	233	28.0	9.6
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2441.00	105.5 PK			2.53 V	72	72.6	32.9
2	*2441.00	75.4 AV			2.53 V	72	42.5	32.9
3	4882.00	59.0 PK	74.0	-15.0	3.83 V	265	55.8	3.2
4	4882.00	28.9 AV	54.0	-25.1	3.83 V	265	25.7	3.2
5	7323.00	61.8 PK	74.0	-12.2	3.83 V	303	52.2	9.6
6	7323.00	31.7 AV	54.0	-22.3	3.83 V	303	22.1	9.6

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on  $0.625 * 5$  per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to:  $20\log(3.125 / 100) = -30.1$  dB
7. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	105.3 PK			1.16 H	60	72.6	32.7
2	*2480.00	75.2 AV			1.16 H	60	42.5	32.7
3	2483.50	51.1 PK	74.0	-22.9	1.22 H	57	54.6	-3.5
4	2483.50	21.0 AV	54.0	-33.0	1.22 H	57	24.5	-3.5
5	4960.00	61.8 PK	74.0	-12.2	1.07 H	199	58.4	3.4
6	4960.00	31.7 AV	54.0	-22.3	1.07 H	199	28.3	3.4
7	<b>7440.00</b>	<b>69.6 PK</b>	<b>74.0</b>	<b>-4.4</b>	<b>2.28 H</b>	<b>253</b>	<b>59.4</b>	<b>10.2</b>
8	7440.00	39.5 AV	54.0	-14.5	2.28 H	253	29.3	10.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	104.5 PK			2.50 V	76	71.8	32.7
2	*2480.00	74.4 AV			2.50 V	76	41.7	32.7
3	2483.50	51.8 PK	74.0	-22.2	2.66 V	63	55.3	-3.5
4	2483.50	21.7 AV	54.0	-32.3	2.66 V	63	25.2	-3.5
5	4960.00	55.8 PK	74.0	-18.2	3.89 V	260	52.4	3.4
6	4960.00	25.7 AV	54.0	-28.3	3.89 V	260	22.3	3.4
7	7440.00	63.6 PK	74.0	-10.4	3.86 V	293	53.4	10.2
8	7440.00	33.5 AV	54.0	-20.5	3.86 V	293	23.3	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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on  $0.625 * 5$  per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to:  $20\log(3.125 / 100) = -30.1$  dB
7. The average value of fundamental and harmonic frequency is: Average = Peak value +  $20 \log(\text{Duty cycle})$

# Below 1GHz Data:

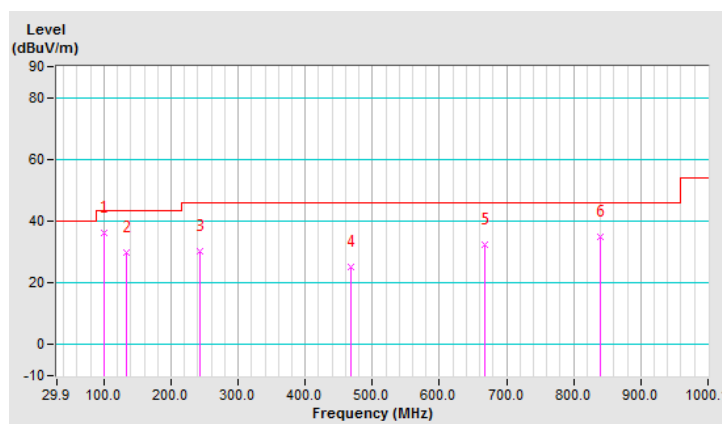
## BT\_GFSK

CHANNEL	TX Channel 39	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	99.89	36.3 QP	43.5	-7.2	1.50 H	240	50.0	-13.7
2	132.95	30.0 QP	43.5	-13.5	2.00 H	55	40.4	-10.4
3	243.77	30.3 QP	46.0	-15.7	1.01 H	239	40.0	-9.7
4	467.36	25.2 QP	46.0	-20.8	1.01 H	149	29.2	-4.0
5	667.63	32.3 QP	46.0	-13.7	1.01 H	43	32.6	-0.3
6	840.67	35.0 QP	46.0	-11.0	1.01 H	43	32.1	2.9

## REMARKS:

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

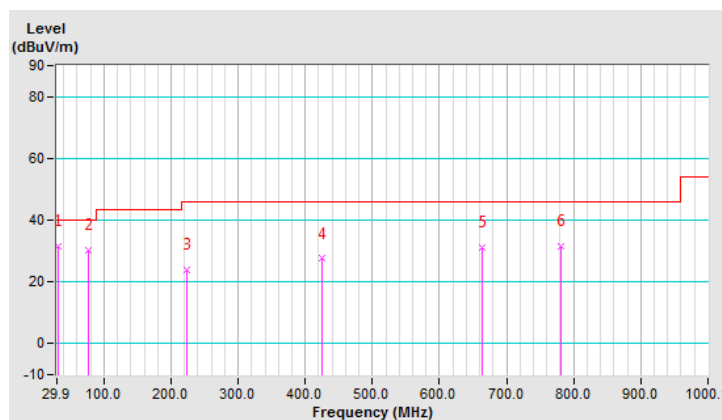


<b>CHANNEL</b>	TX Channel 39	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP)
<b>FREQUENCY RANGE</b>	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	31.84	31.7 QP	40.0	-8.3	1.00 V	197	42.7	-11.0
2	76.56	30.2 QP	40.0	-9.8	1.00 V	202	42.9	-12.7
3	224.33	23.7 QP	46.0	-22.3	1.50 V	161	34.9	-11.2
4	424.59	27.5 QP	46.0	-18.5	2.00 V	10	32.3	-4.8
5	663.74	31.0 QP	46.0	-15.0	1.00 V	70	31.3	-0.3
6	780.40	31.5 QP	46.0	-14.5	1.50 V	69	29.1	2.4

#### REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz :the amplitude of spurious emissions attenuated more than 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 0.50MHz.

### 4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCS30	100291	Sep. 03, 2018	Sep. 02, 2019
RF signal cable Woken	5D-FB	Cable-cond1-01	Sep. 05, 2018	Sep. 04, 2019
LISN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 26, 2018	Feb. 25, 2019
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 19, 2018	Aug. 18, 2019
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-2040.

#### 4.2.3 Test Procedures

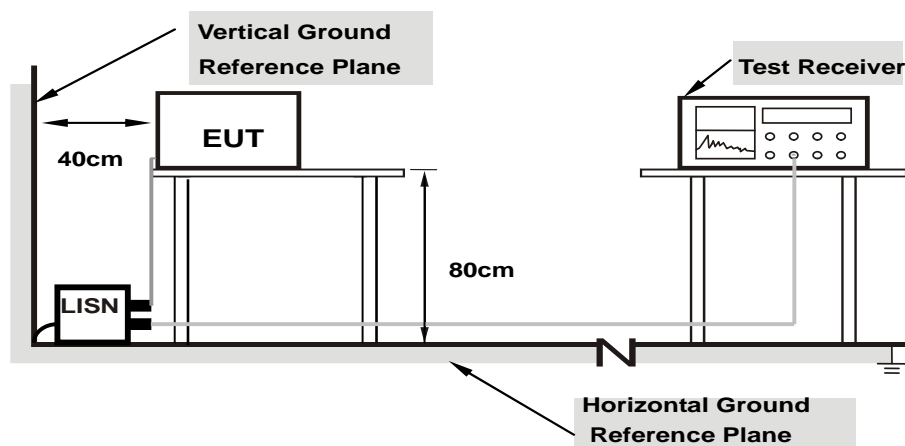
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

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

#### 4.2.4 Deviation From Test Standard

No deviation.

#### 4.2.5 Test Setup



**Note: 1.Support units were connected to second LISN.**

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

#### 4.2.6 EUT Operating Condition

Same as 4.1.6.

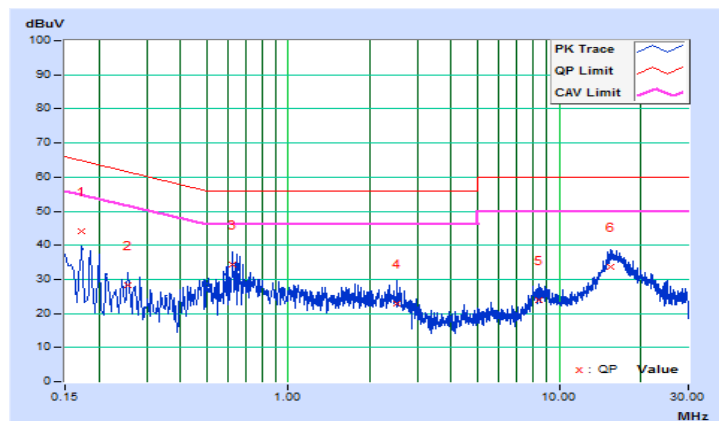
#### 4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
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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	0.17346	10.04	33.94	17.81	43.98	27.85	64.79	54.79	-20.81	-26.94
2	0.25557	10.05	18.26	2.70	28.31	12.75	61.57	51.57	-33.26	-38.82
3	0.62311	10.05	24.18	10.95	34.23	21.00	56.00	46.00	-21.77	-25.00
4	2.51555	10.15	12.62	6.02	22.77	16.17	56.00	46.00	-33.23	-29.83
5	8.41183	10.48	13.44	6.68	23.92	17.16	60.00	50.00	-36.08	-32.84
6	15.57495	10.91	22.84	17.23	33.75	28.14	60.00	50.00	-26.25	-21.86

#### Remarks:

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

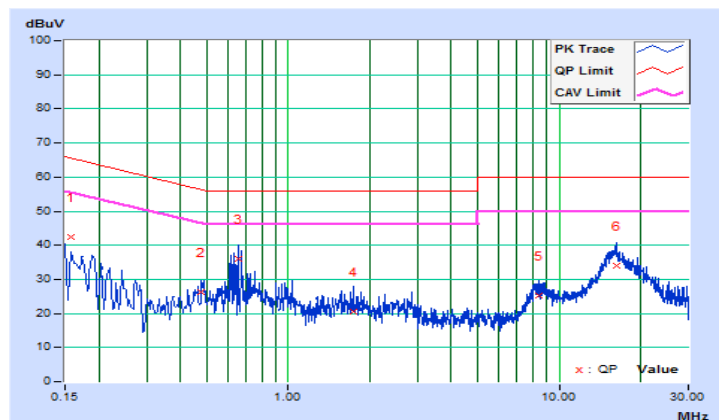


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
-------	-------------	-------------------	--------------------------------

No	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	0.15782	10.04	32.34	17.01	42.38	27.05	65.58	55.58	-23.20	-28.53
2	0.47915	10.05	16.25	6.93	26.30	16.98	56.35	46.35	-30.05	-29.37
3	<b>0.65439</b>	<b>10.05</b>	<b>26.11</b>	<b>11.77</b>	<b>36.16</b>	<b>21.82</b>	<b>56.00</b>	<b>46.00</b>	<b>-19.84</b>	<b>-24.18</b>
4	1.73355	10.10	10.45	3.35	20.55	13.45	56.00	46.00	-35.45	-32.55
5	8.38446	10.42	14.75	8.18	25.17	18.60	60.00	50.00	-34.83	-31.40
6	16.34131	10.77	23.39	17.72	34.16	28.49	60.00	50.00	-25.84	-21.51

**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

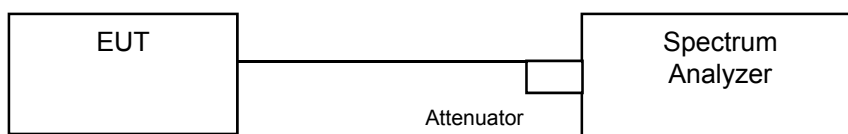


### 4.3 Number of Hopping Frequency Used

#### 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

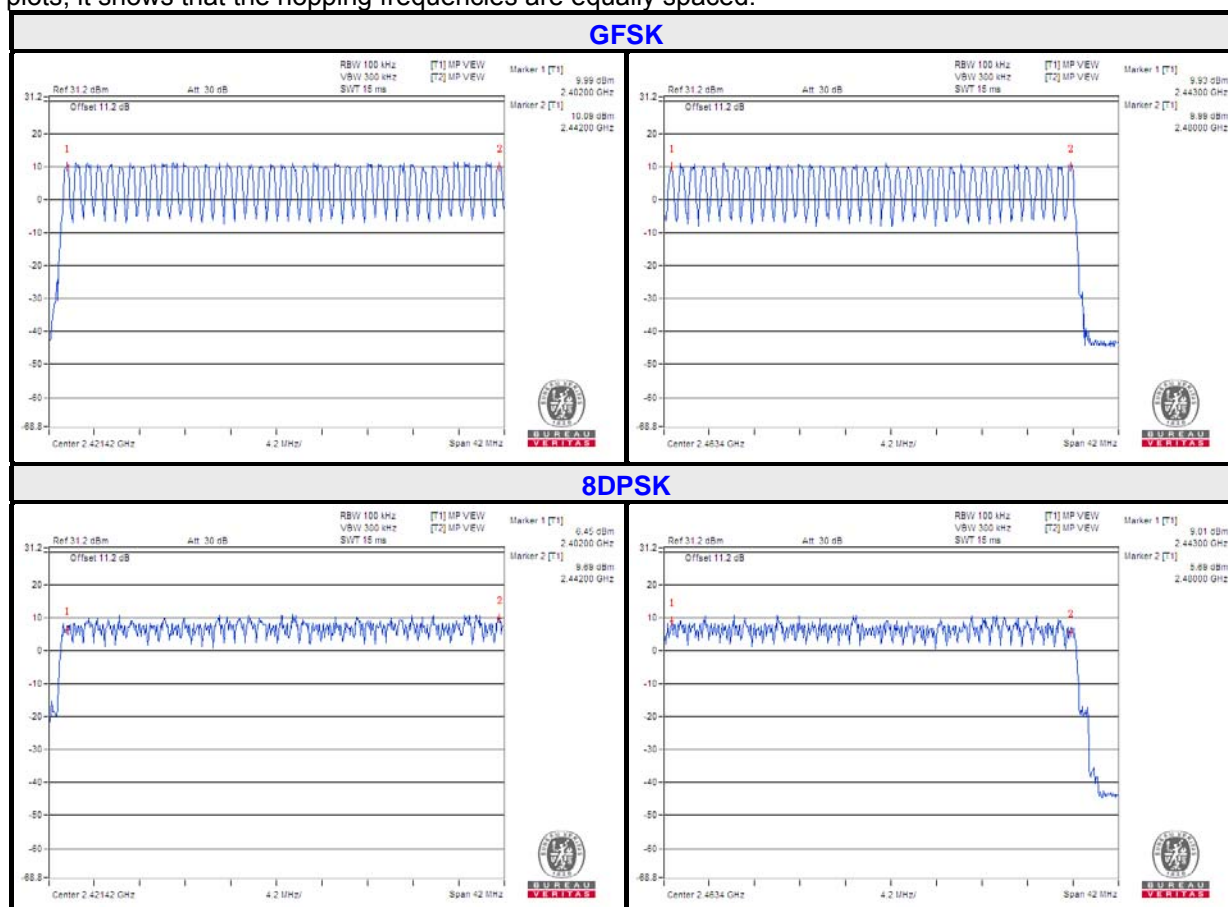
- Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
- 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.
- Set the SA on View mode and then plot the result on SA screen.
- 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.

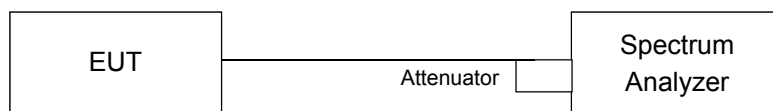


#### 4.4 Dwell Time on Each Channel

##### 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

- 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.

##### 4.4.5 Deviation from Test Standard

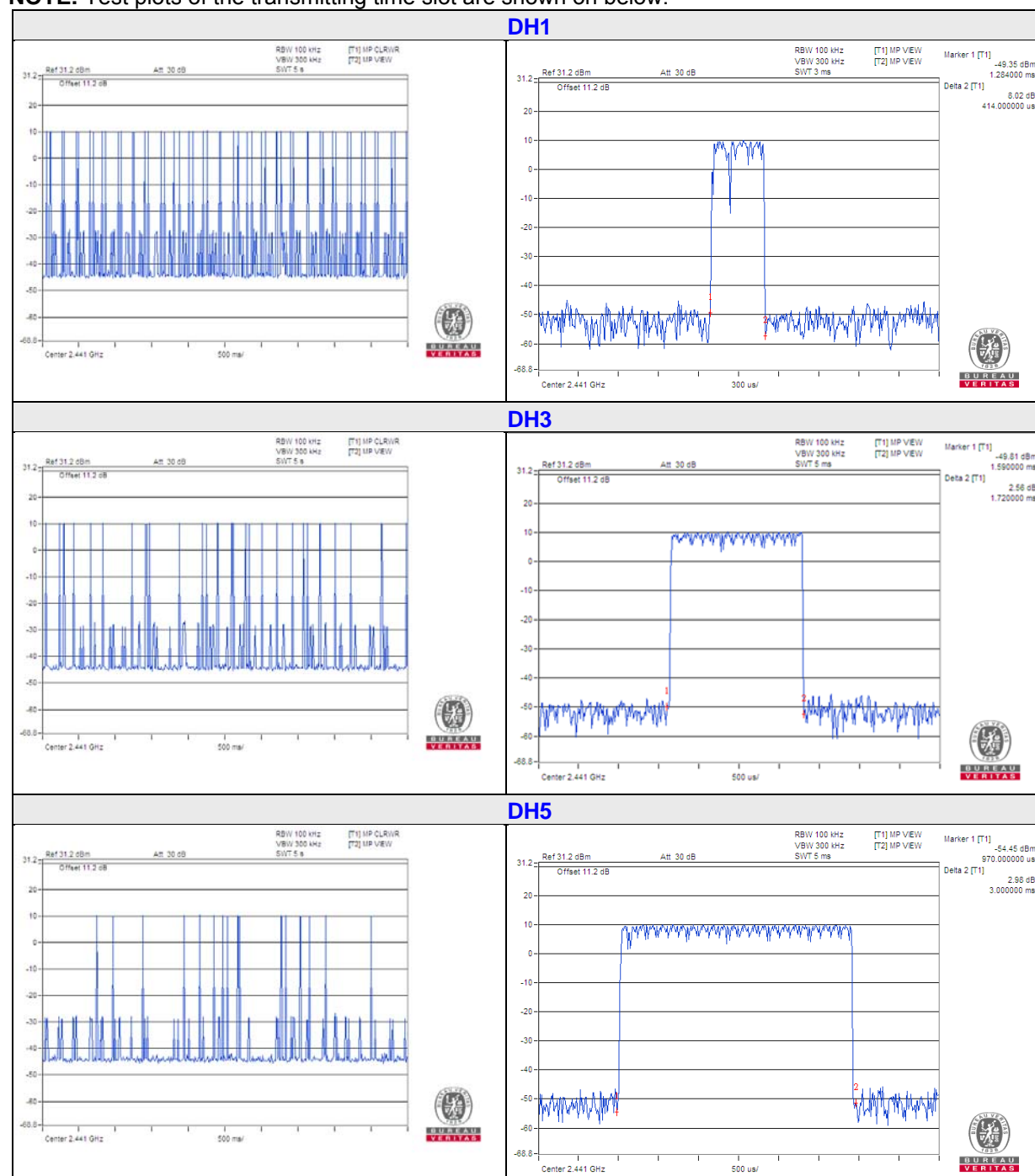
No deviation.

## 4.4.6 Test Results

### GFSK

Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
DH1	50 (times / 5 sec) * 6.32 = 316.00 times	0.414	130.8	400
DH3	27 (times / 5 sec) * 6.32 = 170.64 times	1.72	293.5	400
DH5	16 (times / 5 sec) * 6.32 = 101.12 times	3	303.4	400

**NOTE:** Test plots of the transmitting time slot are shown on below.

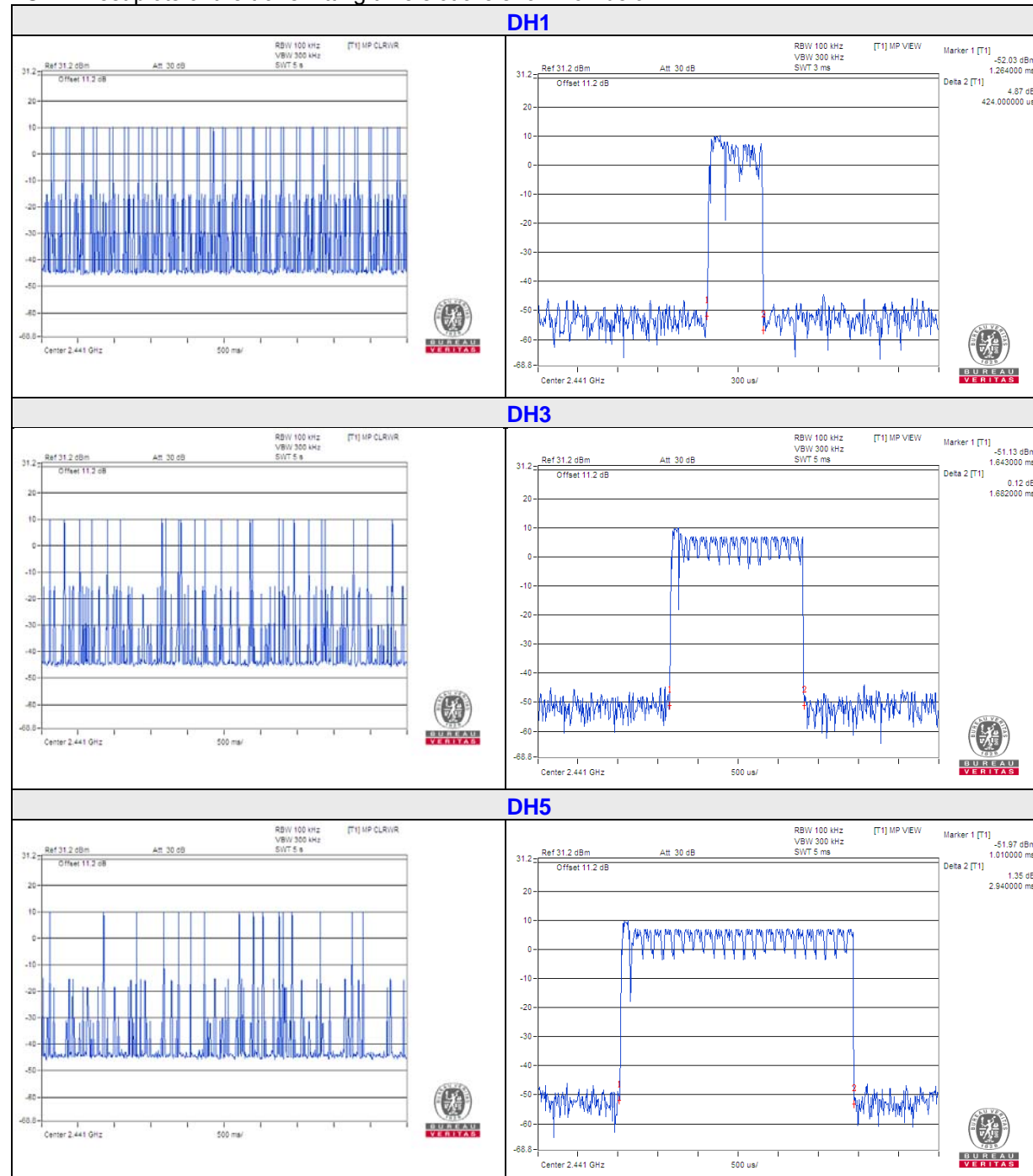




## 8DPSK

Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
DH1	50 (times / 5 sec) * 6.32 = 316.00 times	0.424	134	400
DH3	25 (times / 5 sec) * 6.32 = 158.00 times	1.682	265.8	400
DH5	16 (times / 5 sec) * 6.32 = 101.12 times	2.94	297.3	400

**NOTE:** Test plots of the transmitting time slot are shown on below.

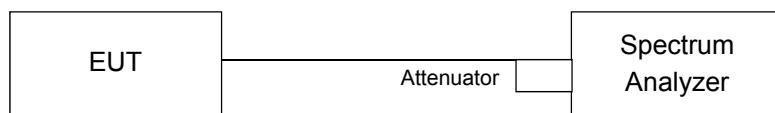


## 4.5 Channel Bandwidth

### 4.5.1 Limits of Channel Bandwidth Measurement

For frequency hopping system operating in the 2400-2483.5MHz, If the 20dB bandwidth of hopping channel is greater than 25kHz, two-thirds 20dB 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 20dB 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

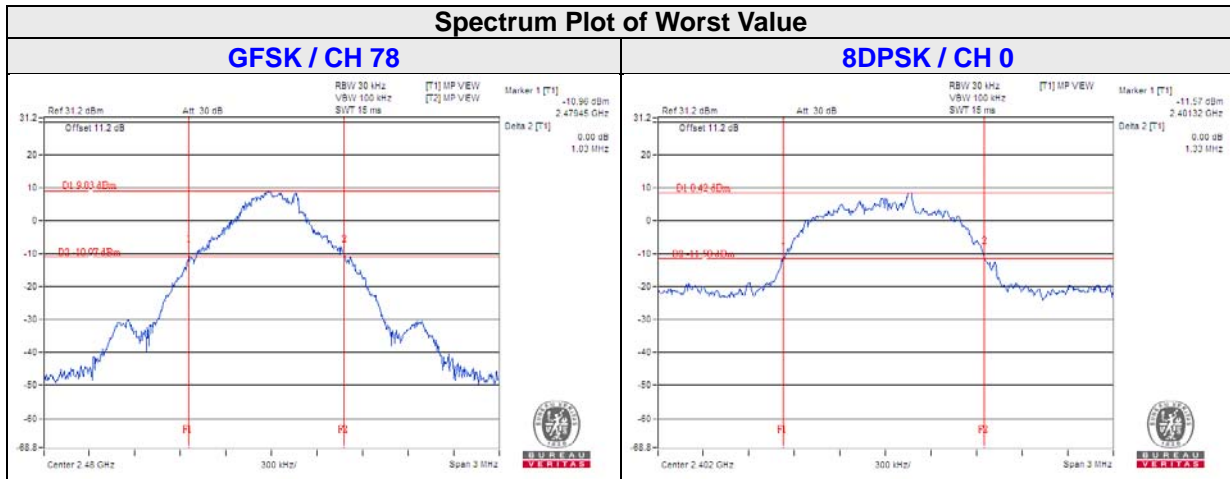
No deviation.

### 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)	20dB Bandwidth (MHz)	
		GFSK	8DPSK
0	2402	0.99	1.33
39	2441	0.98	1.33
78	2480	1.03	1.33

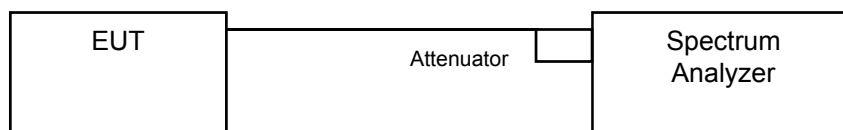


## 4.6 Hopping Channel Separation

### 4.6.1 Limits of Hopping Channel Separation Measurement

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

### 4.6.2 Test Setup



### 4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.6.4 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.

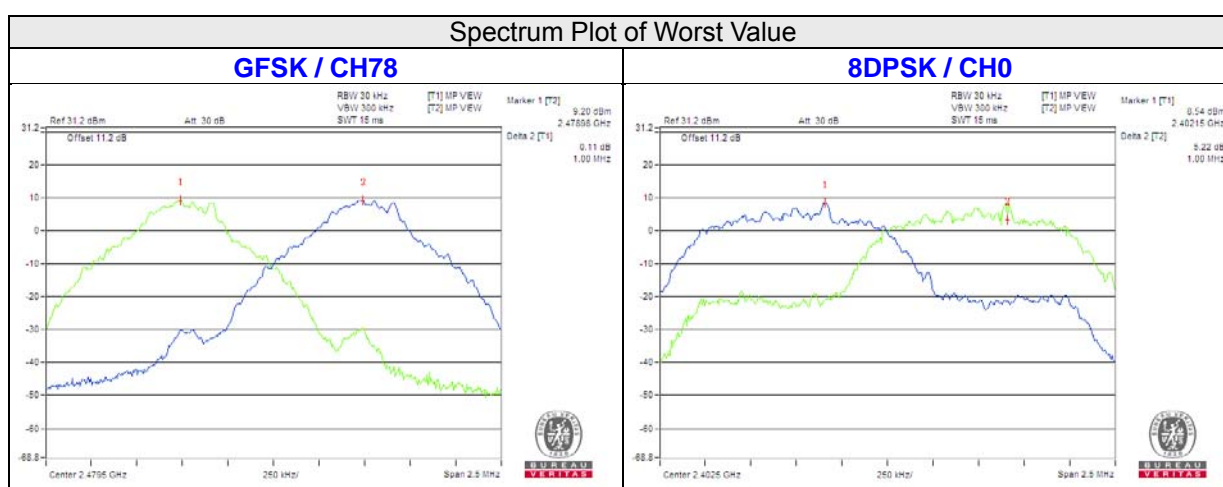
### 4.6.5 Deviation from Test Standard

No deviation.

#### 4.6.6 Test Results

Channel	Frequency (MHz)	Adjacent Channel Separation (MHz)		20dB Bandwidth (MHz)		Minimum Limit (MHz)		Pass / Fail
		GFSK	8DPSK	GFSK	8DPSK	GFSK	8DPSK	
0	2402	1.00	1.00	0.99	1.33	0.66	0.89	Pass
39	2441	1.00	1.00	0.98	1.33	0.66	0.89	Pass
78	2480	1.00	1.00	1.03	1.33	0.69	0.89	Pass

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

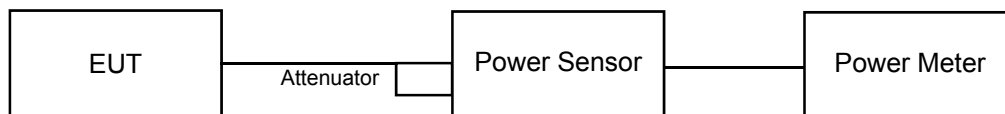


## 4.7 Maximum Output Power

### 4.7.1 Limits of Maximum Output Power Measurement

The Maximum Output Power Measurement is 125mW.

### 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

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.

### 4.7.5 Deviation from Test Standard

No deviation.

### 4.7.6 EUT Operating Condition

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

#### 4.7.7 Test Results

Channel	Frequency (MHZ)	Output Power (mW)		Output Power (dBm)		Power Limit (mW)	Pass / Fail
		GFSK	8DPSK	GFSK	8DPSK		
0	2402	15.524	15.524	11.91	11.91	125	Pass
39	2441	16.406	<b>16.52</b>	12.15	12.18	125	Pass
78	2480	15.311	15.241	11.85	11.83	125	Pass

## **4.8 Conducted Out of Band Emission Measurement**

### **4.8.1 Limits of Conducted Out of Band Emission Measurement**

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

### **4.8.2 Test Instruments**

Refer to section 4.1.2 to get information of above instrument.

### **4.8.3 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.

### **4.8.4 Deviation from Test Standard**

No deviation.

### **4.8.5 EUT Operating Condition**

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

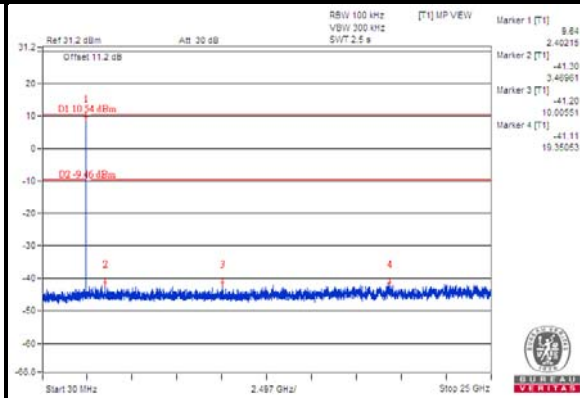
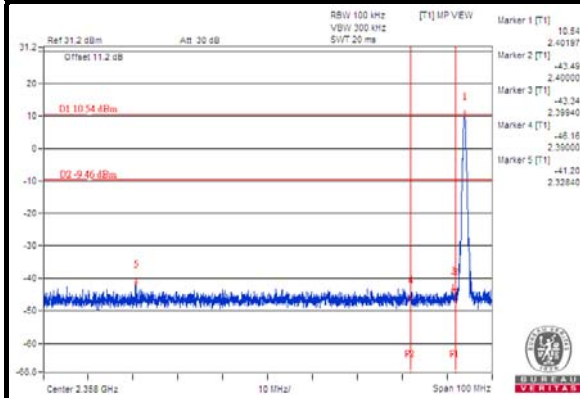
### **4.8.6 Test Results**

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

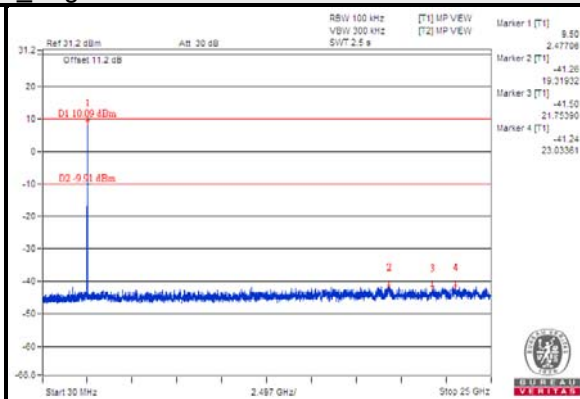
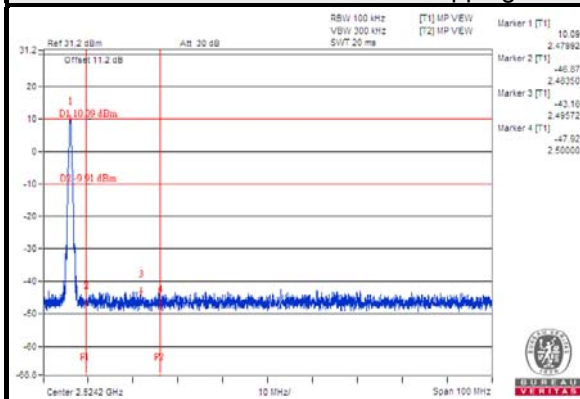


# GFSK

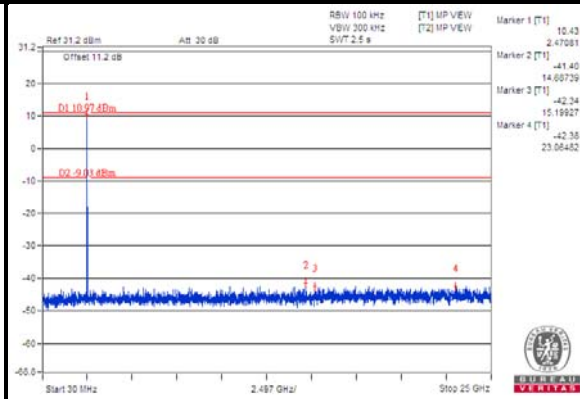
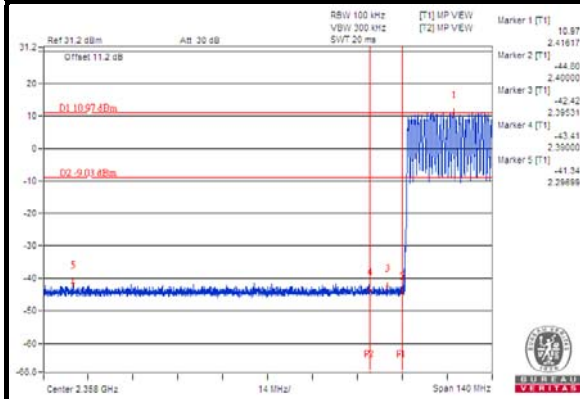
## Hopping disabled Low Channel



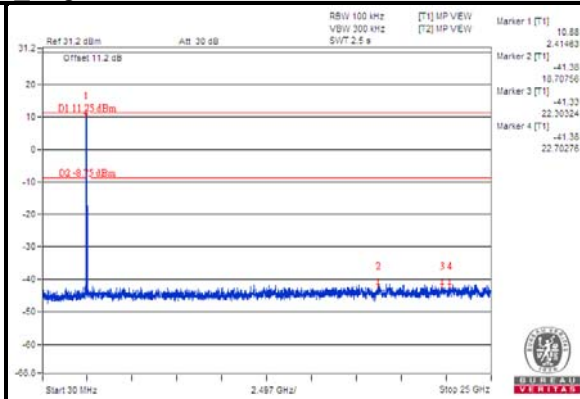
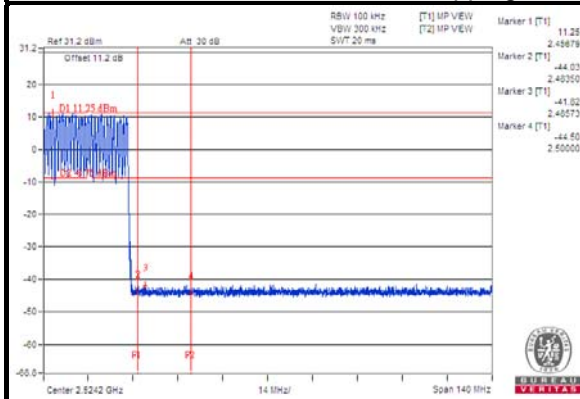
## Hopping disabled High Channel

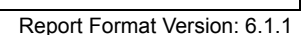


## Hopping enabled Low Channel



## Hopping enabled High Channel





## 5 Pictures of Test Arrangements

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

## Appendix – Information of the Testing Laboratories

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