



Test Report No.: RF150522N017-1



# FCC TEST REPORT

## (Bluetooth EDR)

**Product:** LTE Smartphone  
**Model No.:** XP7700  
**FCC ID:** WYPL14V012AA  
**Applicant:** Sonim Technologies, Inc.  
**Address:** 1825 S. Grant St., Suite 200., San Mateo, CA, 94402  
**Manufacturer:** Sonim Technologies (Shenzhen) Limited  
**Address:** Block B, 2nd Floor, Building #2, Daqian Industrial Park,  
Longchang Road, 67 District Baoan, Shenzhen, Guangdong,  
P.R.China  
**Prepared by:** Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch  
**Lab Location:** No. 34, Chenwulu Section, Guantai Rd., Houjie Town,  
Dongguan City, Guangdong 523942, China  
**TEL:** +86 769 8593 5656  
**FAX:** +86 769 8593 1080  
**E-MAIL:** [customerservice.dg@cn.bureauveritas.com](mailto:customerservice.dg@cn.bureauveritas.com)  
**Report No.:** RF150522N017-1  
**Received Date:** May 22, 2015  
**Test Date:** May 22, 2015 ~ May 27, 2015  
**Issued Date:** May 28, 2015

This report should not be used by the client to claim product certification, approval, or endorsement by A2LA or any government agencies.

Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specifically mentioned, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification.

## TABLE OF CONTENTS

<b>RELEASE CONTROL RECORD .....</b>	<b>5</b>
<b>1 CERTIFICATION .....</b>	<b>6</b>
<b>2 SUMMARY OF TEST RESULTS .....</b>	<b>7</b>
2.1 MEASUREMENT UNCERTAINTY .....	7
<b>3 GENERAL INFORMATION .....</b>	<b>8</b>
3.1 GENERAL DESCRIPTION OF EUT.....	8
3.2 DESCRIPTION OF TEST MODES.....	9
3.2.1 ONFIGURATION OF SYSTEM UNDER TEST .....	10
3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL .....	10
3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS.....	12
3.4 DESCRIPTION OF SUPPORT UNITS.....	12
<b>4 TEST TYPES AND RESULTS .....</b>	<b>13</b>
4.1 CONDUCTED EMISSION MEASUREMENT.....	13
4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT .....	13
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.....	15
4.1.7 TEST RESULTS .....	16
4.2 RADIATED EMISSION AND BANDEDGE MEASUREMENT .....	18
4.2.1 LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT .....	18
4.2.2 TEST INSTRUMENTS.....	19
4.2.3 TEST PROCEDURES .....	20
4.2.4 DEVIATION FROM TEST STANDARD .....	20
4.2.5 TEST SETUP.....	21
4.2.6 EUT OPERATING CONDITIONS.....	21
4.2.7 TEST RESULTS .....	22
4.3 NUMBER OF HOPPING FREQUENCY USED.....	30
4.3.1 LIMIT OF HOPPING FREQUENCY USED .....	30
4.3.2 TEST SETUP.....	30
4.3.3 TEST INSTRUMENTS.....	30
4.3.4 TEST PROCEDURES .....	31
4.3.5 DEVIATION FROM TEST STANDARD .....	31
4.3.6 TEST RESULTS .....	31



4.4 DWELL TIME ON EACH CHANNEL ..... 34

    4.4.1 LIMIT OF DWELL TIME USED ..... 34

    4.4.2 TEST SETUP ..... 34

    4.4.3 TEST INSTRUMENTS ..... 34

    4.4.4 TEST PROCEDURES ..... 34

    4.4.5 DEVIATION FROM TEST STANDARD ..... 35

    4.4.6 TEST RESULTS ..... 35

4.5 CHANNEL BANDWIDTH ..... 39

    4.5.1 LIMITS OF CHANNEL BANDWIDTH ..... 39

    4.5.2 TEST SETUP ..... 39

    4.5.3 TEST INSTRUMENTS ..... 39

    4.5.4 TEST PROCEDURE ..... 39

    4.5.5 DEVIATION FROM TEST STANDARD ..... 39

    4.5.6 EUT OPERATING CONDITION ..... 39

    4.5.7 TEST RESULTS ..... 40

4.6 HOPPING CHANNEL SEPARATION ..... 44

    4.6.1 LIMIT OF HOPPING CHANNEL SEPARATION ..... 44

    4.6.2 TEST SETUP ..... 44

    4.6.3 TEST INSTRUMENTS ..... 44

    4.6.4 TEST PROCEDURES ..... 44

    4.6.5 DEVIATION FROM TEST STANDARD ..... 44

    4.6.6 TEST RESULTS ..... 45

4.7 MAXIMUM OUTPUT POWER ..... 49

    4.7.1 LIMITS OF MAXIMUM OUTPUT POWER MEASUREMENT ..... 49

    4.7.2 TEST SETUP ..... 49

    4.7.3 TEST INSTRUMENTS ..... 49

    4.7.4 TEST PROCEDURES ..... 49

    4.7.5 DEVIATION FROM TEST STANDARD ..... 49

    4.7.6 EUT OPERATING CONDITION ..... 49

    4.7.7 TEST RESULTS ..... 50

4.8 OUT OF BAND MEASUREMENT ..... 51

    4.8.1 LIMITS OF OUT OF BAND MEASUREMENT ..... 51

    4.8.2 TEST INSTRUMENTS ..... 51

    4.8.3 TEST PROCEDURE ..... 51

    4.8.4 DEVIATION FROM TEST STANDARD ..... 51

    4.8.5 EUT OPERATING CONDITION ..... 51

    4.8.6 TEST RESULTS ..... 51



**BUREAU  
VERITAS**

**Test Report No.: RF150522N017-1**

<b>5</b>	<b>PHOTOGRAPHS OF THE TEST CONFIGURATION .....</b>	<b>54</b>
<b>6</b>	<b>APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB.....</b>	<b>55</b>



Test Report No.: RF150522N017-1


## RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF150522N017-1	Original release	May 28, 2015

# 1 CERTIFICATION

**PRODUCT:** LTE Smartphone  
**BRAND:** Sonim  
**MODEL NO.:** XP7700  
**APPLICANT:** Sonim Technologies, Inc.  
**TESTED:** May 22, 2015 ~ May 27, 2015  
**TEST SAMPLE:** Identical Prototype  
**STANDARDS:** **FCC Part 15, Subpart C. Section 15.247**  
ANSI C63.10-2009

The above equipment has been tested by **Bureau Veritas Shenzhen Co., Ltd. Dongguan 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 EMC characteristics under the conditions specified in this report.

**PREPARED BY :**  , **DATE:** May 28, 2015  
(Yuqiang Yin / Engineer)

**APPROVED BY :**  , **DATE:** May 28, 2015  
( Glyn He / Supervisor )



## 2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -11.06dB at 0.63856MHz
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.
15.247(d)& 15.209	Transmitter Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -6.6dB at 2400.00MHz.
15.247(d)	Out of band Measurement	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	UNCERTAINTY
Conducted emissions	9kHz~30MHz	2.66dB
Radiated emissions	9KHz ~ 30MHz	2.74dB
	30MHz ~ 1GMHz	3.55dB
	1GHz ~ 18GHz	4.84dB
	18GHz ~ 40GHz	1.94dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.



### 3 GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

<b>PRODUCT</b>	LTE Smartphone
<b>MODEL NO.</b>	XP7700
<b>TYPE NUMBER</b>	L14V012AA
<b>POWER SUPPLY</b>	5.0Vdc (adapter or host equipment) 3.7Vdc (battery)
<b>MODULATION TECHNOLOGY</b>	FHSS
<b>MODULATION TYPE</b>	GFSK, 8DPSK, $\pi/4$ DQPSK
<b>OPERATING FREQUENCY</b>	2402MHz~2480MHz
<b>NUMBER OF CHANNEL</b>	79
<b>MAX. OUTPUT POWER</b>	17.91mW (Max. Measured)
<b>ANTENNA TYPE</b>	PCB Antenna with -1dBi gain
<b>I/O PORTS</b>	Refer to user's manual
<b>CABLE SUPPLIED</b>	USB cable: Unshielded, detachable, 1.1m Earphone cable: Unshielded, detachable, 1.2m

**NOTE:**

- For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
- The EUT was powered by the following adapter:

<b>ADAPTER</b>	
<b>BRAND:</b>	Sonim
<b>MODEL:</b>	S11C02
<b>INPUT:</b>	AC 100-240V, 450mA
<b>OUTPUT:</b>	DC 5V, 2100mA

- The EUT matched the following USB cable:

<b>USB CABLE</b>	
<b>BRAND:</b>	Sunway
<b>MODEL:</b>	APC01G
<b>SIGNAL LINE:</b>	1.1 METER

- For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.





### 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 ONFIGURATION OF SYSTEM UNDER TEST

Please see section 5 photograph of the test configuration for reference.

### 3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports

The worst case was found when positioned on X axis for radiated emission.

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

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE<1G	RE≥1G	PLC	APCM	
-	√	√	√	√	-

Where RE<1G: Radiated Emission below 1GHz  
PLC: Power Line Conducted Emission

RE≥1G: Radiated Emission above 1GHz  
APCM: Antenna Port Conducted Measurement

#### RADIATED EMISSION TEST (BELOW 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.
- 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	DH5

For the test results, only the worst case was shown in test report.

#### RADIATED EMISSION TEST (ABOVE 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.
- 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	DH5



**POWER LINE CONDUCTED EMISSION TEST:**

The EUT was tested with the following mode

EUT CONFIGURE MODE	TESTED CONDITION
-	BT Link + USB cable + Earphone + Adapter

**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, antenna ports (if EUT with antenna diversity architecture), and packet types.
- Following channel(s) was (were) selected for the final test as listed below.

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	DH5

**TEST CONDITION:**

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	TEST VOLTAGE (SYSTEM)	TESTED BY
RE<1G	22deg. C, 54%RH	DC 5V from adaptor	Blue Zheng
RE≥1G	22deg. C, 54%RH	DC 5V from adaptor	Blue Zheng
PLC	25deg. C, 60%RH	DC 5V from adaptor	Yuqiang Yin
APCM	25deg. C, 60%RH	DC 3.7V from battery	Yuqiang Yin



### 3.3 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. Section 15.247**

**ANSI C63.10-2009**

**558074 D01 DTS Meas Guidance V03r01**

**FCC Public Notice DA 00-705**

- NOTE:**
1. All test items have been performed and recorded as per the above standards.
  2. The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (Verification). The test report has been issued separately.

### 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	DC source	LONG WEI	PS-6403D	010934269	N/A
2	PC	HP	A6608CN	3CR83825X3	N/A
3	Earphone	Minami	ME-816B5-E	N/A	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	DC Line: Unshielded, Detachable 1.0m
2	AC Line: Unshielded, Detachable 1.5m
3	DC Line: Unshielded, Detachable 1.2m



## 4 TEST TYPES AND RESULTS

### 4.1 CONDUCTED EMISSION MEASUREMENT

#### 4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBµV)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56	56 to 46
0.5 ~ 5	56	46
5 ~ 30	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.
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

#### 4.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCS30	100340	May 11, 15	May 10, 16
Artificial Mains Network	Rohde&Schwarz	ENV216	101173	May 11, 15	May 10, 16
Artificial Mains Network	Rohde&Schwarz	ESH3-Z5	100317	May 11, 15	May 10, 16
Test software	ADT	ADT_Cond_V7.3.7	N/A	N/A	N/A

**NOTE:**

1. The test was performed in shielded room 553.
2. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.



#### 4.1.3 TEST PROCEDURES

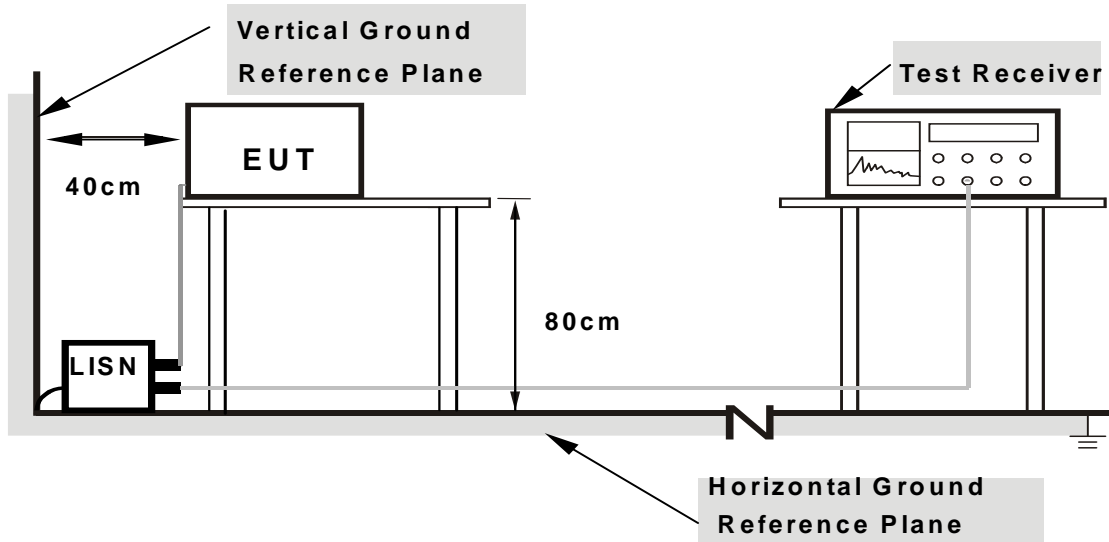
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling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

**NOTE:** 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



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

**2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes**

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

#### 4.1.6 EUT OPERATING CONDITIONS

- a. Turned on the power and connected of all equipment.
- b. EUT was operated according to the type used was description in manufacturer's specifications or the User's Manual.



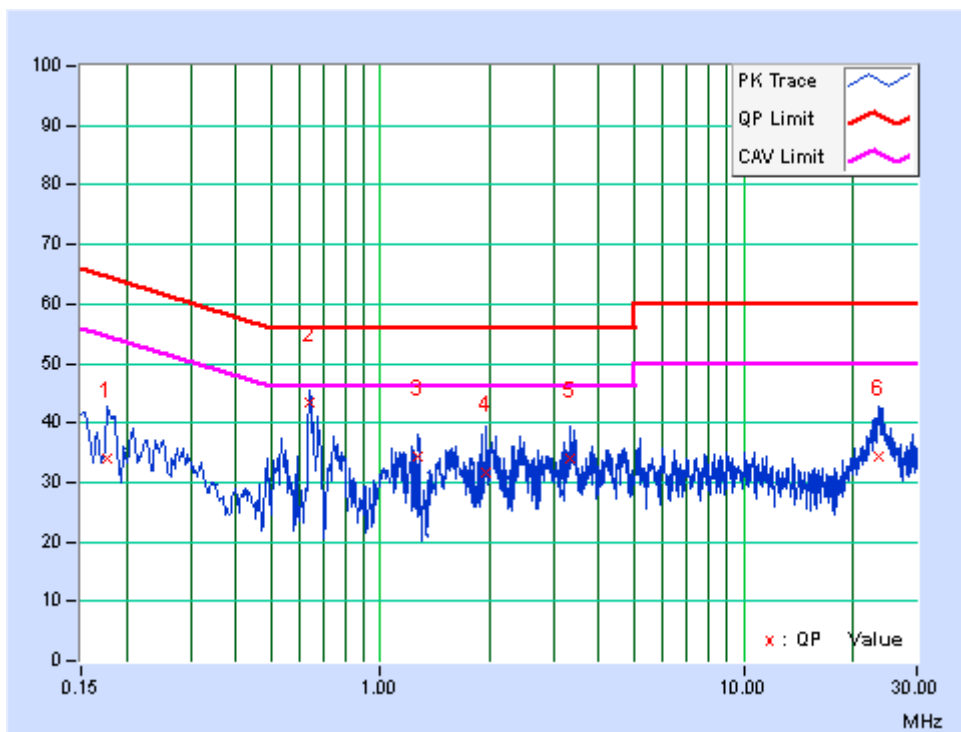
### 4.1.7 TEST RESULTS

#### CONDUCTED WORST-CASE DATA:

<b>PHASE</b>	Line	<b>6dB BANDWIDTH</b>	9kHz
--------------	------	----------------------	------

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.17744	10.71	23.20	9.57	33.91	20.28	64.60	54.60	-30.69	-34.32
2	<b>0.63856</b>	<b>10.46</b>	<b>32.99</b>	<b>24.48</b>	<b>43.45</b>	<b>34.94</b>	<b>56.00</b>	<b>46.00</b>	<b>-12.55</b>	<b>-11.06</b>
3	1.27608	10.19	24.16	10.38	34.35	20.57	56.00	46.00	-21.65	-25.43
4	1.96424	10.08	21.63	8.10	31.71	18.18	56.00	46.00	-24.29	-27.82
5	3.32492	10.10	23.96	8.08	34.06	18.18	56.00	46.00	-21.94	-27.82
6	23.45751	10.66	23.81	11.52	34.47	22.18	60.00	50.00	-25.53	-27.82

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Emission level - Limit value
  5. Correction factor = Insertion loss + Cable loss
  6. Emission Level = Correction Factor + Reading Value.



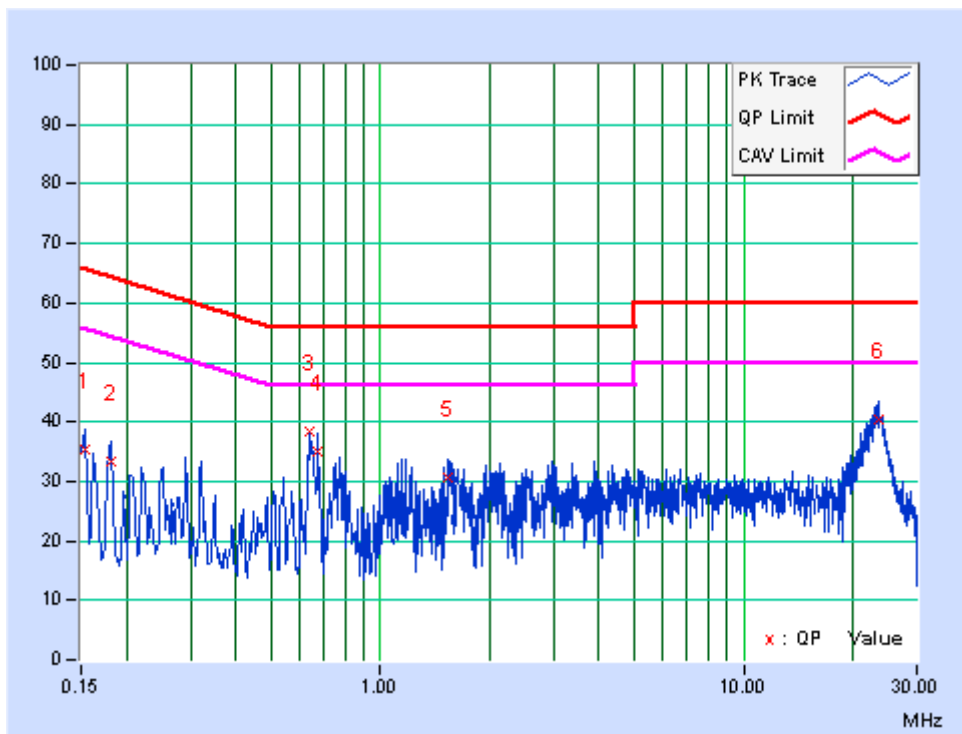




<b>PHASE</b>	Neutral	<b>6dB BANDWIDTH</b>	9kHz
--------------	---------	----------------------	------

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	10.61	24.58	9.62	35.19	20.23	65.79	55.79	-30.59	-35.55
2	0.18122	10.56	22.92	7.59	33.48	18.15	64.43	54.43	-30.95	-36.28
3	0.63856	10.39	27.88	18.93	38.27	29.32	56.00	46.00	-17.73	-16.68
4	0.67394	10.35	24.71	13.05	35.06	23.40	56.00	46.00	-20.94	-22.60
5	1.52746	10.00	20.64	6.42	30.64	16.42	56.00	46.00	-25.36	-29.58
6	23.45751	10.53	29.77	10.76	40.30	21.29	60.00	50.00	-19.70	-28.71

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Emission level - Limit value
  5. Correction factor = Insertion loss + Cable loss
  6. Emission Level = Correction Factor + Reading Value.





## 4.2 RADIATED EMISSION AND BANDEDGE MEASUREMENT

### 4.2.1 LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a). 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. As shown in 15.35(b), 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.



#### 4.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESU 26	100005	May 11,15	May 10,16
Bilog Antenna	Teseq	CBL 6111D	30643	Jul. 25, 14	Jul. 24, 15
Horn Antenna (1GHz -18GHz)	ETS -Lindgren	3117	00062558	May 30, 14	May 29, 16
Amplifier (9kHz-1GHz)	SONOMA	310D	186955	Mar. 04,15	Mar. 03, 16
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Nov. 20,14	Nov. 19,15
Pre-Amplifier (100MHz-26.5GHz)	Agilent	8449B	3008A00409	May 11,15	May 10,16
GPS Generator+ Antenna	TOJOIN	GNSS-5000A	E1-010119	Aug. 08, 14	Aug. 07, 15
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	NSEMC003	Apr. 19,14	Apr. 18,16
Test Software	ADT	ADT_Radiated _V7.6.15.9.2	N/A	N/A	N/A

**NOTE:**

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
2. The test was performed in 966 Chamber.
3. The FCC Site Registration No. is 502831.



#### 4.2.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. 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 antenna is a broadband antenna, and its height 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 Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, For battery operated equipment, the equipment tests shall be perform using fresh batteries. The turntable was rotated to maximize the emission level.

#### **NOTE:**

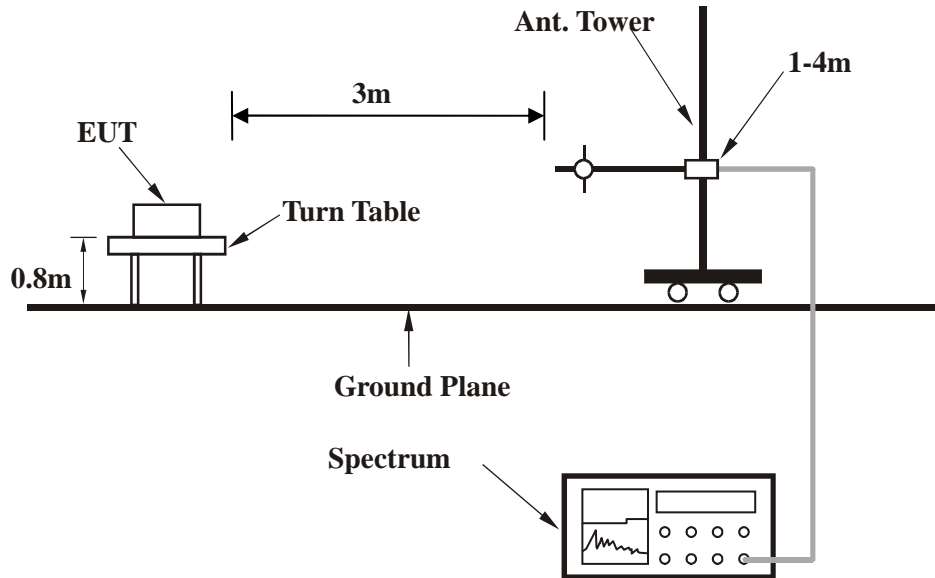
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.2.4 DEVIATION FROM TEST STANDARD

No deviation.



#### 4.2.5 TEST SETUP



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

#### 4.2.6 EUT OPERATING CONDITIONS

- Set the EUT under full load condition and placed them on a testing table.
- Set the transmitter part of EUT under transmission condition continuously at specific channel frequency.
- The necessary accessories enable the EUT in full functions.



### 4.2.7 TEST RESULTS

#### BELOW 1GHz WORST-CASE DATA:

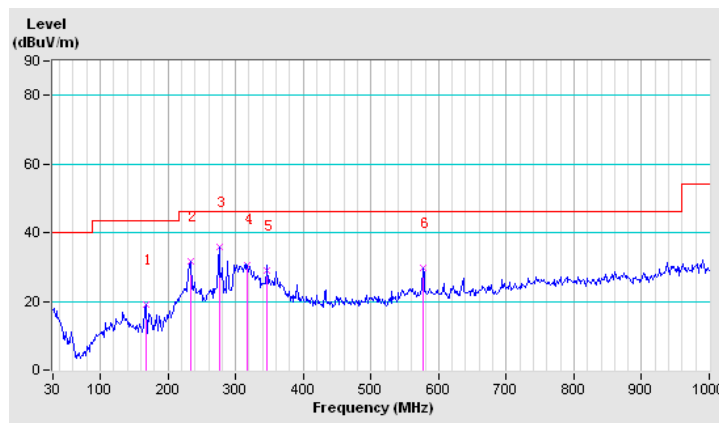
#### 8DPSK DH5

CHANNEL	Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 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	167.42	18.9 QP	43.5	-24.6	1.00 H	194	7.12	11.77
2	233.70	31.5 QP	46.0	-14.5	1.00 H	183	18.48	13.01
3	275.73	35.8 QP	46.0	-10.2	1.00 H	172	20.27	15.56
4	317.77	30.7 QP	46.0	-15.3	1.00 H	160	13.75	16.95
5	345.25	29.0 QP	46.0	-17.0	1.00 H	150	11.80	17.18
6	576.43	29.6 QP	46.0	-16.4	1.00 H	104	5.01	24.55

#### 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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.



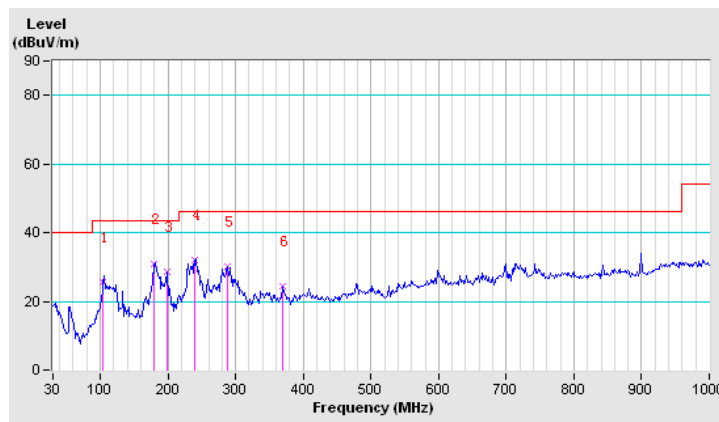


<b>CHANNEL</b>	Channel 0	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP)
<b>FREQUENCY RANGE</b>	30MHz ~ 1GHz		

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	104.37	25.6 QP	43.5	-17.9	1.00 V	301	13.21	12.43
2	178.73	30.8 QP	43.5	-12.8	1.00 V	334	19.43	11.32
3	198.13	28.7 QP	43.5	-14.8	1.00 V	0	18.36	10.35
4	240.17	32.2 QP	46.0	-13.8	1.00 V	345	18.60	13.57
5	288.67	30.0 QP	46.0	-16.0	1.00 V	356	14.30	15.72
6	369.50	24.4 QP	46.0	-21.6	1.00 V	359	6.00	18.42

**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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.





ABOVE 1GHz WORST-CASE DATA:

GFSK DH5

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	44.6 PK	74.0	-29.4	1.20 H	110	8.63	35.97
2	2390.00	32.6 AV	54.0	-21.4	1.20 H	110	-3.37	35.97
3	#2400.00	68.3 PK	82.3	-14.0	1.00 H	120	32.32	35.98
4	#2400.00	40.2 AV	46.8	-6.6	1.00 H	120	4.22	35.98
5	*2402.00	102.3 PK			1.51 H	220	66.32	35.98
6	*2402.00	66.8 AV			1.51 H	220	30.82	35.98
7	4804.00	46.3 PK	74.0	-27.7	1.00 H	205	6.94	39.36
8	4804.00	34.2 AV	54.0	-19.8	1.00 H	205	-5.16	39.36

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	42.3 PK	74.0	-31.7	1.05 V	238	6.33	35.97
2	2390.00	32.6 AV	54.0	-21.4	1.05 V	238	-3.37	35.97
3	#2400.00	53.5 PK	76.6	-23.1	1.05 V	123	17.52	35.98
4	#2400.00	36.8 AV	43.5	-6.7	1.05 V	123	0.77	35.98
5	*2402.00	96.6 PK			N/A V	105	60.62	35.98
6	*2402.00	63.5 AV			N/A V	105	27.50	35.98
7	4804.00	46.8 PK	74.0	-27.2	N/A V	N/A	7.44	39.36
8	4804.00	34.5 AV	54.0	-19.5	1.05 V	0	-4.86	39.36

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).
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.





CHANNEL	TX Channel 39	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	*2441.00	99.6 PK			1.63 H	220	63.57	36.03
2	*2441.00	64.9 AV			1.63 H	220	28.87	36.03
3	4882.00	45.3 PK	74.0	-28.7	1.00 H	211	5.92	39.38
4	4882.00	35.6 AV	54.0	-18.4	1.00 H	211	-3.78	39.38
5	7323.00	50.0 PK	74.0	-24.0	1.00 H	220	7.25	42.75
6	7323.00	42.6 AV	54.0	-11.4	1.00 H	220	-0.15	42.75
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	96.3 PK			1.00 V	21	60.27	36.03
2	*2441.00	63.5 AV			1.00 V	21	27.47	36.03
3	4882.00	45.9 PK	74.0	-28.1	1.00 V	214	6.52	39.38
4	4882.00	34.5 AV	54.0	-19.5	1.00 V	214	-4.88	39.38
5	7323.00	50.6 PK	74.0	-23.4	1.00 V	202	7.85	42.75
6	7323.00	43.1 AV	54.0	-10.9	1.00 V	202	0.35	42.75

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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " \* ": Fundamental frequency.



CHANNEL	TX Channel 78	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	*2480.00	100.0 PK			1.42 H	213	63.92	36.08
2	*2480.00	95.6 AV			1.42 H	213	59.52	36.08
3	2483.50	52.3 PK	74.0	-21.7	1.00 H	320	16.21	36.09
4	2483.50	45.3 AV	54.0	-8.7	1.00 H	320	9.21	36.09
5	4960.00	46.3 PK	74.0	-27.7	1.00 H	221	6.91	39.39
6	4960.00	35.2 AV	54.0	-18.8	1.00 H	221	-4.19	39.39
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	97.2 PK			1.45 V	202	61.12	36.08
2	*2480.00	64.1 AV			1.45 V	202	28.02	36.08
3	2483.50	46.8 PK	74.0	-27.2	1.00 V	145	10.71	36.09
4	2483.50	35.2 AV	54.0	-18.8	1.00 V	145	-0.89	36.09
5	4960.00	45.3 PK	74.0	-28.7	1.00 V	215	5.91	39.39
6	4960.00	35.3 AV	54.0	-18.7	1.00 V	215	-4.09	39.39

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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " \* ": Fundamental frequency.



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	44.2 PK	74.0	-29.8	1.00 H	203	8.23	35.97
2	2390.00	33.9 AV	54.0	-20.1	1.00 H	203	-2.07	35.97
3	#2400.00	69.5 PK	83.2	-13.7	1.24 H	225	33.47	35.98
4	#2400.00	43.5 AV	76.4	-32.9	1.24 H	225	7.52	35.98
5	*2402.00	103.2 PK			1.48 H	236	67.22	35.98
6	*2402.00	96.4 AV			1.48 H	236	60.42	35.98
7	4804.00	45.6 PK	74.0	-28.4	1.00 H	25	6.24	39.36
8	4804.00	34.2 AV	54.0	-19.8	1.00 H	25	-5.16	39.36
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	43.6 PK	74.0	-30.4	1.25 V	201	7.63	35.97
2	2390.00	33.8 AV	54.0	-20.2	1.25 V	201	-2.17	35.97
3	#2400.00	68.8 PK	81.0	-12.2	1.00 V	288	32.82	35.98
4	#2400.00	43.1 AV	75.2	-32.1	1.00 V	288	7.12	35.98
5	*2402.00	101.0 PK			1.32 V	288	65.02	35.98
6	*2402.00	95.2 AV			1.32 V	288	59.22	35.98
7	4804.00	46.6 PK	74.0	-27.4	1.00 V	0	7.24	39.36
8	4804.00	35.2 AV	54.0	-18.8	1.00 V	0	-4.16	39.36

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).
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.



CHANNEL	TX Channel 39	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	*2441.00	102.3 PK			1.42 H	201	66.27	36.03
2	*2441.00	96.2 AV			1.42 H	201	60.17	36.03
3	4882.00	45.6 PK	74.0	-28.4	1.00 H	212	6.22	39.38
4	4882.00	35.6 AV	54.0	-18.4	1.00 H	212	-3.78	39.38
5	7323.00	51.8 PK	74.0	-22.2	1.00 H	223	9.05	42.75
6	7323.00	37.1 AV	54.0	-16.9	1.00 H	223	-5.65	42.75
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	97.7 PK			1.52 V	282	61.67	36.03
2	*2441.00	63.9 AV			1.52 V	282	27.87	36.03
3	4882.00	44.3 PK	74.0	-29.7	1.00 V	202	4.92	39.38
4	4882.00	34.4 AV	54.0	-19.6	1.00 V	202	-4.98	39.38
5	7323.00	50.3 PK	74.0	-23.7	1.00 V	210	7.55	42.75
6	7323.00	36.6 AV	54.0	-17.4	1.00 V	210	-6.15	42.75

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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " \* ": Fundamental frequency.



CHANNEL	TX Channel 78	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	*2480.00	99.8 PK			1.00 H	145	63.72	36.08
2	*2480.00	95.4 AV			1.00 H	145	59.32	36.08
3	2483.50	51.6 PK	74.0	-22.4	1.00 H	203	15.51	36.09
4	2483.50	45.2 AV	54.0	-8.8	1.00 H	203	9.11	36.09
5	4960.00	46.8 PK	74.0	-27.2	1.00 H	110	7.41	39.39
6	4960.00	35.5 AV	54.0	-18.5	1.00 H	110	-3.89	39.39
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	98.6 PK			1.00 V	100	62.52	36.08
2	*2480.00	63.8 AV			1.00 V	100	27.72	36.08
3	2483.50	45.9 PK	74.0	-28.1	1.00 V	206	9.81	36.09
4	2483.50	35.1 AV	54.0	-18.9	1.00 V	206	-0.99	36.09
5	4960.00	46.3 PK	74.0	-27.7	1.00 V	208	6.91	39.39
6	4960.00	36.4 AV	54.0	-17.6	1.00 V	208	-2.99	39.39

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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " \* ": Fundamental frequency.

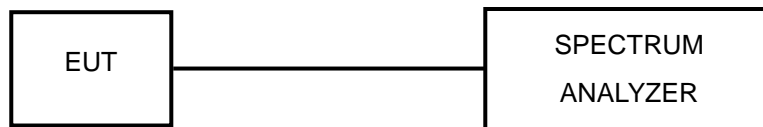


### 4.3 NUMBER OF HOPPING FREQUENCY USED

#### 4.3.1 LIMIT OF HOPPING FREQUENCY USED

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

#### 4.3.2 TEST SETUP



#### 4.3.3 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Spectrum Analyzer (10Hz-40GHz)	Rohde&Schwarz	FSV40	101003	Apr. 07,15	Apr. 06,16
Power Meter	Anritsu	ML2495A	1139001	Feb. 20,15	Feb. 19,16
Power Sensor	Anritsu	MA2411B	1126068	Feb. 20,15	Feb. 19,16
Digital Multimeter	FLUKE	15B	A1220010DG	Oct. 29, 14	Oct. 28, 15
Humid & Temp Programmable Tester	Haida	HD-2257	110807201	Sep.04,14	Sep. 03,15

**NOTE:**

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
2. The test was performed in RF Oven room.

#### 4.3.4 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. 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 completed.

#### 4.3.5 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.3.6 TEST RESULTS

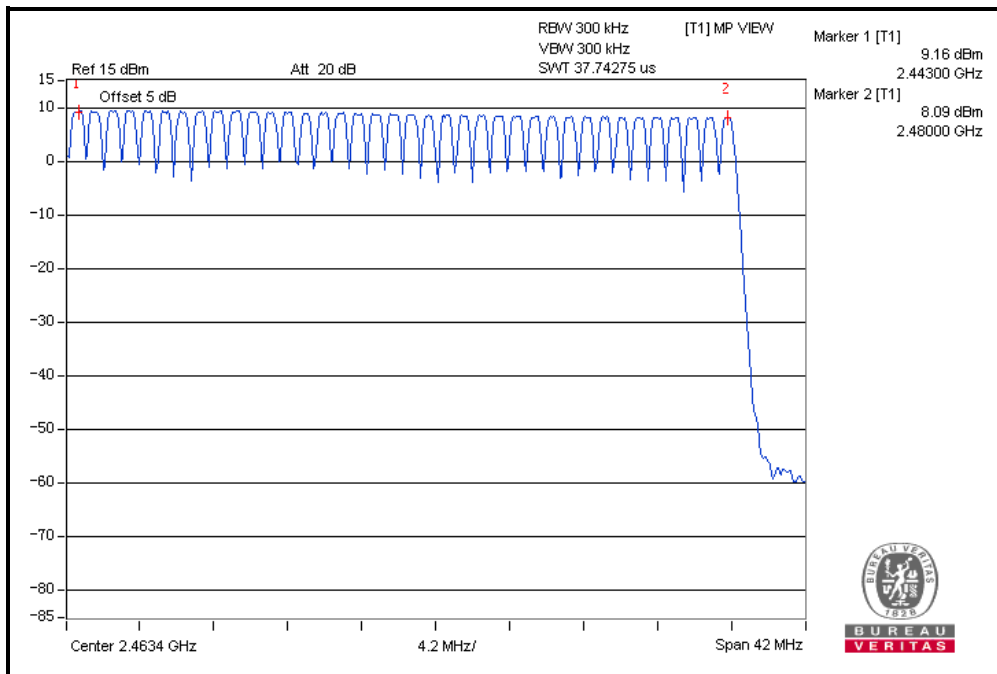
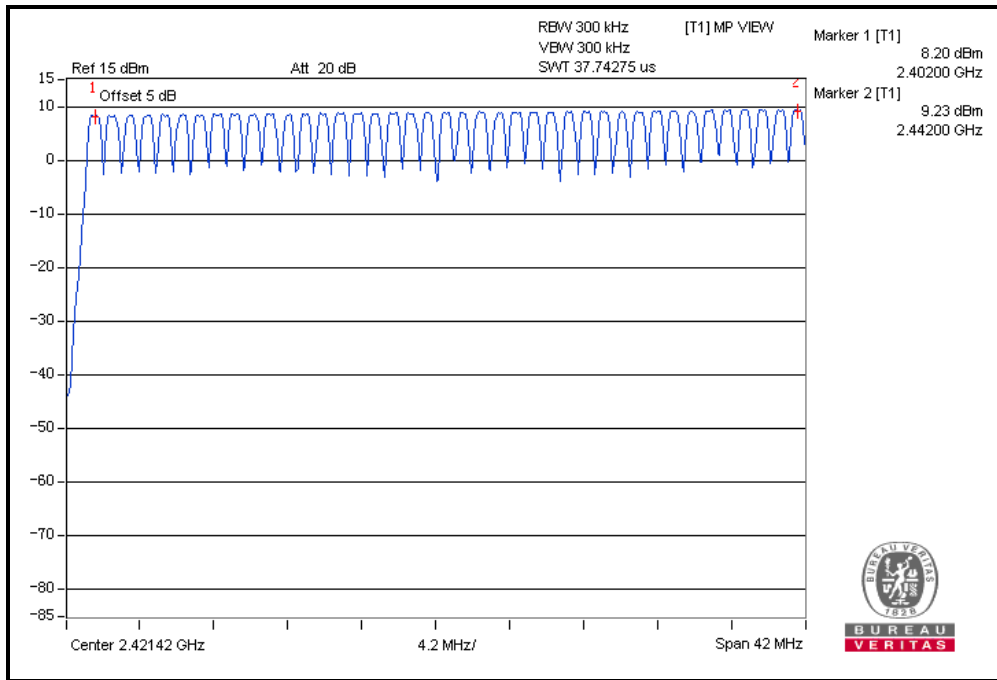
There are 79 hopping frequencies in the hopping mode. Please refer to next two pages for the test result. On the plots, it shows that the hopping frequencies are equally spaced.



BUREAU VERITAS

Test Report No.: RF150522N017-1

GFSK



Bureau Veritas Shenzhen Co., Ltd.  
Dongguan Branch

No. 34, Chenwulu Section, Guantai Rd., Houjie  
Town, Dongguan City,  
Guangdong 523942, China

Tel: +86 769 8593 5656  
Fax: +86 769 8593 1080  
Email: [customerservice.dg@cn.bureauveritas.com](mailto:customerservice.dg@cn.bureauveritas.com)

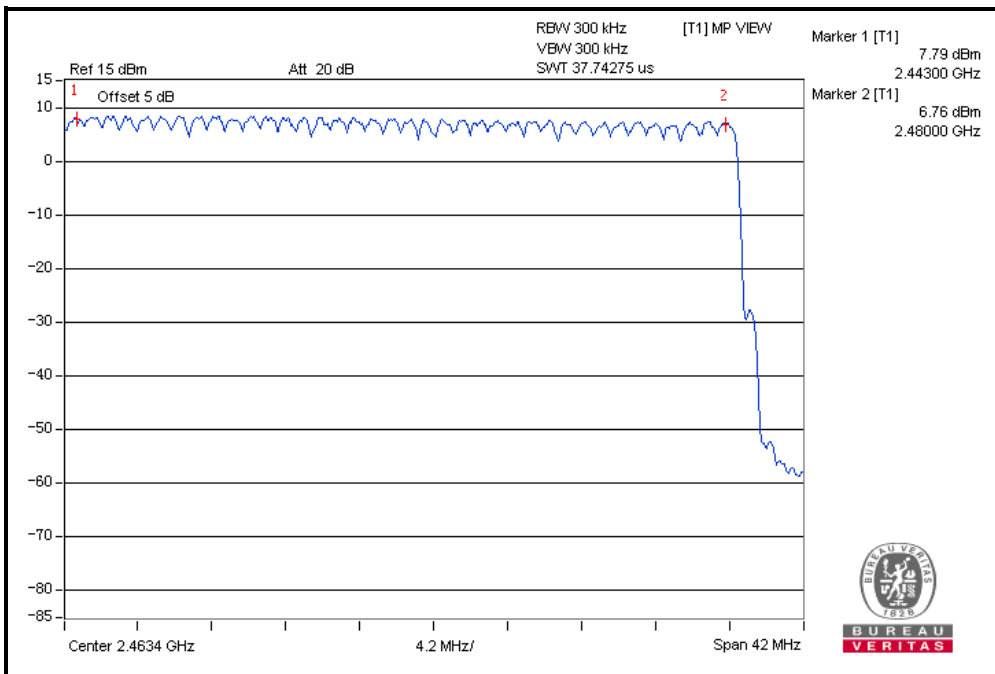
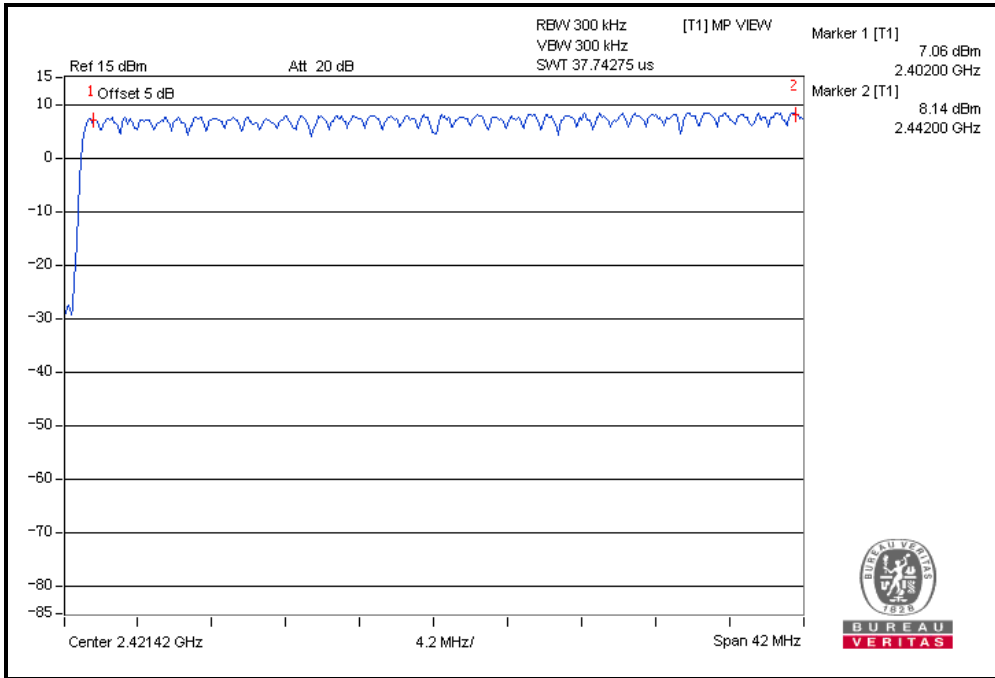




BUREAU VERITAS

Test Report No.: RF150522N017-1

8DPSK



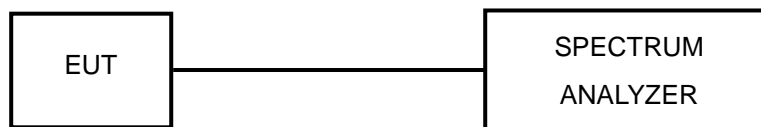


## 4.4 DWELL TIME ON EACH CHANNEL

### 4.4.1 LIMIT OF DWELL TIME USED

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 4.3.3 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.

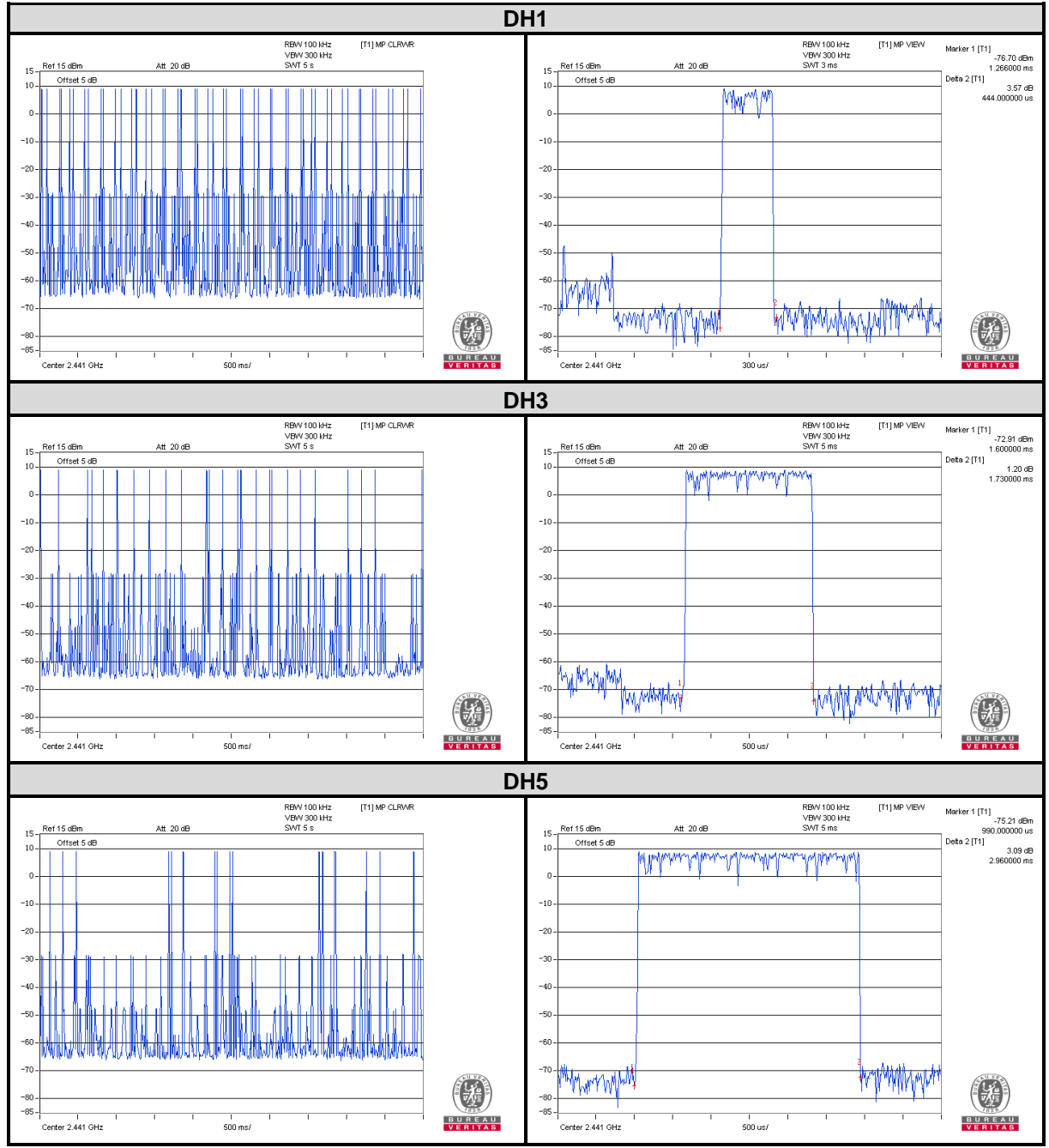
#### 4.4.6 TEST RESULTS

##### GFSK

Mode	Number of Hopping Channel	Number of transmission in a period(channel number*0.4 sec)				Length of transmission time (msec)	Result (msec)	Limit (msec)	PASS / FAIL
		period (sec)	sweep time (sec)	times in a sweep	times in a period				
DH1	79	31.6	5	51	322.32	0.444	143.11	400	PASS
DH3	79	31.6	5	24	151.68	1.73	262.41	400	PASS
DH5	79	31.6	5	16	101.12	2.96	299.32	400	PASS

**NOTE:** Test plots of the transmitting time slot are shown on next 3 pages.

**GFSK**





**8DPSK**

Mode	Number of Hopping Channel	Number of transmission in a period(channel number*0.4 sec)				Length of transmission time (msec)	Result (msec)	Limit (msec)	PASS / FAIL
		period (sec)	sweep time (sec)	times in a sweep	times in a period				
DH1	79	31.6	5	50	316	0.462	145.99	400	PASS
DH3	79	31.6	5	26	164.32	1.72	282.63	400	PASS
DH5	79	31.6	5	14	88.48	2.99	264.56	400	PASS

**NOTE:** Test plots of the transmitting time slot are shown on next 3 pages.



BUREAU VERITAS

Test Report No.: RF150522N017-1

### 8DPSK



Bureau Veritas Shenzhen Co., Ltd.  
Dongguan Branch

No. 34, Chenwulu Section, Guantai Rd., Houjie  
Town, Dongguan City,  
Guangdong 523942, China

Tel: +86 769 8593 5656  
Fax: +86 769 8593 1080  
Email: [customerservice.dg@cn.bureauveritas.com](mailto:customerservice.dg@cn.bureauveritas.com)

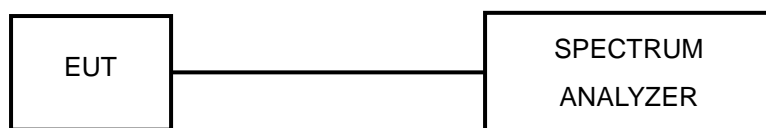


## 4.5 CHANNEL BANDWIDTH

### 4.5.1 LIMITS OF CHANNEL BANDWIDTH

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 4.3.3 to get information of above instrument.

### 4.5.4 TEST PROCEDURE

- a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b. 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.
- c. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
- d. 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 to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

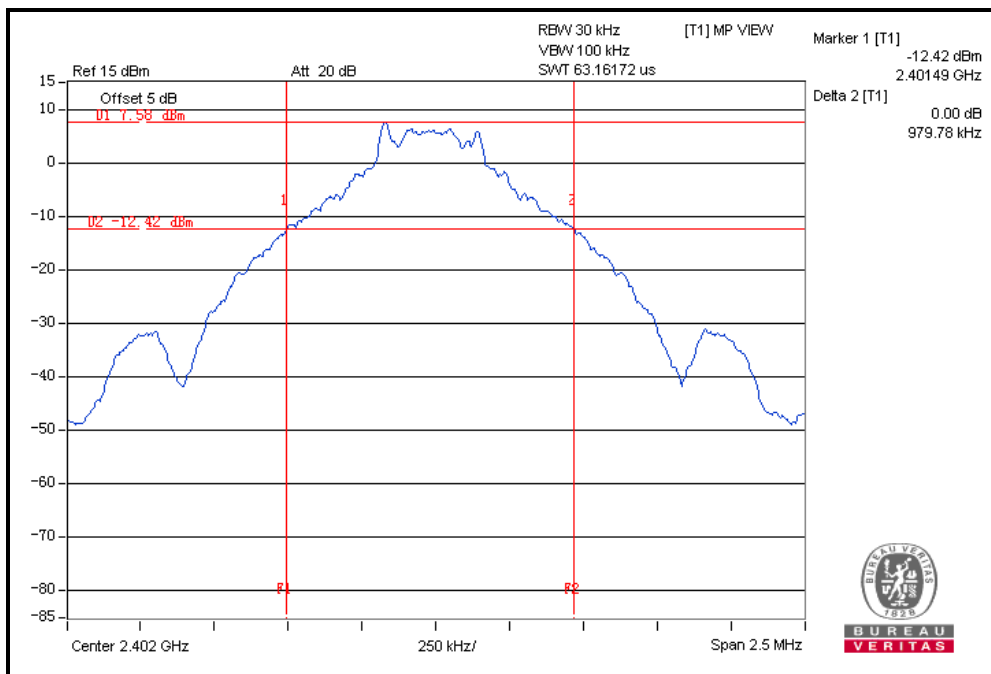


### 4.5.7 TEST RESULTS

#### GFSK

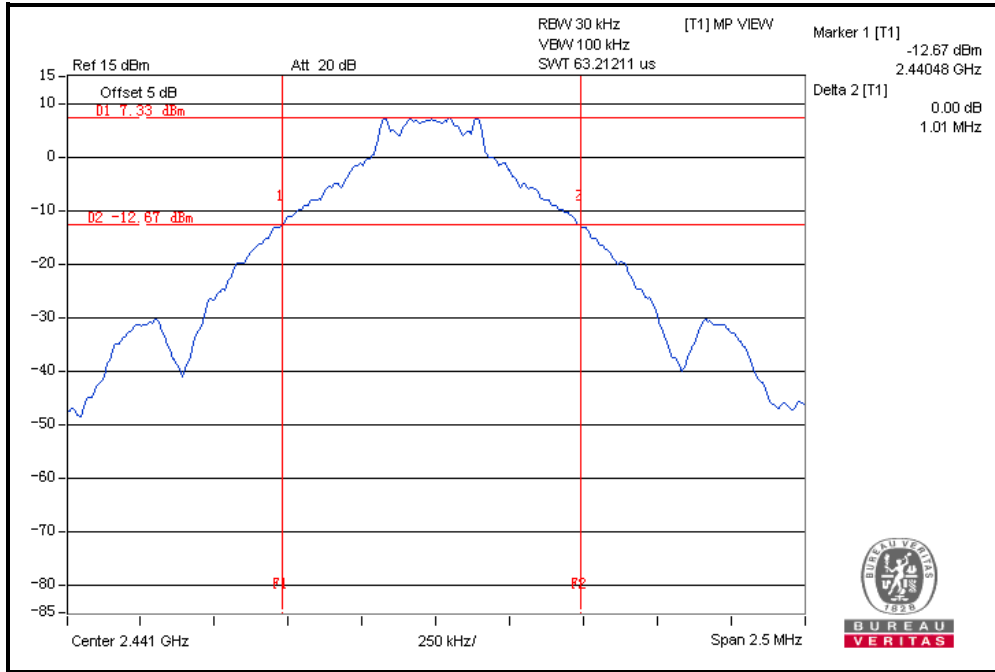
CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	0.98
39	2441	1.01
78	2480	1.02

#### CH 0

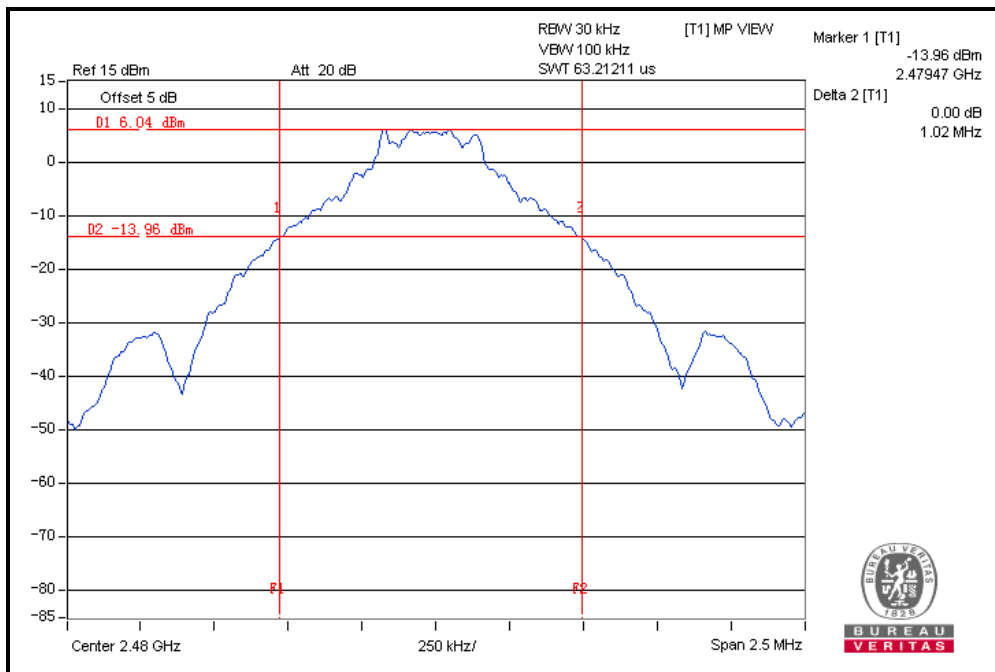




CH 39



CH 78





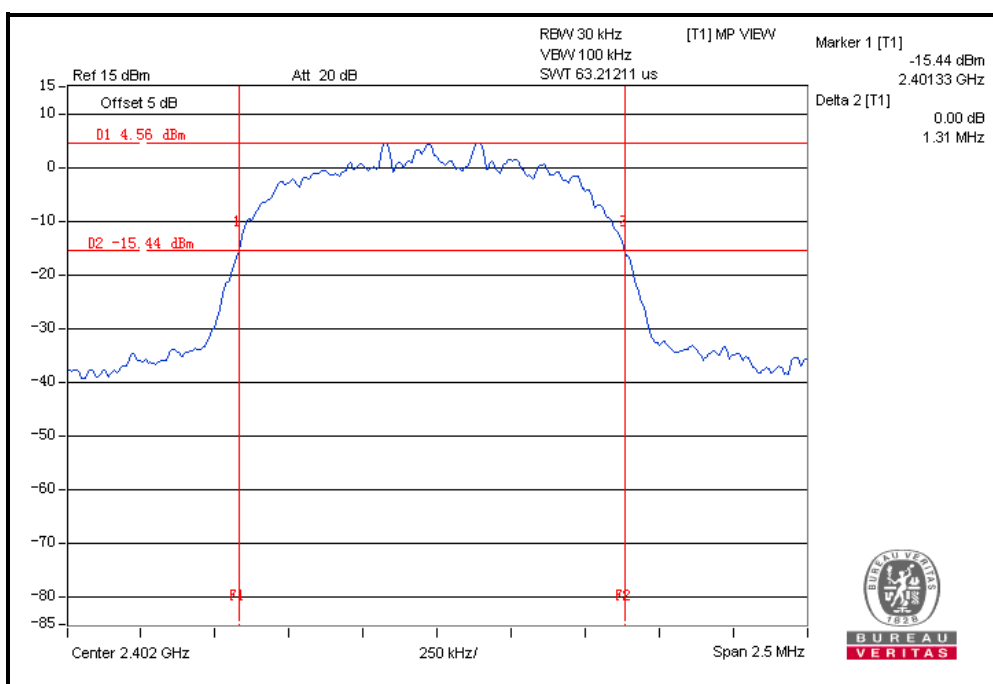
BUREAU VERITAS

Test Report No.: RF150522N017-1

### 8DPSK

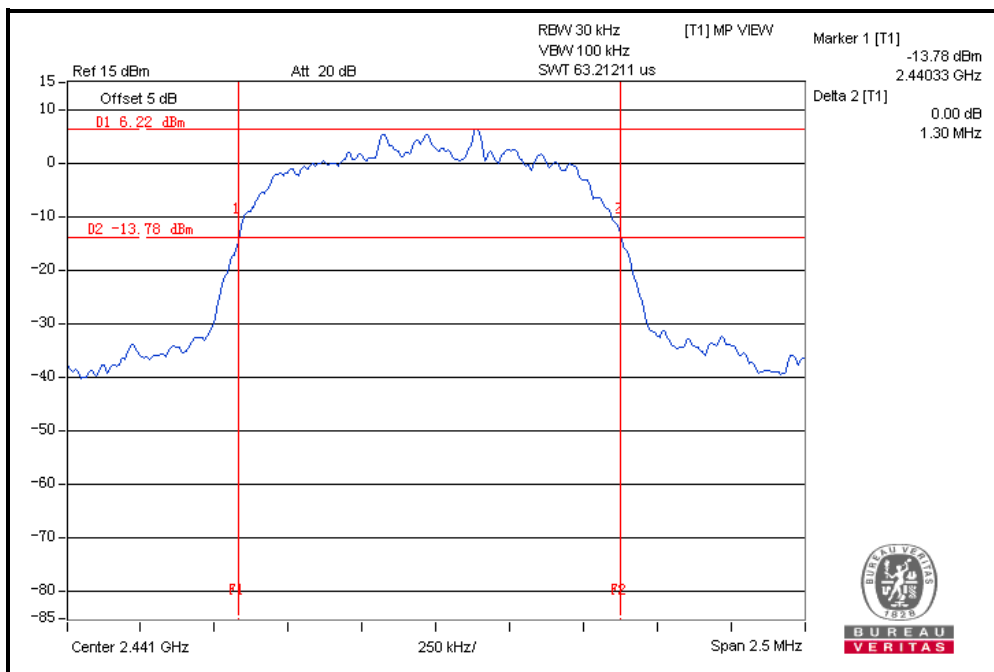
CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	1.31
39	2441	1.30
78	2480	1.29

### CH 0

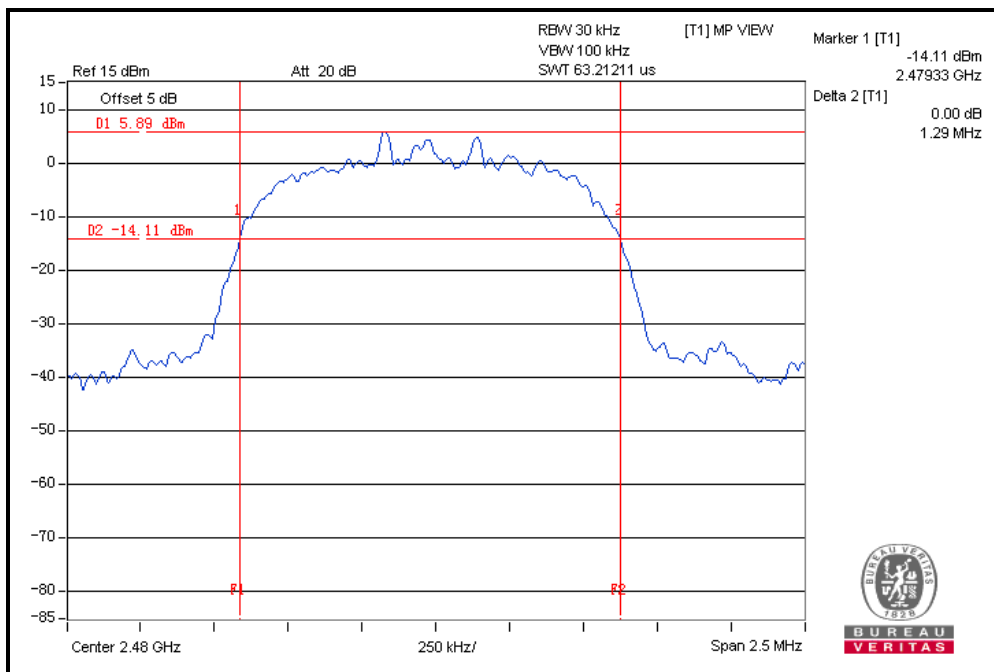


BUREAU VERITAS

CH 39



CH 78

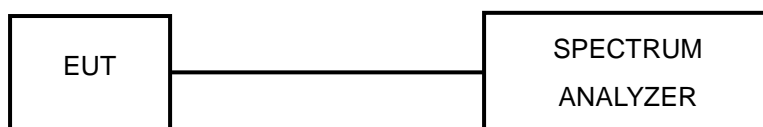


## 4.6 HOPPING CHANNEL SEPARATION

### 4.6.1 LIMIT OF HOPPING CHANNEL SEPARATION

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 4.3.3 to get information of above instrument.

### 4.6.4 TEST PROCEDURES

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

### 4.6.5 DEVIATION FROM TEST STANDARD

No deviation.



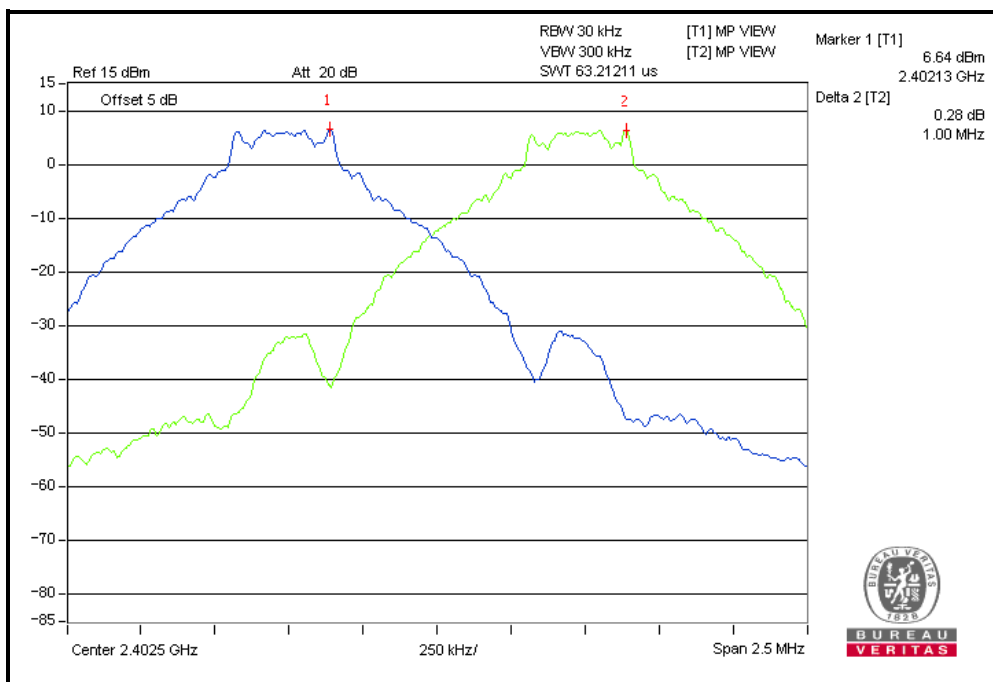
### 4.6.6 TEST RESULTS

#### GFSK

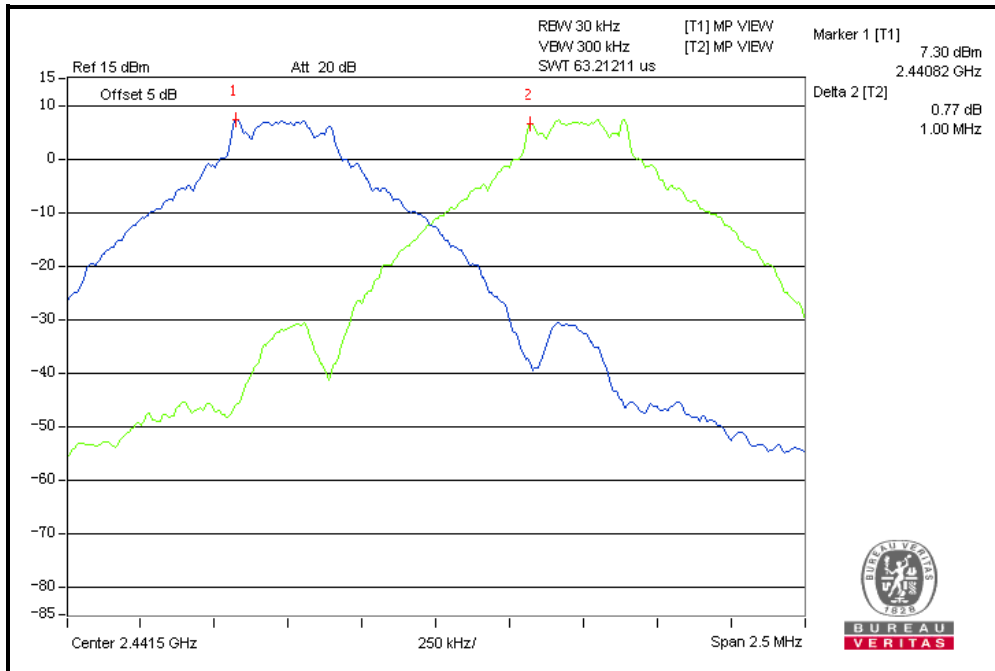
CHANNEL	FREQUENCY (MHz)	ADJACENT CHANNEL SEPARATION (MHz)	20dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	1.00	0.98	0.657	PASS
39	2441	1.00	1.01	0.678	PASS
78	2480	1.00	1.02	0.683	PASS

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

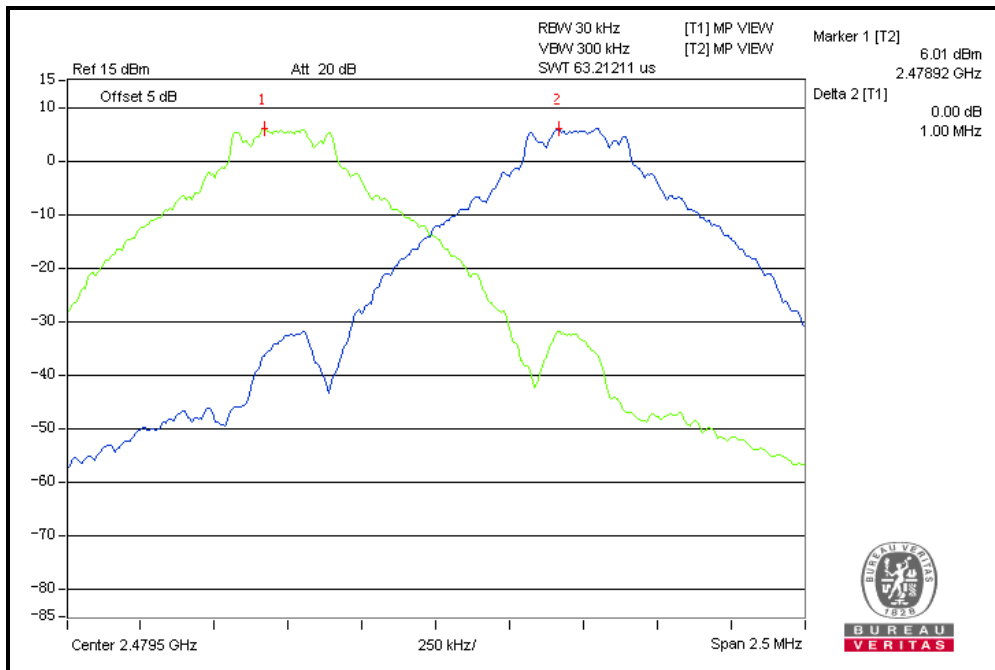
#### CH 0



CH 39



CH 78



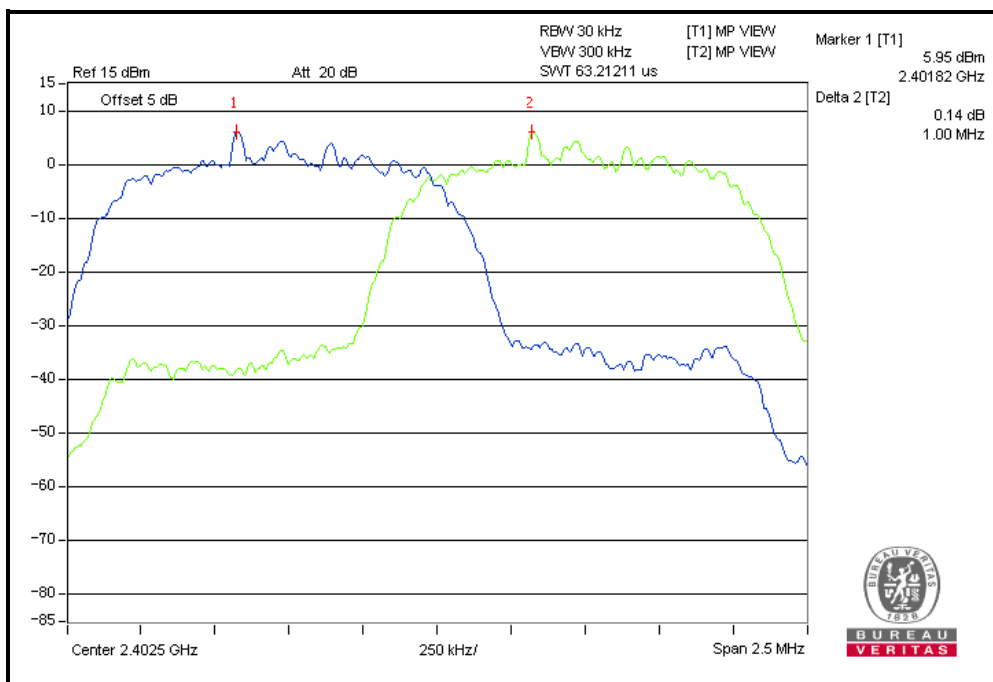


8DPSK

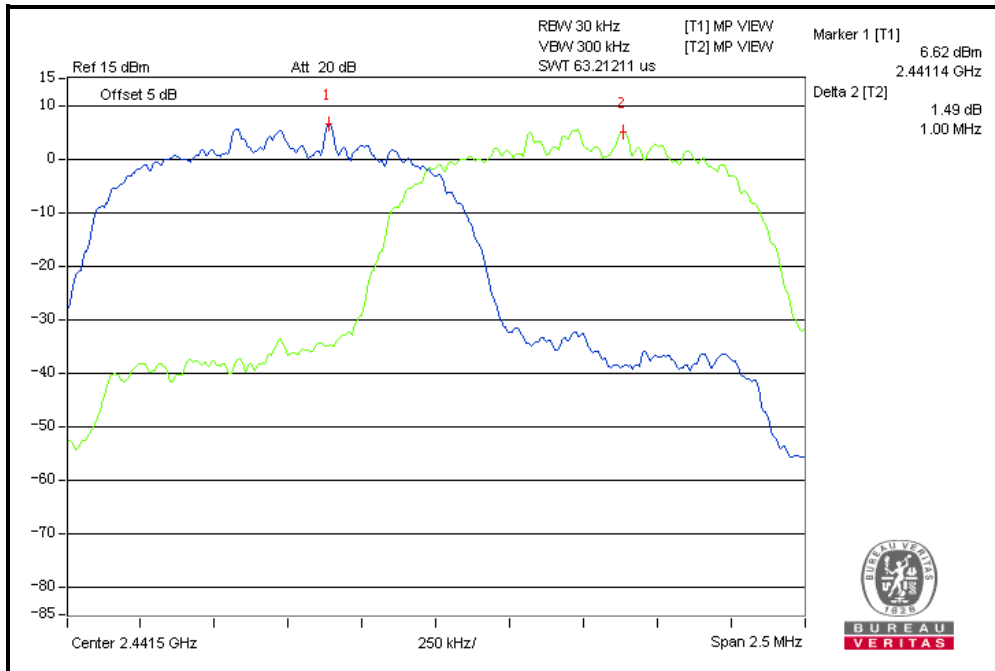
CHANNEL	FREQUENCY (MHz)	ADJACENT CHANNEL SEPARATION (MHz)	20dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	1.00	1.31	0.878	PASS
39	2441	1.00	1.30	0.871	PASS
78	2480	1.00	1.29	0.864	PASS

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

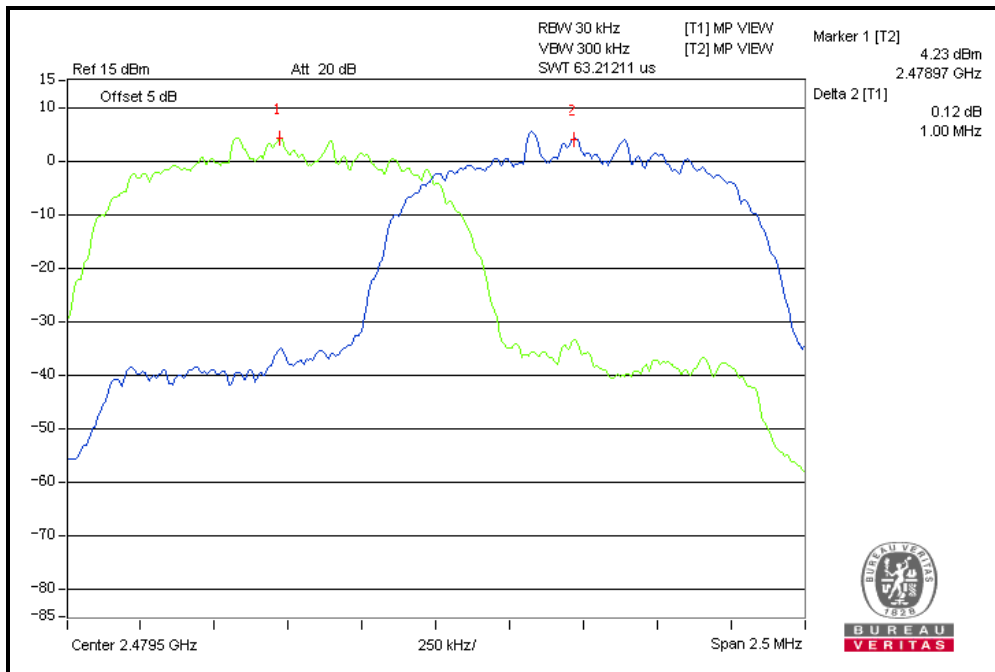
CH 0



CH 39



CH 78





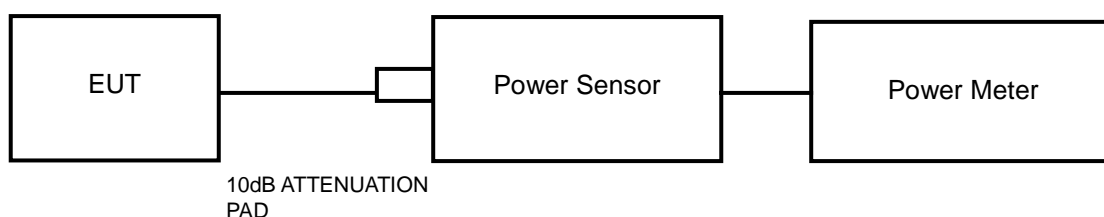


## 4.7 MAXIMUM OUTPUT POWER

### 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 4.3.3 to get information of above instrument.

### 4.7.4 TEST PROCEDURES

A power sensor was used on the output port of the EUT. A power meter was used to read the response of the 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 to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.



#### 4.7.7 TEST RESULTS

##### GFSK

CHANNEL	CHANNEL FREQUENCY (MHz)	POWER OUTPUT (dBm)	POWER OUTPUT (mW)	POWER LIMIT (mW)	PASS/FAIL
0	2402	11.26	13.366	125	PASS
39	2441	11.64	14.590	125	PASS
78	2480	10.37	10.890	125	PASS

##### 8DPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	POWER OUTPUT (dBm)	POWER OUTPUT (mW)	POWER LIMIT (mW)	PASS/FAIL
0	2402	12.07	16.110	125	PASS
39	2441	<b>12.53</b>	<b>17.910</b>	125	PASS
78	2480	11.30	13.490	125	PASS



## 4.8 OUT OF BAND MEASUREMENT

### 4.8.1 LIMITS OF OUT OF BAND MEASUREMENT

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

### 4.8.2 TEST INSTRUMENTS

Refer to section 4.3.3 to get information of above instrument.

### 4.8.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low loss cable. of Spectrum Analyzer was set RBW to 100 kHz and VBW to 100 kHz with suitable frequency span including 100 MHz bandwidth from band edge. Detector = PEAK and Trace mode = Max Hold. 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 to enable the EUT under transmission condition continuously 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 to the requirement.

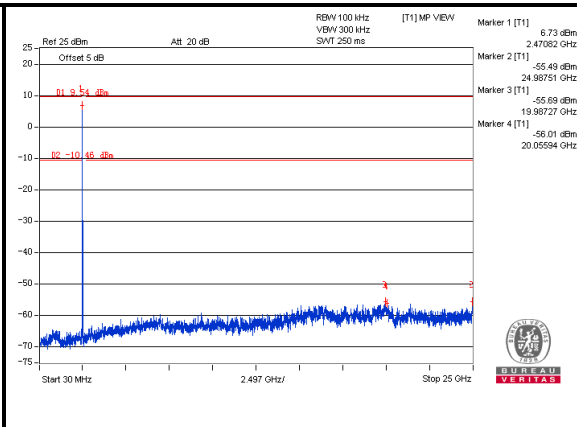
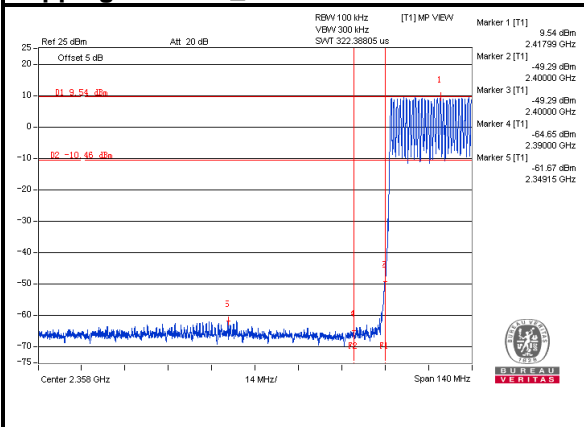


BUREAU VERITAS

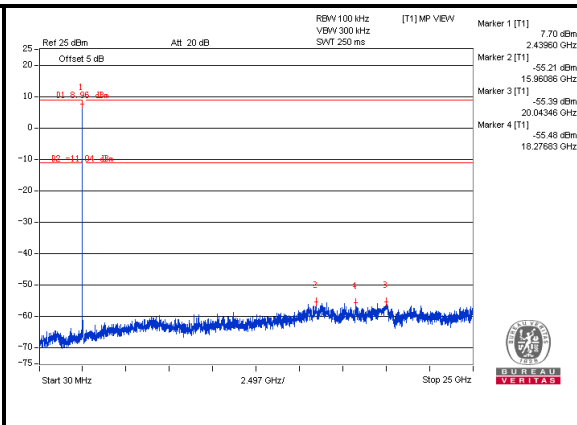
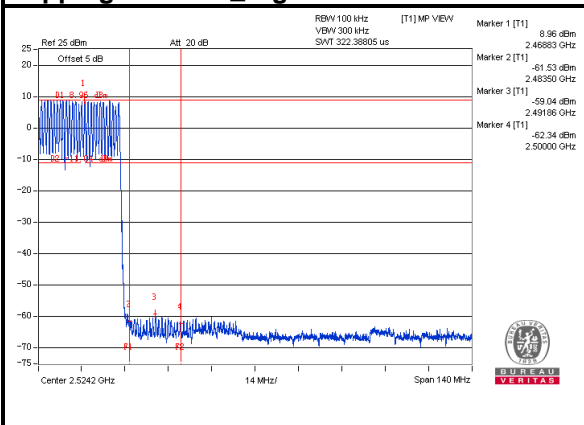
Test Report No.: RF150522N017-1

GFSK

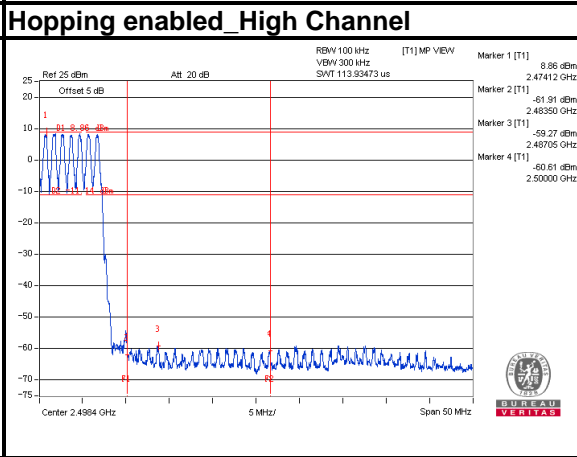
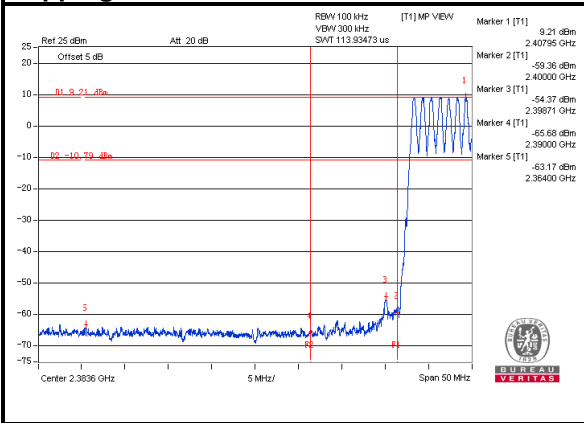
### Hopping disabled\_Low Channel



### Hopping disabled\_High Channel



### Hopping enabled\_Low Channel

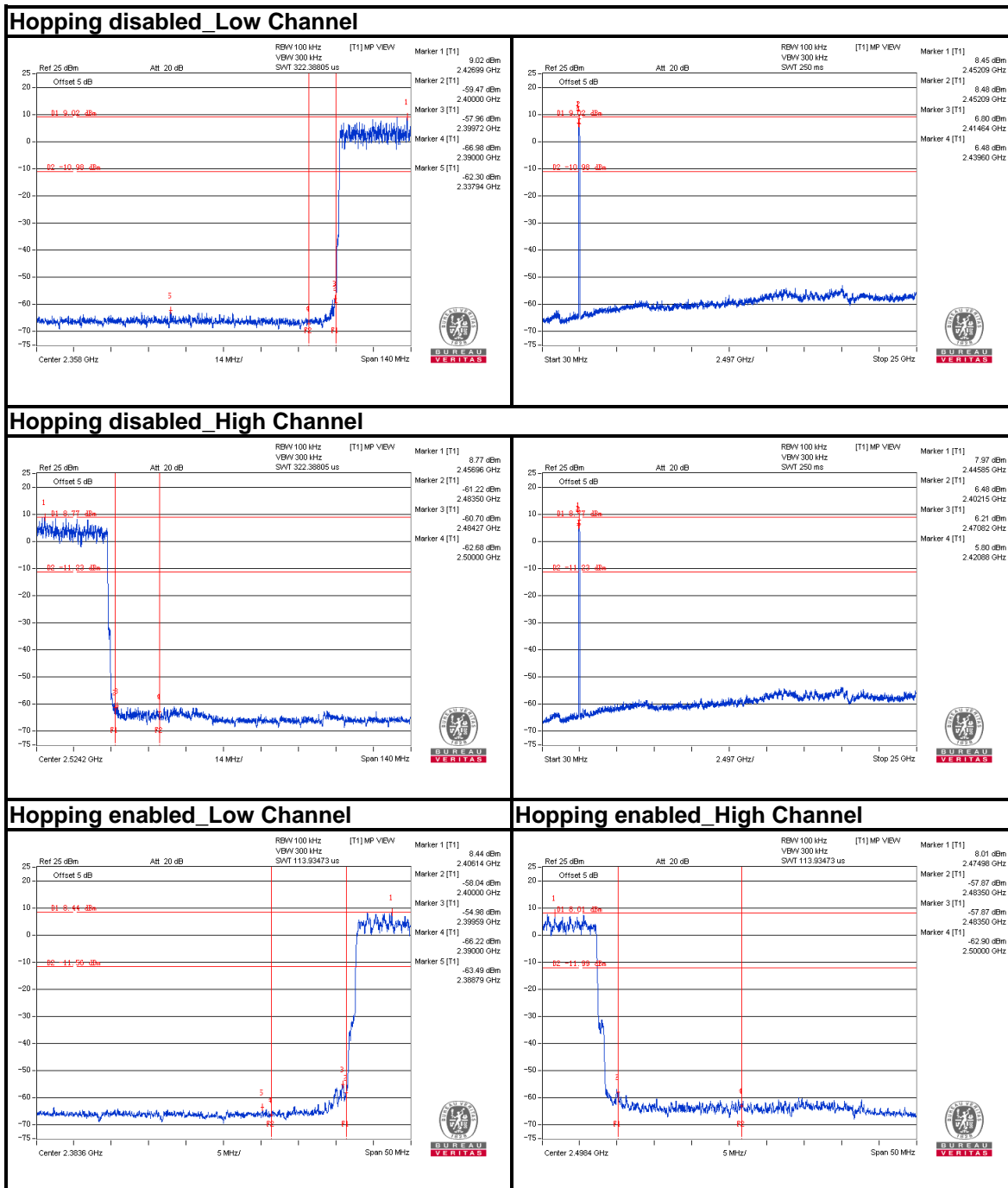


Bureau Veritas Shenzhen Co., Ltd.  
Dongguan Branch

No. 34, Chenwulu Section, Guantai Rd., Houjie  
Town, Dongguan City,  
Guangdong 523942, China

Tel: +86 769 8593 5656  
Fax: +86 769 8593 1080  
Email: [customerservice.dg@cn.bureauveritas.com](mailto:customerservice.dg@cn.bureauveritas.com)

8DPSK





**BUREAU  
VERITAS**

Test Report No.: RF150522N017-1

## 5 PHOTOGRAPHS OF THE TEST CONFIGURATION

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



**BUREAU  
VERITAS**

Test Report No.: RF150522N017-1

## **6 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB**

No any modifications are made to the EUT by the lab during the test.

**---END---**