Test Lab
Cert 2951.01

TEST REPORT

Applicant	VOXLAND
Address	CS90234 - 13311 Marseille Cedex 14

Manufacturer or Supplier	Guangzhou Panyu Fantasia Creation Toys Co., Ltd
Address	Block 3, Biaozhun Industrial Zone, Tai Shi Industrial Park, Dongyong, Panyu, Guangzhou, Guangdong ,China.
Product	Bluetooth Mini Robot
Brand Name	BEEWI
Model	BBZ150
Additional Model & Model Difference	N/A
Date of tests	Nov. 17, 2012 ~ Dec. 06, 2012

the tests have been carried out according to the requirements of the following standard:

☒ **FCC Part 15, Subpart C (Section 15.249)**

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Tested by Glyn He Project Engineer / EMC Department	Approved by Sam Tung Manager / EMC Department
	 Date: Dec. 07, 2012

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

TABLE OF CONTENTS

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF121116N025	Original release	Dec. 07, 2012

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.249)			
STANDARD SECTION	**TEST TYPE AND LIMIT**	**RESULT**	**REMARK**
§15.203	Antenna Requirement	PASS	Compliant
§15.207 (a)	Conducted Emission	N/A	EUT is powered by battery
§15.205	Restricted Band of Operation	PASS	Compliant
§15.209 §15.249(a)	Radiated Emission	PASS	Compliant
§15.215(c)	20dB Bandwidth Test	PASS	Compliant

2 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	2.44dB
Radiated emissions	30MHz ~1GHz	3.64dB
	1GHz ~ 18GHz	2.26dB
	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

PRODUCT	Bluetooth Mini Robot
MODEL NO.	BBZ150
FCC ID	ZKI-BBZ150
NOMINAL VOLTAGE	DC 3V by battery
MODULATION TECHNOLOGY	FHSS
OPERATING FREQUENCY	2402-2480MHz
ANTENNA TYPE	Integral PCB Antenna with gain -2 dBi
I/O PORTS	N/A
CABLE SUPPLIED	N/A

NOTE:

1 .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.

2. 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

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

TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE	PACKET TYPE
Low, Middle, High	FHSS	GFSK	1M	DH1/3/5
Low, Middle, High	FHSS	π/4 DPSK	2M	DH1/3/5
Low, Middle, High	FHSS	8DPSK	3M	DH1/3/5

CHANNEL NUMBER	TESTED CHANNEL	TESTED FREQUENCY
0	Low	2402 MHz
39	Middle	2441 MHz
78	High	2480 MHz

After estimating all the combination of every test mode, the result shown as below is the worst case

TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE	PACKET TYPE
Low, Middle, High	FHSS	GFSK	1M	DH5

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 (15.249)

ANSI C63.4-2003

ANSI C63.10-2009

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

NOTE: 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 without any other necessary accessories or support units.

4 TEST TYPES AND RESULTS

4.1 RADIATED EMISSION MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

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

According to §15.249(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field strength of fundamental (milli-volts/meter)	Field strength of harmonics (micro-volts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

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.

4.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Spectrum Analyzer	Agilent	E4446A	MY46180622	May 02,12	May 01,13
EMI Test Receiver	Rohde&Schwarz	ESVD	847398/003	May 15,12	May 14,13
Bilog Antenna (25MHz-2GHz)	Teseq	CBL 6111D	27089	Jul. 16,12	Jul. 15,13
Horn Antenna (1GHz -18GHz)	EMCO	3117	00062558	Oct.18,12	Oct.17,13
Pre-Amplifier (20MHz-3GHz)	EMCI	EMC 330	980095	Nov. 02,12	Nov.01,13
Pre-Amplifier (100MHz-26.5GHz)	Agilent	8449B	3008A00409	May 31,12	May 30,13
10m Semi-anechoic Chamber	CHANGLING	21.4m*12.1m*8.8m	NSEMC006	Mar. 24,12	Mar. 23,13
Digital Multimeter	FLUKE	15B	A1220010DG	Jan. 14,12	Jan. 13,13
Bluetooth tester	Rohde&Schwarz	CBT	100325	N/A	N/A
Test Software	ADT	ADT_Radiated_V7.6.15	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 and NIM/CHINA.

2. The test was performed in 10m Chamber

4.1.3 TEST PROCEDURES

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meters 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. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

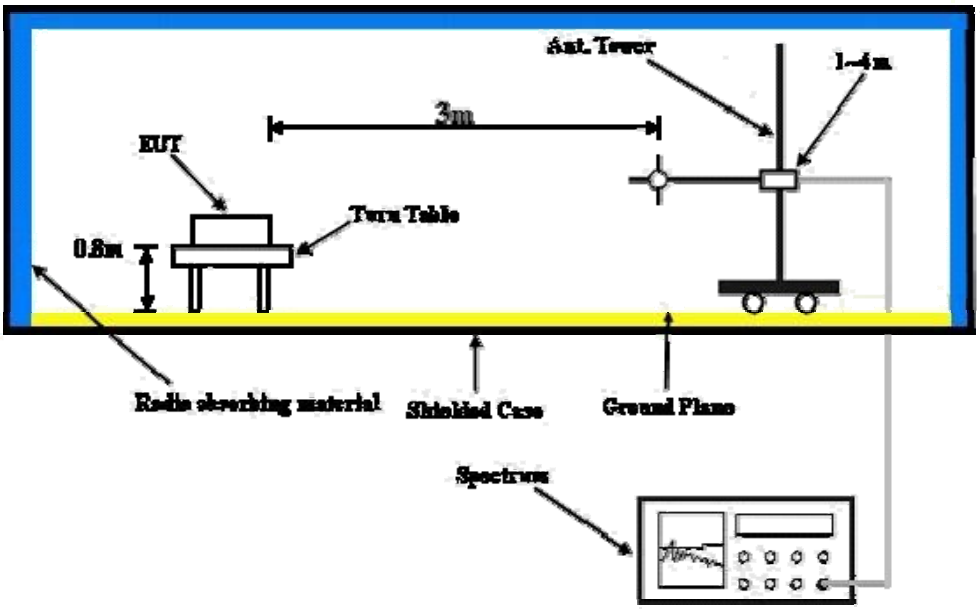
NOTE:

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 1MHz 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.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 TEST SETUP



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

4.1.6 EUT OPERATING CONDITIONS

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

4.1.7 TEST RESULTS

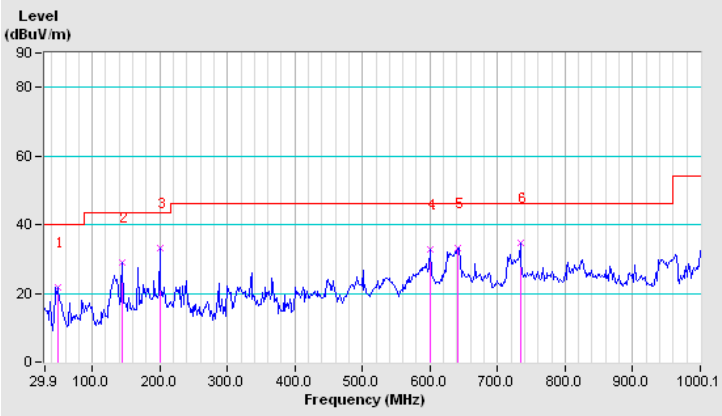
BELOW 1GHz WORST-CASE DATA: GFSK DH5

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	49.30	21.6 QP	40.0	-18.4	1.56 H	110	11.09	10.47
2	144.71	28.9 QP	43.5	-14.7	1.27 H	254	16.27	12.58
3	199.69	33.1 QP	43.5	-10.4	1.06 H	280	22.66	10.40
4	600.70	32.9 QP	46.0	-13.1	1.34 H	180	10.28	22.63
5	641.13	33.1 QP	46.0	-12.9	1.72 H	199	9.87	23.20
6	733.29	34.6 QP	46.0	-11.4	1.45 H	231	9.71	24.85

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.

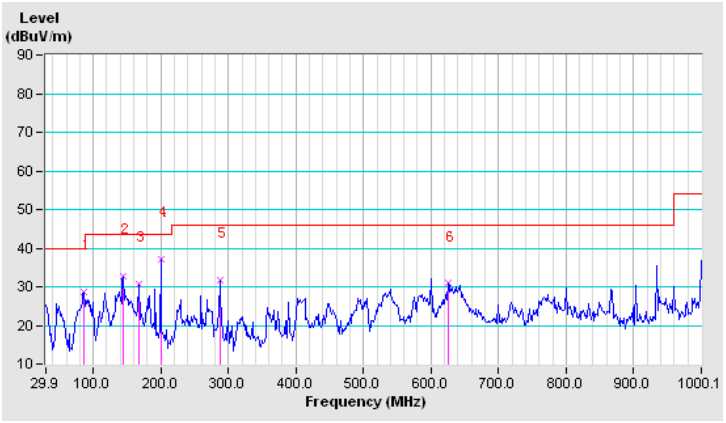


CHANNEL	TX Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

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	86.50	28.6 QP	40.0	-11.4	1.02 V	173	19.37	9.24
2	144.71	32.9 QP	43.5	-10.7	1.00 V	124	20.27	12.58
3	167.34	30.7 QP	43.5	-12.8	1.72 V	267	19.50	11.16
4	**199.69**	**37.1 QP**	**43.5**	**-6.4**	**1.00 V**	**85**	**26.69**	**10.40**
5	287.00	31.8 QP	46.0	-14.3	1.16 V	197	16.93	14.82
6	624.96	30.9 QP	46.0	-15.1	1.33 V	218	7.82	23.06

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

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	1 ~ 25GHz
TEST VOLTAGE	DC 3V by battery	DETECTOR FUNCTION	Peak (PK) 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	2400.00	70.6 PK	74.0	-3.4	1.03 H	162	34.10	36.50
2	2400.00	40.5 AV	54.0	-13.5	1.03 H	162	4.00	36.50
3	*2402.00	103.3 PK	114.0	-10.7	1.03 H	162	66.78	36.52
4	*2402.00	73.2 AV	94.0	-20.8	1.03 H	162	36.68	36.52
5	4804.00	58.4 PK	74.0	-15.6	1.23 H	324	9.15	49.25
6	4804.00	28.3 AV	54.0	-25.7	1.23 H	324	-20.95	49.25
7	7206.00	52.7 PK	74.0	-21.3	1.03 H	146	6.18	46.52
8	7206.00	22.6 AV	54.0	-31.4	1.03 H	146	-23.92	46.52
9	9608.00	54.5 PK	74.0	-19.5	1.00 H	218	9.60	44.90
10	9608.00	24.4 AV	54.0	-29.6	1.00 H	218	-20.50	44.90
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	**2400.00**	**70.8 PK**	**74.0**	**-3.2**	**1.08 V**	**55**	**34.30**	**36.50**
2	2400.00	40.7 AV	54.0	-13.3	1.08 V	55	4.20	36.50
3	*2402.00	98.4 PK	114.0	-15.6	1.08 V	55	61.88	36.52
4	*2402.00	68.3 AV	94.0	-25.7	1.08 V	55	31.78	36.52
5	4804.00	58.6 PK	74.0	-15.4	1.13 V	176	9.35	49.25
6	4804.00	28.5 AV	54.0	-25.5	1.13 V	176	-20.75	49.25
7	7206.00	54.9 PK	74.0	-19.1	1.00 V	234	8.38	46.52
8	7206.00	24.8 AV	54.0	-29.2	1.00 V	234	-21.72	46.52
9	9608.00	53.6 PK	74.0	-20.4	1.10 V	159	8.70	44.90
10	9608.00	23.5 AV	54.0	-30.5	1.10 V	159	-21.40	44.90

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 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: 20log(3.125 / 100)= -30.1dB
7. Average value = peak reading + 20log(duty cycle).

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	FREQUENCY RANGE	1 ~ 25GHz
TEST VOLTAGE	DC 3V by battery	DETECTOR FUNCTION	Peak (PK) 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	102.5 PK	114.0	-11.5	1.00 H	160	65.63	36.87
2	*2441.00	72.4 AV	94.0	-21.6	1.00 H	160	35.53	36.87
3	4882.00	57.2 PK	74.0	-16.8	1.00 H	288	7.97	49.23
4	4882.00	27.1 AV	54.0	-26.9	1.00 H	288	-22.13	49.23
5	7323.00	52.9 PK	74.0	-21.1	1.06 H	210	6.29	46.61
6	7323.00	22.8 AV	54.0	-31.2	1.06 H	210	-23.81	46.61
7	9764.00	52.6 PK	74.0	-21.4	1.00 H	137	7.79	44.81
8	9764.00	22.5 AV	54.0	-31.5	1.00 H	137	-22.31	44.81
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	97.5 PK	114.0	-16.5	1.06 V	58	60.63	36.87
2	*2441.00	67.4 AV	94.0	-26.6	1.06 V	58	30.53	36.87
3	4882.00	57.3 PK	74.0	-16.7	1.00 V	327	8.07	49.23
4	4882.00	27.2 AV	54.0	-26.8	1.00 V	327	-22.03	49.23
5	7323.00	55.2 PK	74.0	-18.8	1.00 V	39	8.59	46.61
6	7323.00	25.1 AV	54.0	-28.9	1.00 V	39	-21.51	46.61
7	9764.00	52.4 PK	74.0	-21.6	1.08 V	228	7.59	44.81
8	9764.00	22.3 AV	54.0	-31.7	1.08 V	228	-22.51	44.81

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 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: 20log(3.125 / 100)= -30.1 dB.
7. Average value = peak reading + 20log(duty cycle).

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	FREQUENCY RANGE	1 ~ 25GHz
TEST VOLTAGE	DC 3V by battery	DETECTOR FUNCTION	Peak (PK) 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	100.7 PK	114.0	-13.3	1.00 H	160	63.49	37.21
2	*2480.00	70.6 AV	94.0	-23.4	1.00 H	160	33.39	37.21
3	2483.50	55.4 PK	74.0	-18.6	1.00 H	160	18.16	37.24
4	2483.50	25.3 AV	54.0	-28.7	1.00 H	160	-11.94	37.24
5	4960.00	57.7 PK	74.0	-16.3	1.09 H	135	8.49	49.21
6	4960.00	27.6 AV	54.0	-26.4	1.09 H	135	-21.61	49.21
7	7440.00	53.3 PK	74.0	-20.7	1.00 H	336	6.60	46.70
8	7440.00	23.2 AV	54.0	-30.8	1.00 H	336	-23.50	46.70
9	9920.00	53.1 PK	74.0	-20.9	1.10 H	196	8.39	44.71
10	9920.00	23.0 AV	54.0	-31.0	1.10 H	196	-21.71	44.71
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	114.0	-16.8	1.04 V	60	59.99	37.21
2	*2480.00	67.1 AV	94.0	-26.9	1.04 V	60	29.89	37.21
3	2483.50	49.2 PK	74.0	-24.8	1.04 V	60	11.96	37.24
4	2483.50	19.1 AV	54.0	-34.9	1.04 V	60	-18.14	37.24
5	4960.00	57.9 PK	74.0	-16.1	1.04 V	119	8.69	49.21
6	4960.00	27.8 AV	54.0	-26.2	1.04 V	119	-21.41	49.21
7	7440.00	56.8 PK	74.0	-17.2	1.13 V	248	10.10	46.70
8	7440.00	26.7 AV	54.0	-27.3	1.13 V	248	-20.00	46.70
9	9920.00	55.8 PK	74.0	-18.2	1.00 V	312	11.09	44.71
10	9920.00	25.7 AV	54.0	-28.3	1.00 V	312	-19.01	44.71

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 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: 20log(3.125 / 100)= -30.1 dB.
7. Average value = peak reading + 20log(duty cycle)

BT_8DPSK DH5

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	1 ~ 25GHz
TEST VOLTAGE	DC 3V by battery	DETECTOR FUNCTION	Peak (PK) 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	2400.00	69.4 PK	74.0	-4.6	1.00 H	161	32.90	36.50
2	2400.00	39.3 AV	54.0	-14.7	1.00 H	161	2.80	36.50
3	*2402.00	103.1 PK	114.0	-10.9	1.00 H	161	66.58	36.52
4	*2402.00	73.0 AV	94.0	-21.0	1.00 H	161	36.48	36.52
5	4804.00	56.9 PK	74.0	-17.1	1.00 H	125	7.65	49.25
6	4804.00	26.8 AV	54.0	-27.2	1.00 H	125	-22.45	49.25
7	7206.00	52.9 PK	74.0	-21.1	1.08 H	234	6.38	46.52
8	7206.00	22.8 AV	54.0	-31.2	1.08 H	234	-23.72	46.52
9	9608.00	53.5 PK	74.0	-20.5	1.00 H	354	8.60	44.90
10	9608.00	23.4 AV	54.0	-30.6	1.00 H	354	-21.50	44.90
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	2400.00	63.6 PK	74.0	-10.4	1.09 V	56	27.10	36.50
2	2400.00	33.5 AV	54.0	-20.5	1.09 V	56	-3.00	36.50
3	*2402.00	98.1 PK	114.0	-15.9	1.09 V	56	61.58	36.52
4	*2402.00	68.0 AV	94.0	-26.0	1.09 V	56	31.48	36.52
5	4804.00	56.6 PK	74.0	-17.4	1.00 V	315	7.35	49.25
6	4804.00	26.5 AV	54.0	-27.5	1.00 V	315	-22.75	49.25
7	7206.00	53.2 PK	74.0	-20.8	1.13 V	89	6.68	46.52
8	7206.00	23.1 AV	54.0	-30.9	1.13 V	89	-23.42	46.52
9	9608.00	52.9 PK	74.0	-21.1	1.00 V	167	8.00	44.90
10	9608.00	22.8 AV	54.0	-31.2	1.00 V	167	-22.10	44.90

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 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: 20log(3.125 / 100)= -30.1 dB.
7. Average value = peak reading + 20log(duty cycle).

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	FREQUENCY RANGE	1 ~ 25GHz
TEST VOLTAGE	DC 3V by battery	DETECTOR FUNCTION	Peak (PK) 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	102.4 PK	114.0	-11.6	1.00 H	160	65.53	36.87
2	*2441.00	72.3 AV	94.0	-21.7	1.00 H	160	35.43	36.87
3	4882.00	56.6 PK	74.0	-17.4	1.00 H	330	7.37	49.23
4	4882.00	26.5 AV	54.0	-27.5	1.00 H	330	-22.73	49.23
5	7323.00	53.8 PK	74.0	-20.2	1.10 H	167	7.19	46.61
6	7323.00	23.7 AV	54.0	-30.3	1.10 H	167	-22.91	46.61
7	9764.00	52.7 PK	74.0	-21.3	1.00 H	315	7.89	44.81
8	9764.00	22.6 AV	54.0	-31.4	1.00 H	315	-22.21	44.81
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	97.2 PK	114.0	-16.8	1.04 V	59	60.33	36.87
2	*2441.00	67.1 AV	94.0	-26.9	1.04 V	59	30.23	36.87
3	4882.00	55.7 PK	74.0	-18.3	1.02 V	149	6.47	49.23
4	4882.00	25.6 AV	54.0	-28.4	1.02 V	149	-23.63	49.23
5	7323.00	53.5 PK	74.0	-20.5	1.00 V	216	6.89	46.61
6	7323.00	23.4 AV	54.0	-30.6	1.00 V	216	-23.21	46.61
7	9764.00	53.6 PK	74.0	-20.4	1.05 V	228	8.79	44.81
8	9764.00	23.5 AV	54.0	-30.5	1.05 V	228	-21.31	44.81

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 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: 20log(3.125 / 100)= -30.1 dB.
7. Average value = peak reading + 20log(duty cycle).

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	FREQUENCY RANGE	1 ~ 25GHz
TEST VOLTAGE	DC 3V by battery	DETECTOR FUNCTION	Peak (PK) 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	100.8 PK	114.0	-13.2	1.00 H	161	63.59	37.21
2	*2480.00	70.7 AV	94.0	-23.3	1.00 H	161	33.49	37.21
3	2483.50	50.2 PK	74.0	-23.8	1.00 H	161	12.96	37.24
4	2483.50	20.1 AV	54.0	-33.9	1.00 H	161	-17.14	37.24
5	4960.00	55.9 PK	74.0	-18.1	1.04 H	162	6.69	49.21
6	4960.00	25.8 AV	54.0	-28.2	1.04 H	162	-23.41	49.21
7	7440.00	52.7 PK	74.0	-21.3	1.00 H	238	6.00	46.70
8	7440.00	22.6 AV	54.0	-31.4	1.00 H	238	-24.10	46.70
9	9920.00	53.2 PK	74.0	-20.8	1.00 H	310	8.49	44.71
10	9920.00	23.1 AV	54.0	-30.9	1.00 H	310	-21.61	44.71
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	97.8 PK	114.0	-16.2	1.00 V	59	60.59	37.21
2	*2480.00	67.7 AV	94.0	-26.3	1.00 V	59	30.49	37.21
3	2483.50	56.3 PK	74.0	-17.7	1.00 V	59	19.06	37.24
4	2483.50	26.2 AV	54.0	-27.8	1.00 V	59	-11.04	37.24
5	4960.00	57.2 PK	74.0	-16.8	1.00 V	324	7.99	49.21
6	4960.00	27.1 AV	54.0	-26.9	1.00 V	324	-22.11	49.21
7	7440.00	53.5 PK	74.0	-20.5	1.13 V	156	6.80	46.70
8	7440.00	23.4 AV	54.0	-30.6	1.13 V	156	-23.30	46.70
9	9920.00	53.7 PK	74.0	-20.3	1.00 V	164	8.99	44.71
10	9920.00	23.6 AV	54.0	-30.4	1.00 V	164	-21.11	44.71

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 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: 20log(3.125 / 100)= -30.1 dB.
7. Average value = peak reading + 20log(duty cycle).

4.2 20dB BANDWIDTH MEASUREMENT

4.2.1 LIMITS OF 20dB BANDWIDTH MEASUREMENT

According to FCC 15.215(c), must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

4.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Horn Antenna	EMCO	3117	00062558	Oct.18,12	Oct.17,13
Horn Antenna	EMCO	3117	00085519	Feb. 11,12	Feb. 10,13
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170242	Jan. 01,11	Jan. 01,13
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170147	Feb. 18,11	Feb. 18,13
Spectrum Analyzer	Agilent	E4446A	MY46180622	May 02,12	May 01,13
Pre-Amplifier (100MHz-26.5GHz)	Agilent	8449B	3008A00409	May 31,12	May 30,13
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Nov. 04,12	Nov. 03,13
Test Software	ADT	ADT_Radiated _V7.6.15	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 and NIM/CHINA

2. The test was performed in Dongguan Chamber 10m.

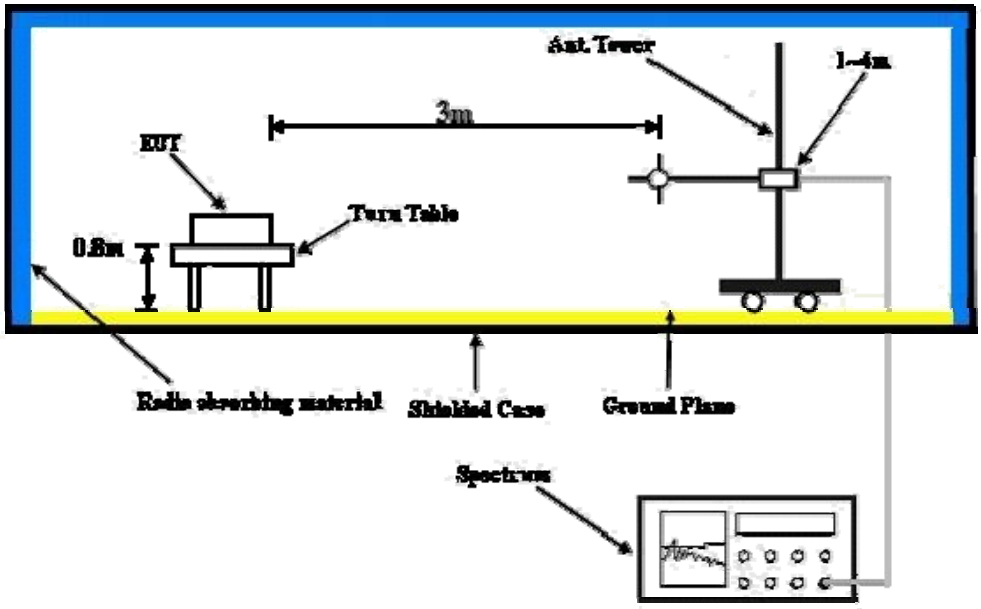
4.2.3 TEST PROCEDURE

The EUT was placed on a turn table which was 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on a antenna tower. The measuring antenna moved up and down to find out the maximum emission level. It moved from 1 to 4 m for horizontal and vertical polarizations.The spectrum analyzer was receiving the maximum emission level. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

4.2.5 TEST SETUP



4.2.6 EUT OPERATING CONDITIONS

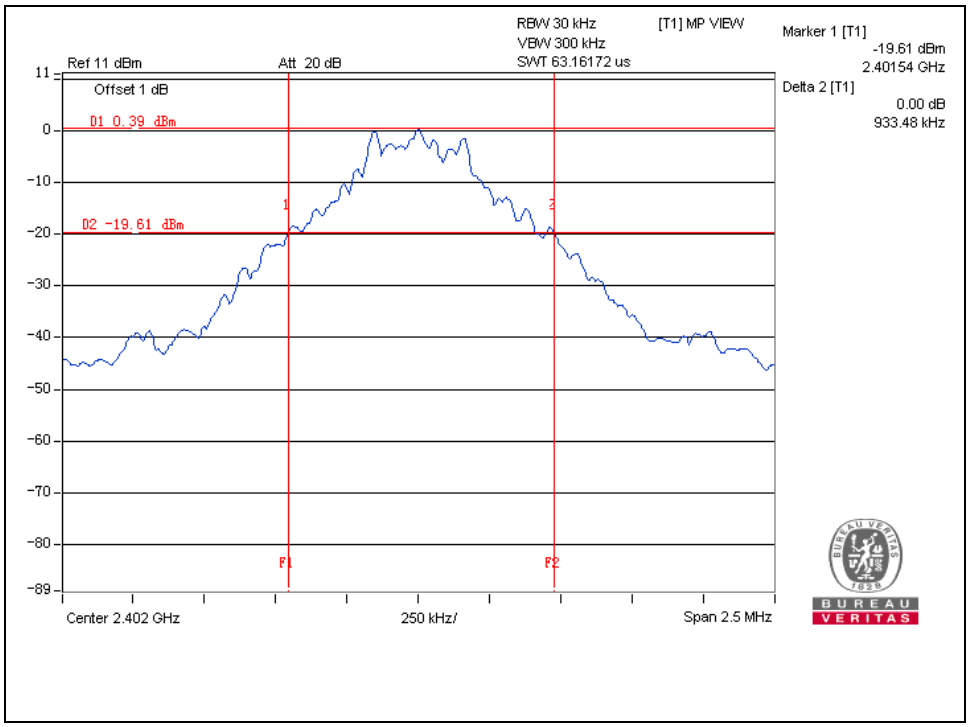
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.2.7 TEST RESULTS

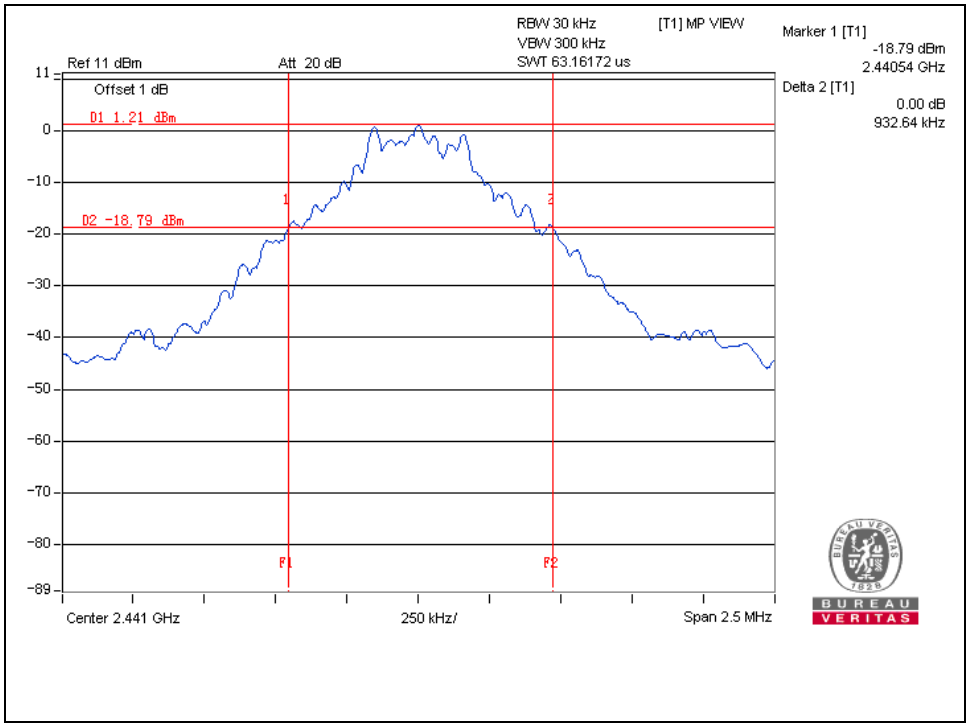
GFSK DH5

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
Low	2402	0.93348
Middle	2441	0.93264
High	2480	0.9306

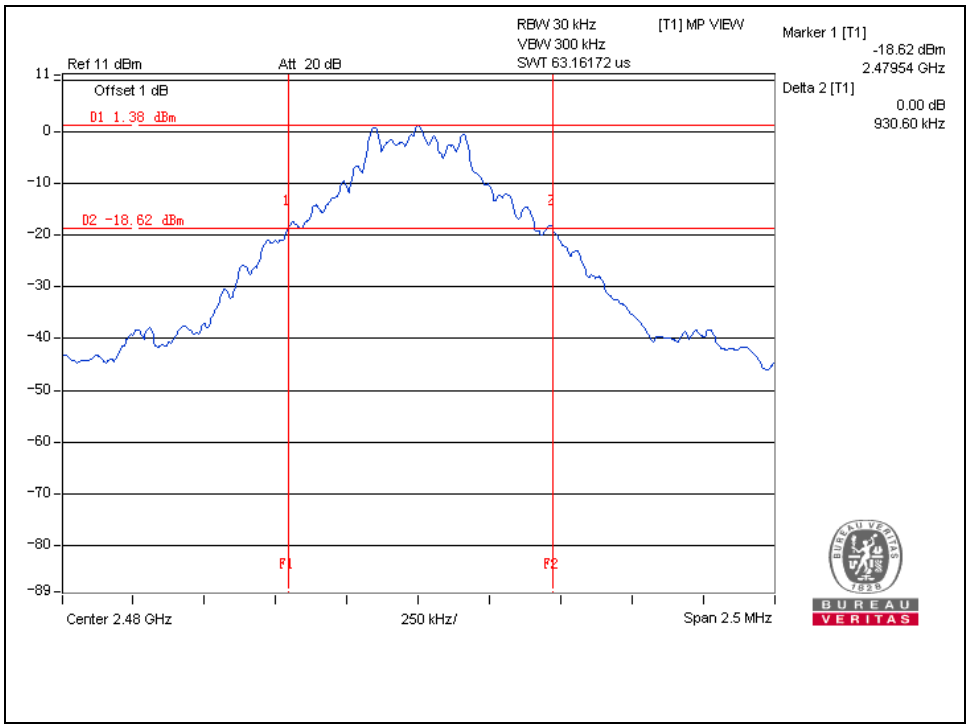
Test Data: Low channel



Test Data: Middle channel



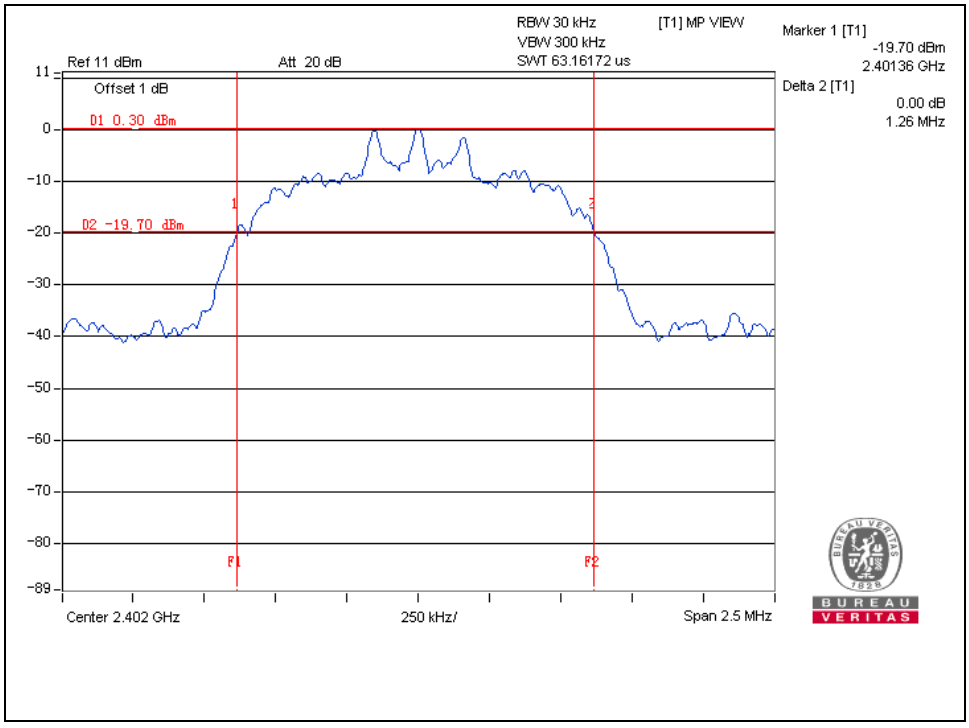
Test Data: High channel



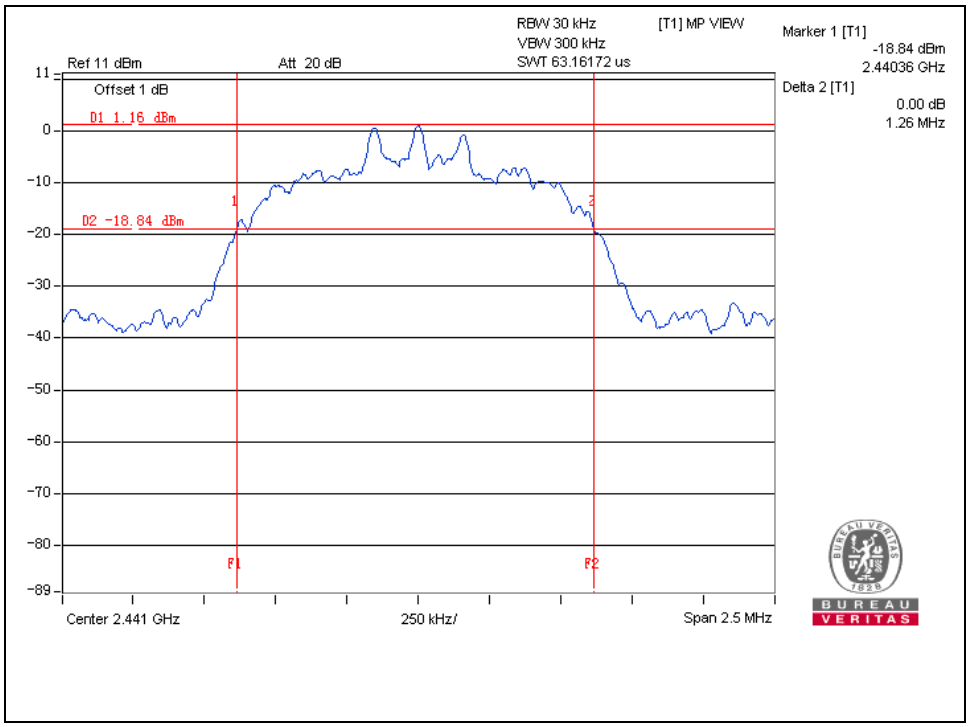
8DPSK DH5

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
Low	2402	1.26
Middle	2441	1.26
Hight	2480	1.26

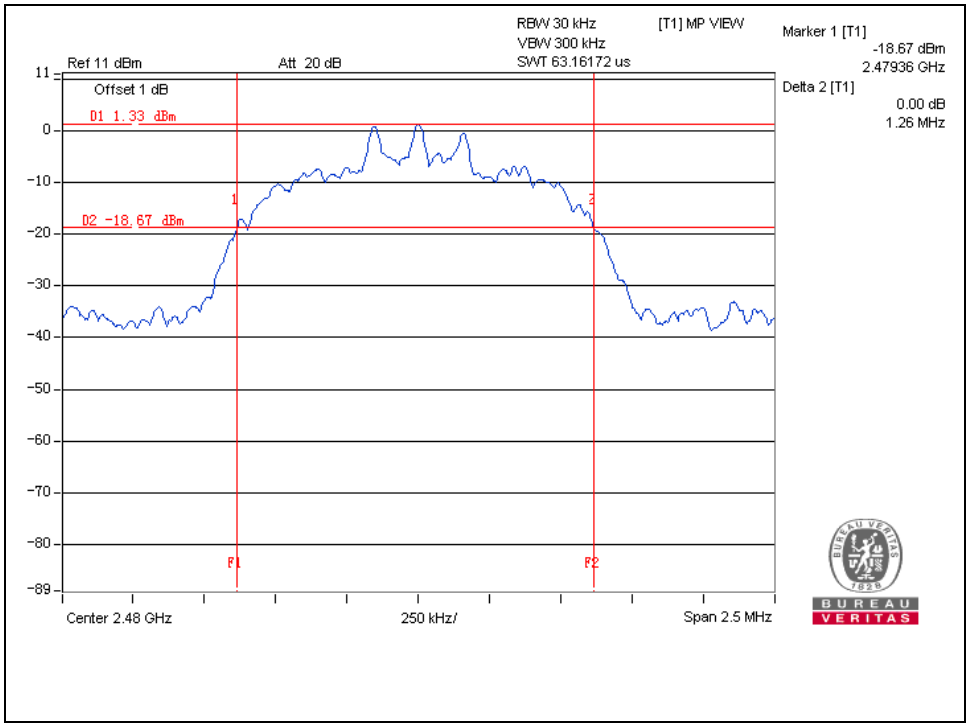
Test Data: Low channel



Test Data: Middle channel



Test Data: High channel



5 PHOTOGRAPHS OF THE TEST CONFIGURATION

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

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---