Test Lab
Cert 2951.01

TEST REPORT

Applicant	Plastoform Industries Ltd.
Address	Rm. 902-4 Seapower Center 73 Lei Muk Road, Kwai Chung Hong Kong

Manufacturer or Supplier	DELL (CHINA) COMPANY LIMITED
Address	No.2388,Jinshang Road,Information Photo-Electronic Park,Xiamen Torch Hi-tech Zone,China
Product	Wireless Speaker System
Brand Name	DELL
Model	AC411
Additional Model & Model Difference	N/A
Date of tests	May. 23, 2013 ~ Jul. 01, 2013

The submitted sample of the above equipment has been tested according to the requirements of the following standards:

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

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

Tested by Kent Liu Project Engineer / EMC Department	Approved by Sam Tung Manager / EMC Department
	 Date: Jul. 01, 2013

This report is for your exclusive use. 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 specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF130522N001	Original release	Jul. 01, 2013

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	PASS	Compliant
§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	Wireless Speaker System
TEST MODEL	AC411
FCC ID	VL5-AC411
NOMINAL VOLTAGE	DC 18V from Adapter
MODULATION TECHNOLOGY	FHSS
MODULATION TYPE	GFSK, 8DPSK, π/4 DQPSK
OPERATING FREQUENCY	2402-2480MHz
ANTENNA TYPE	CHIP antenna; 2.66dBi gain
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	Speaker Line: Unshielded, Detachable. 1.8m Controller Line: Unshielded, Detachable. 2.0m

NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

2. The EUT was powered by the following adapter:

Adapter	
Brand:	HON-KWANG
Model:	HK-X345-A18, HK-X245-A18
Input:	100-240V ~ 50/60Hz 1.5A
Output:	18V/2.5A
DC Line:	Unshielded, Undetachable. 1.8m

3. 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

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and packet type.
The EUT was tested under the following modes, and the final worst is marked in boldface and recorded in the report.

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE<1G	RE≥1G	PLC	BW	
A	√	√	√	√	**Powered by adapter with Bluetooth link**

Where **RE<1G:** Radiated Emission below 1GHz **RE≥1G:** Radiated Emission above 1GHz
PLC: Power Line Conducted Emission **BW:** 20db bandwidth

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 DQPSK	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
Low, Middle, High	FHSS	8DPSK	3M	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

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 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	BT Tester	Rohde&Schwarz	CBT 32	1153.9000.32	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	AC Cable: Unshielded, Detachable, 1.5m

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	ESU 26	100005	May 14,13	May 13,14
Artificial Mains Network	Rohde&Schwarz	ENV216	101173	May 14,13	May 13,14
Artificial Mains Network	Rohde&Schwarz	ESH3-Z5	100317	May 14,13	May 13,14
Test software	ADT	ADT_Cond _V7.3.7	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 Shielding Room 553.

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.

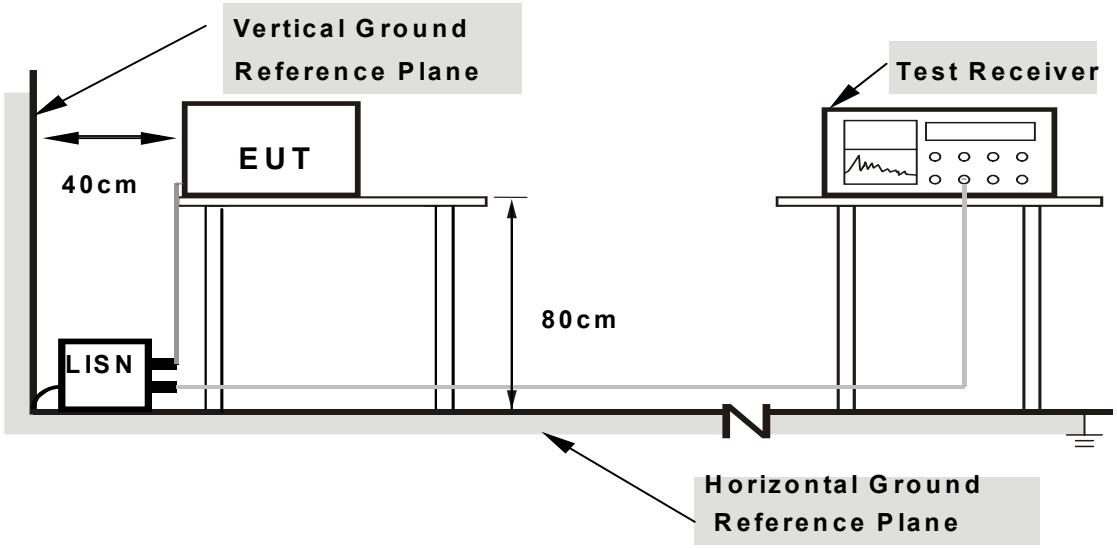
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) were not recorded.

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

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

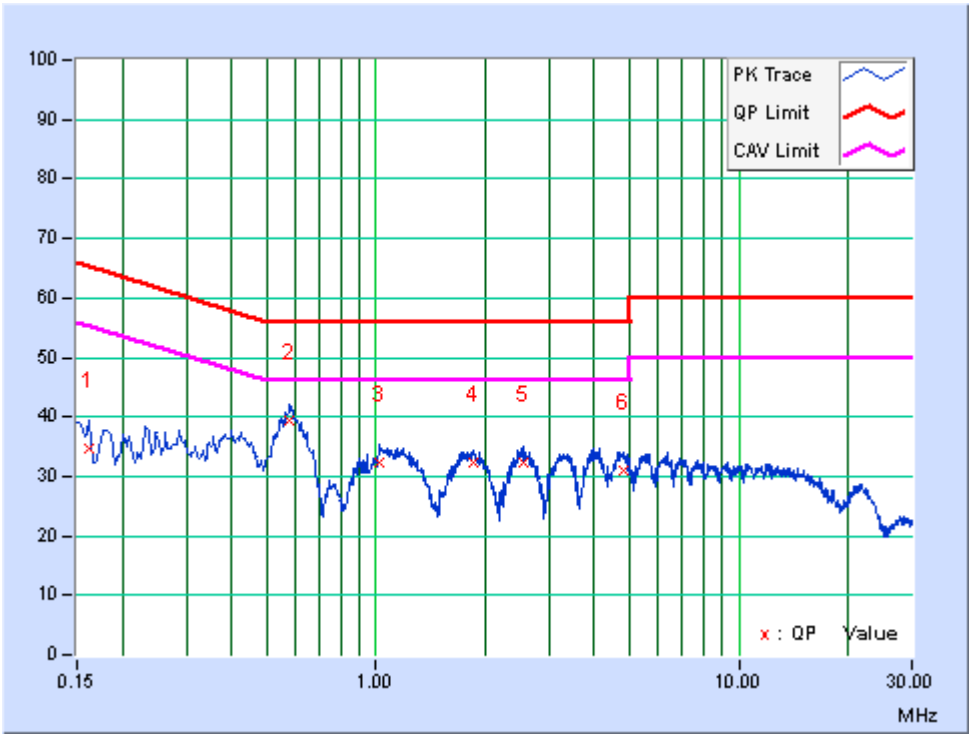
4.1.7 TEST RESULTS

CONDUCTED WORST-CASE DATA: GFSK DH5

PHASE	Line 1	6dB BANDWIDTH	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	0.1617	10.62	24.21	12.20	34.83	22.82	65.37	55.37	-30.55	-32.56
2	0.5801	10.28	29.28	20.23	39.56	30.51	56	46	-16.44	-15.49
3	1.0260	10.00	22.46	14.63	32.46	24.63	56	46	-23.54	-21.37
4	1.8514	9.91	22.49	15.33	32.40	25.24	56	46	-23.60	-20.76
5	2.5351	9.91	22.38	15.80	32.29	25.71	56	46	-23.71	-20.29
6	4.8420	9.95	20.88	13.08	30.83	23.03	56	46	-25.17	-22.97

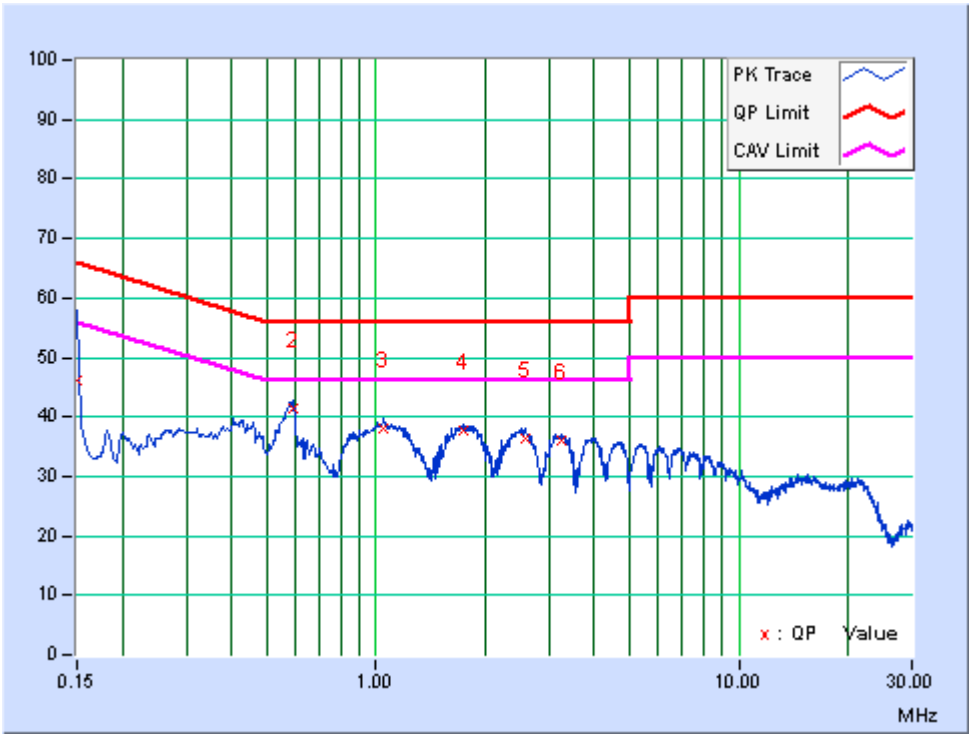
REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission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



PHASE	Neutral	6dB BANDWIDTH	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	0.1500	10.54	35.56	19.15	46.10	29.69	66	56	-19.90	-26.31
2	**0.5879**	**10.36**	**31.21**	**22.61**	**41.57**	**32.97**	**56**	**46**	**-14.43**	**-13.03**
3	1.0534	9.86	28.25	20.73	38.11	30.59	56	46	-17.89	-15.41
4	1.7452	9.73	27.82	20.72	37.55	30.45	56	46	-18.45	-15.55
5	2.5898	9.70	26.8	19.9	36.50	29.60	56	46	-19.50	-16.40
6	3.2310	9.72	26.41	20.28	36.13	30.00	56	46	-19.87	-16.00

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 MEASUREMENT

4.2.1 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.

4.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Spectrum Analyzer	Agilent	E4446A	MY46180622	Apr. 24,13	Apr. 23,14
EMI Test Receiver	Rohde&Schwarz	ESVD	847398/003	May 14,13	May 13,14
Bilog Antenna (25MHz-2GHz)	Teseq	CBL 6111D	27089	Jul. 16,12	Jul. 15,13
Bilog Antenna	Teseq	CBL 6111D	25757	Nov. 22,12	Nov. 21,13
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 14,13	May 13,14
10m Semi-anechoic Chamber	CHANGLING	21.4m*12.1m*8.8m	NSEMC006	Mar. 24,13	Mar. 23,14
Digital Multimeter	FLUKE	15B	A1220010DG	Oct. 31,12	Oct. 30,13
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, GRGT/CHINA and NIM/CHINA.
2. The test was performed in 10m 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 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/spectrum 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.

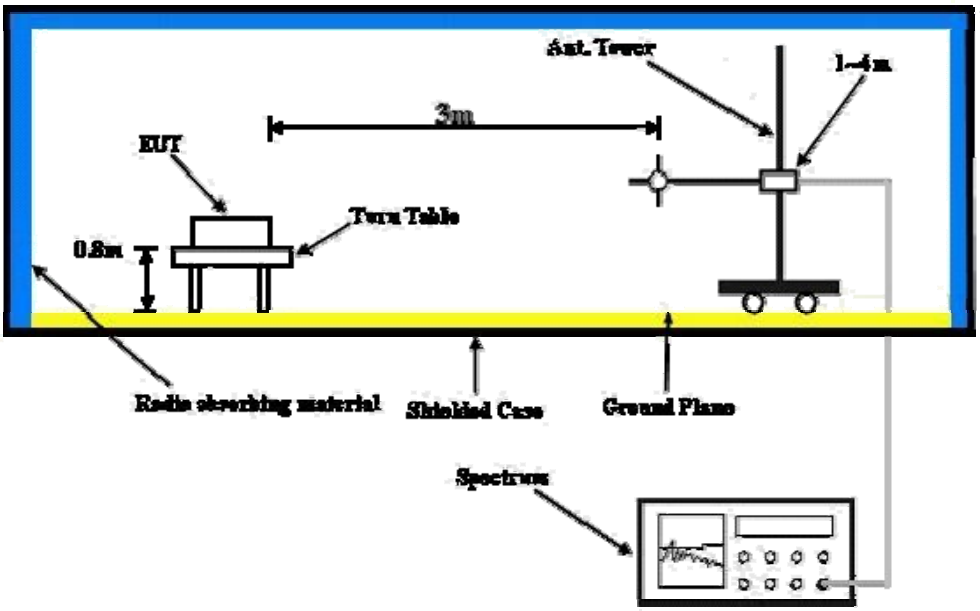
NOTE:

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.

4.2.4 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 transmission condition continuously at specific channel frequency.

4.2.7 TEST RESULTS

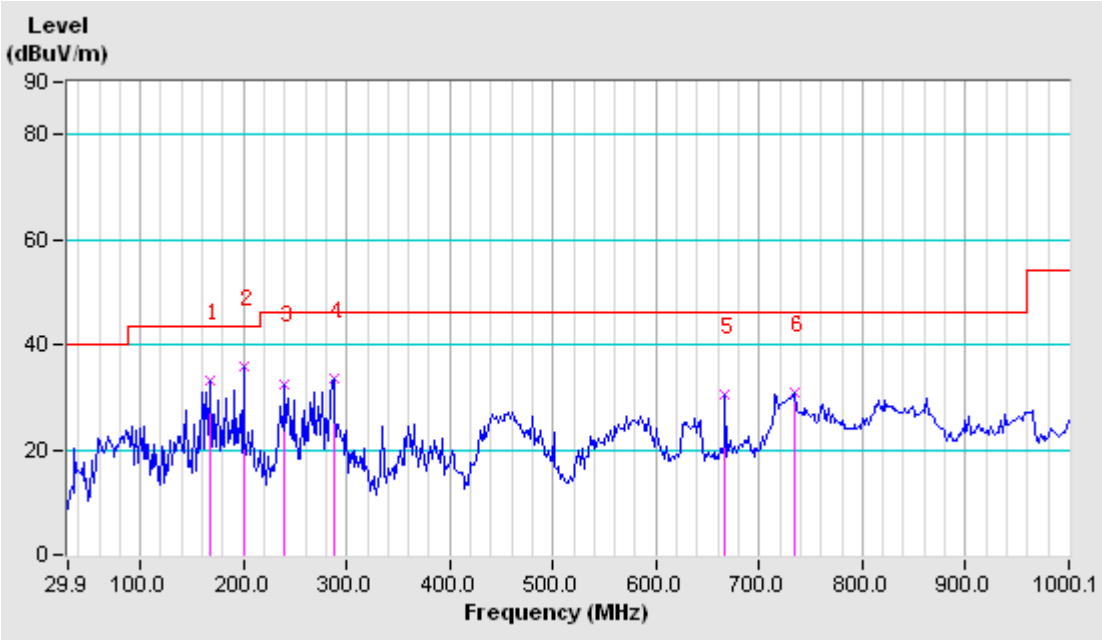
BELOW 1GHz WORST-CASE DATA: GFSK DH5

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	167.34	33.3 QP	43.5	-10.2	1.46 H	321	21.97	11.30
2	199.69	35.9 QP	43.5	-7.6	1.17 H	354	24.88	10.99
3	240.11	32.6 QP	46.0	-13.4	1.76 H	287	19.26	13.33
4	287.00	33.5 QP	46.0	-12.5	1.29 H	340	17.94	15.53
5	667.00	30.5 QP	46.0	-15.6	1.90 H	271	6.30	24.15
6	733.29	30.9 QP	46.0	-15.1	1.61 H	305	4.80	26.06

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.

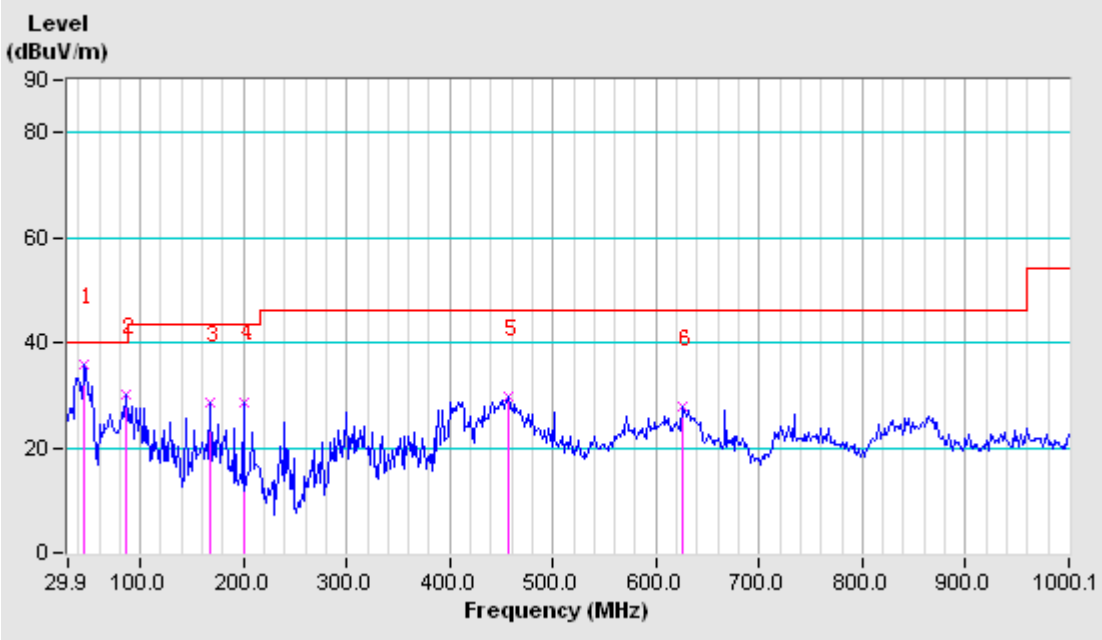


CHANNEL	TX Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

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	**46.07**	**35.7 QP**	**40.0**	**-4.3**	**1.00 V**	**42**	**24.82**	**10.88**
2	86.50	30.2 QP	40.0	-9.8	1.00 V	164	20.28	9.89
3	167.34	28.7 QP	43.5	-14.9	1.00 V	66	17.35	11.30
4	199.69	28.8 QP	43.5	-14.7	1.00 V	184	17.79	10.99
5	456.79	29.6 QP	46.0	-16.4	1.00 V	84	9.26	20.37
6	624.96	27.9 QP	46.0	-18.1	1.00 V	102	3.90	24.01

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	120Vac, 60 Hz	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	61.2 PK	74.0	-12.8	1.23 H	228	23.93	37.27
2	2400.00	31.1 AV	54.0	-22.9	1.23 H	228	-6.17	37.27
3	*2402.00	101.9 PK	114.0	-12.1	1.23 H	228	64.63	37.27
4	*2402.00	71.8 AV	94.0	-22.2	1.23 H	228	34.53	37.27
5	4804.00	55.5 PK	74.0	-18.5	1.20 H	315	13.89	41.61
6	4804.00	25.4 AV	54.0	-28.6	1.20 H	315	-16.21	41.61
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	61.6 PK	74.0	-12.4	1.04 V	251	24.33	37.27
2	2400.00	31.5 AV	54.0	-22.5	1.04 V	251	-5.77	37.27
3	*2402.00	102.2 PK	114.0	-11.8	1.04 V	251	64.93	37.27
4	*2402.00	72.1 AV	94.0	-21.9	1.04 V	251	34.83	37.27
5	4804.00	56.9 PK	74.0	-17.1	1.00 V	276	15.29	41.61
6	4804.00	26.8 AV	54.0	-27.2	1.00 V	276	-14.81	41.61

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	120Vac, 60 Hz	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	102.7 PK	114.0	-11.3	1.19 H	227	65.36	37.34
2	*2441.00	72.6 AV	94.0	-21.4	1.19 H	227	35.26	37.34
3	4882.00	56.9 PK	74.0	-17.1	1.17 H	322	15.20	41.70
4	4882.00	26.8 AV	54.0	-27.2	1.17 H	322	-14.90	41.70
5	7323.00	61.5 PK	74.0	-12.5	1.10 H	187	15.71	45.79
6	7323.00	31.4 AV	54.0	-22.6	1.10 H	187	-14.39	45.79
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**	**103.1 PK**	**114.0**	**-10.9**	**1.04 V**	**244**	**65.76**	**37.34**
2	*2441.00	73.0 AV	94.0	-21.0	1.04 V	244	35.66	37.34
3	4882.00	55.7 PK	74.0	-18.3	1.00 V	280	14.00	41.70
4	4882.00	25.6 AV	54.0	-28.4	1.00 V	280	-16.10	41.70
5	7323.00	59.8 PK	74.0	-14.2	1.08 V	142	14.01	45.79
6	7323.00	29.7 AV	54.0	-24.3	1.08 V	142	-16.09	45.79

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	120Vac, 60 Hz	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	100.1 PK	114.0	-13.9	1.16 H	224	62.69	37.41
2	*2480.00	70.0 AV	94.0	-24.0	1.16 H	224	32.59	37.41
3	2483.50	48.3 PK	74.0	-25.7	1.16 H	224	10.89	37.41
4	2483.50	18.2 AV	54.0	-35.8	1.16 H	224	-19.21	37.41
5	4960.00	58.7 PK	74.0	-15.3	1.12 H	318	16.90	41.80
6	4960.00	28.6 AV	54.0	-25.4	1.12 H	318	-13.20	41.80
7	7440.00	62.5 PK	74.0	-11.5	1.06 H	190	16.68	45.82
8	7440.00	32.4 AV	54.0	-21.6	1.06 H	190	-13.42	45.82
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	99.5 PK	114.0	-14.5	1.00 V	228	62.09	37.41
2	*2480.00	69.4 AV	94.0	-24.6	1.00 V	228	31.99	37.41
3	2483.50	47.9 PK	74.0	-26.1	1.00 V	228	10.49	37.41
4	2483.50	17.8 AV	54.0	-36.2	1.00 V	228	-19.61	37.41
5	4960.00	56.4 PK	74.0	-17.6	1.00 V	279	14.60	41.80
6	4960.00	26.3 AV	54.0	-27.7	1.00 V	279	-15.50	41.80
7	7440.00	60.6 PK	74.0	-13.4	1.13 V	138	14.78	45.82
8	7440.00	30.5 AV	54.0	-23.5	1.13 V	138	-15.32	45.82

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	120Vac, 60 Hz	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	60.2 PK	74.0	-13.8	1.20 H	226	22.93	37.27
2	2400.00	30.1 AV	54.0	-23.9	1.20 H	226	-7.17	37.27
3	*2402.00	100.5 PK	114.0	-13.5	1.20 H	226	63.23	37.27
4	*2402.00	70.4 AV	94.0	-23.6	1.20 H	226	33.13	37.27
5	4804.00	55.2 PK	74.0	-18.8	1.14 H	0	13.59	41.61
6	4804.00	25.1 AV	54.0	-28.9	1.14 H	0	-16.51	41.61
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	59.7 PK	74.0	-14.3	1.00 V	248	22.43	37.27
2	2400.00	29.6 AV	54.0	-24.4	1.00 V	248	-7.67	37.27
3	*2402.00	101.3 PK	114.0	-12.7	1.00 V	248	64.03	37.27
4	*2402.00	71.2 AV	94.0	-22.8	1.00 V	248	33.93	37.27
5	4804.00	54.5 PK	74.0	-19.5	1.06 V	274	12.89	41.61
6	4804.00	24.4 AV	54.0	-29.6	1.06 V	274	-17.21	41.61

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	120Vac, 60 Hz	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	100.9 PK	114.0	-13.1	1.24 H	225	63.56	37.34
2	*2441.00	70.8 AV	94.0	-23.2	1.24 H	225	33.46	37.34
3	4882.00	55.3 PK	74.0	-18.7	1.12 H	316	13.60	41.70
4	4882.00	25.2 AV	54.0	-28.8	1.12 H	316	-16.50	41.70
5	7323.00	57.8 PK	74.0	-16.2	1.07 H	192	12.01	45.79
6	7323.00	27.6 AV	54.0	-26.4	1.07 H	192	-18.19	45.79
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	102.4 PK	114.0	-11.6	1.03 V	241	65.06	37.34
2	*2441.00	72.3 AV	94.0	-21.7	1.03 V	241	34.96	37.34
3	4882.00	56.6 PK	74.0	-17.4	1.00 V	274	14.90	41.70
4	4882.00	26.5 AV	54.0	-27.5	1.00 V	274	-15.20	41.70
5	7323.00	58.8 PK	74.0	-15.2	1.04 V	135	13.01	45.79
6	7323.00	28.7 AV	54.0	-25.3	1.04 V	135	-17.09	45.79

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	120Vac, 60 Hz	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	99.5 PK	114.0	-14.5	1.14 H	227	62.09	37.41
2	*2480.00	69.4 AV	94.0	-24.6	1.14 H	227	31.99	37.41
3	2483.50	48.7 PK	74.0	-25.3	1.14 H	227	11.29	37.41
4	2483.50	18.6 AV	54.0	-35.4	1.14 H	227	-18.81	37.41
5	4960.00	55.3 PK	74.0	-18.7	1.10 H	321	13.50	41.80
6	4960.00	25.2 AV	54.0	-28.8	1.10 H	321	-16.60	41.80
7	7440.00	58.7 PK	74.0	-15.3	1.07 H	185	12.88	45.82
8	7440.00	28.6 AV	54.0	-25.4	1.07 H	185	-17.22	45.82
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	98.7 PK	114.0	-15.3	1.02 V	223	61.29	37.41
2	*2480.00	68.6 AV	94.0	-25.4	1.02 V	223	31.19	37.41
3	2483.50	46.5 PK	74.0	-27.5	1.02 V	223	9.09	37.41
4	2483.50	16.4 AV	54.0	-37.6	1.02 V	223	-21.01	37.41
5	4960.00	54.6 PK	74.0	-19.4	1.05 V	275	12.80	41.80
6	4960.00	24.5 AV	54.0	-29.5	1.05 V	275	-17.30	41.80
7	7440.00	59.2 PK	74.0	-14.8	1.10 V	140	13.38	45.82
8	7440.00	29.1 AV	54.0	-24.9	1.10 V	140	-16.72	45.82

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).

4.3 20dB BANDWIDTH MEASUREMENT

4.3.1 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.

4.3.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Spectrum Analyzer	Agilent	E4446A	MY46180622	Apr. 24,13	Apr. 23,14
EMI Test Receiver	Rohde&Schwarz	ESVD	847398/003	May 14,13	May 13,14
Bilog Antenna (25MHz-2GHz)	Teseq	CBL 6111D	27089	Jul. 16,12	Jul. 15,13
Bilog Antenna	Teseq	CBL 6111D	25757	Nov. 22,12	Nov. 21,13
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 14,13	May 13,14
10m Semi-anechoic Chamber	CHANGLING	21.4m*12.1m*8.8m	NSEMC006	Mar. 24,13	Mar. 23,14
Digital Multimeter	FLUKE	15B	A1220010DG	Oct. 31,12	Oct. 30,13
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, GRGT/CHINA and NIM/CHINA.
2. The test was performed in 10m Chamber
3. The FCC Site Registration No. is 502831

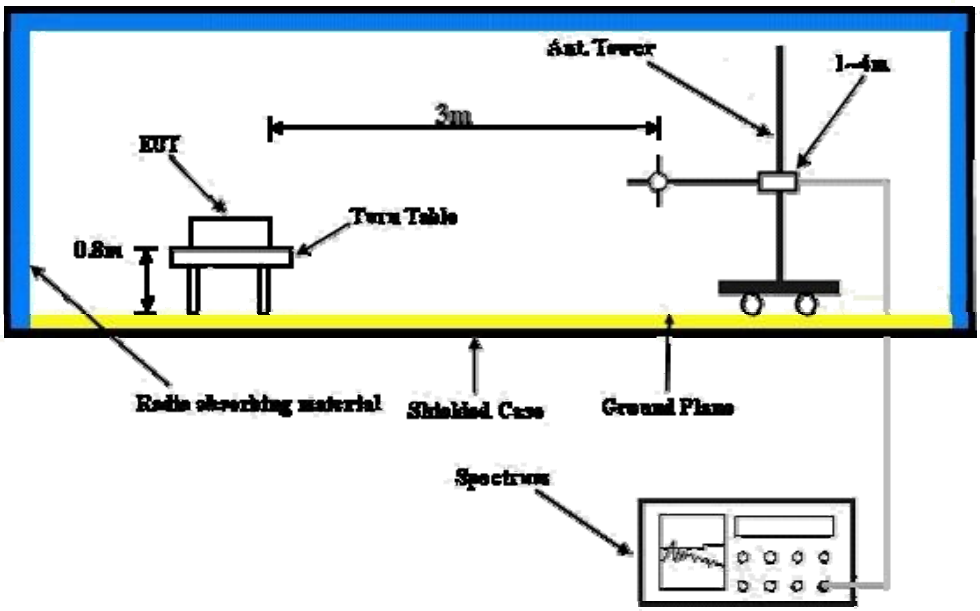
4.3.3 TEST PROCEDURE

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.

4.3.4 DEVIATION FROM TEST STANDARD

No deviation.

4.3.5 TEST SETUP



4.3.6 EUT OPERATING CONDITIONS

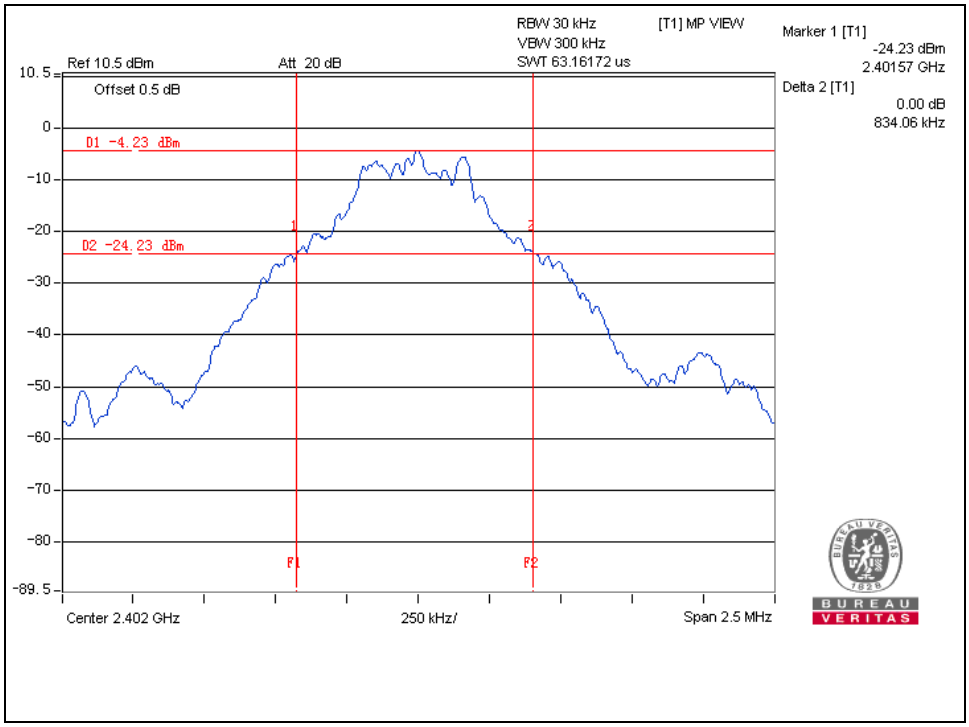
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.3.7 TEST RESULTS

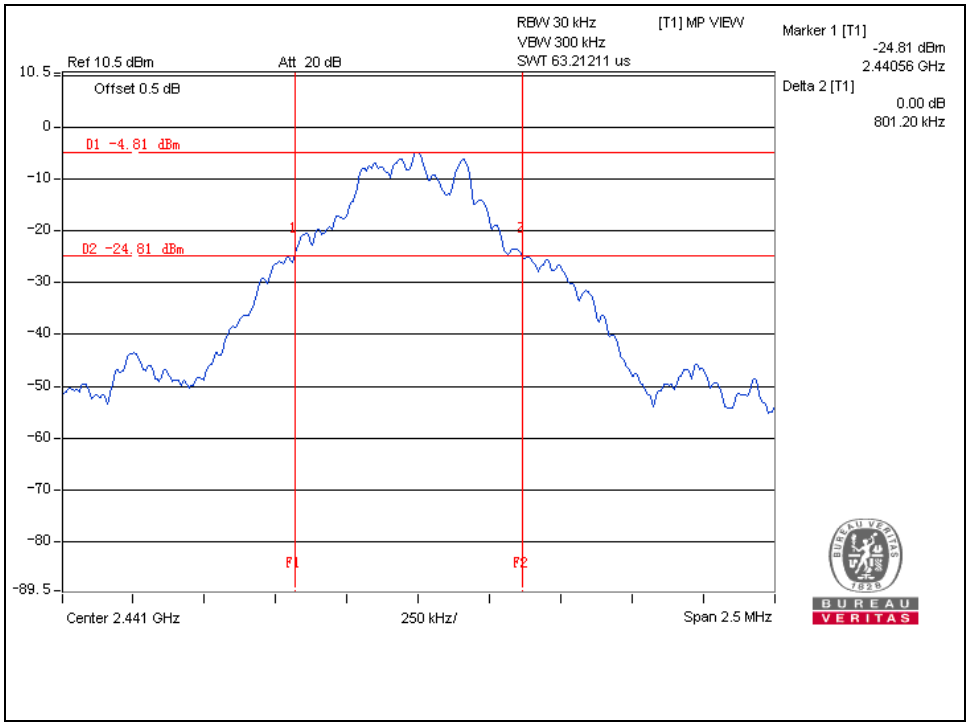
GFSK DH5

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
Low	2402	0.834
Middle	2441	0.801
High	2480	0.845

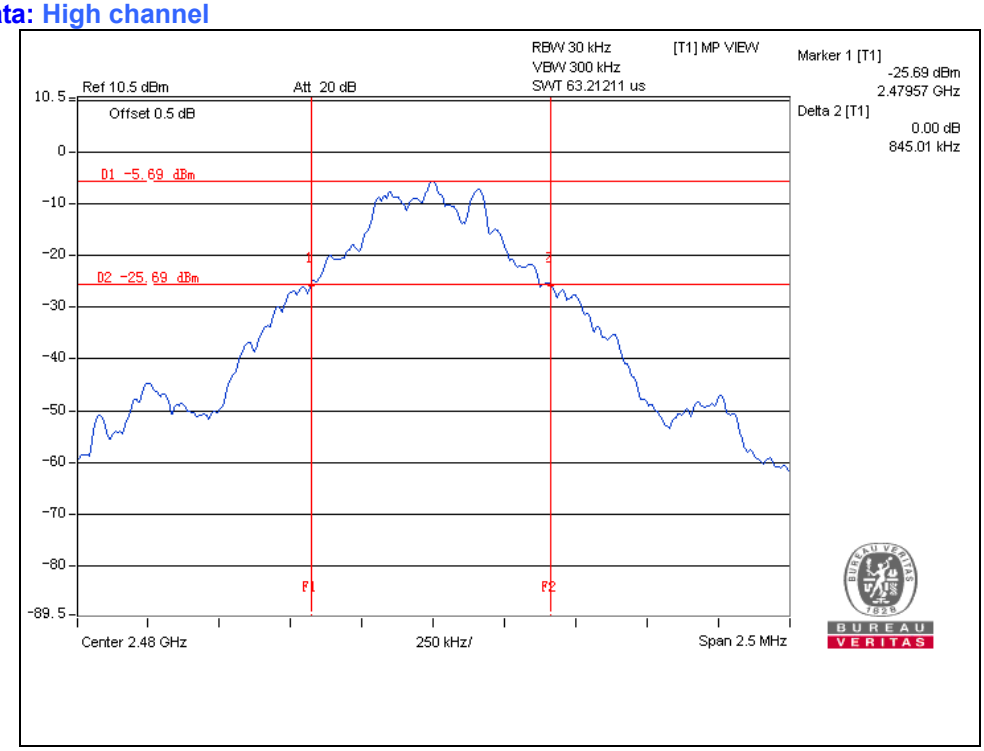
Test Data: Low channel



Test Data: Middle channel



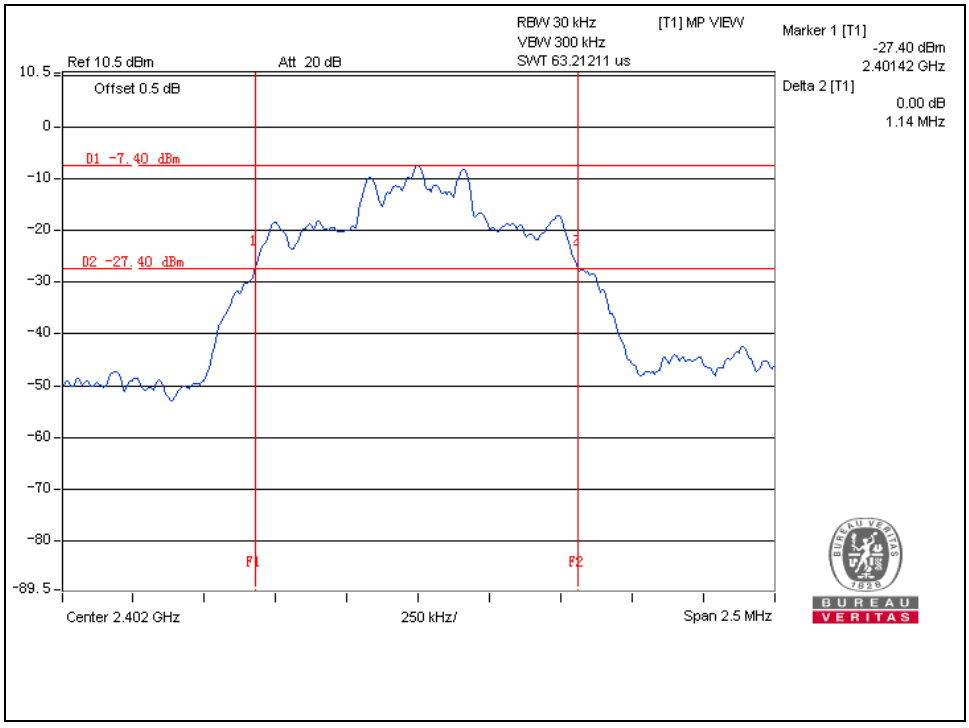
Test Data: High channel



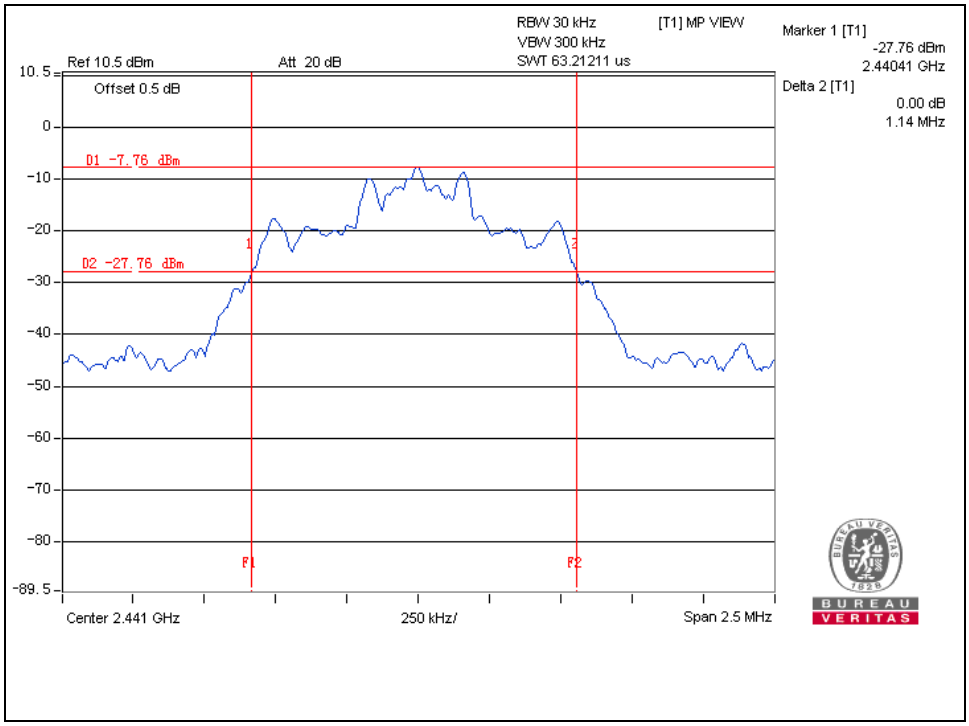
8DPSK DH5

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
Low	2402	1.14
Middle	2441	1.14
Hight	2480	1.15

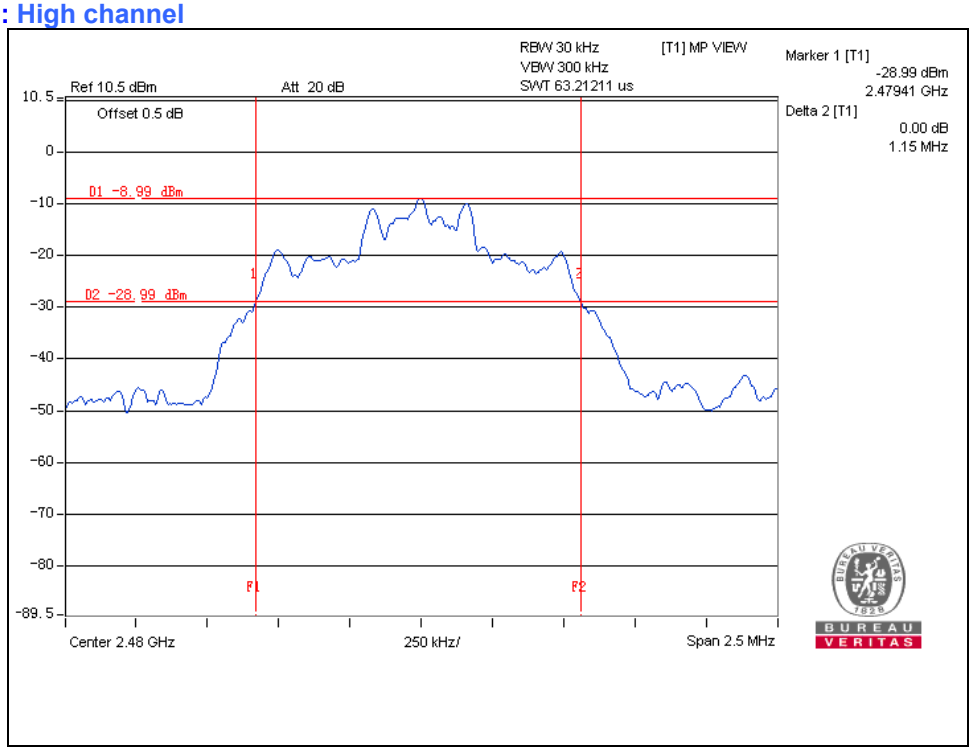
Test Data: Low channel



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---