



Test Report No.: RF130521N008



TEST REPORT

Applicant	Zhongshan K-mate General Electronics Co.,Ltd
Address	B1 Building,Fuwan Ind.Zone,Fuwan Nan Road,East District,Zhongshan,China

Manufacturer or Supplier	Zhongshan K-mate General Electronics Co.,Ltd
Address	B1 Building,Fuwan Ind.Zone,Fuwan Nan Road,East District,Zhongshan,China
Product:	Bluetooth audio transmitter
Brand Name:	K-mate
Model:	BTT023
Additional Model & Model Difference:	N/A
Date of tests:	May 21, 2013 ~ Jun. 07, 2013

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: Jun. 07, 2013

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF130521N008	Original release	Jun. 07, 2013



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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	2.2dB
	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 audio transmitter
MODEL NO.	BTT023
FCC ID	WAD-BTT023
NOMINAL VOLTAGE	DC 3.7V by battery or DC 5V by host device
MODULATION TECHNOLOGY	FHSS
MODULATION TYPE	GFSK, 8DPSK, $\pi/4$ DQPSK
OPERATING FREQUENCY	2402-2480MHz
ANTENNA TYPE	Integral CHIP Antenna
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	USB Cable, Shielded, Detachable 1.2m Audio Line: Unshielded, Undetachable 0.1m

NOTE:

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

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and packet type. The worst case was found when the EUT was positioned on Z axis for radiated emission. 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 PC with Bluetooth link
B	√	-	-	-	Powered by battery with Bluetooth link

Where RE<1G: Radiated Emission below 1GHz

PLC: Power Line Conducted Emission

RE≥1G: Radiated Emission above 1GHz

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



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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 C63.10-2009

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 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	Laptop	DELL	5P2PM2X	12400120329	N/A
2	Printer	HP	hp LaserJet 1300	CNSJF75989	N/A
3	Mouse	DELL	MO56UOA	0168808Z	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	AC Line :Unshielded, Detachable 1.5m;DC Line: Unshielded, Undetachable 1.8m
2	USB Line: Shielded, Detachable 1.5m;
3	USB Line: Shielded, Undetachable 1.5m;



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4. TEST TYPES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB μ V)	
	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 and NIM/CHINA
2. The test was performed in Shielding Room 553.



4.1.3 TEST PROCEDURES

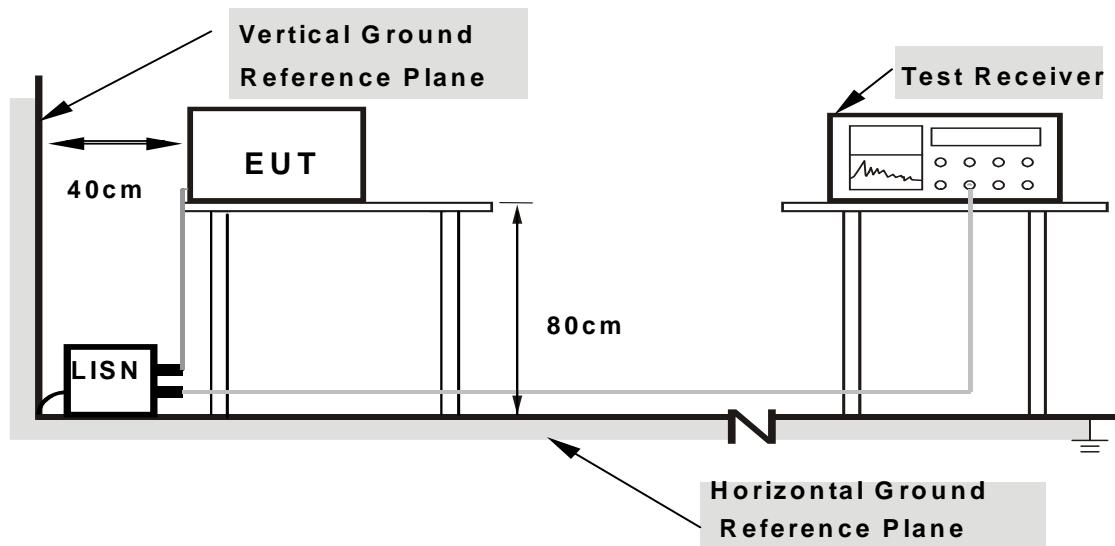
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling 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) 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

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



4.1.7 TEST RESULTS

CONDUCTED WORST-CASE DATA

PHASE	Line 1	6dB BANDWIDTH		9kHz	
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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	10.48	34.47	17.64	44.95	28.12	64.60	54.60	-19.66	-26.49
2	0.19305	10.44	29.13	13.24	39.57	23.68	63.90	53.90	-24.33	-30.22
3	0.24384	10.32	29.66	17.20	39.98	27.52	61.96	51.96	-21.98	-24.44
4	3.23108	9.79	24.24	16.88	34.03	26.67	56.00	46.00	-21.97	-19.33
5	20.85345	10.12	29.94	22.22	40.06	32.34	60.00	50.00	-19.94	-17.66
6	23.12516	10.22	29.09	21.15	39.31	31.37	60.00	50.00	-20.69	-18.63

REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.

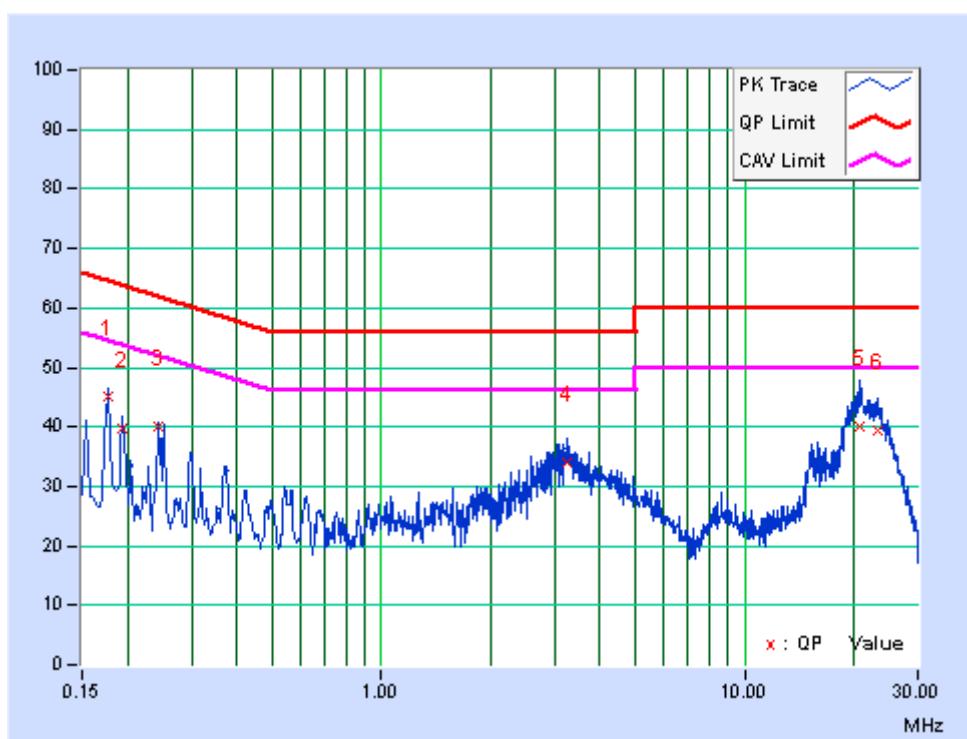
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.

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.



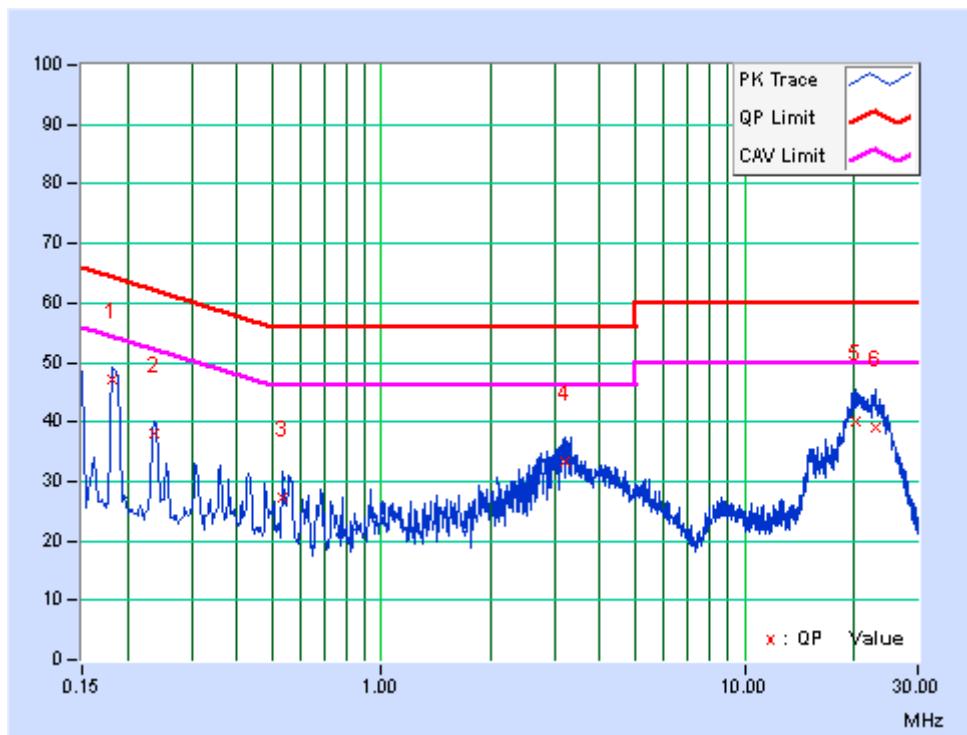


PHASE	Neutral	6dB BANDWIDTH	9kHz
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.18170	10.44	36.76	21.67	47.20	32.11	64.41	54.41	-17.21	-22.30
2	0.23648	10.28	27.65	11.68	37.93	21.96	62.22	52.22	-24.29	-30.26
3	0.53709	10.32	16.91	7.40	27.23	17.72	56.00	46.00	-28.77	-28.28
4	3.21544	9.47	23.71	16.59	33.18	26.06	56.00	46.00	-22.82	-19.94
5	20.34906	10.01	30.00	21.65	40.01	31.66	60.00	50.00	-19.99	-18.34
6	23.01568	10.17	29.04	21.32	39.21	31.49	60.00	50.00	-20.79	-18.51

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 (dB_{uV}/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
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
Horn Antenna (15GHz-40GHz)	SCHWARZBECK	BBHA 9170	BBHA9170147	Jan. 04,12	Jan. 03,14
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Nov. 04,12	Nov. 03,13
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



4.2.3 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 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:

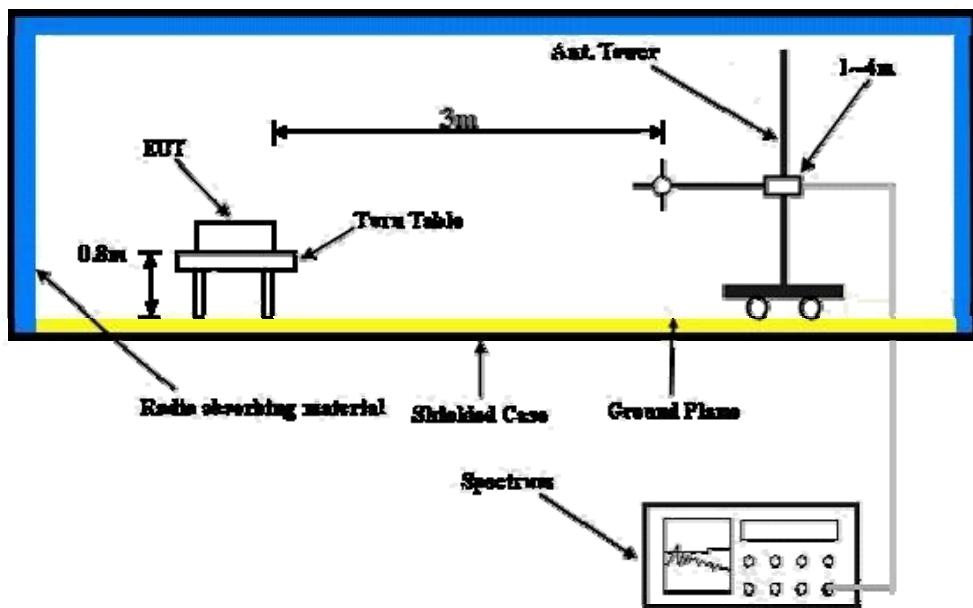
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution 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

Same as item 4.1.6



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4.2.7 TEST RESULTS

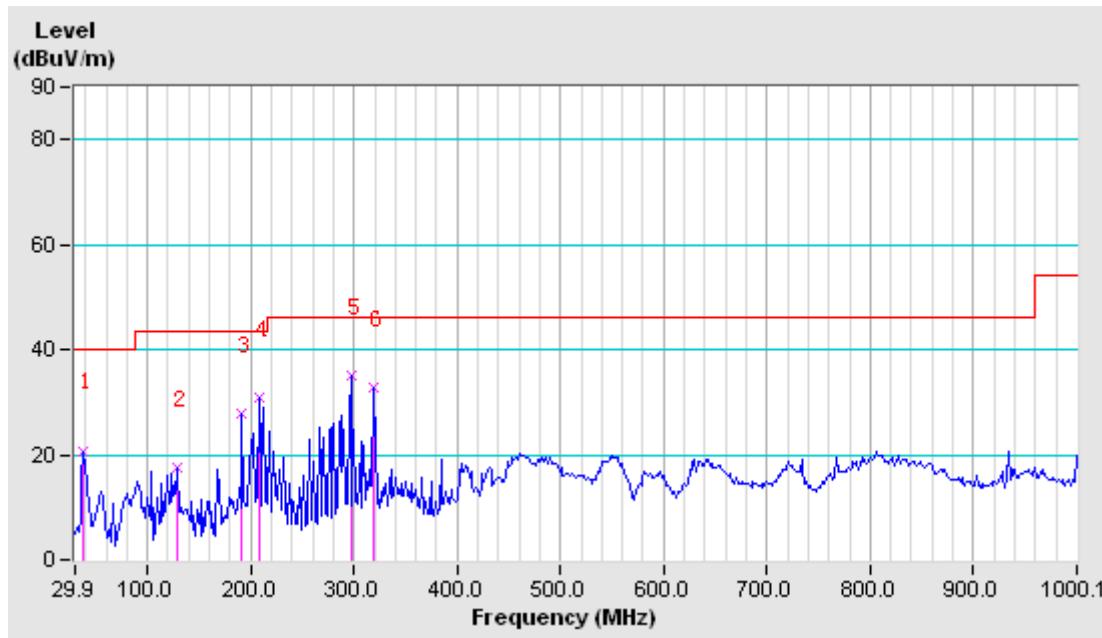
BELow 1GHz WORST-CASE DATA: GFSK DH5

CHANNEL	Channel 39	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	37.98	20.8 QP	40.0	-19.2	1.33 H	225	5.41	15.36
2	128.54	17.4 QP	43.5	-26.1	1.80 H	165	3.91	13.47
3	191.60	27.9 QP	43.5	-15.6	1.50 H	203	17.18	10.69
4	207.77	31.0 QP	43.5	-12.5	1.15 H	248	19.69	11.27
5	296.70	35.1 QP	46.0	-10.9	1.00 H	290	19.36	15.76
6	319.34	32.9 QP	46.0	-13.1	1.02 H	267	16.77	16.09

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.





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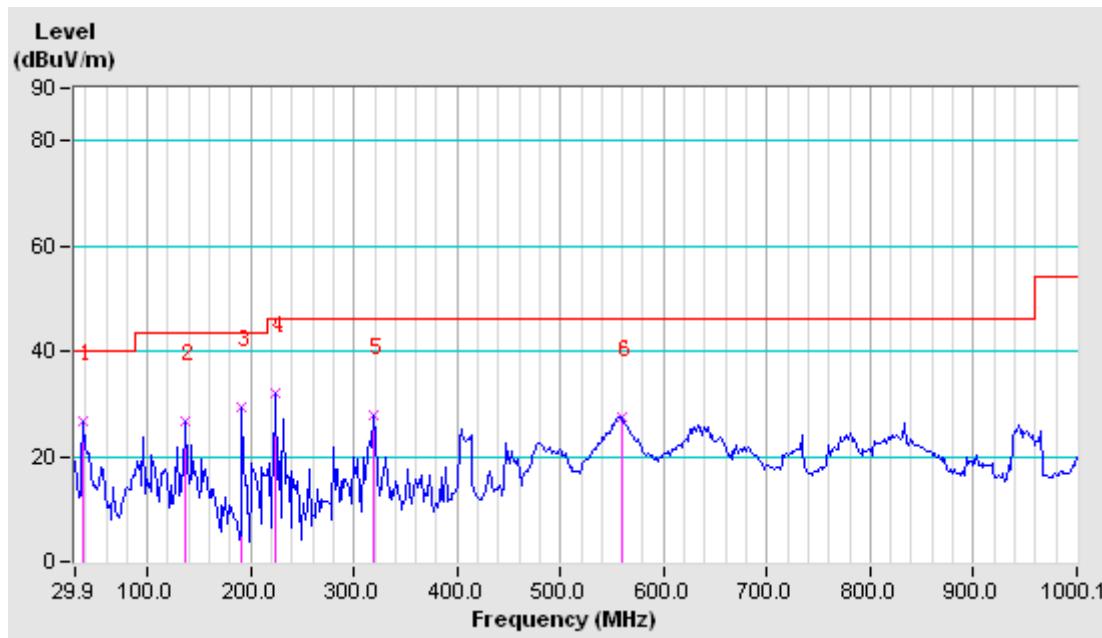
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CHANNEL	Channel 39	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

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	37.98	26.7 QP	40.0	-13.3	1.20 V	306	11.30	15.37
2	136.62	26.7 QP	43.5	-16.8	1.00 V	288	13.47	13.19
3	191.60	29.3 QP	43.5	-14.2	1.00 V	271	18.59	10.69
4	223.94	31.9 QP	46.0	-14.1	1.08 V	255	20.12	11.74
5	319.34	27.8 QP	46.0	-18.2	1.00 V	327	11.71	16.09
6	558.66	27.5 QP	46.0	-18.5	1.28 V	349	3.67	23.85

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.





ABOVE 1GHz WORST-CASE DATA: GFSK DH5

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		Channel 0		FREQUENCY RANGE 1 ~ 25GHz
TEST VOLTAGE		5V DC		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	61.3 PK	74.0	-12.7	1.24 H	206	24.03	37.27
2	2400.00	31.2 AV	54.0	-22.8	1.24 H	206	-6.07	37.27
3	*2402.00	95.7 PK	114.0	-18.3	1.24 H	206	58.43	37.27
4	*2402.00	65.6 AV	94.0	-28.4	1.24 H	206	28.33	37.27
5	4804.00	53.8 PK	74.0	-20.2	1.00 H	145	12.19	41.61
6	4804.00	23.7 AV	54.0	-30.3	1.00 H	145	-17.91	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	57.7 PK	74.0	-16.3	1.00 V	236	20.43	37.27
2	2400.00	27.6 AV	54.0	-26.4	1.00 V	236	-9.67	37.27
3	*2402.00	91.9 PK	114.0	-22.1	1.00 V	236	54.63	37.27
4	*2402.00	61.8 AV	94.0	-32.2	1.00 V	236	24.53	37.27
5	4804.00	59.2 PK	74.0	-14.8	1.00 V	252	17.59	41.61
6	4804.00	29.1 AV	54.0	-24.9	1.00 V	252	-12.51	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: $20\log(3.125 / 100) = -30.1 \text{ dB}$.
7. Average value = peak reading + $20\log(\text{duty cycle})$.
Therefore, the duty cycle correlation factor be equal to: $20\log(3.125 / 100) = -30.1 \text{ dB}$
7. Average value = peak reading + $20\log(\text{duty cycle})$.



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EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		Channel 39		FREQUENCY RANGE 1 ~ 25GHz
TEST VOLTAGE		5V DC		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	94.9 PK	114.0	-19.1	1.00 H	169	57.56	37.34
2	*2441.00	64.8 AV	94.0	-29.2	1.00 H	169	27.46	37.34
3	4882.00	52.2 PK	74.0	-21.8	1.08 H	134	10.50	41.70
4	4882.00	22.1 AV	54.0	-31.9	1.08 H	134	-19.60	41.70
5	7323.00	54.7 PK	74.0	-19.3	1.10 H	245	8.91	45.79
6	7323.00	24.6 AV	54.0	-29.4	1.10 H	245	-21.19	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	93.8 PK	114.0	-20.2	1.00 V	172	56.46	37.34
2	*2441.00	63.7 AV	94.0	-30.3	1.00 V	172	26.36	37.34
3	4882.00	54.5 PK	74.0	-19.5	1.06 V	258	12.80	41.70
4	4882.00	24.4 AV	54.0	-29.6	1.06 V	258	-17.30	41.70
5	7323.00	54.8 PK	74.0	-19.2	1.04 V	288	9.01	45.79
6	7323.00	24.7 AV	54.0	-29.3	1.04 V	288	-21.09	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: $20\log(3.125 / 100) = -30.1$ dB.
7. Average value = peak reading + 20log(duty cycle).



EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL	Channel 78	FREQUENCY RANGE		1 ~ 25GHz
TEST VOLTAGE	5V DC	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	93.8 PK	114.0	-20.2	1.00 H	170	56.39	37.41
2	*2480.00	63.7 AV	94.0	-30.3	1.00 H	170	26.29	37.41
3	2483.50	52.7 PK	74.0	-21.3	1.00 H	170	15.29	37.41
4	2483.50	22.6 AV	54.0	-31.4	1.00 H	170	-14.81	37.41
5	4960.00	52.5 PK	74.0	-21.5	1.13 H	130	10.70	41.80
6	4960.00	22.4 AV	54.0	-31.6	1.13 H	130	-19.40	41.80
7	7440.00	54.7 PK	74.0	-19.3	1.00 H	239	8.88	45.82
8	7440.00	24.6 AV	54.0	-29.4	1.00 H	239	-21.22	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	94.2 PK	114.0	-19.8	1.00 V	182	56.79	37.41
2	*2480.00	64.1 AV	94.0	-29.9	1.00 V	182	26.69	37.41
3	2483.50	53.7 PK	74.0	-20.3	1.00 V	182	16.29	37.41
4	2483.50	23.6 AV	54.0	-30.4	1.00 V	182	-13.81	37.41
5	4960.00	54.9 PK	74.0	-19.1	1.05 V	260	13.10	41.80
6	4960.00	24.8 AV	54.0	-29.2	1.05 V	260	-17.00	41.80
7	7440.00	55.1 PK	74.0	-18.9	1.14 V	290	9.28	45.82
8	7440.00	25.0 AV	54.0	-29.0	1.14 V	290	-20.82	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: $20\log(3.125 / 100) = -30.1$ dB.
7. Average value = peak reading + $20\log(\text{duty cycle})$.



BT_8DPSK DH5

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL	Channel 0	FREQUENCY RANGE		1 ~ 25GHz
TEST VOLTAGE	5V DC	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	62.2 PK	74.0	-11.8	1.00 H	168	24.93	37.27
2	2400.00	32.1 AV	54.0	-21.9	1.00 H	168	-5.17	37.27
3	*2402.00	93.9 PK	114.0	-20.1	1.00 H	168	56.63	37.27
4	*2402.00	63.8 AV	94.0	-30.2	1.00 H	168	26.53	37.27
5	4804.00	51.2 PK	74.0	-22.8	1.16 H	140	9.59	41.61
6	4804.00	21.1 AV	54.0	-32.9	1.16 H	140	-20.51	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	59.6 PK	74.0	-14.4	1.00 V	174	22.33	37.27
2	2400.00	29.5 AV	54.0	-24.5	1.00 V	174	-7.77	37.27
3	*2402.00	90.3 PK	114.0	-23.7	1.00 V	174	53.03	37.27
4	*2402.00	60.2 AV	94.0	-33.8	1.00 V	174	22.93	37.27
5	4802.00	52.3 PK	74.0	-21.7	1.07 V	155	10.70	41.60
6	4802.00	22.2 AV	54.0	-31.8	1.07 V	155	-19.40	41.60

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



EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL	Channel 39	FREQUENCY RANGE		1 ~ 25GHz
TEST VOLTAGE	5V DC	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	92.7 PK	114.0	-21.3	1.00 H	169	55.36	37.34
2	*2441.00	62.6 AV	94.0	-31.4	1.00 H	169	25.26	37.34
3	4882.00	51.6 PK	74.0	-22.4	1.05 H	132	9.90	41.70
4	4882.00	21.5 AV	54.0	-32.5	1.05 H	132	-20.20	41.70
5	7323.00	55.2 PK	74.0	-18.8	1.03 H	241	9.41	45.79
6	7323.00	25.1 AV	54.0	-28.9	1.03 H	241	-20.69	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	91.5 PK	114.0	-22.5	1.00 V	171	54.16	37.34
2	*2441.00	61.4 AV	94.0	-32.6	1.00 V	171	24.06	37.34
3	4882.00	52.4 PK	74.0	-21.6	1.05 V	254	10.70	41.70
4	4882.00	22.3 AV	54.0	-31.7	1.05 V	254	-19.40	41.70
5	7323.00	55.3 PK	74.0	-18.7	1.00 V	285	9.51	45.79
6	7323.00	25.2 AV	54.0	-28.8	1.00 V	285	-20.59	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: $20\log(3.125 / 100) = -30.1$ dB.
7. Average value = peak reading + $20\log(\text{duty cycle})$.



EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		Channel 78		FREQUENCY RANGE 1 ~ 25GHz
TEST VOLTAGE		5V DC		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	91.7 PK	114.0	-22.3	1.00 H	170	54.29	37.41
2	*2480.00	61.6 AV	94.0	-32.4	1.00 H	170	24.19	37.41
3	2483.50	54.4 PK	74.0	-19.6	1.00 H	170	16.99	37.41
4	2483.50	24.3 AV	54.0	-29.7	1.00 H	170	-13.11	37.41
5	4960.00	50.8 PK	74.0	-23.2	1.18 H	142	9.00	41.80
6	4960.00	20.7 AV	54.0	-33.3	1.18 H	142	-21.10	41.80
7	7440.00	54.5 PK	74.0	-19.5	1.04 H	257	8.68	45.82
8	7440.00	24.4 AV	54.0	-29.6	1.04 H	257	-21.42	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	91.5 PK	114.0	-22.5	1.00 V	180	54.09	37.41
2	*2480.00	61.4 AV	94.0	-32.6	1.00 V	180	23.99	37.41
3	2483.50	54.8 PK	74.0	-19.2	1.00 V	180	17.39	37.41
4	2483.50	24.7 AV	54.0	-29.3	1.00 V	180	-12.71	37.41
5	4960.00	50.9 PK	74.0	-23.1	1.08 V	252	9.10	41.80
6	4960.00	20.8 AV	54.0	-33.2	1.08 V	252	-21.00	41.80
7	7440.00	54.6 PK	74.0	-19.4	1.08 V	293	8.78	45.82
8	7440.00	24.5 AV	54.0	-29.5	1.08 V	293	-21.32	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: $20\log(3.125 / 100) = -30.1$ dB.
7. Average value = peak reading + $20\log(\text{duty cycle})$.



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
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	A1220010D G	Oct. 31,12	Oct. 30,13
Horn Antenna (15GHz-40GHz)	SCHWARZBECK	BBHA 9170	BBHA91701 47	Jan. 04,12	Jan. 03,14
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Nov. 04,12	Nov. 03,13
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

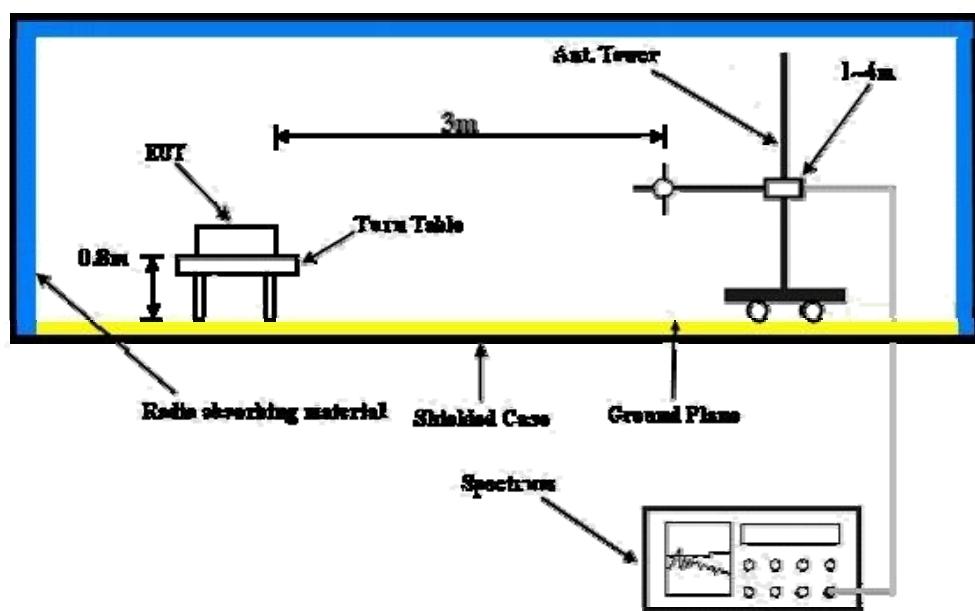
4.3.3 TEST PROCEDURE

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

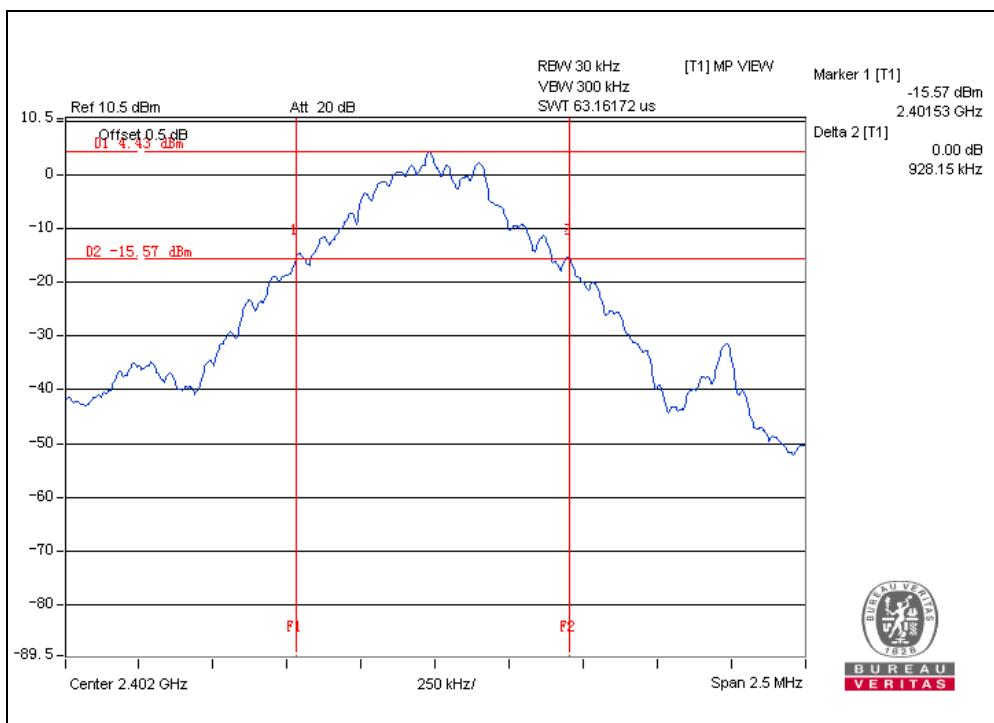
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.3.7 TEST RESULTS

GFSK DH5

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
Low	2402	0.928
Middle	2441	0.867
High	2480	0.927

Test Data: Low channel

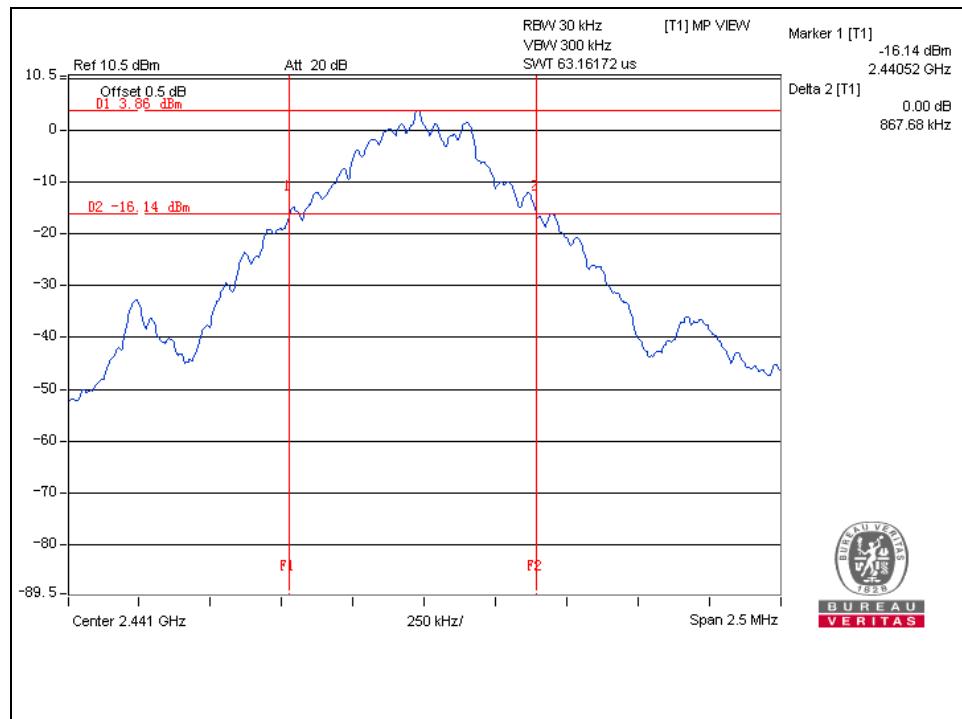




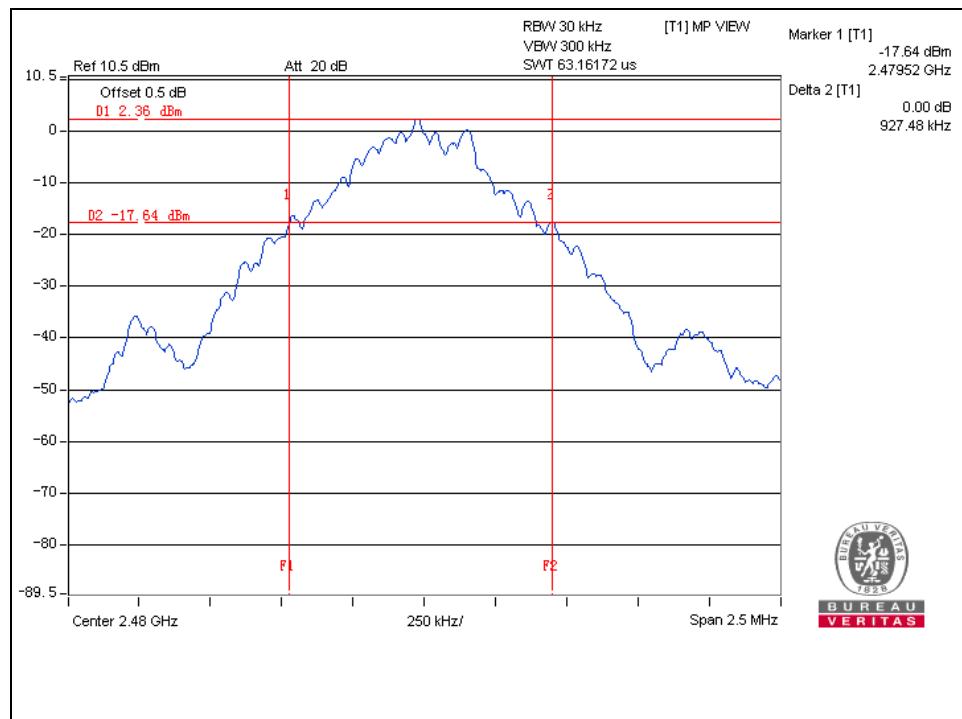
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Test Report No.: RF130521N008

Test Data: Middle channel



Test Data: High channel





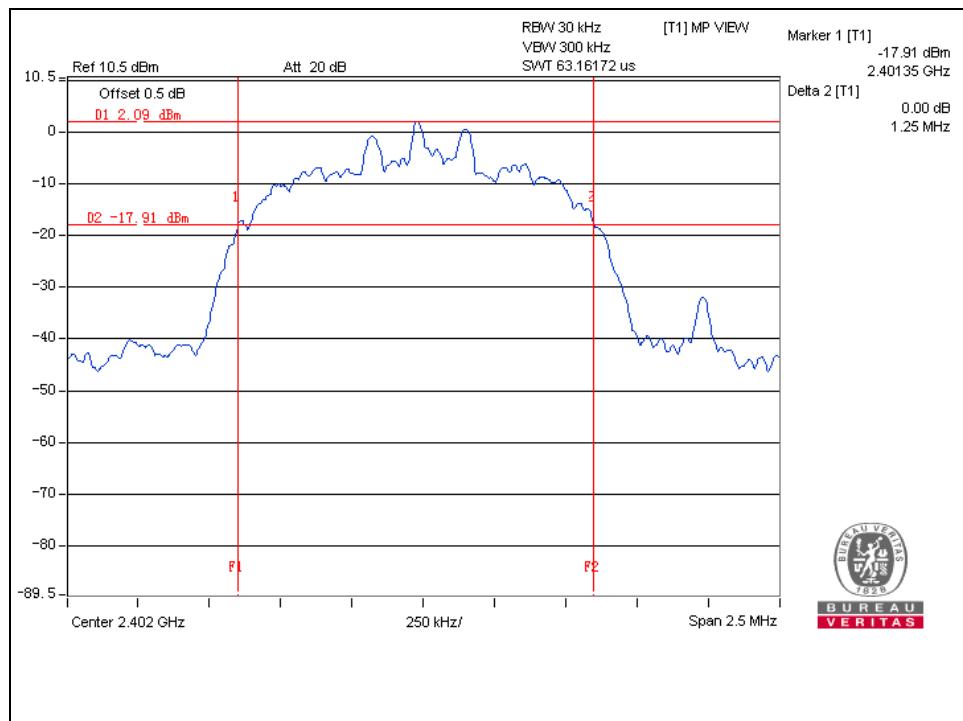
Test Report No.: RF130521N008

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8DPSK DH5

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
Low	2402	1.25
Middle	2441	1.25
Hight	2480	1.25

Test Data: Low channel

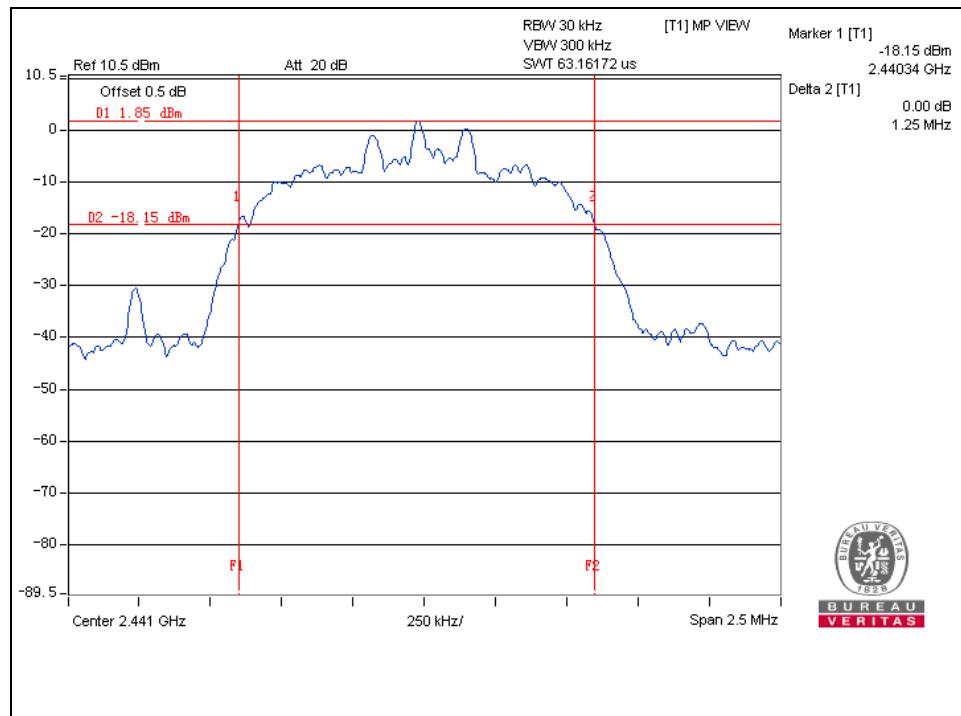




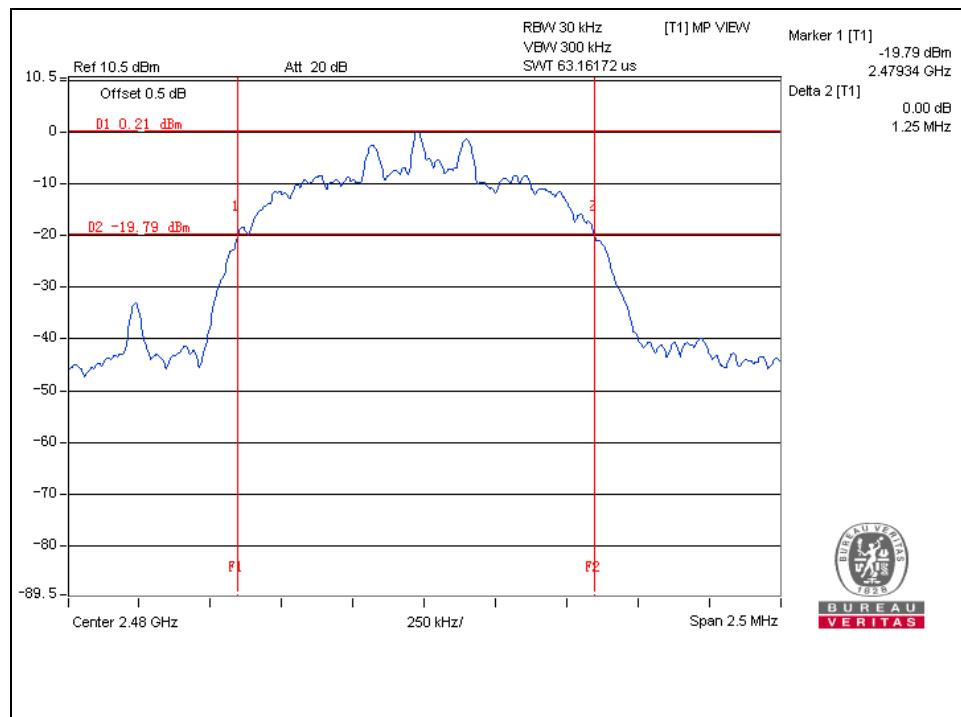
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Test Report No.: RF130521N008

Test Data: Middle channel



Test Data: High channel





Test Report No.: RF130521N008

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5 PHOTOGRAPHS OF THE TEST CONFIGURATION

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



Test Report No.: RF130521N008

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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---