Test Lab
Cert 2951.01

TEST REPORT

Applicant	Jing Mold Electronics Technology(Shenzhen)Co., LTD.
Address	Xinqiao, 3rd Industrial Estate, Shajing Baoan, Shenzhen, China

Manufacturer or Supplier	Jing Mold Electronics Technology (Shenzhen)Co., LTD.
Address	Xinqiao, 3rd Industrial Estate, Shajing Baoan, Shenzhen, China
Product	Slim Bluetooth Keyboard
Brand Name	JME
Model	EBK-10KA
Additional Model & Model Difference	See Item 2.1
Date of tests	Nov. 1 ~ Nov. 17, 2011

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

☒ FCC Part 15, Subpart C (Section 15.247)

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

Tested by Madison Luo Project Engineer / EMC Department	Approved by Sam Tung Manager / EMC Department
Madison	Date: Nov. 21, 2011

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
Original release	N/A	Nov. 21, 2011

1. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C			
STANDARD SECTION	**TEST TYPE AND LIMIT**	**RESULT**	**REMARK**
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit Minimum passing margin is -10.76 dB at 0.40781 MHz
15.247(a)(1)(iii)	Number of Hopping Frequency Used Spec.: At least 15 channels	PASS	Meet the requirement of limit.
15.247(a)(1)(iii)	Dwell Time on Each Channel Spec.: Max. 0.4 second within 31.6 second	PASS	Meet the requirement of limit.
15.247(a)(1)	1. Hopping Channel Separation Spec.: Min. 25 kHz or 20 dB bandwidth, whichever is greater 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	PASS	Meet the requirement of limit.
15.247(b)	Maximum Peak Output Power Spec.: max. 21dBm	PASS	Meet the requirement of limit.
15.247(d)	Transmitter Radiated Emissions Spec.: Table 15.209	PASS	Meet the requirement of limit Minimum passing margin is -4.25dB at 608.27MHz
15.247(d)	Conducted Out-Band Emission Measurement	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used.

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

2. 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:

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

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	0.15MHz ~ 30MHz	+/- 2.56dB
Radiated emissions	30MHz~ 1GHz	+/- 3.58dB
Radiated emissions	1GHz ~ 26.5GHz	+/- 3.58dB

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Slim Bluetooth Keyboard
MODEL NO.	EBK-10KA / EBK-10KB / IRK05-BN
FCC ID	FPW-EBK10KA
POWER SUPPLY	DC 3.7V From Battery and DC 5V From PC
MODULATION TYPE	GFSK
MODULATION TECHNOLOGY	FHSS
DATE RATE	1/2/3Mbps
FREQUENCY RANGE	2402MHz ~ 2480MHz
NUMBER OF CHANNEL	79
MAX. OUTPUT POWER	0.23mW
ANTENNA TYPE	PCB printed antenna with 1.87dBi antenna gain
DATA CABLE	NA
I/O PORTS	USB Mini Port
ASSOCIATED DEVICES	NA

NOTE:

1. Models EBK-10KA / EBK-10KB / IRK05-BN in appearance of the structure, color and the mode number are difference, at the circuit principle, electrical construction and critical parts are same. The EBK-10KA was selected to test with all combinations.

2. The EUT is a Bluetooth Keyboard, Client claim that only applies to the GFSK modulation. The mini USB port is used EUT charging.
3. The above EUT information was declared by the manufacturer and for more detailed feature descriptions, please refer to the manufacturer's specifications or User's Manual.

3.2 DESCRIPTION OF TEST MODES

Seventy-nine channels are provided to this EUT.

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

3.3 TEST MODE APPLICABLITY AND TESTED CHANNEL DETAIL:

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

Where **PLC:** Power Line Conducted Emission **RE < 1G:** Radiated Emission below 1GHz
RE ≥ 1G: Radiated Emission above 1GHz **APCM:** Antenna Port Conducted Measurement
OB: Conducted Out-Band Emission Measurement

Power Line Conducted Emission Test:

☒The EUT was tested under the following modes' the final worst mode were marked in boldface and recorded in this report.

Test Mode	Input Power
Charging	DC 5V From PC Input AC 120V/60Hz

Radiated Emission Test (Below 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

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

Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
0 to 78	78	FHSS	GFSK	DH5

Radiated Emission Test (Above 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

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

Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
0 to 78	0, 39, 78	FHSS	GFSK	DH5

Antenna Port Conducted Measurement:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

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

Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
0 to 78	0, 39, 78	FHSS	GFSK	DH5

Conducted Out-Band Emission Measurement:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

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

Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
0 to 78	0, 78	FHSS	GFSK	DH5

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (system)	TESTED BY
PLC	24deg. C, 54%RH	120Vac, 60 Hz	Madison Luo
RE<1G	23deg. C, 60%RH	120Vac, 60 Hz	Madison Luo
RE≥1G	27deg. C, 65%RH	120Vac, 60 Hz	Madison Luo
APCM	25deg. C, 60%RH	120Vac, 60 Hz	Madison Luo
OB	25deg. C, 60%RH	120Vac, 60 Hz	Madison Luo

3.4 GENERAL DESCRIPTION OF APPLIED STANDARDS

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

FCC Part 15, Subpart C. (15.247)
ANSI C63.4-2003
ANSI C63.10-2009

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

3.5 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	Notebook	DELL	5P2PM2X	12400120329	N/A
2	Mouse	DELL	M-UAR DELT	HS90713510W	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	DC Line: Unshielded 1.5m
2	Unshielded,Undetachable 1.8m

NOTE: All power cords of the above support units are non shielded (1.5m).

3.6 CONFIGURATION OF SYSTEM UNDER TEST

Please refer to setup photos

4. TEST PROCEDURES 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 0.5-5 5-30	66 to 56 56 60	56 to 46 46 50

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. All emanations from a class B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCS30	100199	May 25,11	May 25,12
Artificial Mains Network	Rohde&Schwarz	ENV216	101173	May 25,11	May 25,12
Artificial Mains Network (AUX)	Kyoritsu	KNW-407	8-1579-1	May 25,11	May 25,12
RF Cable	FUJIKURA	3D-2W	553 Cable	May 2,11	May 2,12
Impedance Stabilization Network	TESEQ	ISN T800	27957	Oct 12,11	Oct 12,12

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 Shielded Room 553.

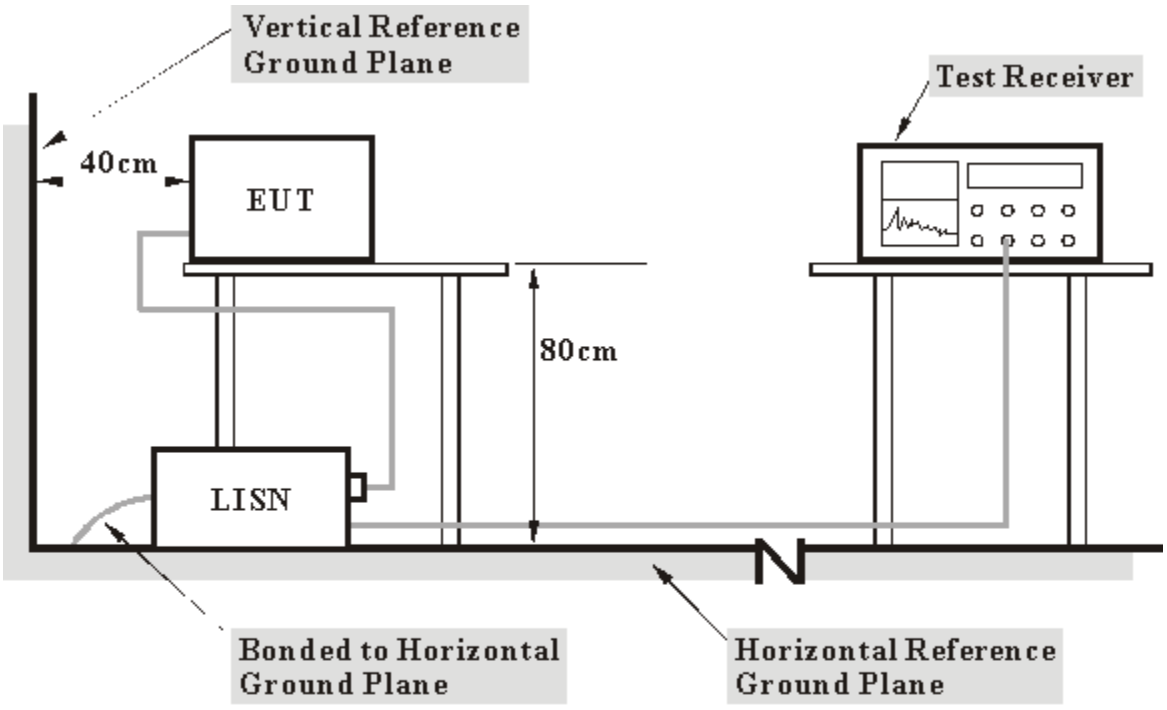
4.1.3 TEST PROCEDURES

a. The EUT/HOST was placed 0.4 meters from the conducting wall of the shielded room with EUT/HOST 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/HOST were checked for maximum conducted interference.

c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels over 10dB under the prescribed limits could not be reported

4.1.4 TEST SETUP



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.1.5 EUT OPERATING CONDITIONS

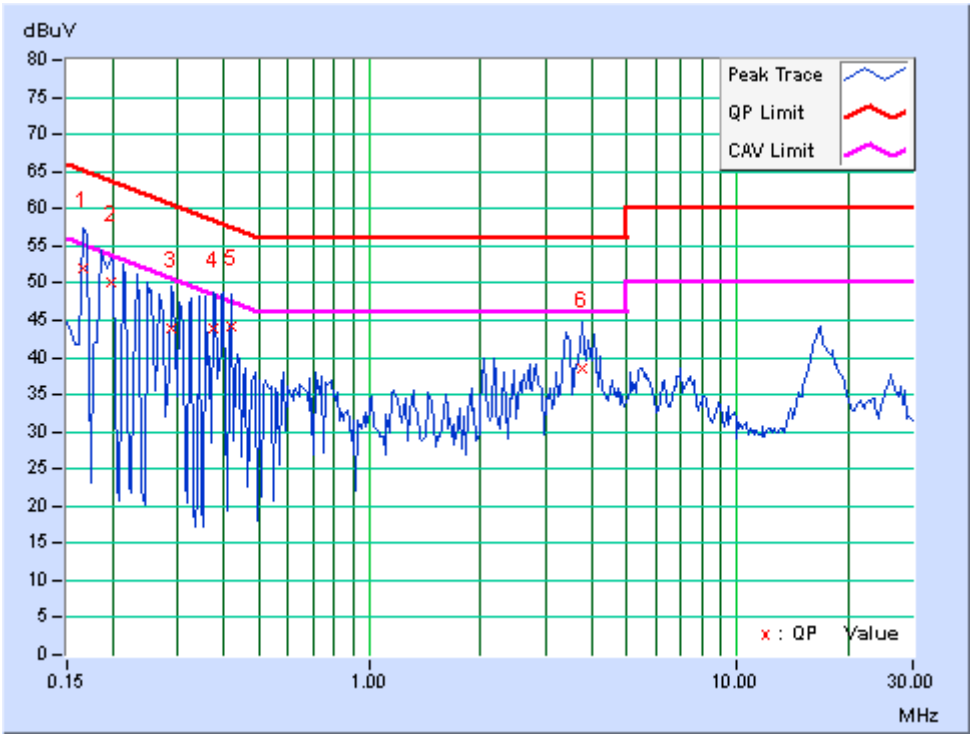
1. The EUT linked to support unit 1 (Notebook Computer) and which was placed on a testing table.
2. The support unit 1 (Notebook Computer) ran a test program “bluetool 1.4.4.9” to enable EUT under transmission condition continuously at specific channel frequency.

4.1.6 TEST RESULTS

TEST MODE	Charging	PHASE	Line(L)
INPUT POWER	DC 5V From PC Input AC 120V/60Hz	6dB BANDWIDTH	9 kHz
ENVIRONMENTAL CONDITIONS	24 deg. C, 54% RH,	TESTED BY: Madison	

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16562	9.64	42.42	29.88	52.06	39.52	65.18	55.18	-13.12	-15.66
2	0.19687	9.64	40.56	31.17	50.20	40.81	63.74	53.74	-13.54	-12.93
3	0.28672	9.57	34.23	23.80	43.80	33.37	60.62	50.62	-16.82	-17.25
4	0.37656	9.50	34.40	22.18	43.90	31.68	58.35	48.35	-14.45	-16.67
5	0.41953	9.47	34.80	20.87	44.27	30.34	57.46	47.46	-13.19	-17.12
6	3.76953	10.19	28.28	17.43	38.47	27.62	56.00	46.00	-17.53	-18.38

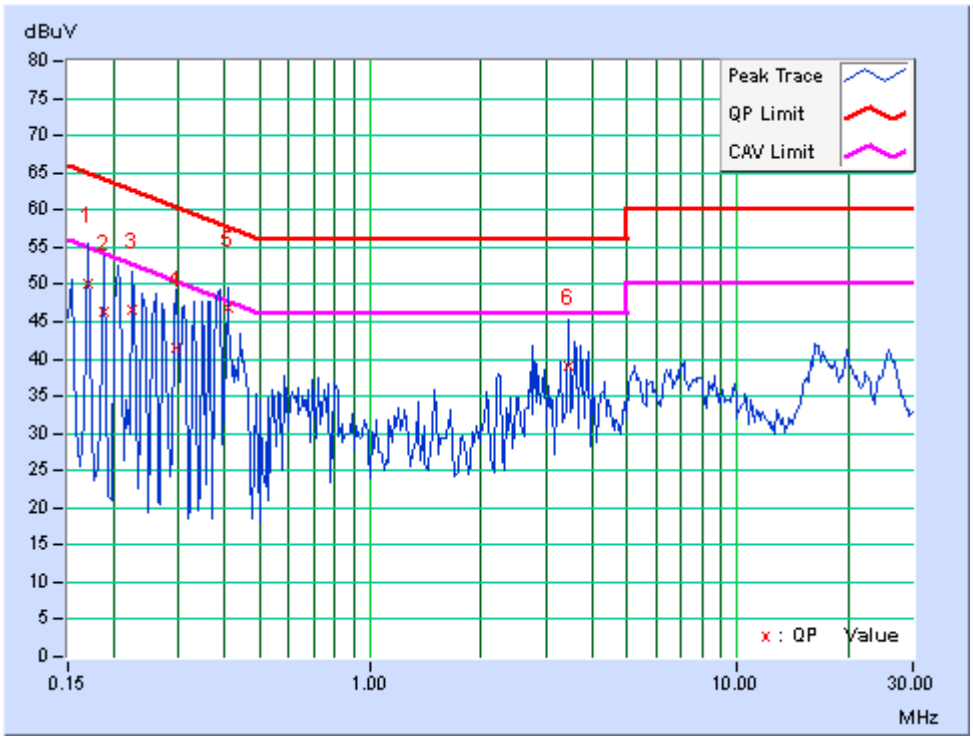
REMARKS:
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading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



TEST MODE	Charging	**6dB BANDWIDTH**	9 kHz
INPUT POWER	DC 5V From PC Input AC 120V/60Hz	**PHASE**	Line (L)
ENVIRONMENTAL CONDITIONS	24 deg. C, 54% RH,	**TESTED BY**: Madison	

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16953	9.63	40.48	28.62	50.11	38.25	64.98	54.98	-14.87	-16.73
2	0.18906	9.63	36.78	25.24	46.41	34.87	64.08	54.08	-17.67	-19.21
3	0.22422	9.61	36.95	23.09	46.56	32.70	62.66	52.66	-16.10	-19.96
4	0.29453	9.56	31.93	20.44	41.49	30.00	60.40	50.40	-18.90	-20.39
5	**0.40781**	**9.48**	**37.46**	**24.42**	**46.94**	**33.90**	**57.69**	**47.69**	**-10.76**	**-13.80**
6	3.44531	10.16	28.99	18.29	39.15	28.45	56.00	46.00	-16.85	-17.55

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



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

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. Section 15.205 restricted bands of operation shall compliance with the limits in Section 15.209.

4.2.2 TEST INSTRUMENTS

Below 1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Spectrum Analyzer	Agilent	E7405A	MY45118807	May 25,11	May 25,12
Spectrum Analyzer	Agilent	E4446A	MY46180622	Apr. 25,11	Apr. 25,12
EMI Test Receiver	Rohde&Schwarz	ESU	100005	May 25,11	May 25,12
Bilog Antenna	Teseq	CBL 6111D	27089	Jul.24,11	Jul.24,12
10m Semi-anechoic Chamber	ETS-LINDGREN	21.4m*12.1m* 8.8m	NSEMC006	May 2,11	May 2,12
RF Cable	IMRO	IMRO-400	10m Cable 1#10m	May 2,11	May 2,12
RF Cable	IMRO	IMRO-400	10m Cable 2#3m	May 2,11	May 2,12
Signal Amplifier	Agilent	8447D	2944A11174	May 2,11	May 2,12

Above 1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Horn Antenna	EMCO	3117	00062558	Oct.19,11	Oct.19,12
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170242	Jan 1,11	Jan 1,12
EMI Test Receiver	Rohde&Schwarz	ESU	100005	May 25,11	May 25,12
Spectrum Analyzer	Agilent	E4446A	MY46180622	Apr. 25,11	Apr. 25,12
Signal Amplifier	BURGEON	PEC-38-30M18G -12-SFF	NSEMC001	Oct.16,11	Oct.16,12
RF Cable	DRAKA	M06/25-RG102	10m Cable	May 2,11	May 2,12

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 Chamber 10m.

4.2.3 TEST PROCEDURES

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 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.

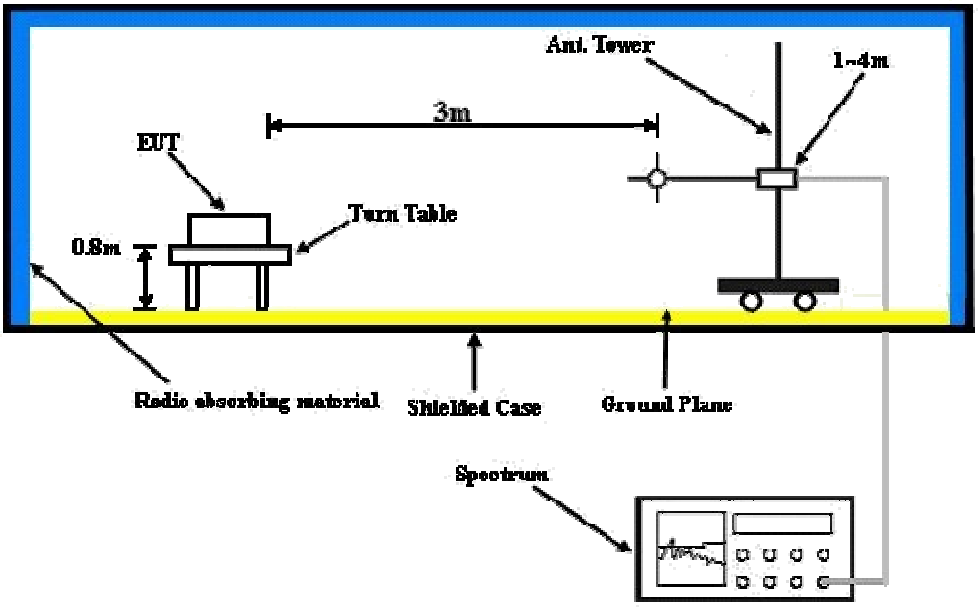
NOTE:

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 4.1.5

4.2.7 TEST RESULTS

BELOW 1GHz WORST-CASE DATA：GFSK MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	23deg. C, 60%RH	TESTED BY	Madison

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	214.98	32.56	43.50	-10.94	325	244	21.70	10.86
2	398.41	36.11	46.00	-9.89	331	360	18.30	17.81
3	569.41	30.56	46.00	-15.44	320	335	8.16	22.40
4	**608.27**	**42.75**	**46.00**	**-3.25**	**352**	**276**	**19.99**	**22.76**
5	645.58	32.50	46.00	-13.50	313	295	9.26	23.24
6	797.92	37.06	46.00	-8.94	262	263	11.80	25.26
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	40.88	31.69	40.00	-8.31	**112**	**165**	17.95	13.74
2	210.32	29.46	43.50	-14.04	110	76	18.77	10.69
3	399.97	35.49	46.00	-10.51	102	175	17.61	17.88
4	570.96	35.78	46.00	-10.22	105	284	13.39	22.39
5	608.94	42.60	46.00	-3.40	121	253	19.83	22.77
6	799.47	35.42	46.00	-10.58	125	217	10.18	25.24

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.

GFSK MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	AC 120V/60Hz	DETECTOR FUNCTION	Peak (PK)
ENVIRONMENTAL CONDITIONS	27deg. C, 65%RH	TESTED BY	Madison

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	54.30 PK	74.0	-19.70	116	54	18.80	35.50
2	2390.00	24.20 AV	54.0	-29.80	116	54	-11.30	35.50
3	*2402.00	88.22 PK			100	62	52.62	35.60
4	*2402.00	58.12 AV			100	62	22.52	35.60
5	4803.98	59.60 PK	74.0	-14.40	112	63	11.46	48.14
6	4803.98	29.50 AV	54.0	-24.50	112	63	-18.64	48.14
7	5355.77	60.44 PK	74.0	-13.56	111	65	14.58	48.86
8	5355.77	30.34AV	54.0	-23.66	111	65	-18.52	48.86
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	53.60 PK	74.0	-20.4	105	23	18.10	35.50
2	2390.00	23.50 AV	54.0	-30.5	105	23	-12.00	35.50
3	*2402.00	88.00 PK			100	25	52.40	35.60
4	*2402.00	57.90 AV			100	25	22.30	35.60
5	4804.00	59.90 PK	74.0	-17.10	110	65	11.76	48.14
6	4804.00	29.80 AV	54.0	-24.2	110	65	-18.34	48.14
7	5329.41	60.48 PK	74.0	-13.52	100	360	14.65	48.83
8	5329.41	30.38 AV	54.0	-23.62	100	360	-18.45	48.83

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
INPUT POWER (SYSTEM)	AC 120V/60Hz	DETECTOR FUNCTION	Peak (PK)
ENVIRONMENTAL CONDITIONS	27deg. C, 65%RH	TESTED BY	Madison

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2441.00	90.81PK			208	32	54.89	35.92
2	*2441.00	60.71 AV			208	32	24.79	35.92
3	4882.00	60.31 PK	74.0	-13.69	185	29	17.26	48.05
4	4882.00	30.21 AV	54.0	-23.79	185	29	-17.84	48.05
5	5344.41	57.99 PK	74.0	-16.01	185	29	14.15	48.84
6	5344.41	27.89 AV	54.0	-26.11	185	29	-20.95	48.84
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2441.00	87.35PK			100	0	51.43	35.92
2	*2441.00	57.25 AV			100	0	21.33	35.92
3	4882.00	58.05 PK	74.0	-15.95	210	333	15.00	48.05
4	4882.00	27.95 AV	54.0	-29.05	210	333	-20.10	48.05
5	5346.25	57.85 PK	74.0	-16.15	105	329	14.00	48.85
6	5346.25	27.75 AV	54.0	-26.25	105	329	-21.10	48.85

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.
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
INPUT POWER (SYSTEM)	AC 120V/60HZ	DETECTOR FUNCTION	Peak (PK)
ENVIRONMENTAL CONDITIONS	27eg. C, 65%RH	TESTED BY	Madison

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	89.05 PK			210	64	52.81	36.24
2	*2480.00	58.95AV			210	64	22.71	36.24
3	2483.50	56.0 PK	74.0	-18.0	200	34	19.74	36.26
4	2483.50	25.9 AV	54.0	-28.1	200	34	-10.36	36.26
5	4960.00	62.04 PK	74.0	-11.96	220	79	19.11	47.93
6	4960.00	31.94AV	54.0	-22.06	220	79	-15.99	47.93
7	5346.31	58.52 PK	74.0	-15.48	220	79	14.67	48.85
8	5346.31	28.42AV	54.0	-25.58	220	79	-20.43	48.85
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	91.78 PK			210	15	55.54	36.24
2	*2480.00	61.68AV			210	15	25.54	36.24
3	2483. 50	56.70 PK	74.0	-17.3	210	47	20.44	36.26
4	2483. 50	26.60 AV	54.0	-27.4	210	47	-9.66	36.26
5	4960.00	60.44 PK	74.0	-13.56	220	79	17.51	47.93
6	4960.00	30.34AV	54.0	-23.66	220	79	-17.59	47.93
7	5423.16	57.93 PK	74.0	-16.07	120	160	13.94	48.99
8	5423.16	27. 83AV	54.0	-26.17	120	160	-21.16	48.99

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 NUMBER OF HOPPING FREQUENCY USED

4.3.1 LIMIT OF HOPPING FREQUENCY USED

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

4.3.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
SPECTRUM ANALYZER(Agilent)	E4446A	MY46180622	Apr. 25,11	May 25,12

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA and NIM/CHINA

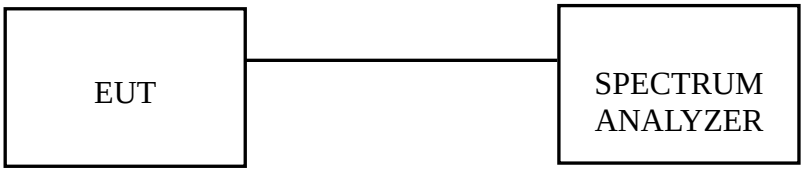
4.3.3 TEST PROCEDURES

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
4. Set the SA on View mode and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

4.3.4 DEVIATION FROM TEST STANDARD

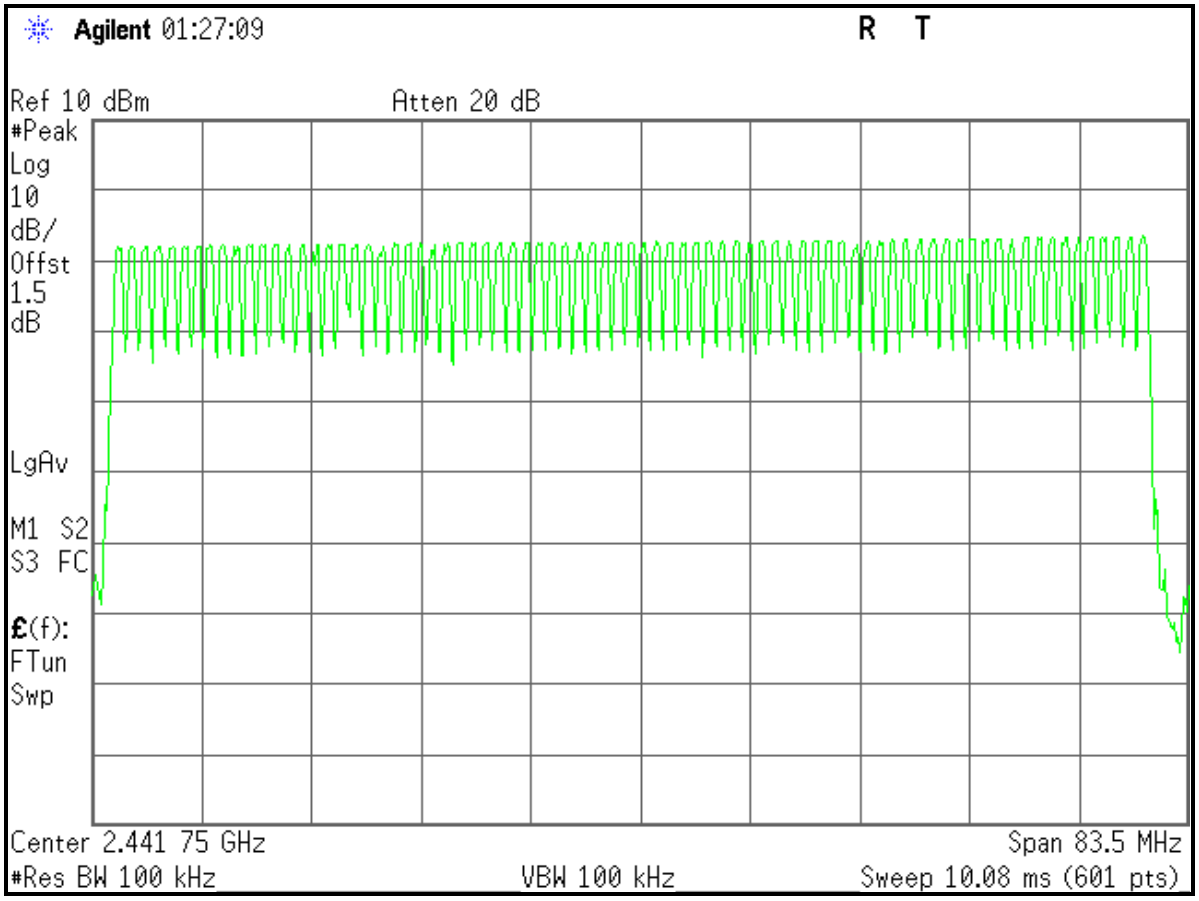
No deviation

4.3.5 TEST SETUP



4.3.6 TEST RESULTS

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



4.4 DWELL TIME ON EACH CHANNEL

4.4.1 LIMIT OF DWELL TIME USED

For FHSS, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 31.6 second period. For hybrid systems, the average time of occupancy on any frequency should not exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4.

4.4.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
SPECTRUM ANALYZER(Agilent)	E4446A	MY46180622	Apr. 25,11	May 25,12

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

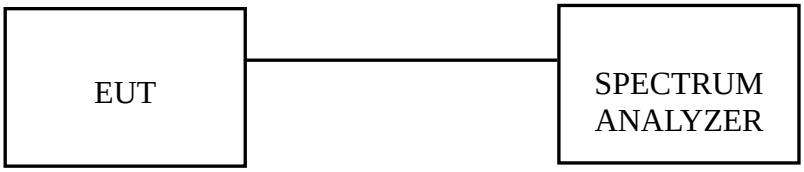
4.4.3 TEST PROCEDURES

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
4. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
5. Repeat above procedures until all frequencies measured were complete

4.4.4 DEVIATION FROM TEST STANDARD

No deviation

4.4.5 TEST SETUP



4.4.6 TEST RESULTS

For GFSK:

DH1:0.425*(1600/2)/79*31.6=136.00 (ms)

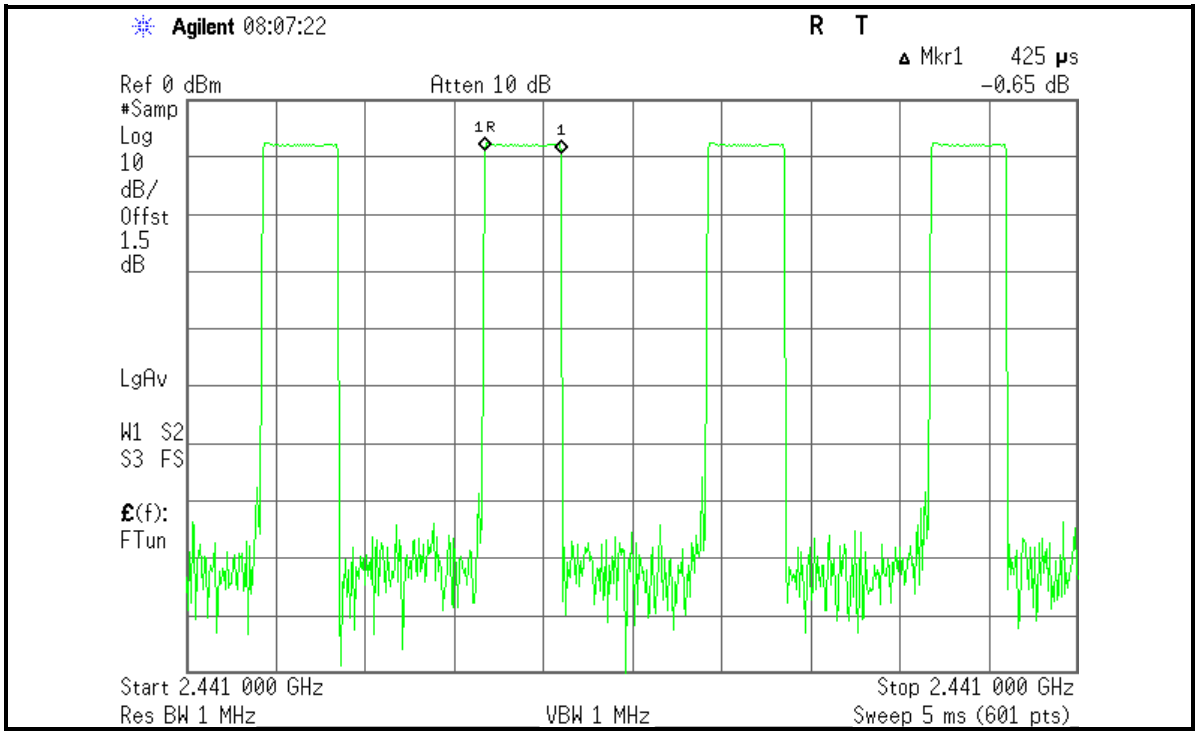
DH3:1.683*(1600/4)/79*31.6= 269.28 (ms)

DH5: 2.925*(1600/6)/79*31.6= 312.01 (ms)

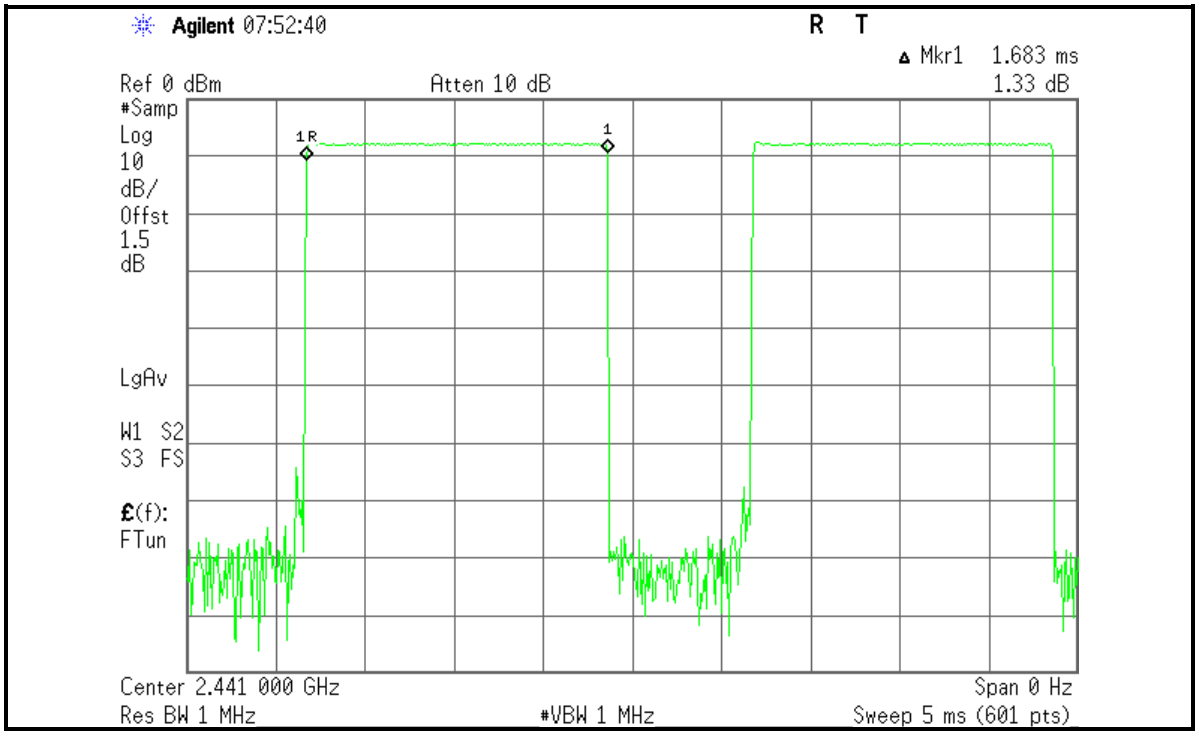
Mode	Pulse Time(ms)	Total of Dwell(ms)	Period Time(S)	Limit (msec)	Result
DH1	0.425	136.00	31.6	400	PASS
DH3	1.683	269.28	31.6	400	PASS
DH5	2.925	312.01	31.6	400	PASS

NOTE: Test plots of the transmitting time slot are shown on next 2 pages.

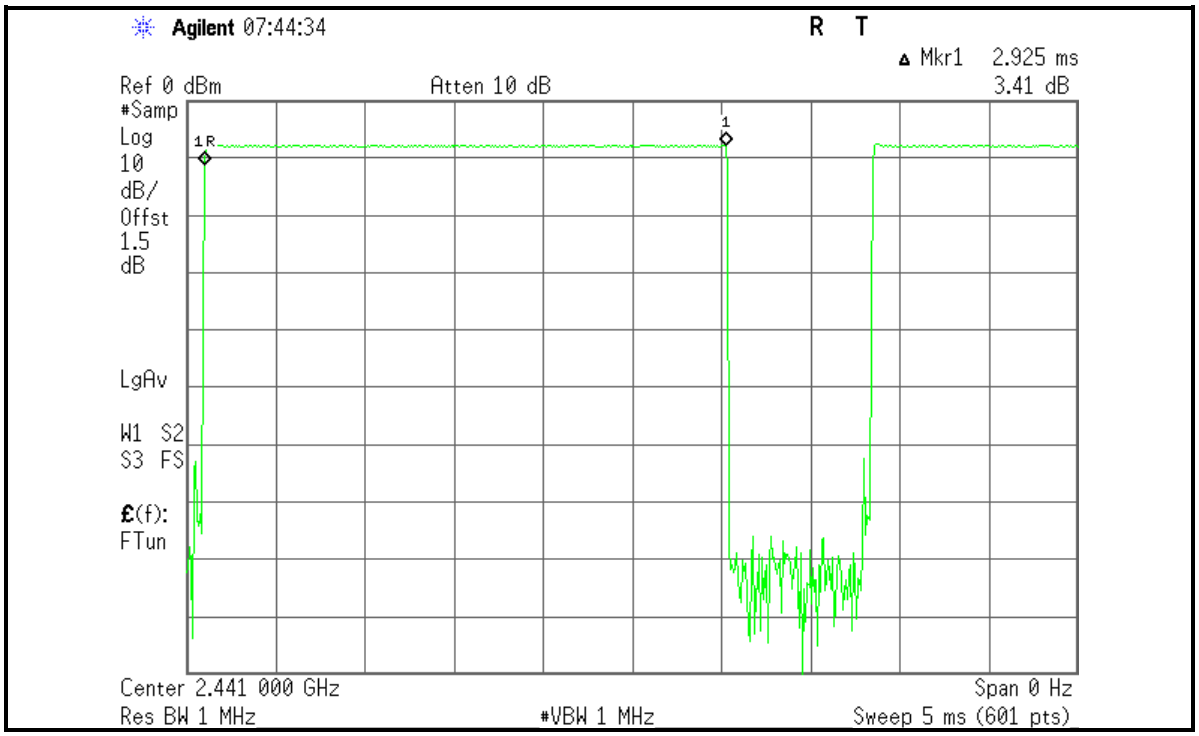
DH1



DH3


Agilent 07:52:40
R T
Mkr1 1.683 ms
1.33 dB
Ref 0 dBm
Atten 10 dB
#Samp
Log
10
dB/
Offst
1.5
dB
1R
1
LgAv
W1 S2
S3 FS
£(f):
FTun
Center 2.441 000 GHz
Span 0 Hz
Res BW 1 MHz
#VBW 1 MHz
Sweep 5 ms (601 pts)

DH5


Agilent 07:44:34
R T
Mkr1 2.925 ms
3.41 dB
Ref 0 dBm
Atten 10 dB
#Samp
Log
10
dB/
Offst
1.5
dB
1R
1
LgAv
W1 S2
S3 FS
£(f):
FTun
Center 2.441 000 GHz
Span 0 Hz
Res BW 1 MHz
#VBW 1 MHz
Sweep 5 ms (601 pts)

4.5 CHANNEL BANDWIDTH

4.5.1 LIMITS OF CHANNEL BANDWIDTH

For frequency hopping system operating in the 2400-2483.5MHz, If the two-thirds 20dB bandwidth of hopping channel is greater than 25kHz, two-thirds 20dB bandwidth of hopping channel shell be a minimum limit for the hopping channel separation.

4.5.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
SPECTRUM ANALYZER(Agilent)	E4446A	MY46180622	Apr. 25,11	Apr. 25,12

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

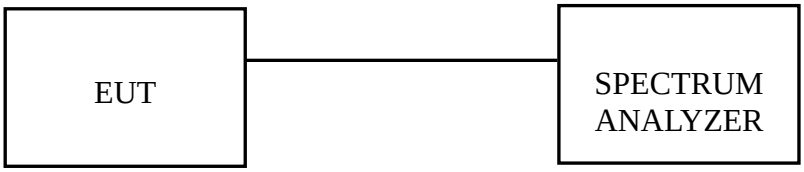
4.5.3 TEST PROCEDURE

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

4.5.4 DEVIATION FROM TEST STANDARD

No deviation

4.5.5 TEST SETUP



4.5.6 EUT OPERATING CONDITION

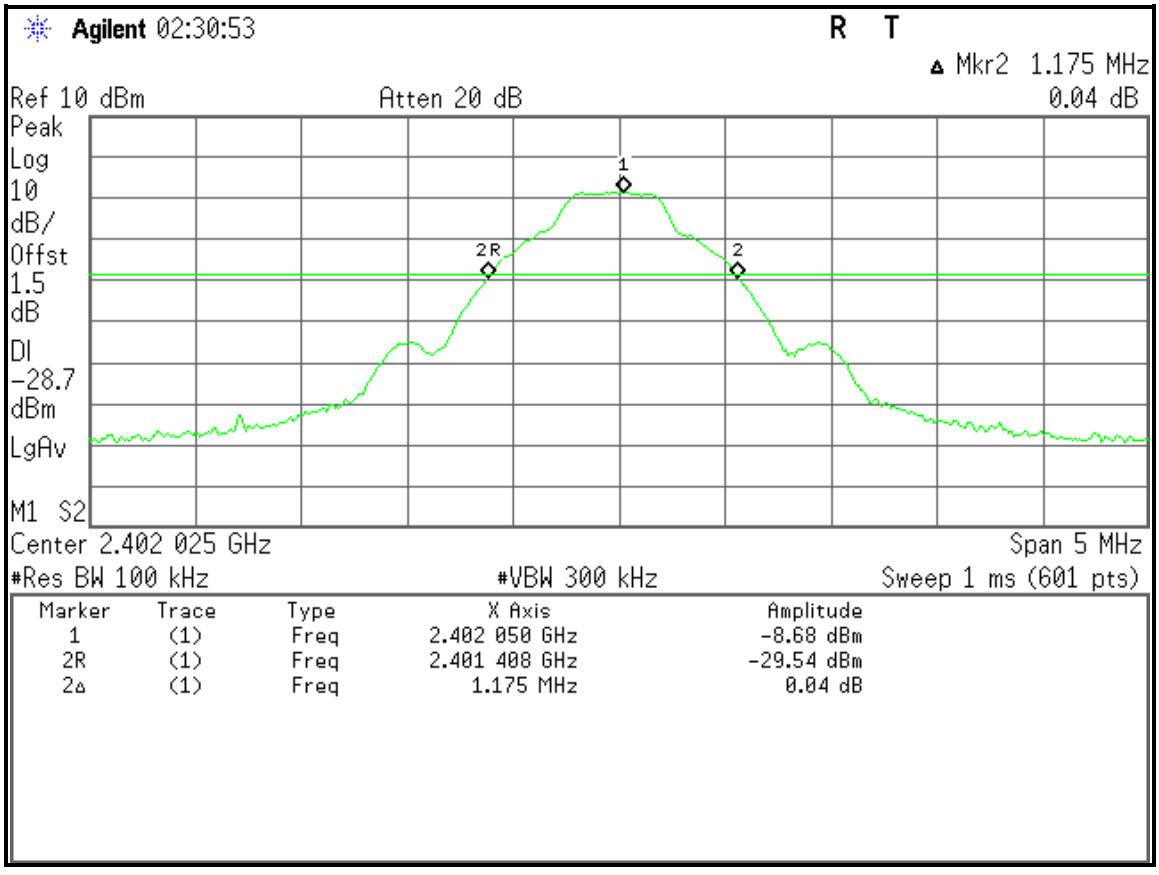
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.5.7 TEST RESULTS

For GFSK:

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	1.175
39	2441	1.175
78	2480	1.142

CH 0



4.6 HOPPING CHANNEL SEPARATION

4.6.1 LIMIT OF HOPPING CHANNEL SEPARATION

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

4.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
SPECTRUM ANALYZER(Agilent)	E4446A	MY46180622	Apr. 25,11	Apr. 25,12

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

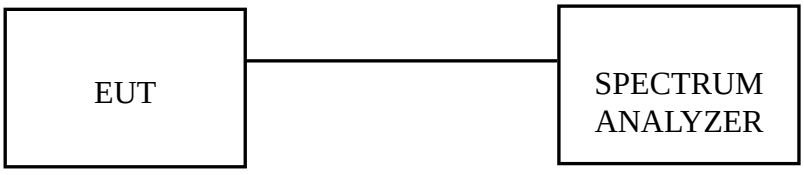
4.6.3 TEST PROCEDURES

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

4.6.4 DEVIATION FROM TEST STANDARD

No deviation

4.6.5 TEST SETUP



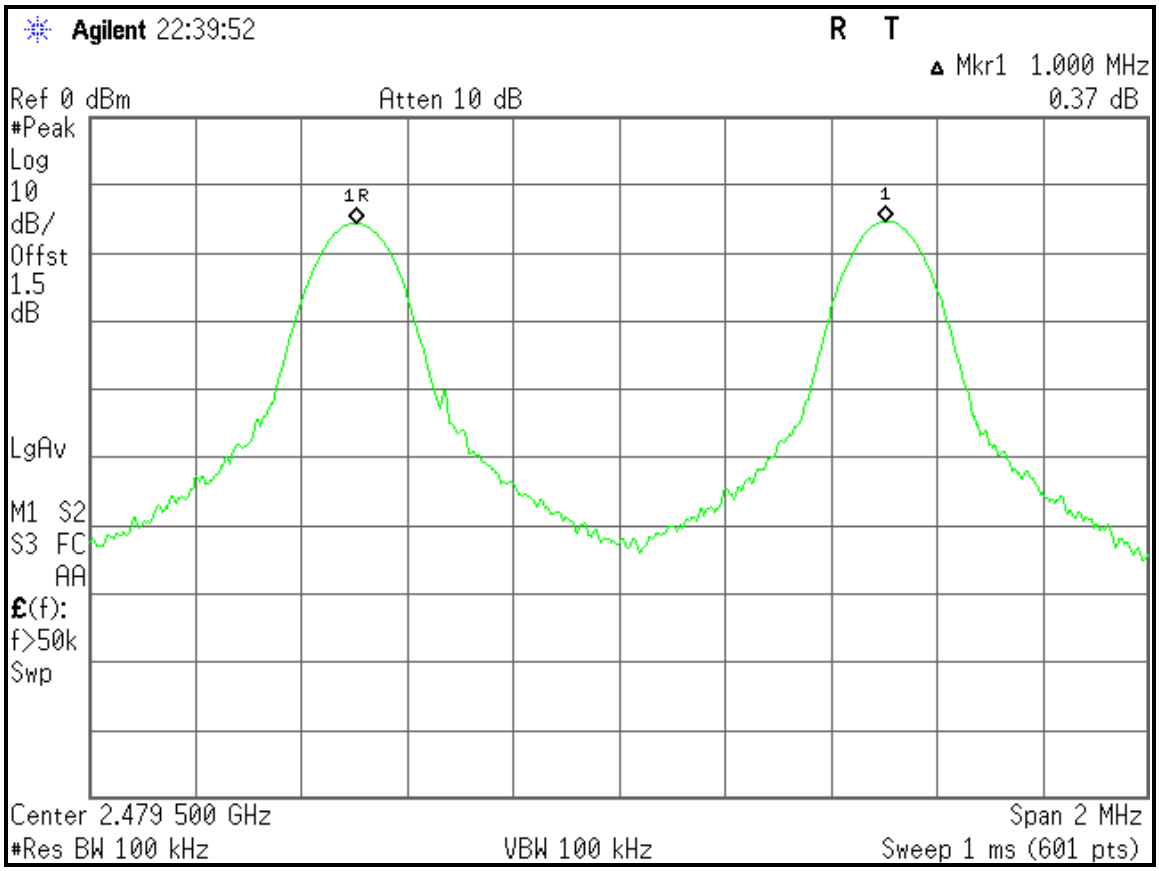
4.6.6 TEST RESULTS

For GFSK

Channel	Frequency (MHz)	Adjacent Channel Separation (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	1.000	0.783	PASS
39	2441	1.000	0.783	PASS
78	2480	1.000	0.761	PASS

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

CH 78



4.7 MAXIMUM PEAK OUTPUT POWER

4.7.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The Maximum Peak Output Power Limit is 125mW.

4.7.2 INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
SPECTRUM ANALYZER(Agilent)	E4446A	MY46180622	Apr. 25,11	Apr. 25,12

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

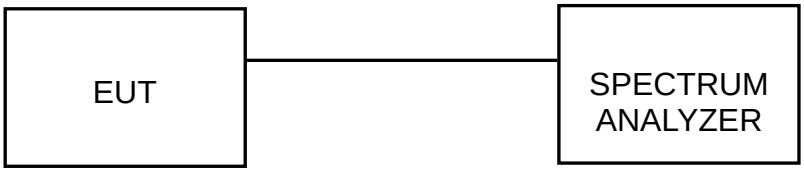
4.7.3 TEST PROCEDURES

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. The center frequency of the spectrum analyzer is set to the fundamental frequency and using 3 MHz RBW and 10 MHz VBW.
4. Measure the captured power within the band and recording the plot.
5. Repeat above procedures until all frequencies measured were complete.

4.7.4 DEVIATION FROM TEST STANDARD

No deviation

4.7.5 TEST SETUP



For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

4.7.6 EUT OPERATING CONDITION

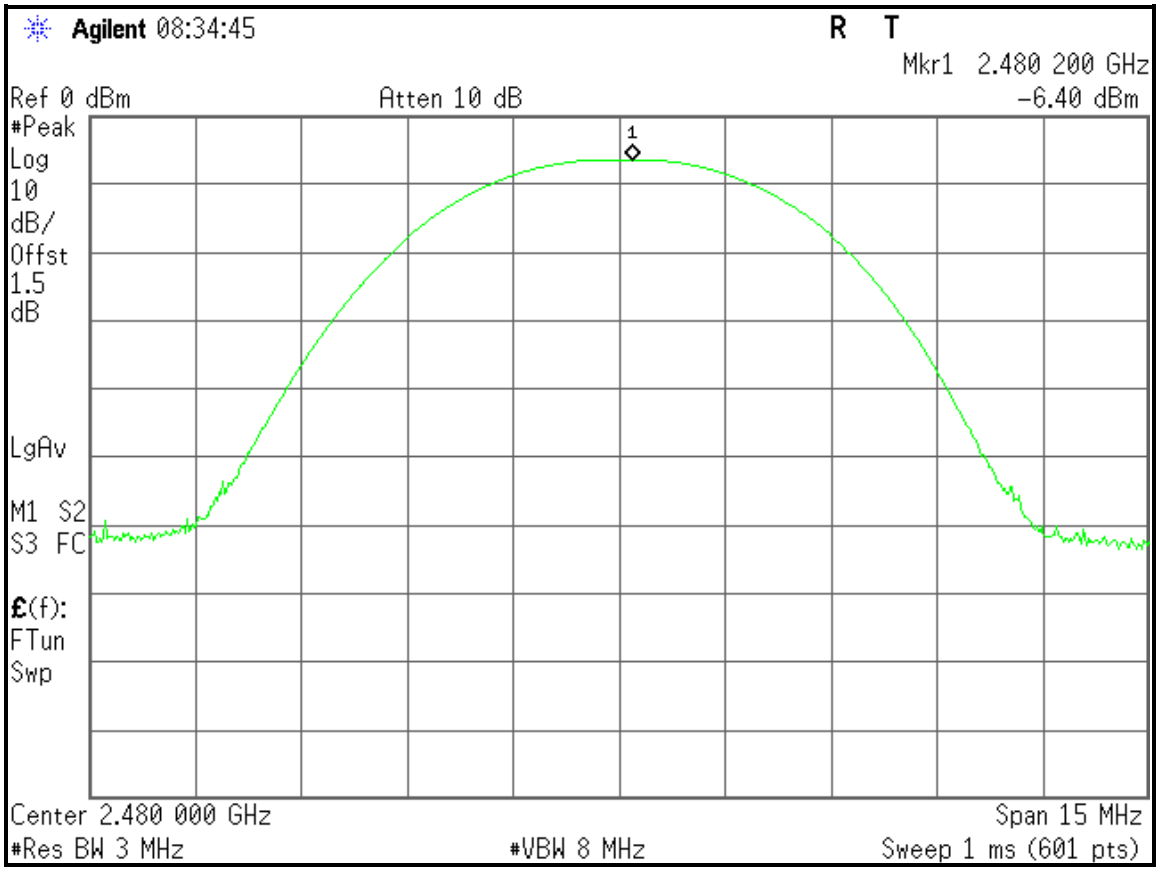
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.7.7 TEST RESULTS

GFSK

CHANNEL	CHANNEL FREQUENCY (MHz)	POWER OUTPUT (dBm)	POWER OUTPUT (mW)	POWER LIMIT (mW)	PASS/FAIL
0	2402	-8.25	0.14	125	PASS
39	2441	-7.70	0.16	125	PASS
78	2480	-6.40	0.23	125	PASS

CH 78



4.8 CONDUCTED OUT-BAND EMISSION MEASUREMENT

4.8.1 LIMITS OF CONDUCTED OUT-BAND EMISSION MEASUREMENT

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

4.8.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
SPECTRUM ANALYZER(Agilent)	E4446A	MY46180622	Apr. 25,11	Apr. 25,12

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.8.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set RBW a of spectrum analyzer to 100 kHz and VBW of spectrum analyzer to 300 kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

4.8.4 DEVIATION FROM TEST STANDARD

No deviation

4.8.5 EUT OPERATING CONDITION

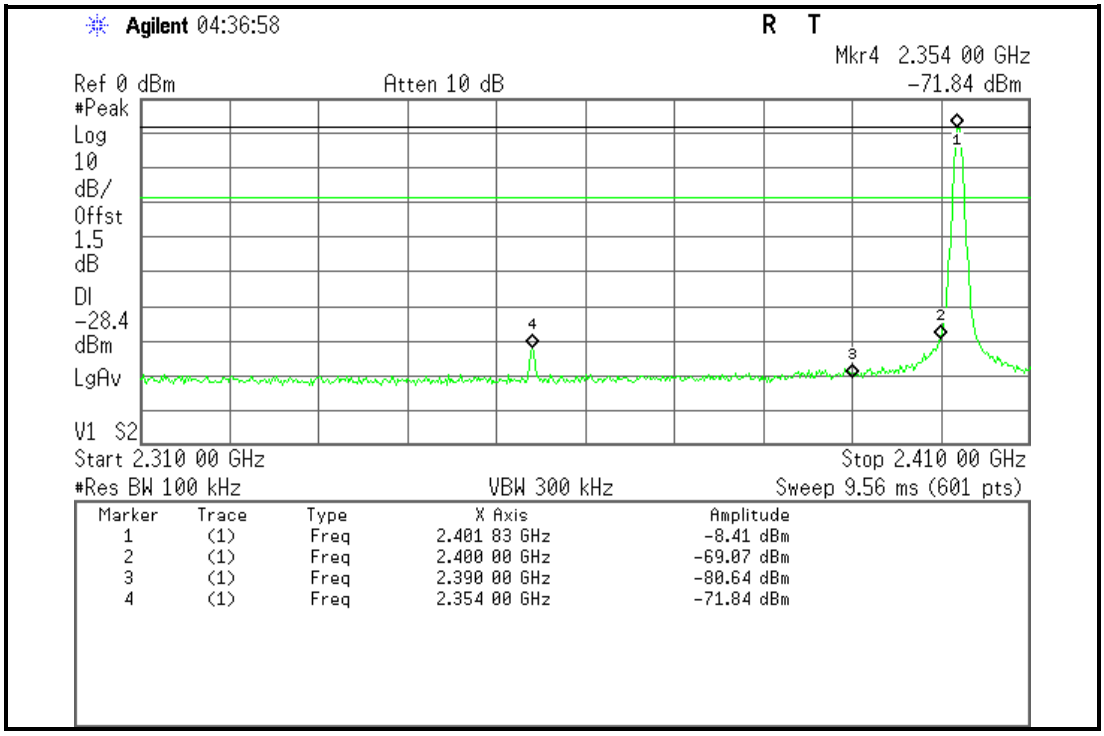
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

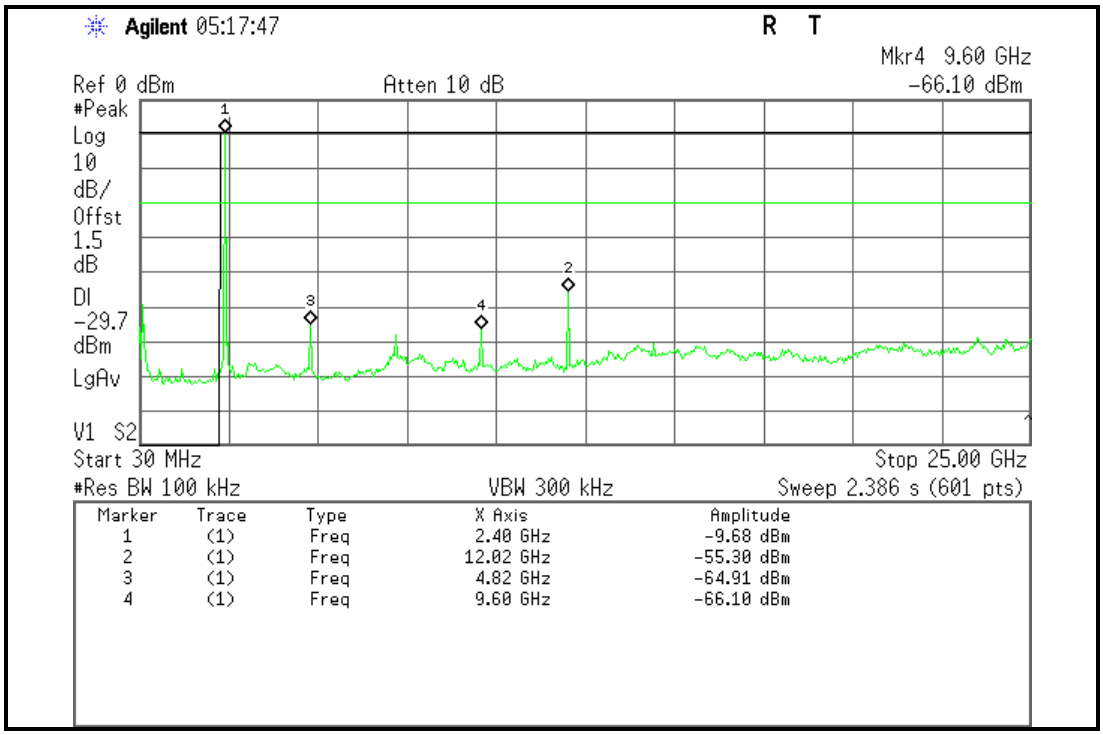
4.8.6 TEST RESULTS

The spectrum plots are attached on the following images. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement in part 15.247(d).

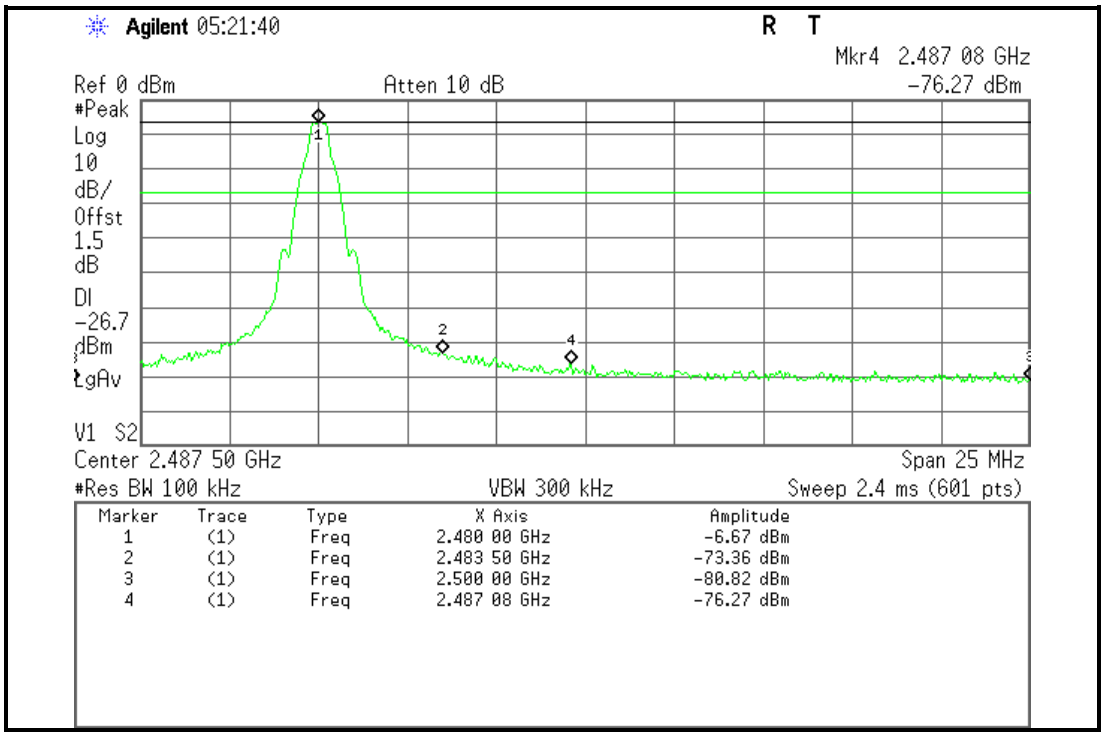
For GFSK Modulation Type:

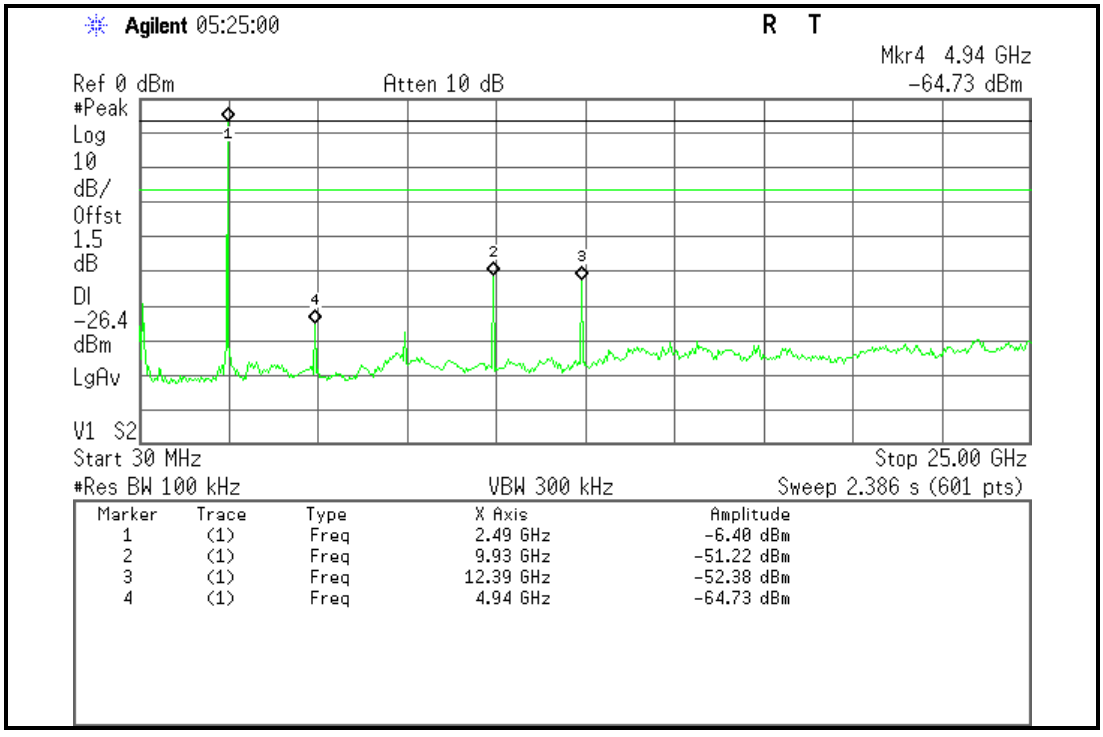
CH 0





CH 78


Agilent 05:21:40
R T
Mkr4 2.487 08 GHz
Ref 0 dBm
Atten 10 dB
-76.27 dBm
#Peak
Log
10
dB/
Offst
1.5
dB
Dl
-26.7
dBm
LgAv
V1 S2
Center 2.487 50 GHz
Span 25 MHz
#Res BW 100 kHz
VBW 300 kHz
Sweep 2.4 ms (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.480 00 GHz -6.67 dBm
2 (1) Freq 2.483 50 GHz -73.36 dBm
3 (1) Freq 2.500 00 GHz -80.82 dBm
4 (1) Freq 2.487 08 GHz -76.27 dBm


Agilent 05:25:00
R T
Mkr4 4.94 GHz
Ref 0 dBm
Atten 10 dB
-64.73 dBm
#Peak
Log
10
dB/
Offst
1.5
dB
Dl
-26.4
dBm
LgAv
V1 S2
Start 30 MHz
Stop 25.00 GHz
#Res BW 100 kHz
VBW 300 kHz
Sweep 2.386 s (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.49 GHz -6.40 dBm
2 (1) Freq 9.93 GHz -51.22 dBm
3 (1) Freq 12.39 GHz -52.38 dBm
4 (1) Freq 4.94 GHz -64.73 dBm

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---