



Shenzhen Certification Technology Service Co., Ltd.  
2F, Building B, East Area of Nanchang Second Industrial  
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518126, P.R. China

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# TEST REPORT

**FCC ID: YEKAC-2121**

Applicant : DIGIDOCK DEVELOPMENT INC.

Address : 6F, No.151, Xinhua 1st Rd., Neihu Dist., Taipei City 11494, Taiwan  
(R.O.C.)

Equipment Under Test (EUT):

Name : Bluetooth FM Transmitter

Model : AC-2121

Multi-listing model No.: AC-212XXXX(X=0~9, YYY=A~Z)

In Accordance with: FCC PART 15.247

Report No : STE121226837

Date of Test : January 4-8, 2013

Date of Issue : January 9, 2013

Test Result: **PASS**

In the configuration tested, the EUT complied with the standards specified above

Authorized Signature

A handwritten signature in dark ink, appearing to read 'Mark Zhu', is written over a horizontal line.

(Mark Zhu)

General Manager

The manufacture should ensure that all the products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of Shenzhen Certification Technology Service Co., Ltd. Or test done by Shenzhen Certification Technology Service Co., Ltd. Approvals in connection with, distribution or use of the product described in this report must be approved by Shenzhen Certification Technology Service Co., Ltd. Approvals in writing.

## Contents

<b>1. General Information.....</b>	<b>4</b>
1.1. Description of Device (EUT).....	4
1.2. Accessories of device (EUT) .....	4
1.3. Test Lab information .....	4
<b>2. Summary of test .....</b>	<b>5</b>
2.1. Summary of test result .....	5
2.2. Assistant equipment used for test.....	5
2.3. Block Diagram .....	5
2.4. Test mode .....	6
2.5. Test Conditions.....	6
2.6. Measurement Uncertainty (95% confidence levels, k=2) .....	6
2.7. Test Equipment.....	7
<b>3. Maximum Peak Output power .....</b>	<b>8</b>
3.1. Limit.....	8
3.2. Test Procedure .....	8
3.3. Test Result.....	8
<b>4. 20dB bandwidth .....</b>	<b>9</b>
4.1. Limit.....	9
4.2. Test Procedure .....	9
4.3. Test Result.....	9
<b>5. Carrier Frequency Separation.....</b>	<b>12</b>
5.1. Limit.....	12
5.2. Test Procedure .....	12
5.3. Test Result.....	12
<b>6. Number Of Hopping Channel.....</b>	<b>14</b>
6.1. Limit.....	14
6.2. Test Procedure .....	14
6.3. Test Result.....	14
<b>7. Dwell Time.....</b>	<b>17</b>
7.1. Test limit .....	17
7.2. Test Procedure.....	17
7.3. Test Results .....	17
<b>8. Radiated emissions.....</b>	<b>28</b>
8.1. Limit.....	28
8.2. Block Diagram of Test setup .....	29
8.3. Test Procedure .....	29
8.4. Test Result.....	30
<b>9. Band Edge Compliance .....</b>	<b>39</b>
9.1. Block Diagram of Test Setup .....	39
9.2. Limit.....	39
9.3. Test Procedure .....	39
9.4. Test Result.....	39

<b>10. Power Line Conducted Emissions .....</b>	<b>48</b>
10.1. Block Diagram of Test Setup .....	48
10.2. Limit.....	48
10.3. Test Procedure .....	48
10.4. Test Result.....	48
<b>11. Antenna Requirements.....</b>	<b>49</b>
11.1. Limit.....	49
11.2. Result.....	49
<b>12. Test setup photo .....</b>	<b>50</b>
<b>13. Photos of EUT .....</b>	<b>51</b>

## 1. General Information

### 1.1. Description of Device (EUT)

EUT : Bluetooth FM Transmitter

Model No. : AC-2121  
Multi-listing model No.: AC-212XXXX(X=0~9, XXX=A~Z)

DIFF. : Only different in appearance, the other the same.  
The test model: AC-2121.

Power supply : DC 12/24V Supply by battery

Radio Technology : Bluetooth 3.0

FCC Operation : 2402MHz -2480MHz  
frequency

Channel number : 79

Modulation : GFSK,  $\pi/4$  DQPSK, 8-DPSK

Antenna Type : PCB antenna, Gain: 1.13dBi

Applicant : DIGIDOCK DEVELOPMENT INC.  
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(R.O.C.)

Manufacturer : DIGIDOCK DEVELOPMENT INC.  
Address : 6F, No.151, Xinhua 1st Rd., Neihu Dist., Taipei City 11494, Taiwan  
(R.O.C.)

### 1.2. Accessories of device (EUT)

Accessories 1 : Audio cable  
Type : 0.3m, unshield

### 1.3. Test Lab information

Shenzhen Certification Technology Service Co., Ltd.  
2F, Building B, East Area of Nanchang Second Industrial Zone,  
Gushu 2<sup>nd</sup> Road, Bao'an District, Shenzhen 518126, P.R. China  
FCC Registered No.:197647

## 2. Summary of test

### 2.1. Summary of test result

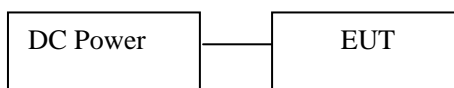
Description of Test Item	Standard	Results
Maximum Peak Output Power	FCC Part 15: 15.247(b)(1) ANSI C63.4 :2003	PASS
20dB Bandwidth	FCC Part 15: 15.215 ANSI C63.4 :2003	PASS
Carrier Frequency Separation	FCC Part 15: 15.247(a)(1) ANSI C63.4 :2003	PASS
Number Of Hopping Channel	FCC Part 15: 15.247(a)(1)(iii) ANSI C63.4 :2003	PASS
Dwell Time	FCC Part 15: 15.247(a)(1)(iii) ANSI C63.4 :2003	PASS
Radiated Emission	FCC Part 15: 15.209 FCC Part 15: 15.247(d) ANSI C63.4 :2003	PASS
Band Edge Compliance	FCC Part 15: 15.247(d) ANSI C63.4 :2003	PASS
Power Line Conducted Emissions	FCC Part 15: 15.207 ANSI C63.4 :2003	PASS
Antenna requirement	FCC Part 15: 15.203	PASS
MPE ESTIMATION	FCC Part 2: 2.1093	PASS

### 2.2. Assistant equipment used for test

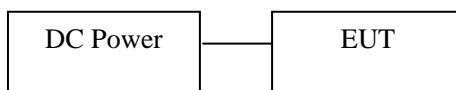
Description : DC Power  
 Manufacturer : LONGWEI  
 Model No. : TPR-12010D

### 2.3. Block Diagram

1, For radiated emissions test: EUT was placed on a turn table, which is 0.8 meter high above ground. EUT was be set into BT test mode by Bluesuite software before test.



2, For Power Line Conducted Emissions Test: EUT was connected to power adapter by 1m USB line



## 2.4. Test mode

The test software “Bluesuite” was used to control EUT work in Continuous TX mode, and select test channel, wireless mode

Tested mode, channel, and data rate information		
Mode	Channel	Frequency (MHz)
BDR:GFSK	Low :CH1	2402
	Middle: CH40	2441
	High: CH79	2480
EDR: $\pi/4$ QPSK	Low :CH1	2402
	Middle: CH40	2441
	High: CH79	2480
EDR:8-DPSK	Low :CH1	2402
	Middle: CH40	2441
	High: CH79	2480

Note: For  $\pi/4$  QPSK its same modulation type with 8-DPSK, and based exploratory test, there is no significant difference of that two types test result, so except output power, all other items final test were only performed with 8-DPSK and GFSK.

## 2.5. Test Conditions

Temperature range	21-25°C
Humidity range	40-75%
Pressure range	86-106kPa

## 2.6. Measurement Uncertainty (95% confidence levels, k=2)

Item	MU	Remark
Uncertainty for Power point Conducted Emissions Test	2.42dB	
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.54dB	Polarize: V
	4.1dB	Polarize: H
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	2.08dB	Polarize: H
	2.56dB	Polarize: V
Uncertainty for radio frequency	$1 \times 10^{-9}$	
Uncertainty for conducted RF Power	0.65dB	
Uncertainty for temperature	0.2°C	
Uncertainty for humidity	1%	
Uncertainty for DC and low frequency voltages	0.06%	

## 2.7. Test Equipment

Equipment	Manufacture	Model No.	Serial No.	Last cal.	Cal Interval
3m Semi-Anechoic	ETS-LINDGR EN	N/A	SEL0017	05.08, 2012	1 Year
Spectrum analyzer	Agilent	E4443A	MY46185649	05.08, 2012	1 Year
Receiver	R&S	ESCI	100492	05.08, 2012	1 Year
Receiver	R&S	ESCI	101202	05.08, 2012	1 Year
Bilog Antenna	Sunol	JB3	A121206	12.15, 2012	1 Year
Horn Antenna	EMCO	3115	640201028-06	12.15, 2012	1 Year
Power Meter	Anritsu	ML2487A	6K00001491	05.08, 2012	1 Year
ETS Horn Antenna	ETS	3160	SEL0076	05.08, 2012	1 Year
Active Loop Antenna	Beijing Daze	ZN30900A	SEL0097	12.15, 2011	1 Year
Cable	Resenberger	N/A	No.1	05.08, 2012	1 Year
Cable	SCHWARZBE CK	N/A	No.2	05.08, 2012	1 Year
Cable	SCHWARZBE CK	N/A	No.3	05.08, 2012	1 Year
Pre-amplifier	R&S	AFS42-0010 1 800-25-S-42	SEL0081	05.08, 2012	1 Year
Pre-amplifier	R&S	AFS33-1800 2650-30-8P- 44	SEL0080	05.08, 2012	1 Year
Base station	Agilent	E5515C	GB44300243	05.08, 2012	1 Year
Temperature controller	Terchy	MHQ	120	05.08, 2012	1 Year
Power divider	Anritsu	K240C	020346	05.08, 2012	1 Year
Signal Generator	HP	83732B	VS3449051	05.08, 2012	1 Year
Attenuator	Agilent	8491B	MY39262165	05.08, 2012	1 Year

### 3. Maximum Peak Output power

#### 3.1. Limit

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts, the e.i.r.p shall not exceed 4W

#### 3.2. Test Procedure

(1).The EUT was placed on a 0.8m high table in the chamber and turned on in continuously transmitting mode.

(2).The maximum fundamental emission (E) at 3m distance was measured and recorded with receive antenna in both vertical and horizontal by rotating the turntable and by moved up and down antenna, the test Spectrum Analyzer was set as below

RBW: 2MHz (>20dB bandwidth of signal)

VBW: 3MHz

Detector: Peak

(3). Calculate the transmitter's peak power using the following equation:

$$P = [(E \cdot D)^2] / (30G)$$

E is the measured maximum fundamental field strength in V/m

G is the numeric gain of the transmitting antenna with reference to an isotropic radiator.

D is the distance in meters from which the field strength was measured.

P is the power in watts

#### 3.3. Test Result

EUT: Bluetooth FM Transmitter M/N: AC-2121						
Test date: 2013-01-05		Test site: RF site		Tested by: Anna Fan		
Mode	Freq (MHz)	Reading Power (dBm)	Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)
GFSK	2402	1.39	0.5	1.89	21	19.11
	2441	1.41	0.5	1.91	21	19.09
	2480	1.08	0.5	1.58	21	19.42
$\pi/4$ QPSK	2402	0.96	0.5	1.46	21	19.54
	2441	0.91	0.5	1.41	21	19.59
	2480	0.94	0.5	1.44	21	19.56
8-DPSK	2402	1.15	0.5	1.65	21	19.35
	2441	1.23	0.5	1.73	21	19.27
	2480	1.21	0.5	1.71	21	19.29
Conclusion: PASS						



## 4. 20dB bandwidth

### 4.1. Limit

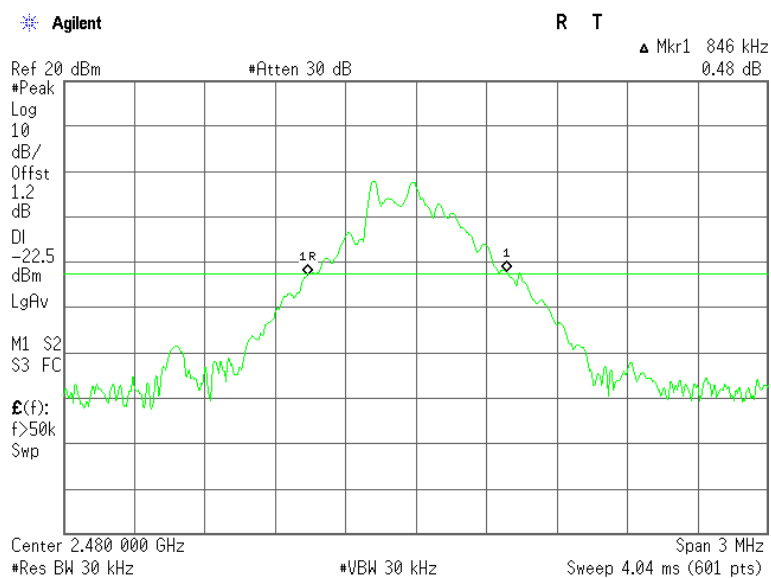
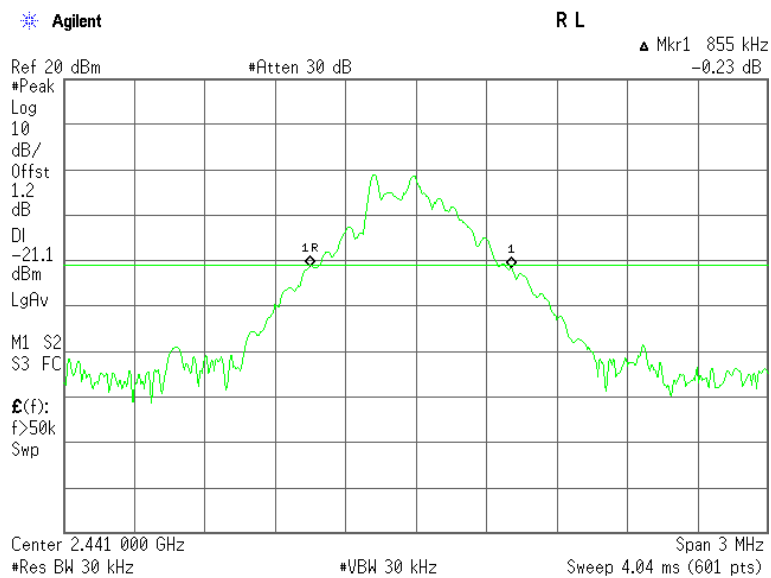
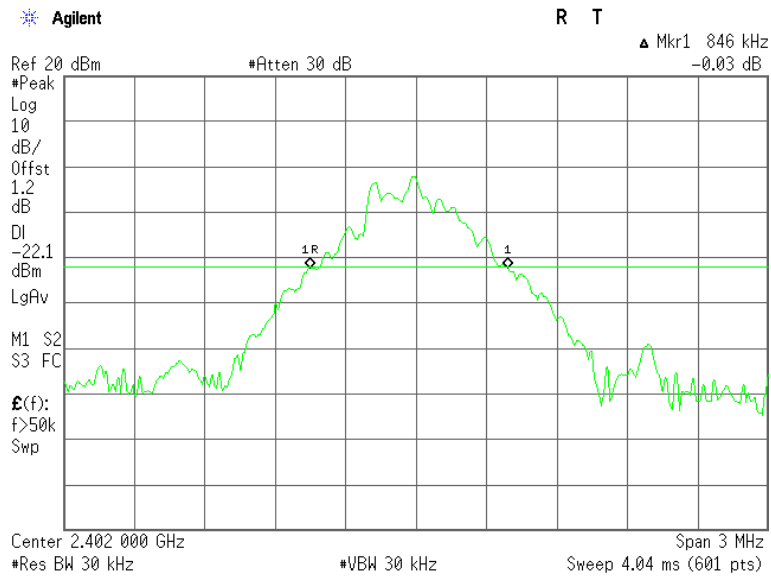
Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

### 4.2. Test Procedure

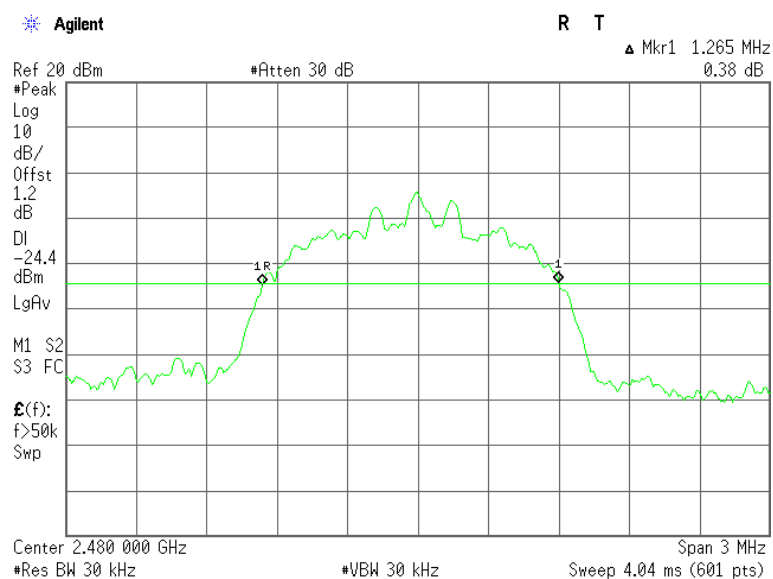
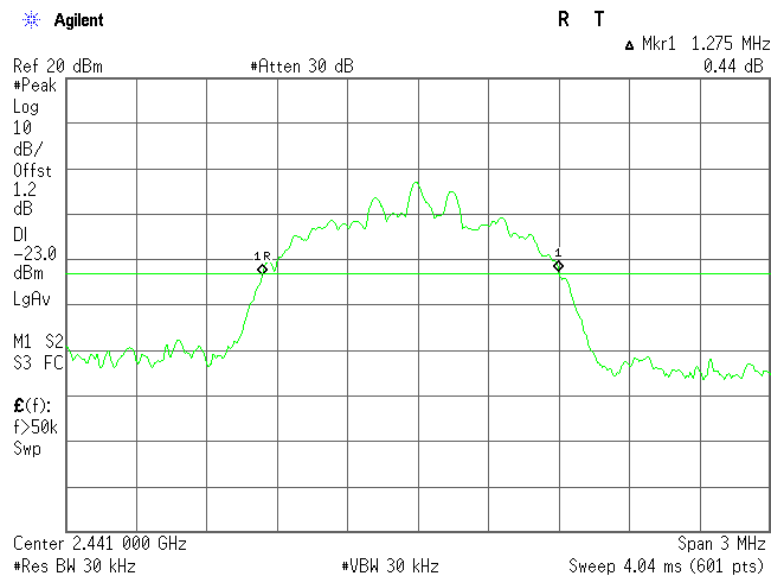
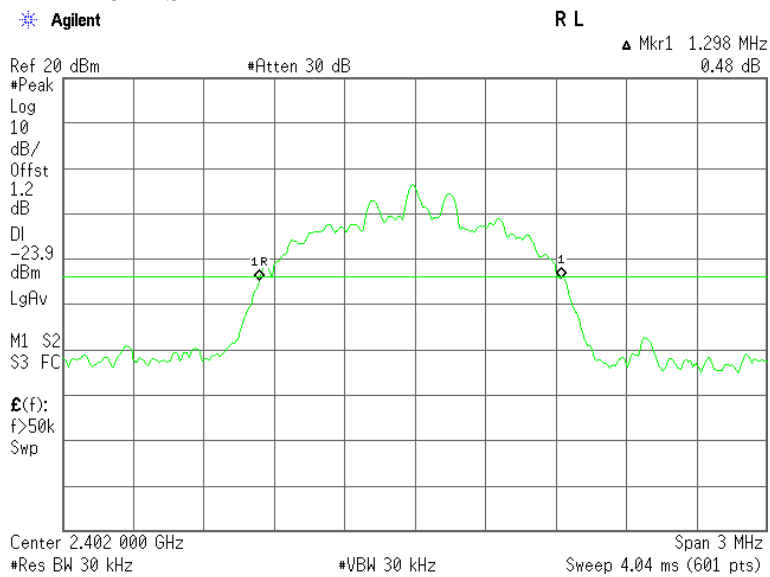
The transmitter output was coupled to a spectrum analyzer via a antenna. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30kHz RBW and 100kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

### 4.3. Test Result

EUT: Bluetooth FM Transmitter      M/N: AC-2121				
Test date: 2013-01-05		Test site: RF site		Tested by: Anna Fan
Mode	Freq (MHz)	20dB Bandwidth (MHz)	Limit (kHz)	Conclusion
GFSK	2402	0.846	/	PASS
	2441	0.855	/	PASS
	2480	0.846	/	PASS
8-DPSK	2402	1.298	/	PASS
	2441	1.275	/	PASS
	2480	1.265	/	PASS

Original Test data For 20dB bandwidth  
GFSK

## 8-DPSK



## 5. Carrier Frequency Separation

### 5.1. Limit

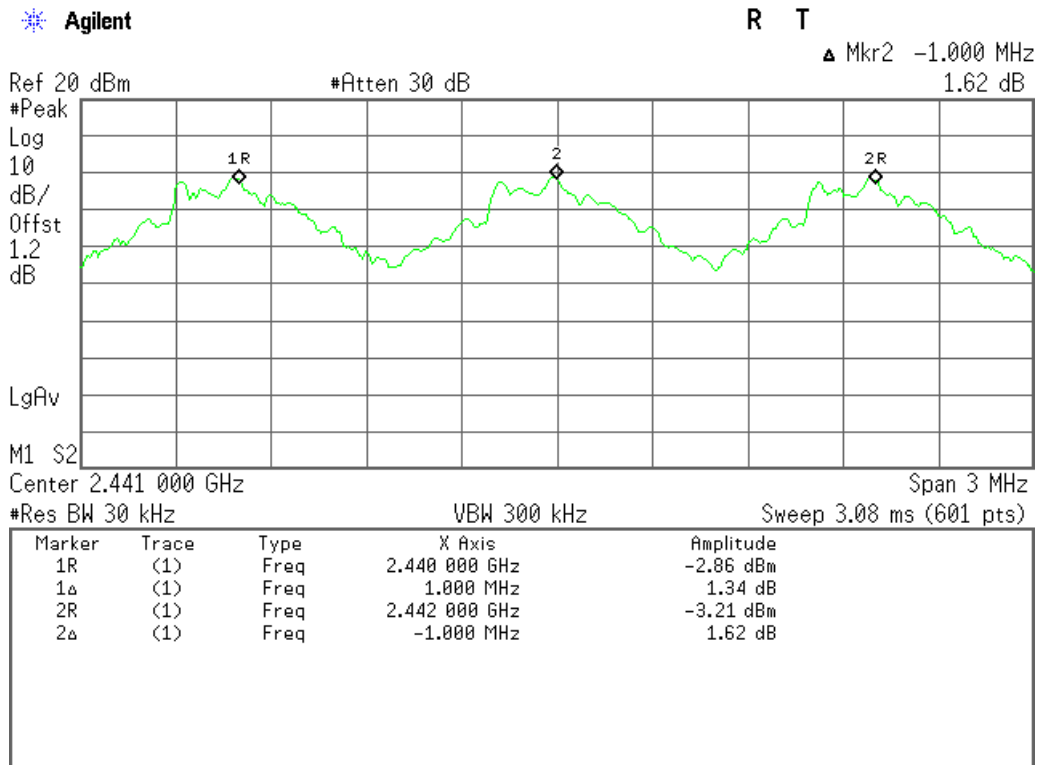
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW

### 5.2. Test Procedure

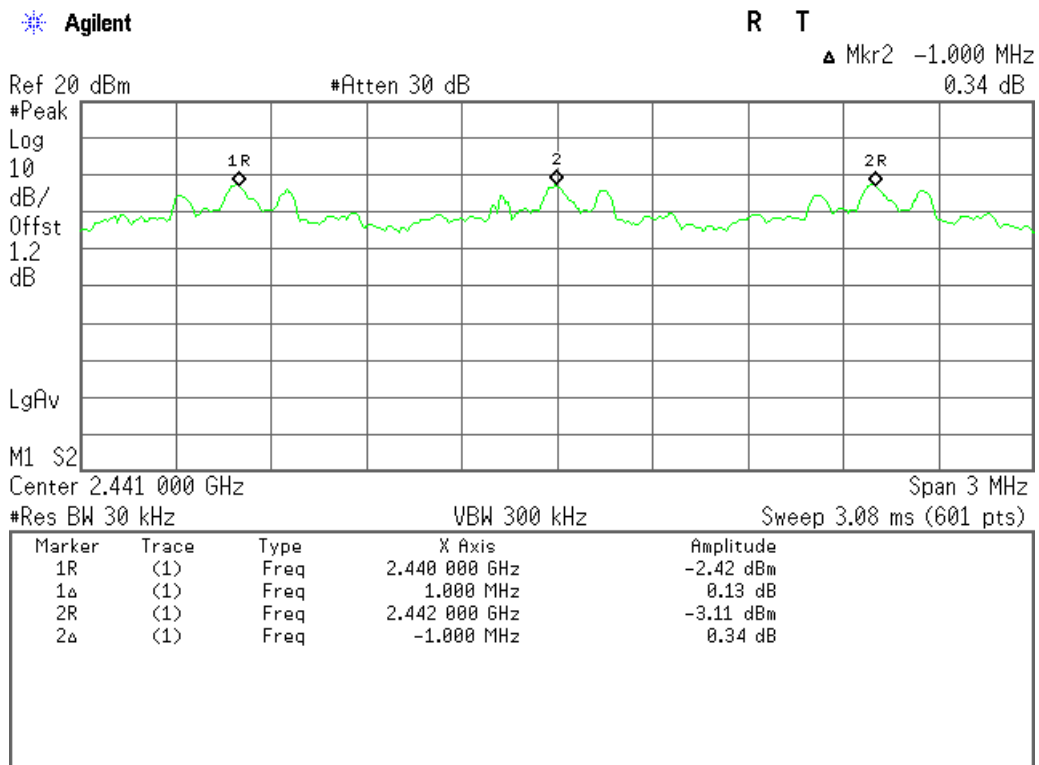
The transmitter output was coupled to a spectrum analyzer via a antenna. The carrier frequency was measured by spectrum analyzer with 30kHz RBW and 100kHz VBW.

### 5.3. Test Result

EUT: Bluetooth FM Transmitter		M/N: AC-2121		
Test date: 2013-01-06		Test site: RF site		Tested by: Anna Fan
Mode	Channel separation (MHz)	20dB Bandwidth (MHz)	Limit (MHz) 2/3 20dB bandwidth	Conclusion
GFSK	1.0	0.855	0.570	PASS
8-DPSK	1.0	1.298	0.865	PASS

Original test data for channel separation  
GFSK

## DPSK



## 6. Number Of Hopping Channel

### 6.1. Limit

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels

### 6.2. Test Procedure

The transmitter output was coupled to a spectrum analyzer via a antenna. The number of hopping channel was measured by spectrum analyzer with 300kHz RBW and 1MHz VBW.

### 6.3. Test Result

EUT: Bluetooth FM Transmitter      M/N: AC-2121			
Test date: 2013-01-06		Test site: RF site	Tested by: Anna Fan
Mode	Number of hopping channel	Limit	Conclusion
GFSK	79	>15	PASS
8-DPSK	79	>15	PASS

Original test data for hopping channel number

GFSK:

Agilent

R T

Mkr1 2.402 00 GHz  
-1.58 dBm

Ref 20 dBm

#Atten 30 dB

#Peak

Log

10

dB/

Offst

1.2

dB

LgAv

M1 S2

S3 FC

 $\mathcal{E}(f)$ :

FTun

Swp

Start 2.400 00 GHz

Stop 2.441 50 GHz

#Res BW 510 kHz

#VBW 510 kHz

Sweep 1 ms (601 pts)

Agilent

R T

Mkr1 2.480 00 GHz  
-1.81 dBm

Ref 20 dBm

#Atten 30 dB

#Peak

Log

10

dB/

Offst

1.2

dB

LgAv

M1 S2

S3 FC

 $\mathcal{E}(f)$ :

FTun

Swp

Start 2.441 50 GHz

Stop 2.483 00 GHz

#Res BW 510 kHz

#VBW 510 kHz

Sweep 1 ms (601 pts)

## 8-DPSK:

Agilent

R T

Mkr1 2.402 00 GHz  
-2.65 dBm

Ref 20 dBm

#Atten 30 dB

#Peak

Log

10

dB/

Offst

1.2

dB

LgAv

M1 S2

S3 FC

£(f):

FTun

Swp

Start 2.400 00 GHz

Stop 2.441 50 GHz

#Res BW 510 kHz

#VBW 510 kHz

Sweep 1 ms (601 pts)

Agilent

R T

Mkr1 2.480 00 GHz  
-3.18 dBm

Ref 20 dBm

#Atten 30 dB

#Peak

Log

10

dB/

Offst

1.2

dB

LgAv

M1 S2

S3 FC

£(f):

FTun

Swp

Start 2.441 50 GHz

Stop 2.483 00 GHz

#Res BW 510 kHz

#VBW 510 kHz

Sweep 1 ms (601 pts)



## 7. Dwell Time

### 7.1. Test limit

Please refer section 15.247

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz. The average time of occupancy on any frequency shall not greater than 0.4 s within period of 0.4 seconds multiplied by the number of hopping channel employed.

### 7.2. Test Procedure

7.2.1. Place the EUT on the table and set it in transmitting mode.

7.2.2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

7.2.3. Set center frequency of spectrum analyzer = operating frequency.

7.2.4. Set the spectrum analyzer as RBW, VBW=1MHz, Span = 0Hz, Sweep = auto.

7.2.5. Repeat above procedures until all frequency measured were complete.

### 7.3. Test Results

PASS.

A period time = 0.4 (s) \* 79 = 31.6(s)

CH Low: DH1 time slot = 0.4026 (ms) \* (1600/(1\*79)) \* 31.6 = 257.66 (ms)

DH3 time slot = 1.658 (ms) \* (1600/(3\*79)) \* 31.6 = 353.7 (ms)

DH5 time slot = 2.892 (ms) \* (1600/(5\*79)) \* 31.6 = 370.18 (ms)

3-DH1 time slot = 0.3916 (ms) \* (1600/(1\*79)) \* 31.6 = 250.62(ms)

3-DH3 time slot = 1.656 (ms) \* (1600/(3\*79)) \* 31.6 = 353.28(ms)

3-DH5 time slot = 2.898 (ms) \* (1600/(5\*79)) \* 31.6 = 370.94 (ms)

CH Mid: DH1 time slot = 0.4026 (ms) \* (1600/(1\*79)) \* 31.6 = 257.66 (ms)

DH3 time slot = 1.644(ms) \* (1600/(3\*79)) \* 31.6 = 350.72 (ms)

DH5 time slot = 2.892 (ms) \* (1600/(5\*79)) \* 31.6 = 370.18(ms)

3-DH1 time slot = 0.4028 (ms) \* (1600/(1\*79)) \* 31.6 = 257.79 (ms)

3-DH3 time slot = 1.656 (ms) \* (1600/(3\*79)) \* 31.6 = 353.28 (ms)

3-DH5 time slot = 2.912 (ms) \* (1600/(5\*79)) \* 31.6 = 372.74 (ms)

CH High: DH1 time slot = 0.4026 (ms) \* (1600/(1\*79)) \* 31.6 = 257.66 (ms)

DH3 time slot = 1.658 (ms) \* (1600/(3\*79)) \* 31.6 = 353.7 (ms)

DH5 time slot = 2.892 (ms) \* (1600/(5\*79)) \* 31.6 = 370.18 (ms)

3-DH1 time slot = 0.4028 (ms) \* (1600/(1\*79)) \* 31.6 = 257.79 (ms)

$$3\text{-DH3 time slot} = 1.656 \text{ (ms)} * (1600/(3*79)) * 31.6 = 353.28 \text{ (ms)}$$

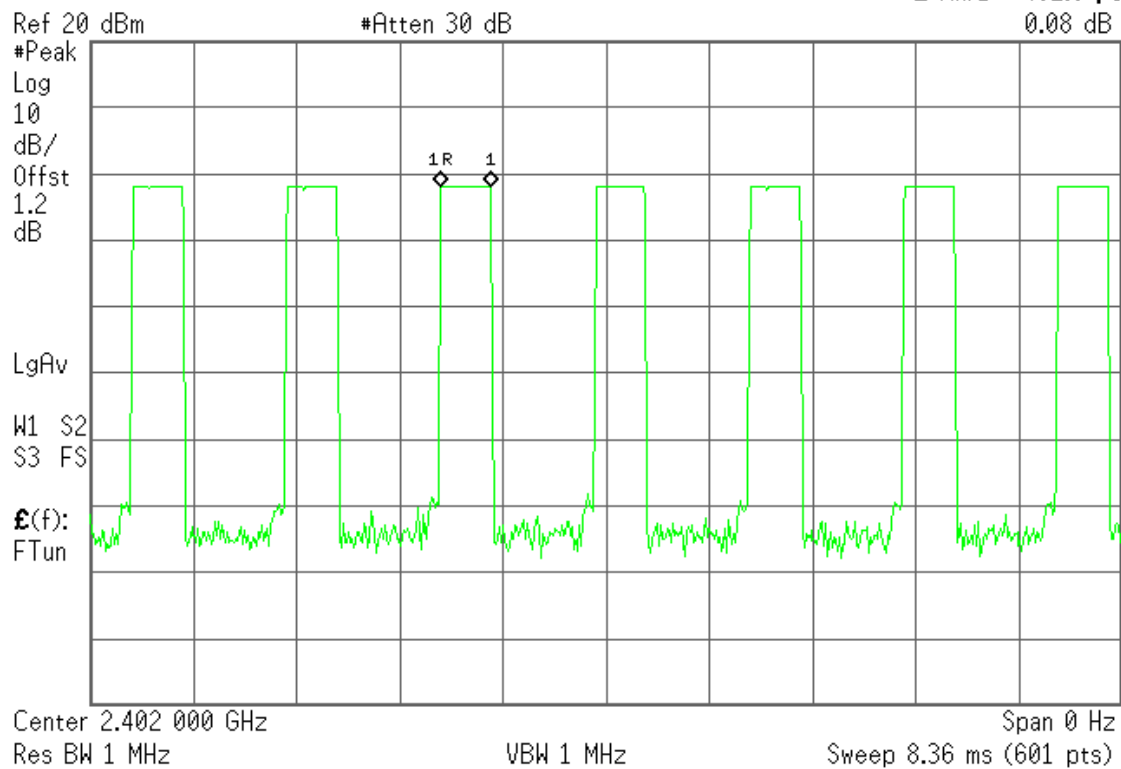
$$3\text{-DH5 time slot} = 2.898 \text{ (ms)} * (1600/(5*79)) * 31.6 = 370.94 \text{ (ms)}$$

Detailed information please see the following page.

## DH1: CH Low

Agilent

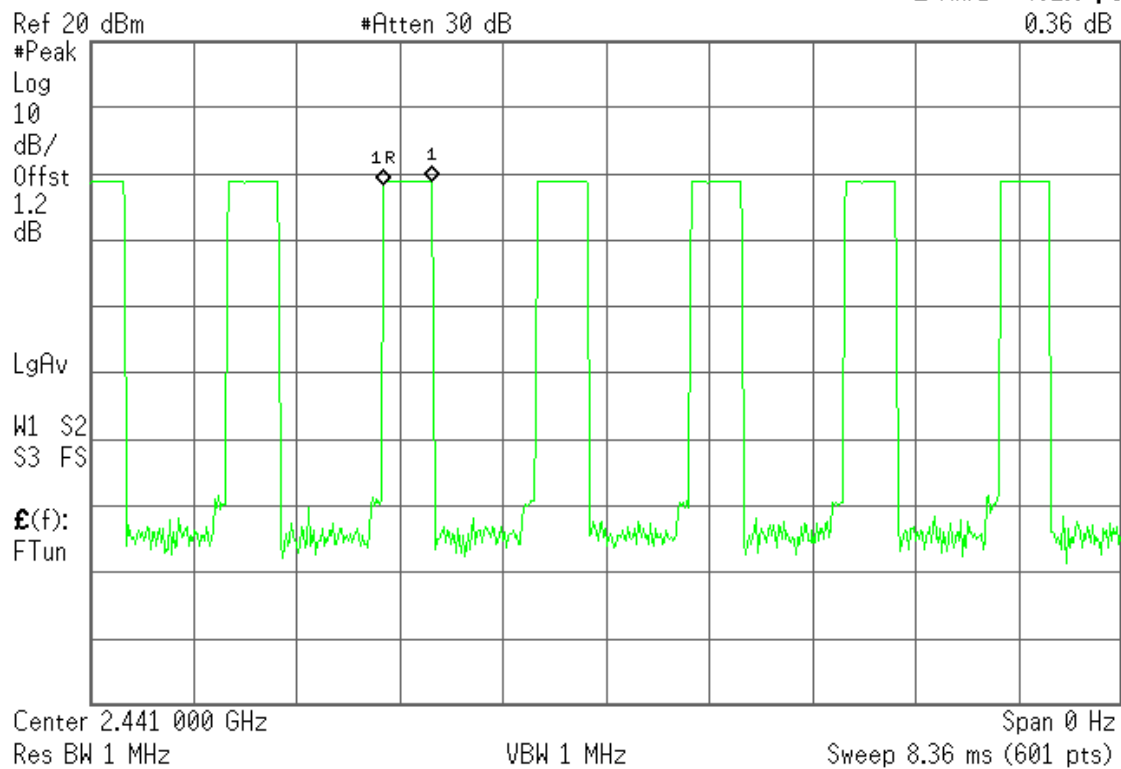
R T

Mkr1 402.6  $\mu$ s  
0.08 dB

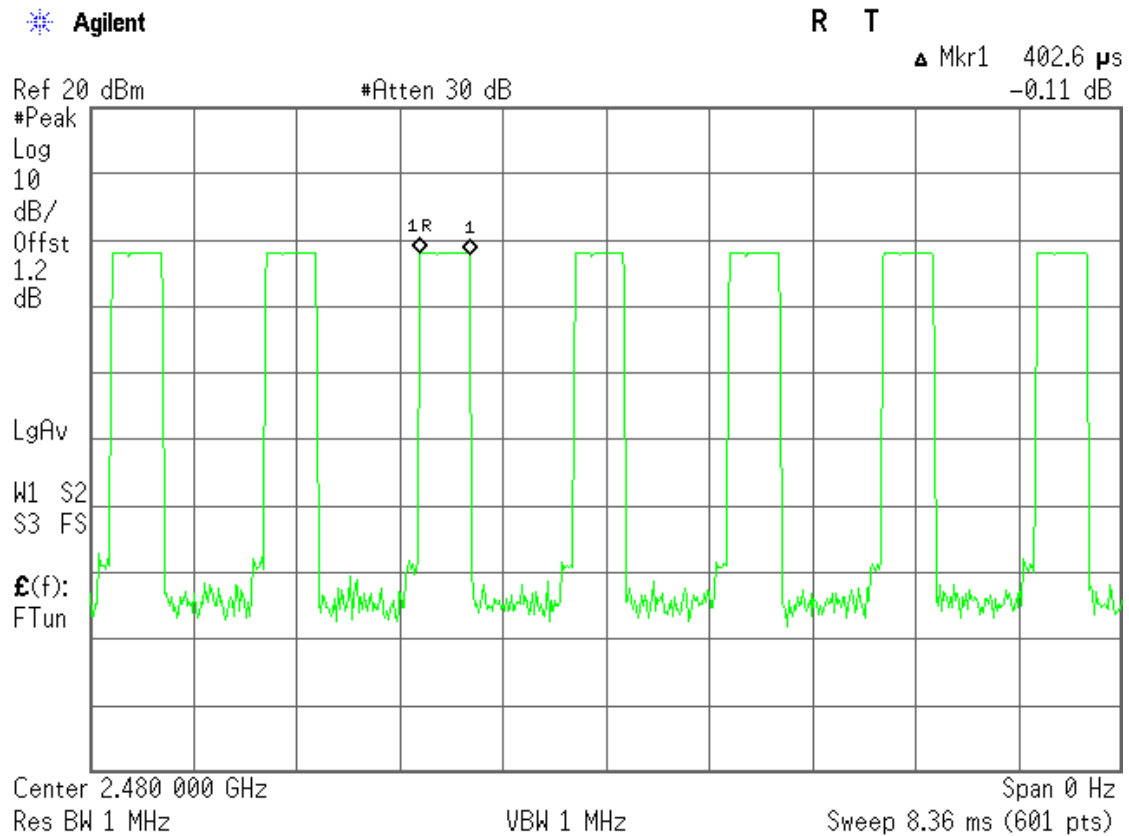
## DH1: CH Mid

Agilent

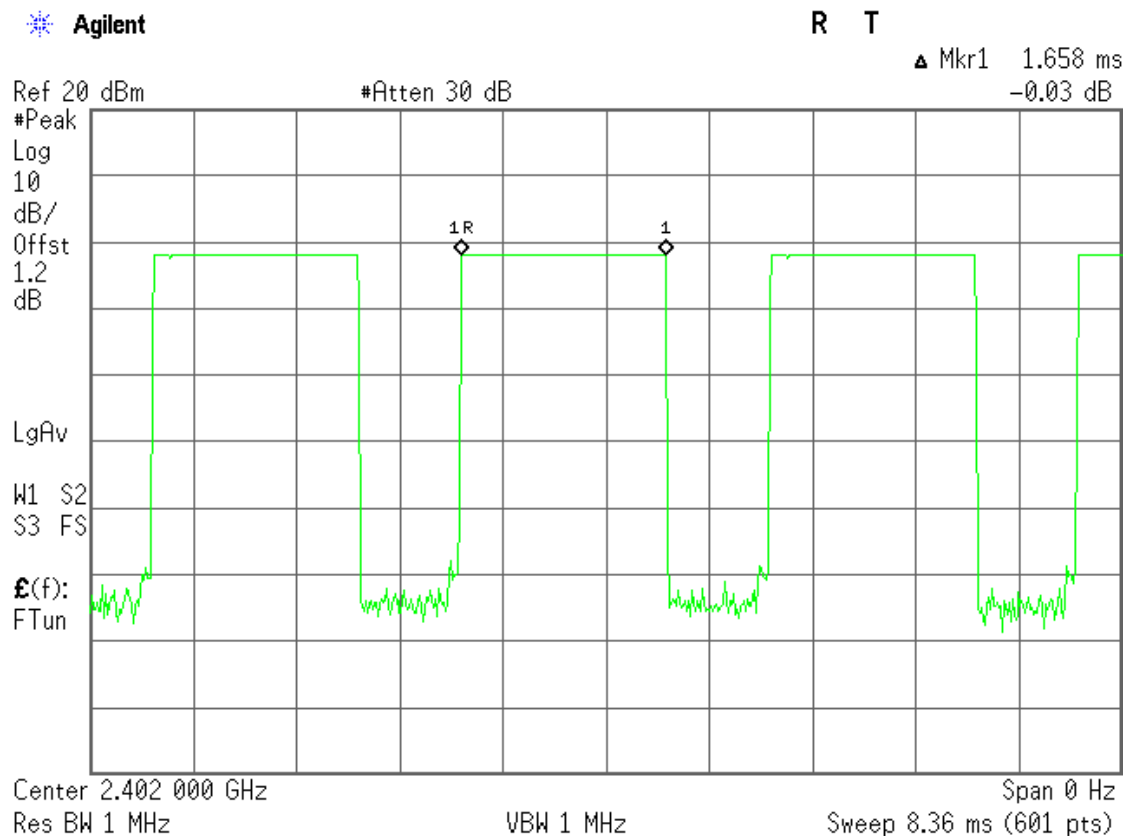
R T

Mkr1 402.6  $\mu$ s  
0.36 dB

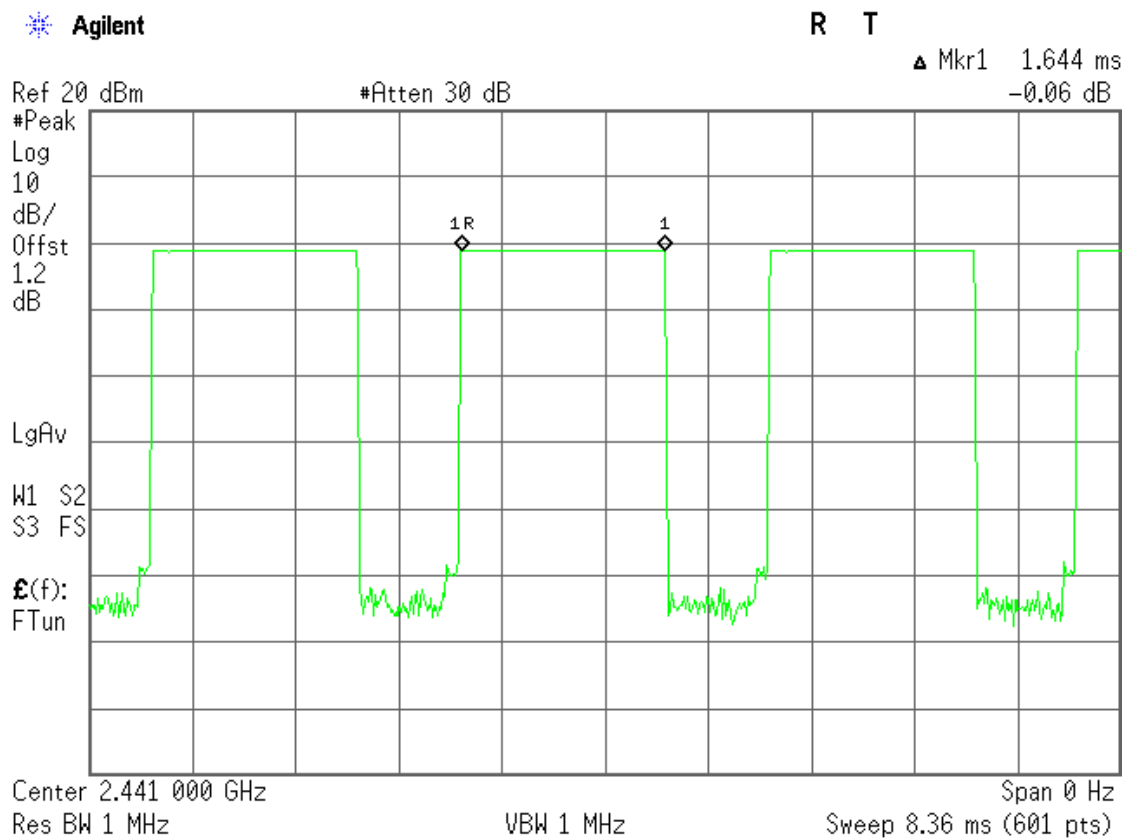
## DH1: CH High



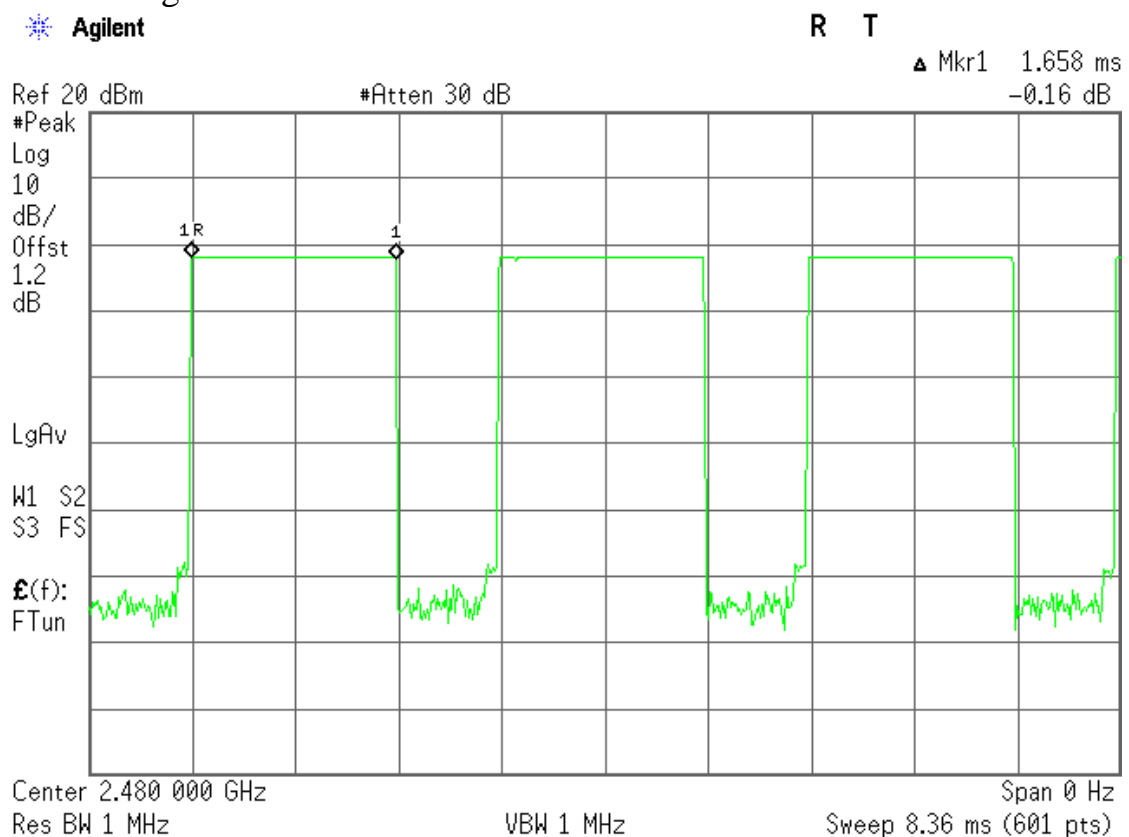
## DH3: CH Low:



## DH3: CH Mid



## DH3 CH High



## DH5 CH Low

Agilent

R T

▲ Mkr1 2.892 ms  
-0.04 dB

Ref 20 dBm

#Atten 30 dB

#Peak

Log

10

dB/

Offst

1.2

dB

LgAv

W1 S2

S3 FS

E(f):

FTun

Center 2.402 000 GHz

Res BW 1 MHz

VBW 1 MHz

Span 0 Hz

Sweep 8.36 ms (601 pts)

## DH5 CH Mid

Agilent

R T

▲ Mkr1 2.892 ms  
0.09 dB

Ref 20 dBm

#Atten 30 dB

#Peak

Log

10

dB/

Offst

1.2

dB

LgAv

W1 S2

S3 FS

E(f):

FTun

Center 2.441 000 GHz

Res BW 1 MHz

VBW 1 MHz

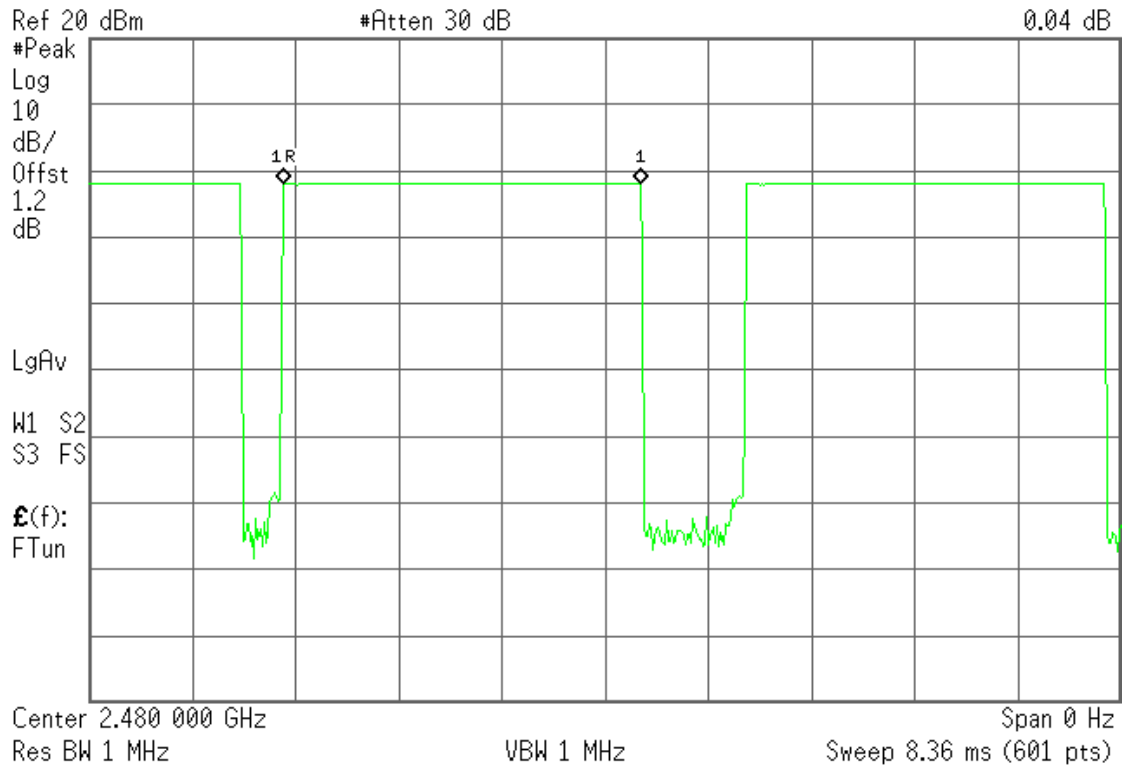
Span 0 Hz

Sweep 8.36 ms (601 pts)

## DH5 CH High

Agilent

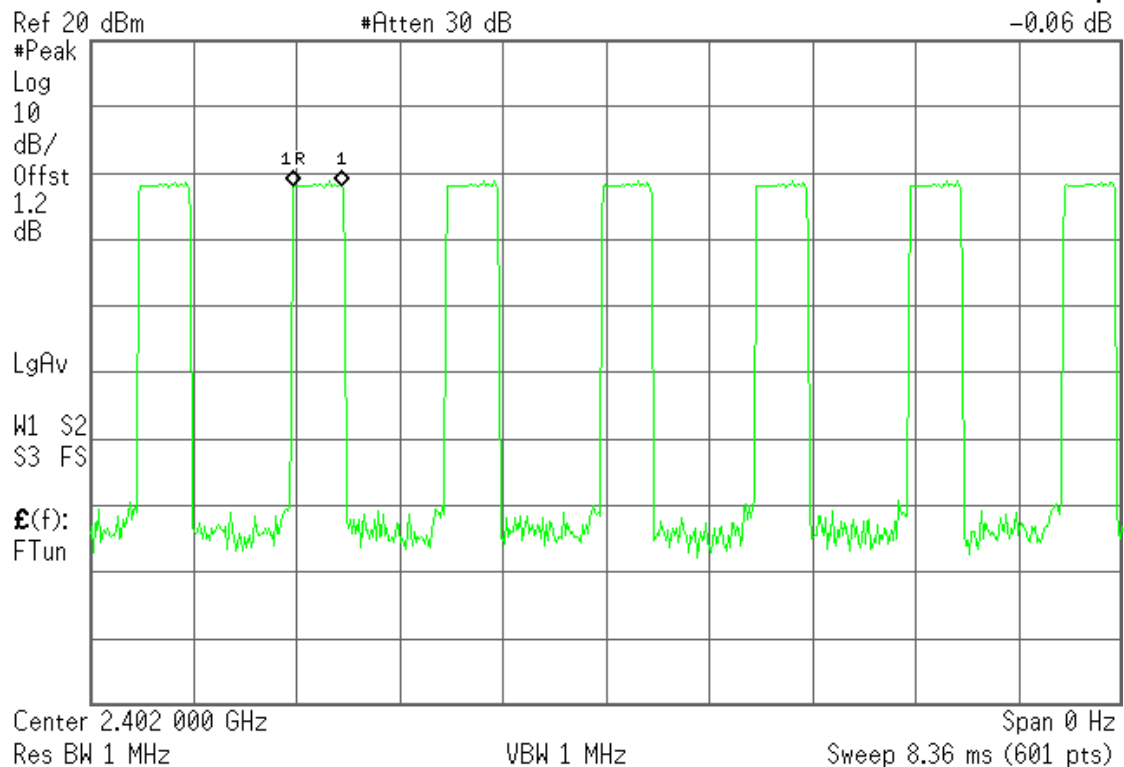
R T

 $\Delta$  Mkr1 2.892 ms  
0.04 dB

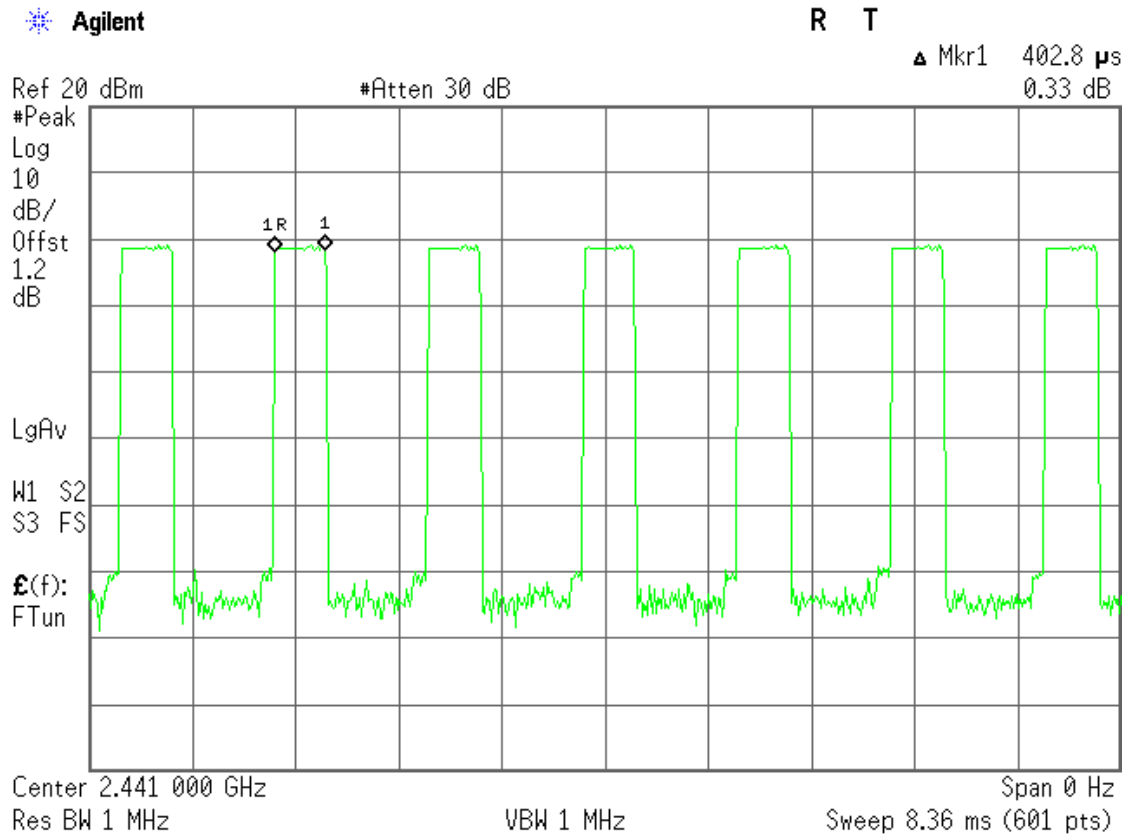
## 3-DH1: CH Low

Agilent

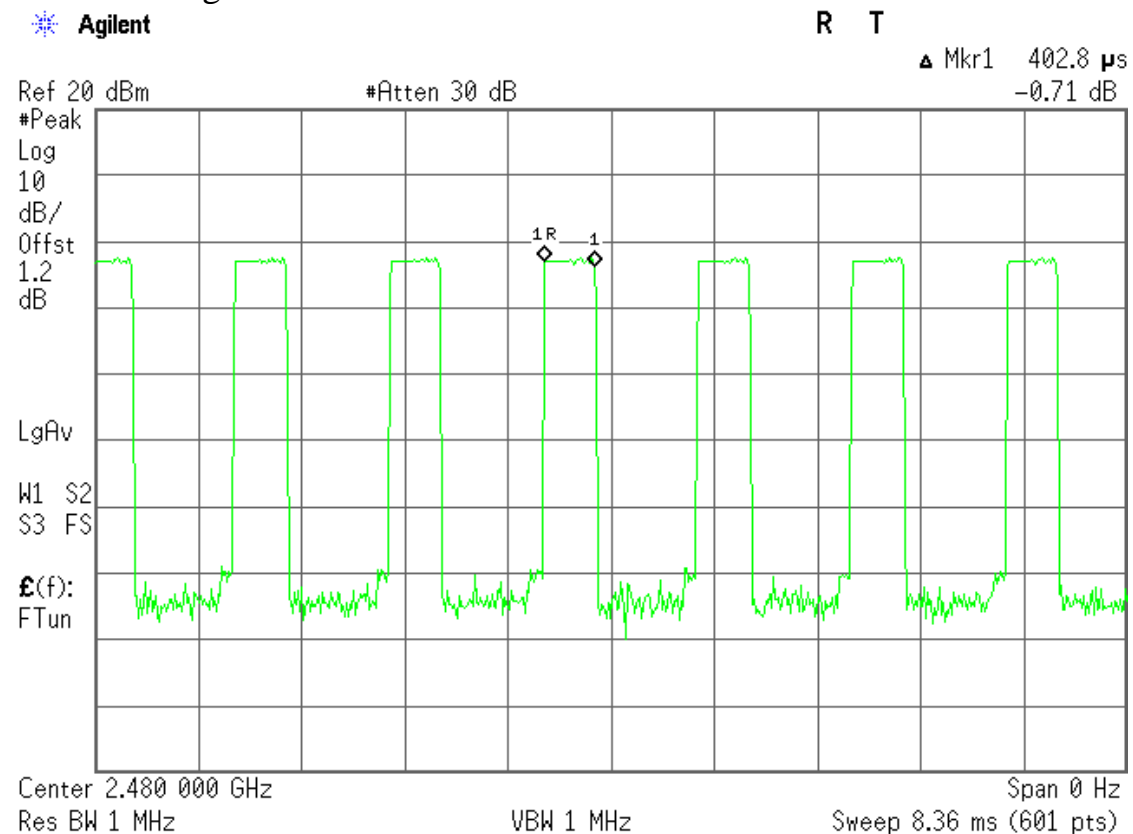
R T

 $\Delta$  Mkr1 391.6  $\mu$ s  
-0.06 dB

## 3-DH1: CH Mid



## 3-DH1: CH High

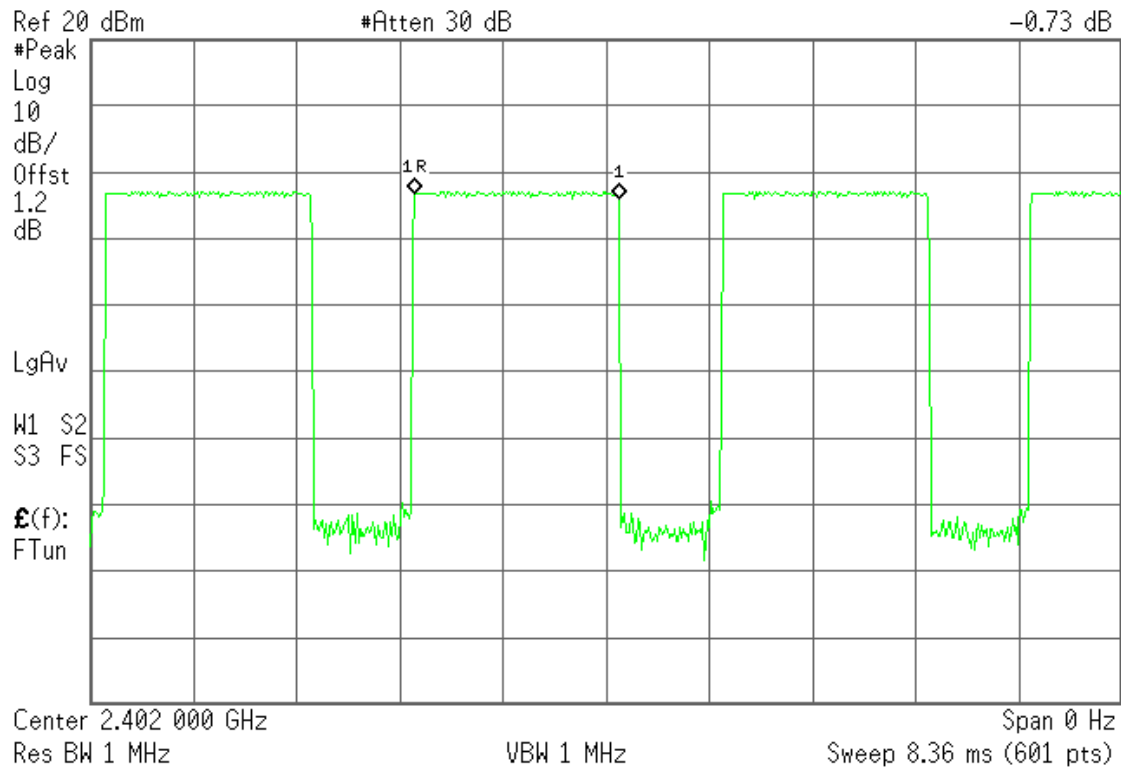




## 3-DH3: CH Low

Agilent

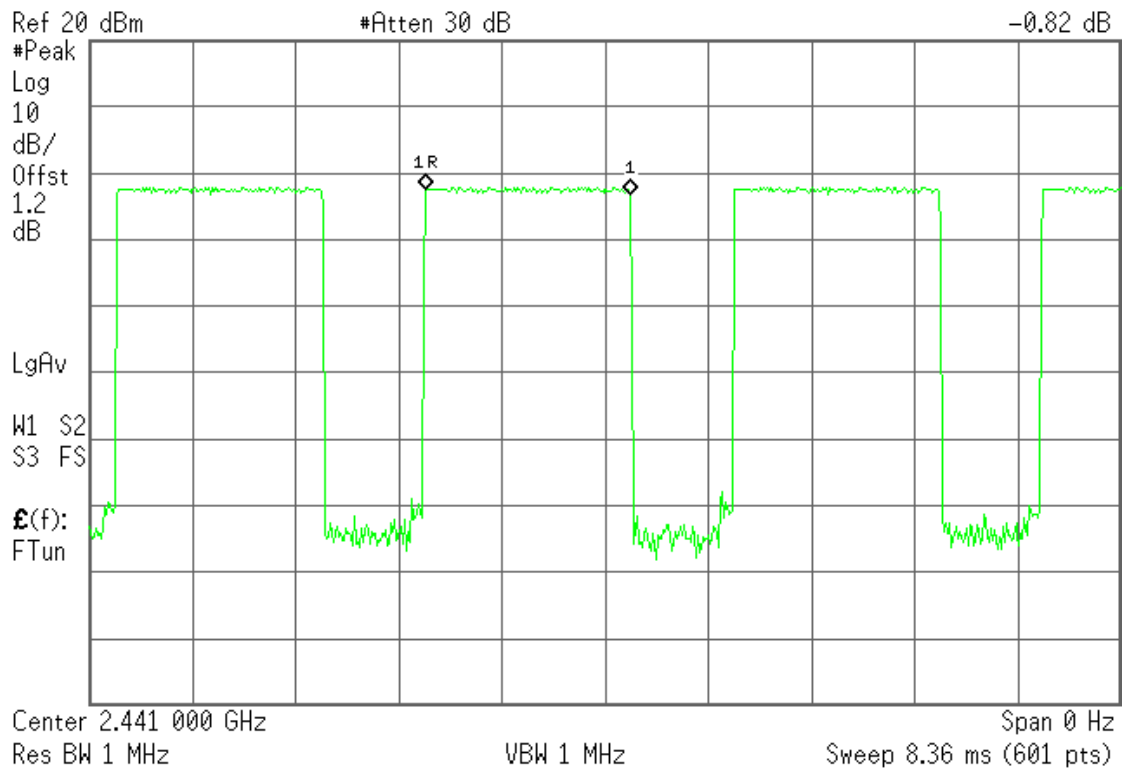
R L

▲ Mkr1 1.656 ms  
-0.73 dB

## 3-DH3: CH Mid

Agilent

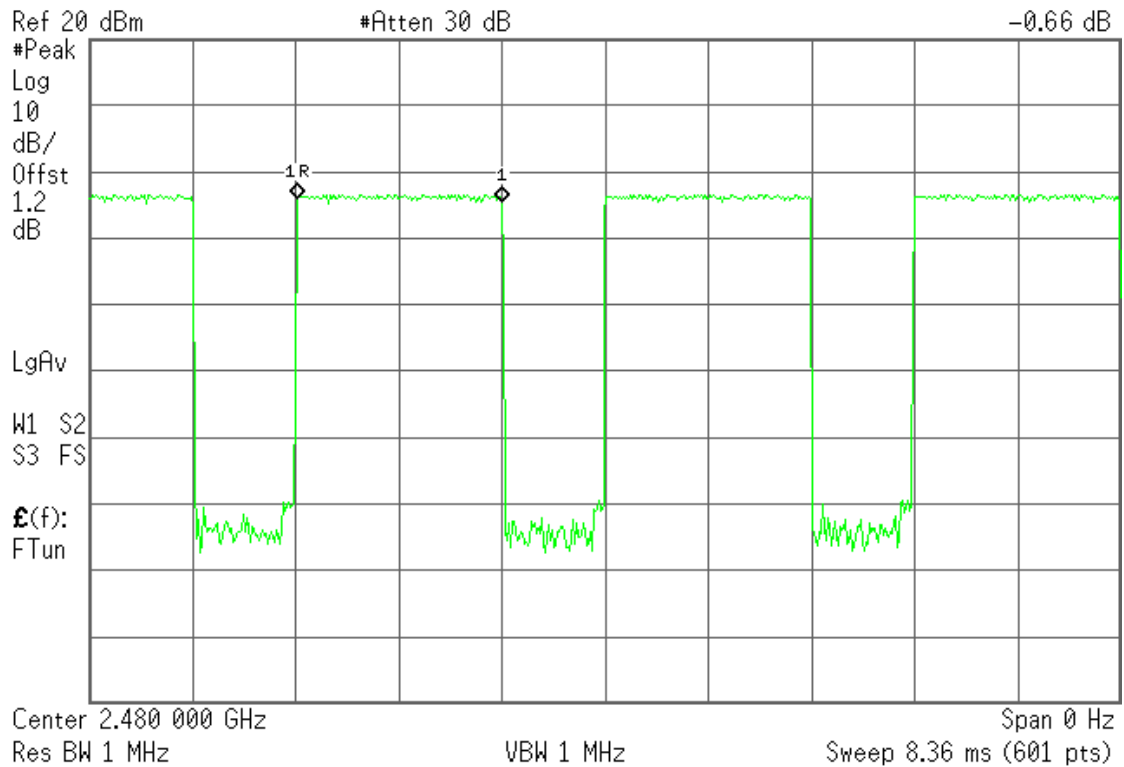
R T

▲ Mkr1 1.656 ms  
-0.82 dB

## 3-DH3: CH High

Agilent

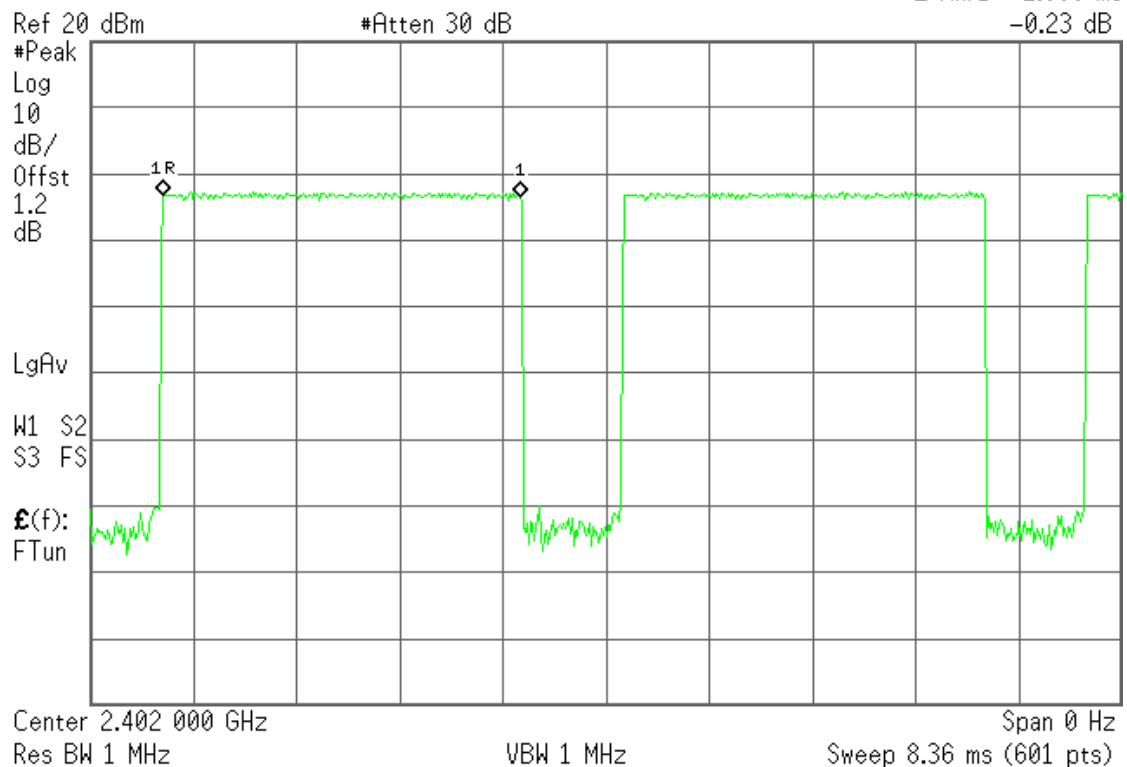
R T

▲ Mkr1 1.656 ms  
-0.66 dB

## 3-DH5: CH Low

Agilent

R T

▲ Mkr1 2.898 ms  
-0.23 dB

## 3-DH5: CH Mid

Agilent

R T

▲ Mkr1 2.912 ms  
-0.34 dB

Ref 20 dBm

#Atten 30 dB

#Peak

Log

10

dB/

Offst

1.2

dB

LgAv

W1 S2

S3 FS

E(f):

FTun

Center 2.441 000 GHz

Res BW 1 MHz

VBW 1 MHz

Span 0 Hz

Sweep 8.36 ms (601 pts)

## 3-DH5: CH High

Agilent

R T

▲ Mkr1 2.898 ms  
-0.21 dB

Ref 20 dBm

#Atten 30 dB

#Peak

Log

10

dB/

Offst

1.2

dB

LgAv

W1 S2

S3 FS

E(f):

FTun

Center 2.480 000 GHz

Res BW 1 MHz

VBW 1 MHz

Span 0 Hz

Sweep 8.36 ms (601 pts)

## 8. Radiated emissions

### 8.1. Limit

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

#### 15.205 Restricted frequency band

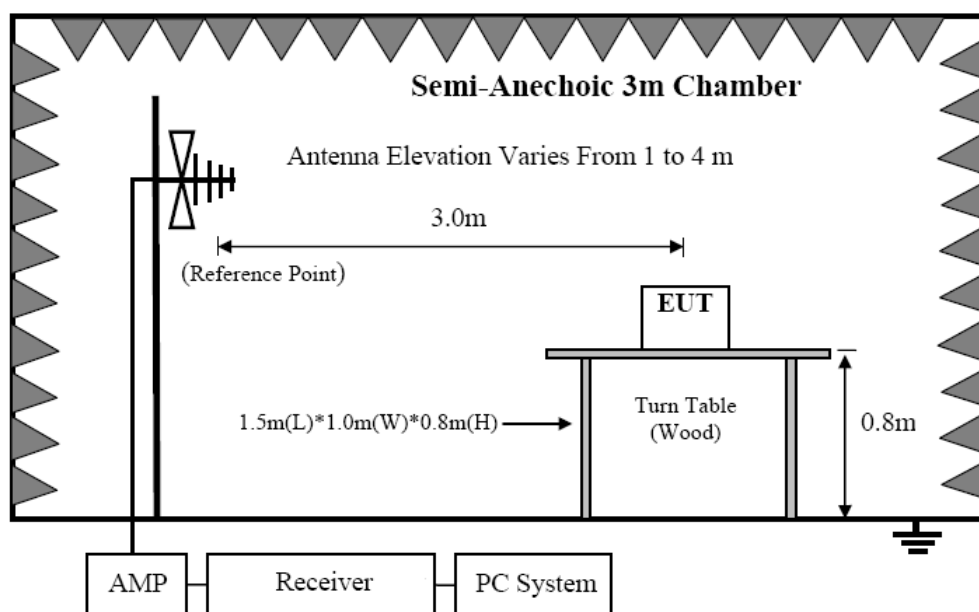
MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
<sup>1</sup> 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	( <sup>2</sup> )

#### 15.209 Limit

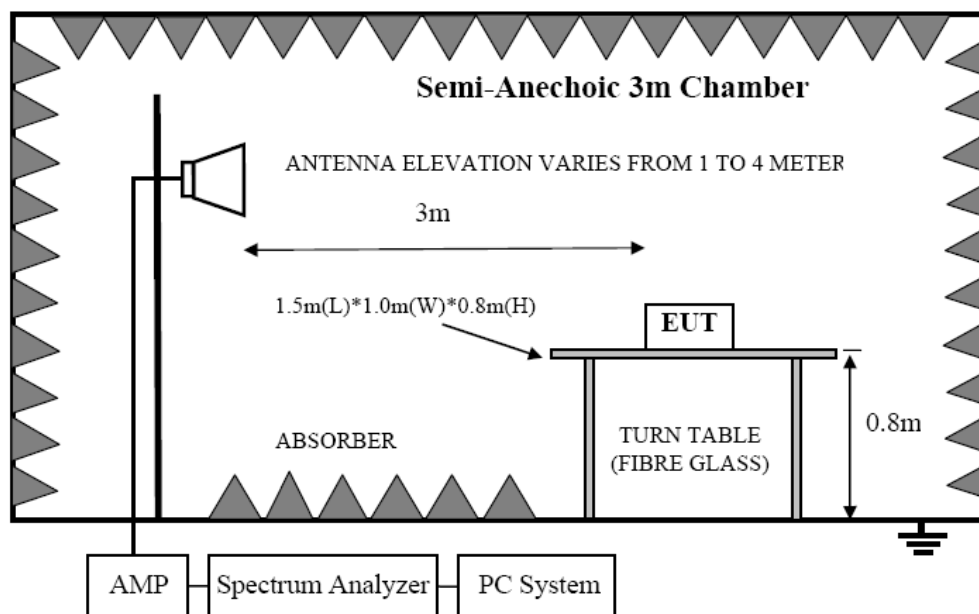
FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		μV/m	dB(μV)/m
0.009-0.490	300	2400/F(KHz)	/
0.490-1.705	30	24000/F(KHz)	/
1.705-30	30	30	29.5
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

## 8.2. Block Diagram of Test setup

### 8.2.1. In 3m Anechoic Chamber Test Setup Diagram for below 1GHz



### 8.2.2. In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP.

## 8.3. Test Procedure

- (1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber.

- (2) Setup EUT and simulator as shown in section 1.4 and 6.1
- (3) Test antenna was located 3m from the EUT on an adjustable mast. Below pre-scan procedure was first performed in order to find prominent radiated emissions.
  - (a) Change work frequency or channel of device if practicable.
  - (b) Change modulation type of device if practicable.
  - (c) Change power supply range from 85% to 115% of the rated supply voltage for AC power supply.
  - (d) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions
- (4) Spectrum frequency from 9KHz to 25GHz (tenth harmonic of fundamental frequency) was investigated
- (5) For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.4 2003 on Radiated Emission test.
- (6) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure; RBW is set at 1MHz, VBW is set at 10Hz for Average measure.

#### 8.4. Test Result

We have scanned the 10th harmonic from 9KHz to the EUT.

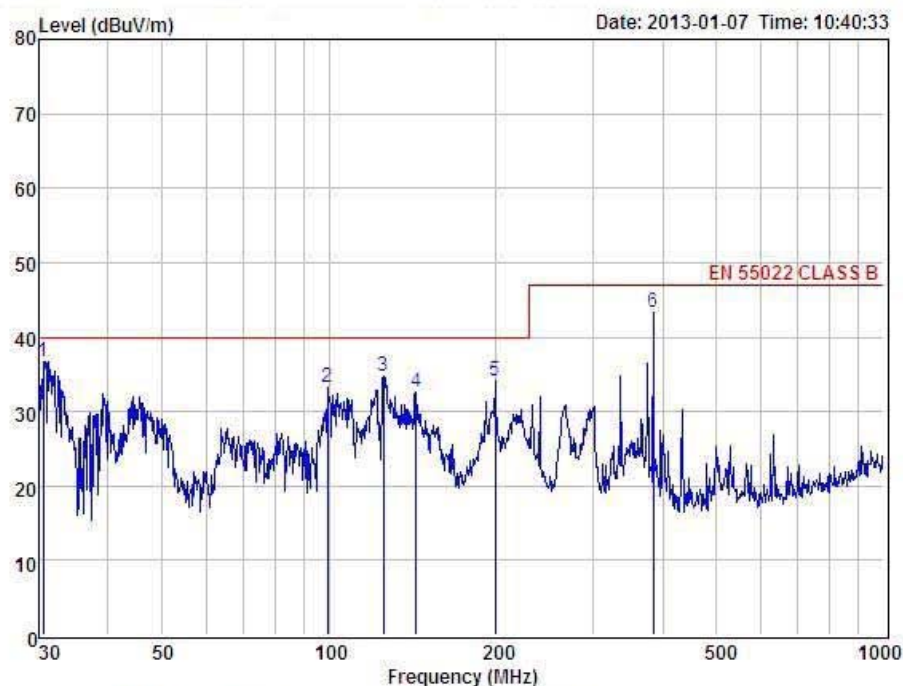
Detailed information please see the following page.

From 9KHz to 30MHz: Conclusion: PASS

Note: The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.



Shenzhen Certification Technology Service Co., Ltd.  
 2F, Building B, East Area of Nanchang Second Industrial Zone  
 Gushu 2nd Road, Bao'an District, Shenzhen 518126, P.R. China  
 Tel: 4006786199 FAX: +86-755-26736857  
 Website: <http://www.cessz.com> Email: [Service@cessz.com](mailto:Service@cessz.com)



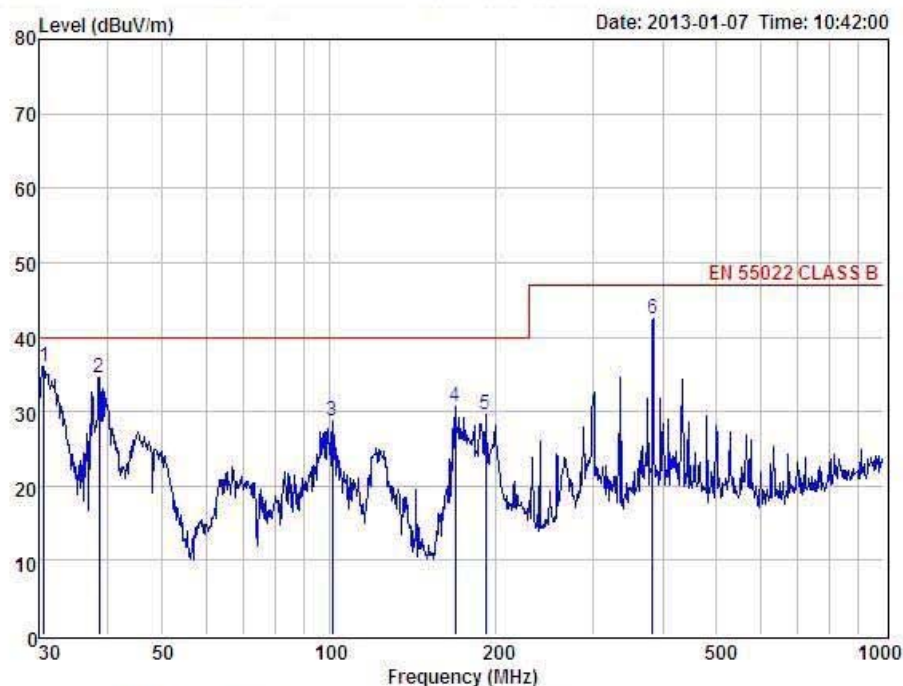
Condition : EN 55022 CLASS B 3m POL: HORIZONTAL  
 EUI : Bluetooth FM Transmitter  
 Model No : AC-2121  
 Test Mode : Working  
 Power : DC 12V  
 Test Engineer : Anna  
 Remark :

Item	Freq MHz	Read Level dBuV	Antenna Factor dB	Preamp Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	30.53	50.88	13.22	27.43	0.07	36.74	40.00	-3.26	QP
2	99.41	49.55	10.15	26.84	0.46	33.32	40.00	-6.68	QP
3	125.27	48.90	12.46	26.88	0.28	34.76	40.00	-5.24	QP
4	143.60	45.41	13.64	26.90	0.38	32.53	40.00	-7.47	QP
5	199.61	50.84	9.90	26.97	0.43	34.20	40.00	-5.80	QP
6	384.30	55.47	14.48	27.38	0.81	43.38	47.00	-3.62	QP

Remark: Level = Read Level + Antenna Factor - Preamp Factor + Cable Loss



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 Tel: 4006786199 FAX: +86-755-26736857  
 Website: <http://www.cessz.com> Email: [Service@cessz.com](mailto:Service@cessz.com)



Condition : EN 55022 CLASS B 3m POL: VERTICAL  
 EUI : Bluetooth FM Transmitter  
 Model No : AC-2121  
 Test Mode : Working  
 Power : DC 12V  
 Test Engineer : Anna  
 Remark :

Item	Freq MHz	Read Level dBuV	Antenna Factor dB	Preamp Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	30.64	50.17	13.22	27.43	0.07	36.03	40.00	-3.97	QP
2	38.56	48.37	13.73	27.73	0.13	34.50	40.00	-5.50	QP
3	101.27	44.84	10.35	26.84	0.40	28.75	40.00	-11.25	QP
4	169.04	43.69	13.37	26.92	0.50	30.64	40.00	-9.36	QP
5	191.64	45.56	10.36	26.95	0.58	29.55	40.00	-10.45	QP
6	383.46	54.42	14.48	27.38	0.86	42.38	47.00	-4.62	QP

Remark: Level = Read Level + Antenna Factor - Preamp Factor + Cable Loss



1GHz—25GHz Radiated emission Test result									
EUT: Bluetooth FM Transmitter M/N: AC-2121									
Power: DC 12V Supply by battery									
Test date: 2013-01-04 Test site: 3m Chamber Tested by: Anna Fan									
Test mode: GFSK Tx CH1 2402MHz									
Antenna polarity: Vertical									
No	Freq (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4804	42.77	33.24	10.20	35.28	50.93	74.00	23.07	PK
2	4804	34.29	33.24	10.20	35.28	42.45	54.00	11.55	AV
3	7206	/							
4	9608	/							
5	12010	/							
Antenna Polarity: Horizontal									
1	4804	43.13	33.24	10.20	35.28	51.29	74.00	22.71	PK
2	4804	34.09	33.24	10.20	35.28	42.25	54.00	11.75	AV
3	7206	/							
4	9608	/							
5	12010	/							
Note:									
1, Measuring frequency from 1GHz to 25GHz									
2, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK									
2, Spectrum Set for AV measure: RBW=1MHz, VBW=10Hz, Sweep time=Auto, Detector: PK									
3, Result = Read level + Antenna factor + cable loss-Amp factor									
4, All the other emissions not reported were too low to read and deemed to comply with FCC limit.									

1GHz—25GHz Radiated emission Test result									
EUT: Bluetooth FM Transmitter M/N: AC-2121									
Power: DC 12V Supply by battery									
Test date: 2013-01-04 Test site: 3m Chamber Tested by: Anna Fan									
Test mode: GFSK Tx CH40 2441MHz									
Antenna polarity: Vertical									
No	Freq (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4882	43.82	34.26	10.23	35.30	53.01	74.00	20.99	PK
2	4882	32.36	34.26	10.23	35.30	41.55	54.00	12.45	AV
3	7323	/							
4	9764	/							
5	12205	/							
Antenna Polarity: Horizontal									
1	4882	41.15	34.26	10.23	35.30	50.34	74.00	23.66	PK
2	4882	33.26	34.26	10.23	35.30	42.45	54.00	11.55	AV
3	7323	/							
4	9764	/							
5	12205	/							
Note:									
1, Measuring frequency from 1GHz to 25GHz									
2, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK									
2, Spectrum Set for AV measure: RBW=1MHz, VBW=10Hz, Sweep time=Auto, Detector: PK									
3, Result = Read level + Antenna factor + cable loss-Amp factor									
4, All the other emissions not reported were too low to read and deemed to comply with FCC limit.									

1GHz—25GHz Radiated emission Test result									
EUT: Bluetooth FM Transmitter M/N: AC-2121									
Power: DC 12V Supply by battery									
Test date: 2013-01-04 Test site: 3m Chamber Tested by: Anna Fan									
Test mode: GFSK Tx CH79 2480MHz									
Antenna polarity: Vertical									
No	Freq (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4960	40.98	34.29	10.25	35.32	50.20	74.00	23.80	PK
2	4960	32.11	34.29	10.25	35.32	41.33	54.00	12.67	AV
3	7440	/							
4	9920	/							
5	12400	/							
Antenna Polarity: Horizontal									
1	4960	43.54	34.29	10.25	35.32	52.76	74.00	21.24	PK
2	4960	31.16	34.29	10.25	35.32	40.38	54.00	13.62	AV
3	7440	/							
4	9920	/							
5	12400	/							
Note:									
1, Measuring frequency from 1GHz to 25GHz									
2, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK									
2, Spectrum Set for AV measure: RBW=1MHz, VBW=10Hz, Sweep time=Auto, Detector: PK									
3, Result = Read level + Antenna factor + cable loss-Amp factor									
4, All the other emissions not reported were too low to read and deemed to comply with FCC limit.									

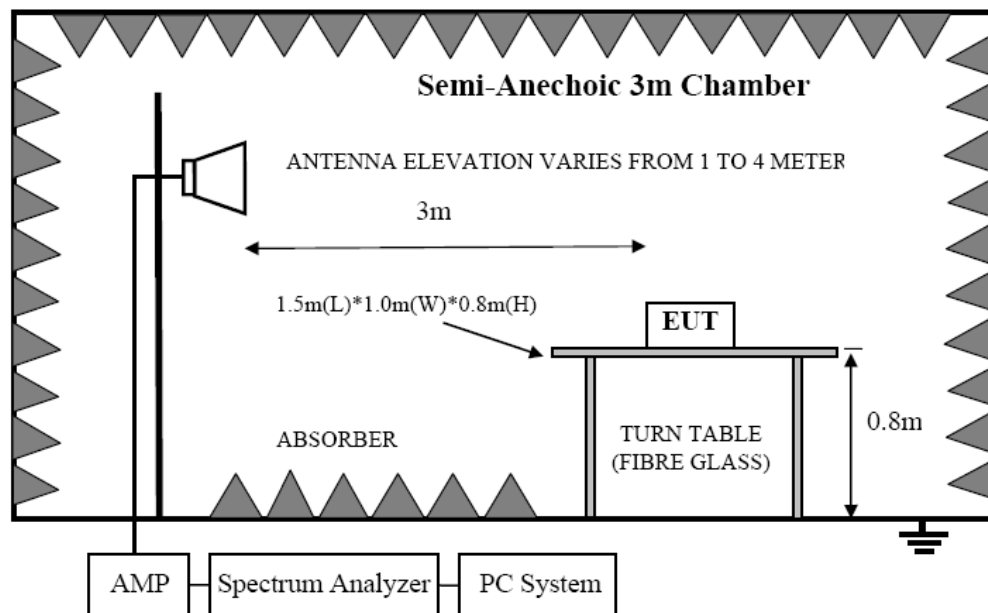
1GHz—25GHz Radiated emission Test result									
EUT: Bluetooth FM Transmitter M/N: AC-2121									
Power: DC 12V Supply by battery									
Test date: 2013-01-04 Test site: 3m Chamber Tested by: Anna Fan									
Test mode: 8-DPSK Tx CH1 2402MHz									
Antenna polarity: Vertical									
No	Freq (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4804	40.83	34.30	10.28	35.34	50.07	74.00	23.93	PK
2	4804	33.41	34.30	10.28	35.34	42.65	54.00	11.35	AV
3	7206	/							
4	9608	/							
5	12010	/							
Antenna Polarity: Horizontal									
1	4804	42.34	34.30	10.28	35.34	51.58	74.00	22.42	PK
2	4804	34.07	34.30	10.28	35.34	43.31	54.00	10.69	AV
3	7206	/							
4	9608	/							
5	12010	/							
Note:									
1,Measuring frequency from 1GHz to 25GHz									
2,Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK									
2,Spectrum Set for AV measure: RBW=1MHz, VBW=10Hz, Sweep time=Auto, Detector: PK									
3,Result = Read level + Antenna factor + cable loss-Amp factor									
4,All the other emissions not reported were too low to read and deemed to comply with FCC limit.									

1GHz—25GHz Radiated emission Test result									
EUT: Bluetooth FM Transmitter M/N: AC-2121									
Power: DC 12V Supply by battery									
Test date: 2013-01-04 Test site: 3m Chamber Tested by: Anna Fan									
Test mode: 8-DPSK Tx CH40 2441MHz									
Antenna polarity: Vertical									
No	Freq (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4882	43.02	34.33	10.30	35.36	52.29	74.00	21.71	PK
2	4882	32.95	34.33	10.30	35.36	42.22	54.00	11.78	AV
3	7323	/							
4	9764	/							
5	12205	/							
Antenna Polarity: Horizontal									
1	4882	42.89	34.33	10.30	35.36	52.16	74.00	21.84	PK
2	4882	33.46	34.33	10.30	35.36	42.73	54.00	11.27	AV
3	7323	/							
4	9764	/							
5	12205	/							
Note:									
1, Measuring frequency from 1GHz to 25GHz									
2, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK									
2, Spectrum Set for AV measure: RBW=1MHz, VBW=10Hz, Sweep time=Auto, Detector: PK									
3, Result = Read level + Antenna factor + cable loss-Amp factor									
4, All the other emissions not reported were too low to read and deemed to comply with FCC limit.									

1GHz—25GHz Radiated emission Test result									
EUT: Bluetooth FM Transmitter M/N: AC-2121									
Power: DC 12V Supply by battery									
Test date: 2013-01-04 Test site: 3m Chamber Tested by: Anna Fan									
Test mode: 8-DPSK Tx CH79 2480MHz									
Antenna polarity: Vertical									
No	Freq (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4960	41.37	34.35	10.34	35.39	50.67	74.00	23.33	PK
2	4960	33.72	34.35	10.34	35.39	43.02	54.00	10.98	AV
3	7440	/							
4	9920	/							
5	12400	/							
Antenna Polarity: Horizontal									
1	4960	43.18	34.35	10.34	35.39	52.48	74.00	21.52	PK
2	4960	34.06	34.35	10.34	35.39	43.36	54.00	10.64	AV
3	7440	/							
4	9920	/							
5	12400	/							
Note:									
1, Measuring frequency from 1GHz to 25GHz									
2, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK									
2, Spectrum Set for AV measure: RBW=1MHz, VBW=10Hz, Sweep time=Auto, Detector: PK									
3, Result = Read level + Antenna factor + cable loss-Amp factor									
4, All the other emissions not reported were too low to read and deemed to comply with FCC limit.									

## 9. Band Edge Compliance

### 9.1. Block Diagram of Test Setup



### 9.2. Limit

All the lower and upper band-edges emissions appearing within 2310MHz to 2390MHz and 2483.5MHz to 2500MHz restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz and 5725MHz to 5850MHz shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

### 9.3. Test Procedure

Same with clause 6.3 except change investigated frequency range from 2310MHz to 2415MHz, 2475MHz to 2500MHz and 5725MHz to 5850MHz

### 9.4. Test Result

**PASS. (See below detailed test data)**

GFSK

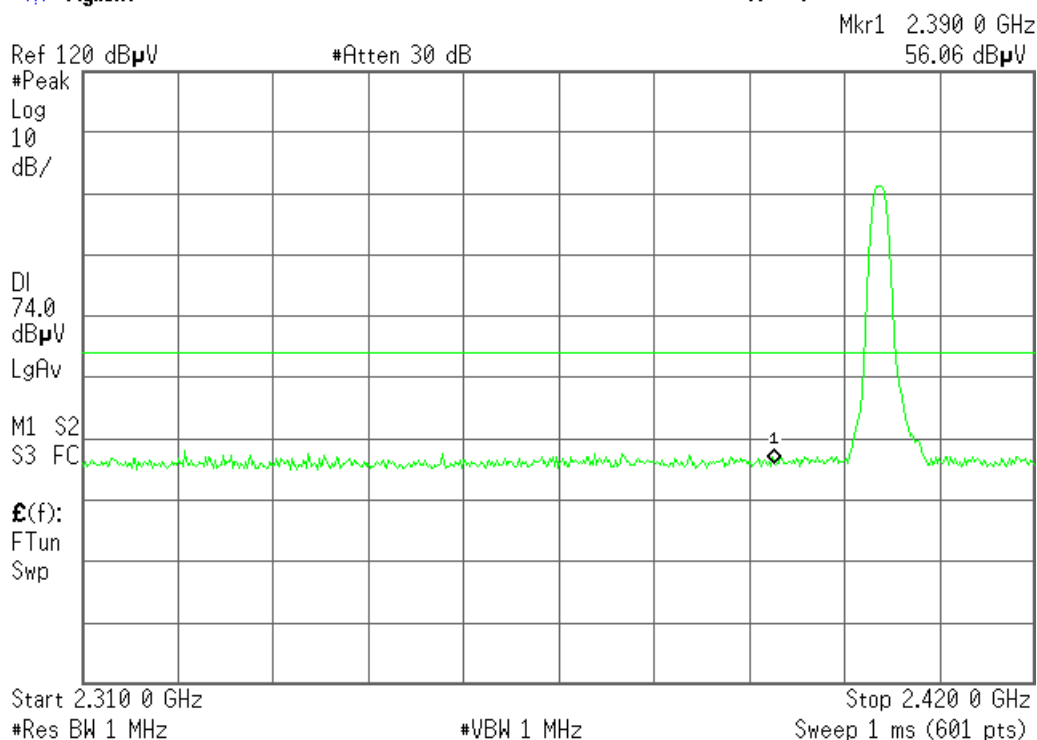
CH LOW :

Detector mode: Peak

Polarity: Vertical

Agilent

R T

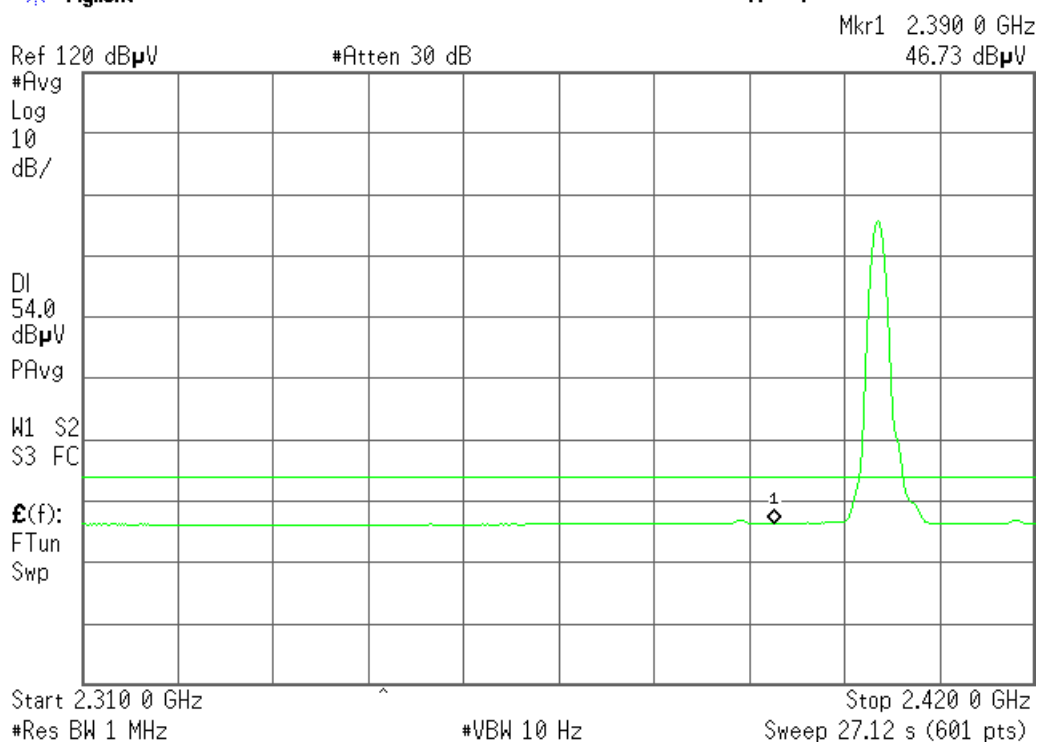


Detector mode: Average

Polarity: Vertical

Agilent

R T





CH High :

**Detector mode: Peak**

**Polarity: Vertical**

 **Agilent**

**R L**

Mkr1 2.483 50 GHz  
58.51 dB $\mu$ V

Ref 120 dB $\mu$ V

#Atten 30 dB

#Peak  
Log  
10  
dB/

DI  
74.0  
dB $\mu$ V  
LgAv

M1 S2  
S3 FC

$\mathcal{E}(f)$ :  
FTun  
Swp

Start 2.450 00 GHz

#Res BW 1 MHz

#VBW 1 MHz

Stop 2.500 00 GHz

Sweep 1 ms (601 pts)

**Detector mode: Average**

**Polarity: Vertical**

 **Agilent**

**R T**

Mkr1 2.483 50 GHz  
46.88 dB $\mu$ V

Ref 120 dB $\mu$ V

#Atten 30 dB

#Avg  
Log  
10  
dB/

DI  
54.0  
dB $\mu$ V  
PAvg

M1 S2  
S3 FC

$\mathcal{E}(f)$ :  
FTun  
Swp

Start 2.450 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

Stop 2.500 00 GHz

Sweep 12.33 s (601 pts)

CH LOW :

Detector mode: Peak

Polarity: Horizontal

Agilent

R T

Mkr1 2.390 0 GHz  
55.37 dB $\mu$ V

Ref 120 dB $\mu$ V

#Atten 30 dB

#Peak  
Log  
10  
dB/

DI  
74.0  
dB $\mu$ V  
LgAv

M1 S2  
S3 FC

E(f):  
FTun  
Swp

Start 2.310 0 GHz

#Res BW 1 MHz

#VBW 1 MHz

Stop 2.420 0 GHz

Sweep 1 ms (601 pts)

Detector mode: Average

Polarity: Horizontal

Agilent

R T

Mkr1 2.390 0 GHz  
46.37 dB $\mu$ V

Ref 120 dB $\mu$ V

#Atten 30 dB

#Avg  
Log  
10  
dB/

DI  
54.0  
dB $\mu$ V  
PAvg

M1 S2  
S3 FC

E(f):  
FTun  
Swp

Start 2.310 0 GHz

#Res BW 1 MHz

#VBW 10 Hz

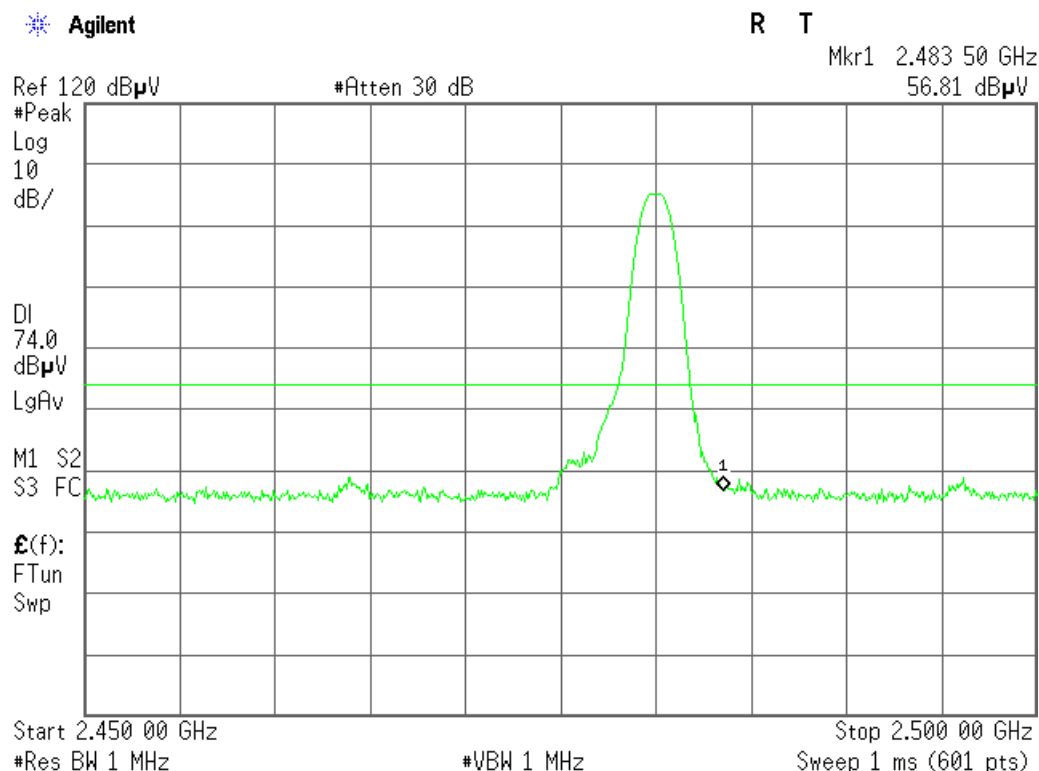
Stop 2.420 0 GHz

Sweep 27.12 s (601 pts)

CH High :

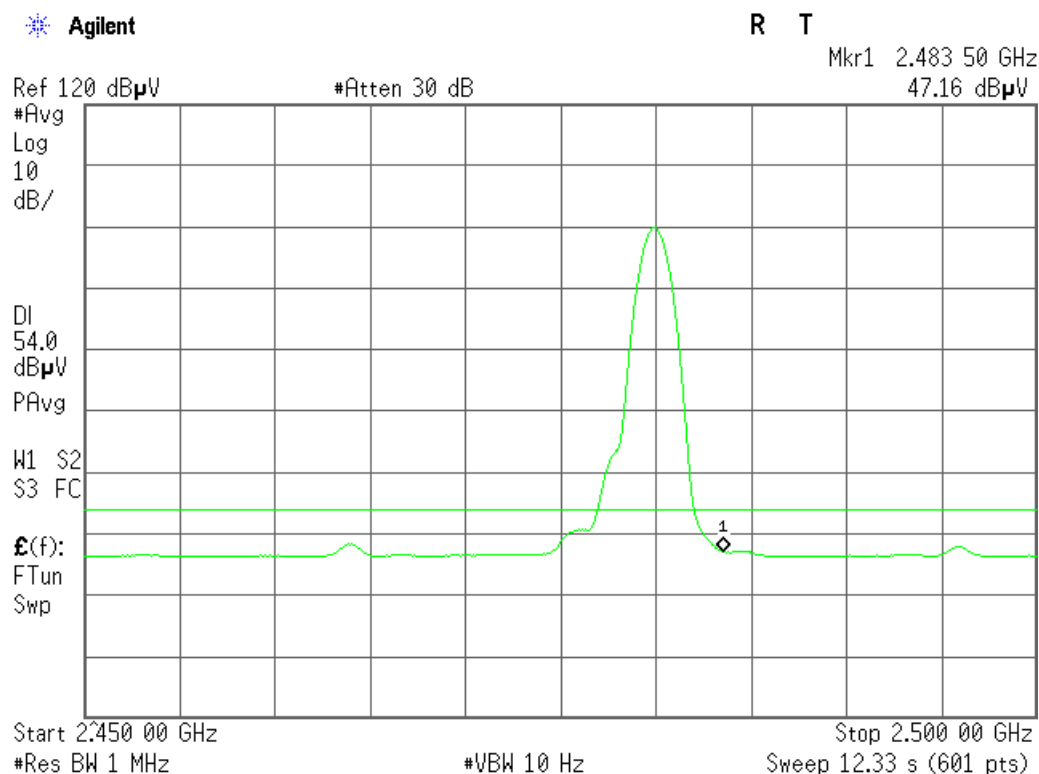
**Detector mode: Peak**

**Polarity: Horizontal**



**Detector mode: Average**

**Polarity: Horizontal**



## 8-DPSK

CH LOW :

**Detector mode: Peak**

**Polarity: Horizontal**

Agilent

R T

Mkr1 2.390 0 GHz  
56.07 dB $\mu$ V

Ref 120 dB $\mu$ V

#Atten 30 dB

#Peak  
Log  
10  
dB/

DI  
74.0  
dB $\mu$ V  
LgAv

M1 S2  
S3 FC

$\mathcal{E}(f)$ :  
FTun  
Swp

Start 2.310 0 GHz

#Res BW 1 MHz

#VBW 1 MHz

Stop 2.420 0 GHz

Sweep 1 ms (601 pts)

**Detector mode: Average**

**Polarity: Horizontal**

Agilent

R T

Mkr1 2.390 0 GHz  
46.42 dB $\mu$ V

Ref 120 dB $\mu$ V

#Atten 30 dB

#Avg  
Log  
10  
dB/

DI  
54.0  
dB $\mu$ V  
PAvg

M1 S2  
S3 FC

$\mathcal{E}(f)$ :  
FTun  
Swp

Start 2.310 0 GHz

#Res BW 1 MHz

#VBW 10 Hz

Stop 2.420 0 GHz

Sweep 27.12 s (601 pts)

CH High :

Detector mode: Peak

Polarity: Horizontal

Agilent

R T

Mkr1 2.483 50 GHz  
59.72 dB $\mu$ V

Ref 120 dB $\mu$ V

#Atten 30 dB

#Peak  
Log  
10  
dB/

DI  
74.0  
dB $\mu$ V  
LgAv

M1 S2  
S3 FC

$\mathcal{E}(f)$ :  
FTun  
Swp

Start 2.450 00 GHz

#Res BW 1 MHz

#VBW 1 MHz

Stop 2.500 00 GHz

Sweep 1 ms (601 pts)

Detector mode: Average

Polarity: Horizontal

Agilent

R T

Mkr1 2.483 50 GHz  
47.89 dB $\mu$ V

Ref 120 dB $\mu$ V

#Atten 30 dB

#Avg  
Log  
10  
dB/

DI  
54.0  
dB $\mu$ V  
PAvg

M1 S2  
S3 FC

$\mathcal{E}(f)$ :  
FTun  
Swp

Start 2.450 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

Stop 2.500 00 GHz

Sweep 12.33 s (601 pts)

CH LOW :

Detector mode: Peak

Polarity: Vertical

Agilent

R T

Mkr1 2.390 0 GHz  
56.03 dB $\mu$ V

Ref 120 dB $\mu$ V

#Atten 30 dB

#Peak  
Log  
10  
dB/

DI  
74.0  
dB $\mu$ V  
LgAv

M1 S2  
S3 FC

$\mathcal{E}(f)$ :  
FTun  
Swp

Start 2.310 0 GHz

#Res BW 1 MHz

#VBW 1 MHz

Stop 2.420 0 GHz

Sweep 1 ms (601 pts)

Detector mode: Average

Polarity: Vertical

Agilent

R T

Mkr1 2.390 0 GHz  
46.49 dB $\mu$ V

Ref 120 dB $\mu$ V

#Atten 30 dB

#Avg  
Log  
10  
dB/

DI  
54.0  
dB $\mu$ V  
PAvg

M1 S2  
S3 FC

$\mathcal{E}(f)$ :  
FTun  
Swp

Start 2.310 0 GHz

#Res BW 1 MHz

#VBW 10 Hz

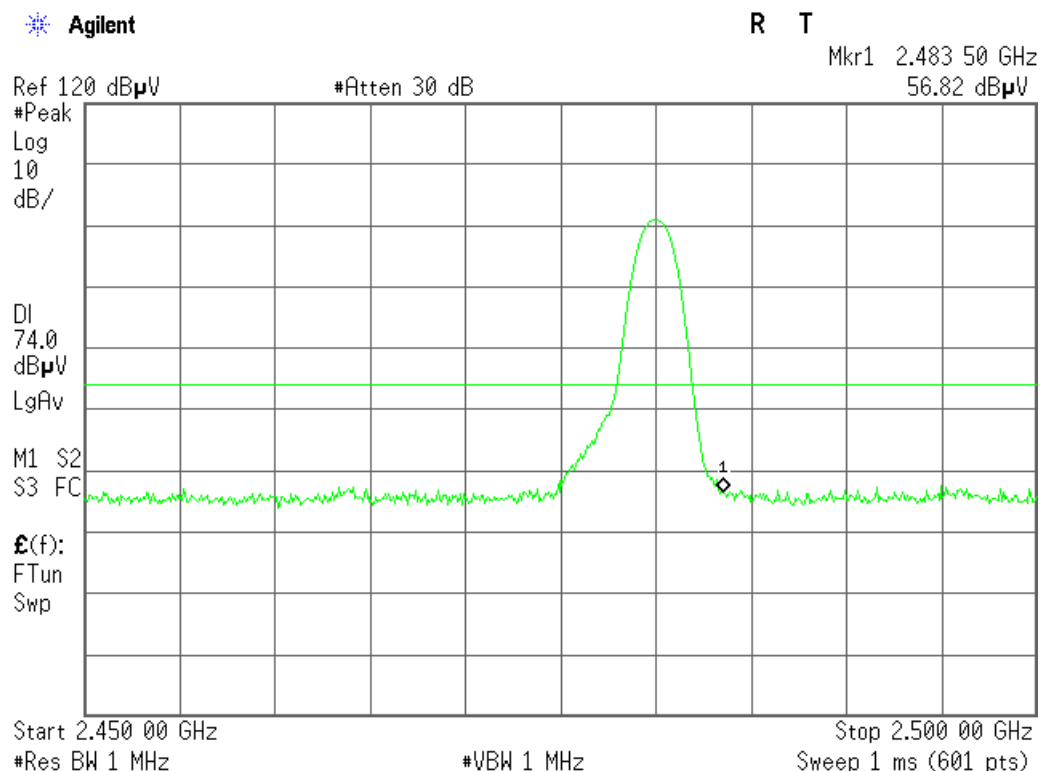
Stop 2.420 0 GHz

Sweep 27.12 s (601 pts)

CH High :

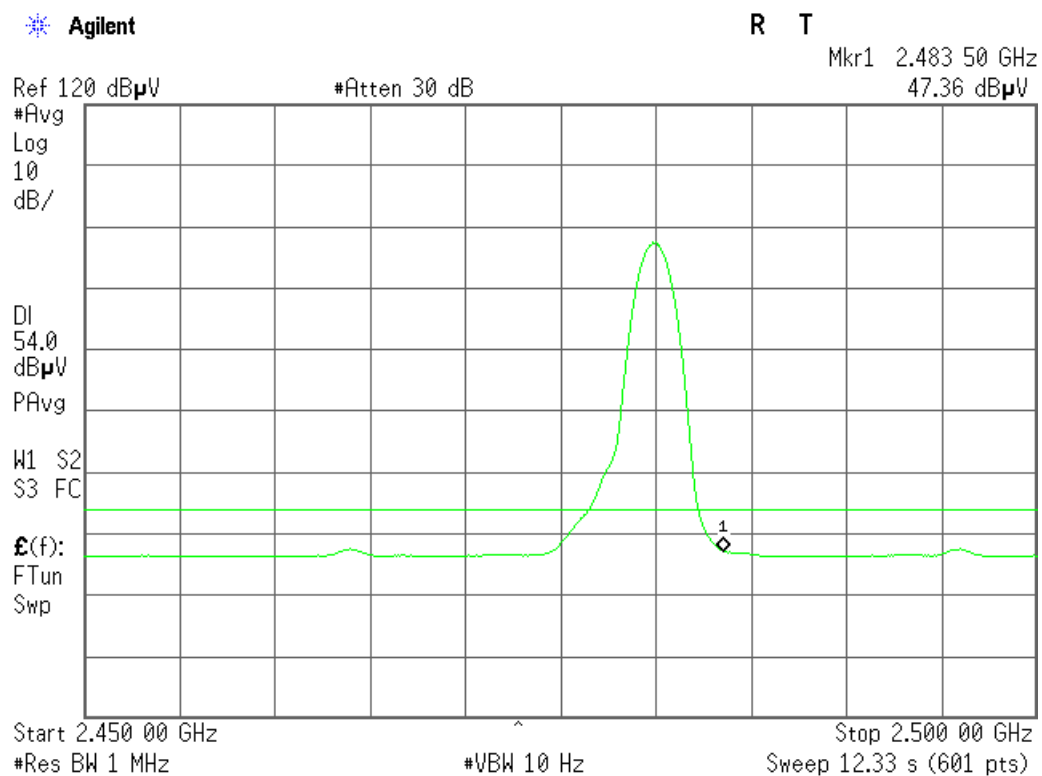
**Detector mode: Peak**

**Polarity: Vertical**



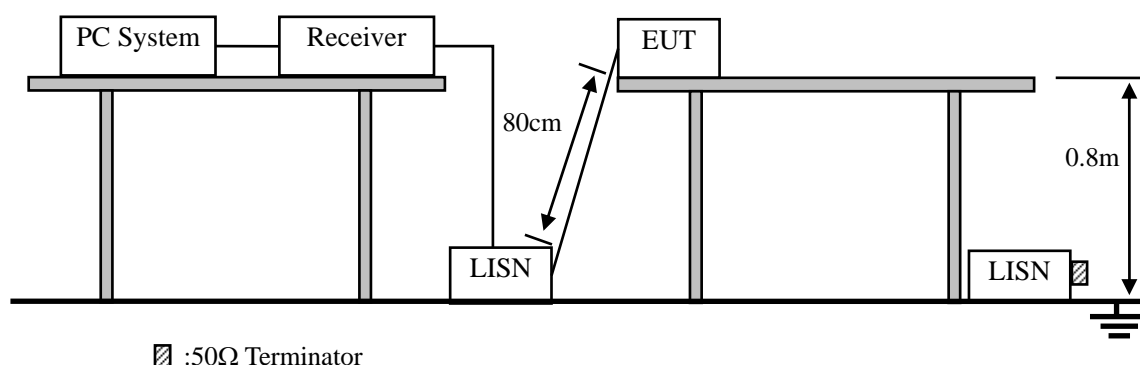
**Detector mode: Average**

**Polarity: Vertical**



## 10. Power Line Conducted Emissions

### 10.1. Block Diagram of Test Setup



### 10.2. Limit

Frequency	Maximum RF Line Voltage	
	Quasi-Peak Level dB( $\mu$ V)	Average Level dB( $\mu$ V)
150kHz ~ 500kHz	66 ~ 56*	56 ~ 46*
500kHz ~ 5MHz	56	46
5MHz ~ 30MHz	60	50

Notes: 1. \* Decreasing linearly with logarithm of frequency.

2. The lower limit shall apply at the transition frequencies.

### 10.3. Test Procedure

- (1) The EUT was placed on a non-metallic table, 80cm above the ground plane.
- (2) Setup the EUT and simulator as shown in 10.1
- (3) The EUT Power connected to the power mains through a power adapter and a line impedance stabilization network (L.I.S.N1). The other peripheral devices power cord connected to the power mains through a line impedance stabilization network (L.I.S.N2), this provided a 50-ohm coupling impedance for the EUT (Please refer to the block diagram of the test setup and photographs). Both sides of power line were checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.4 2003 on conducted Emission test.
- (4) The bandwidth of test receiver is set at 10KHz.
- (5) The frequency range from 150 KHz to 30MHz is checked.

### 10.4. Test Result

EUT Supply by DC Power, So this test is not applicable.



## **11. Antenna Requirements**

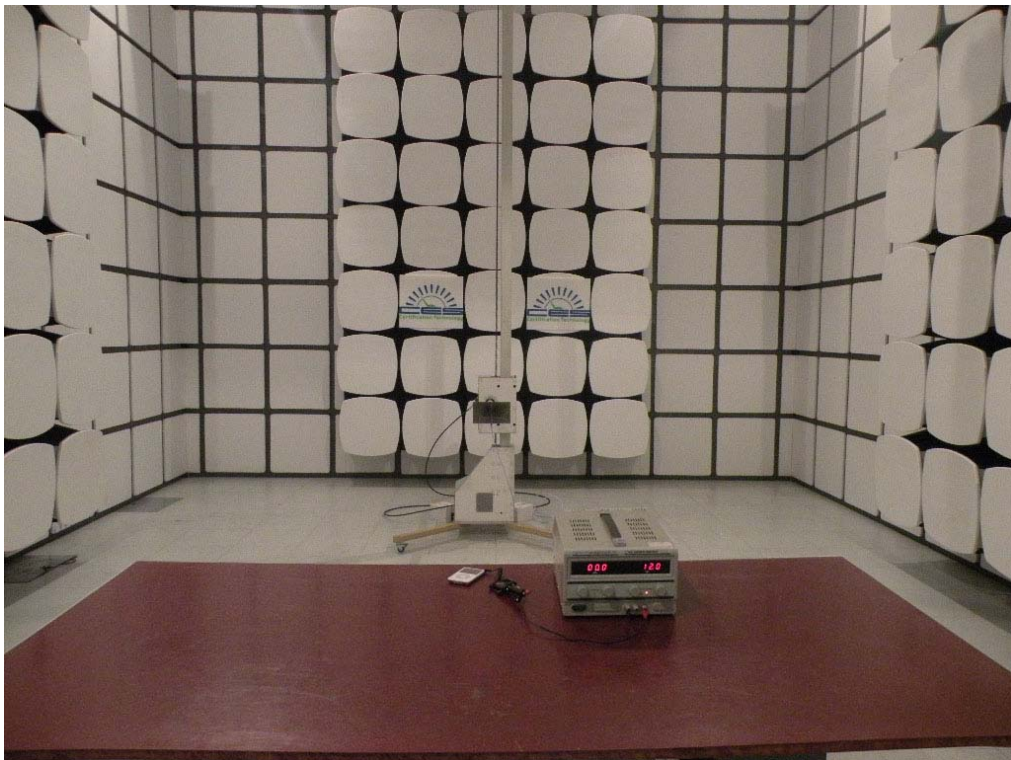
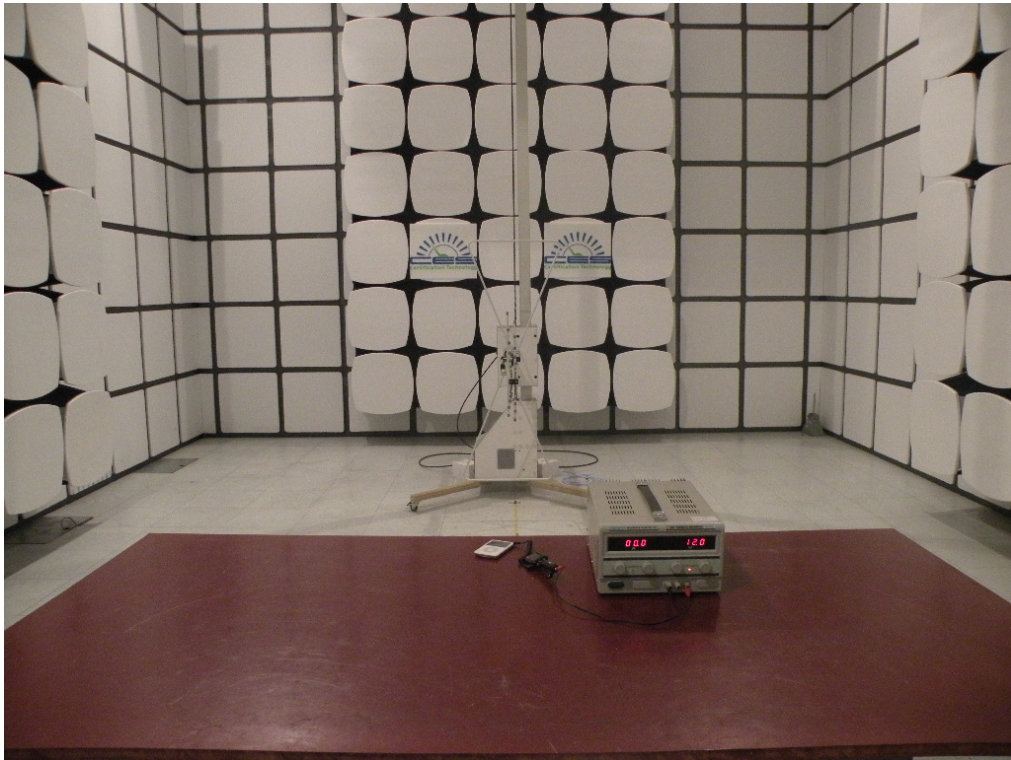
### **11.1. Limit**

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

### **11.2. Result**

The antennas used for this product are integral Patch Antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 1.13dBi.

## 12. Test setup photo



### 13.Photos of EUT

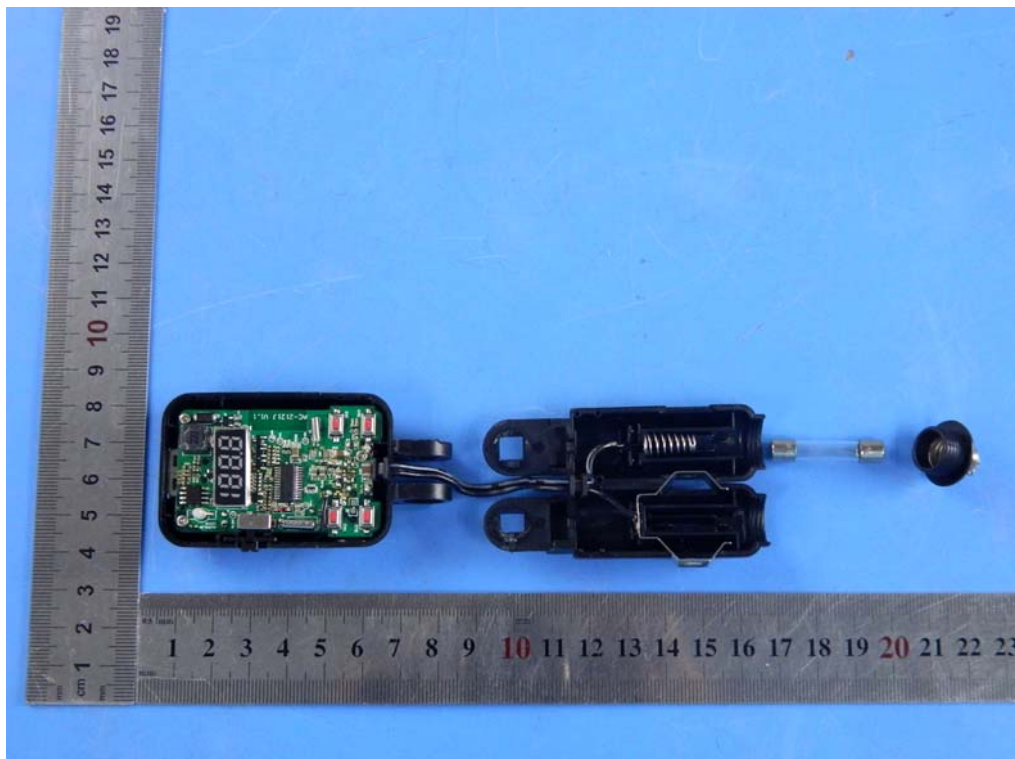


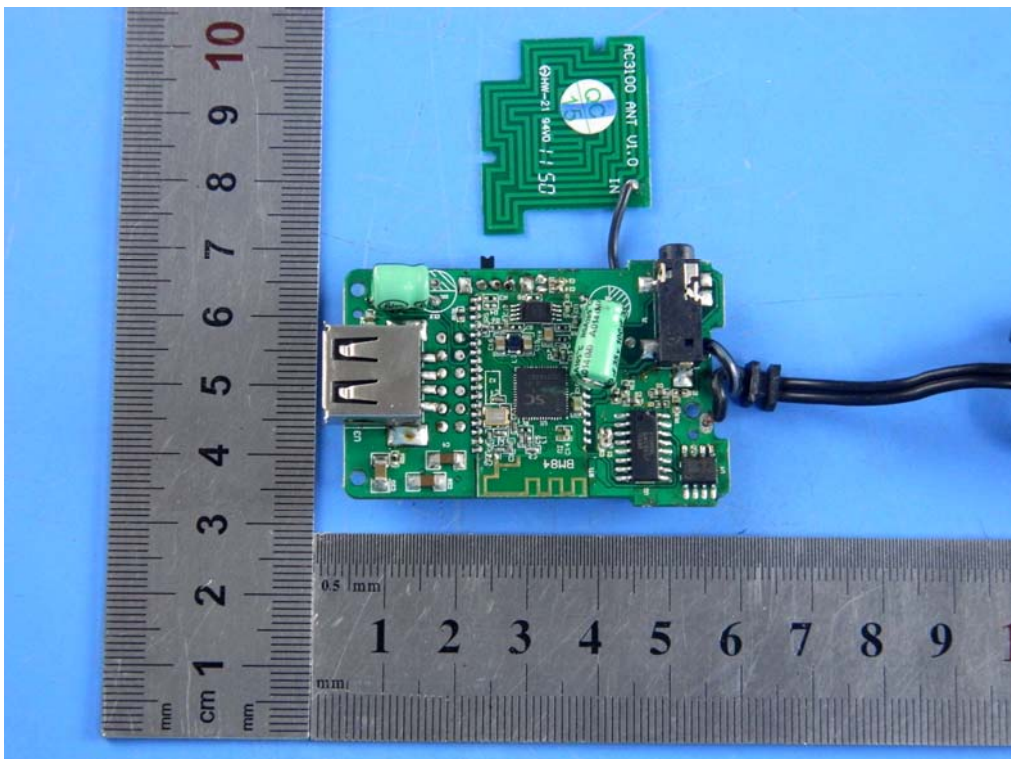
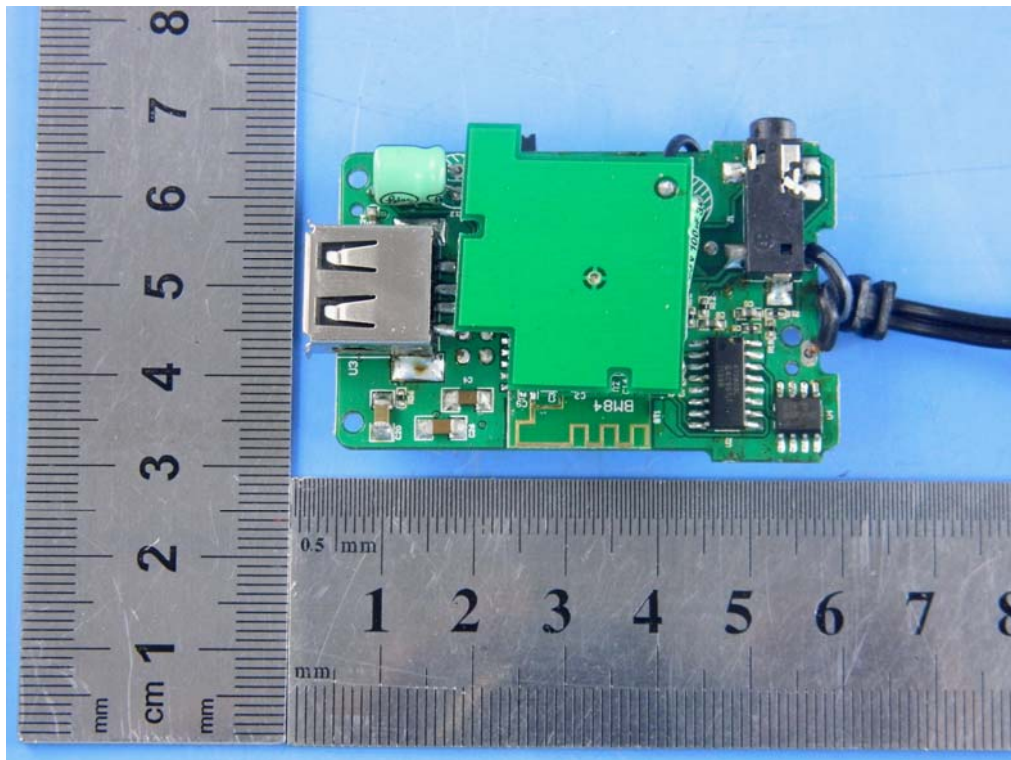


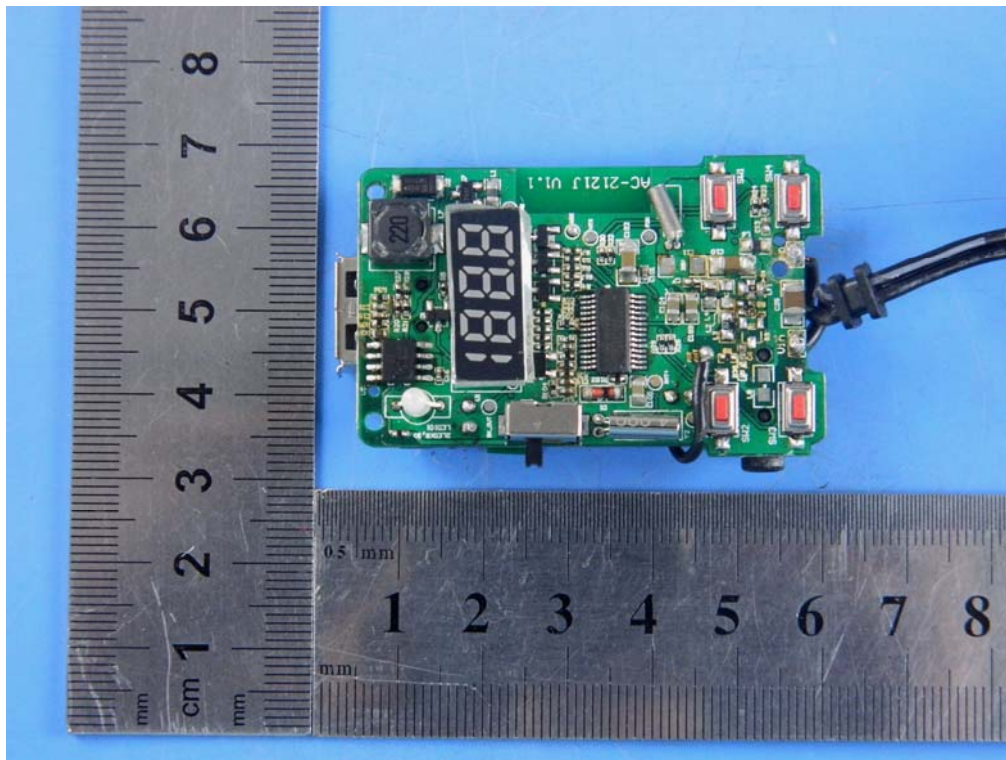












END OF THE REPORT