

# FCC TEST REPORT(Bluetooth)

for

ALL BEST TECHNOLOGY LIMITED

Alarm clock bluetooth speaker with FM radio

Model Number: S1-BT

FCC ID: RH8S1-BT

Prepared for : ALL BEST TECHNOLOGY LIMITED  
Address : No.9,Yincheng1st Road,Xiabian Village, Chang'an Town,  
Dongguan City,Guangdong Province, China

Prepared by : Keyway Testing Technology Co., Ltd.  
Address : Baishun Industrial Zone, Zhangmutou Town,  
Dongguan, Guangdong, China

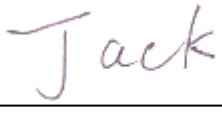
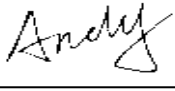
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Report No. : 14KWE111992F  
Date of Test : Nov. 7~ 10, 2014  
Date of Report : Nov. 11, 2014

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## Keyway Testing Technology Co., Ltd.

|                                                                                                                                                                                                              |                                                                                                                   |                                                                                                                     |                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|------------------|
| <b>Applicant:</b>                                                                                                                                                                                            | ALL BEST TECHNOLOGY LIMITED                                                                                       |                                                                                                                     |                  |
| <b>Address:</b>                                                                                                                                                                                              | No.9,Yincheng1st Road,Xiabian Village, Chang'an Town,<br>Dongguan City,Guangdong Province, China                  |                                                                                                                     |                  |
| <b>Manufacturer:</b>                                                                                                                                                                                         | ALL BEST TECHNOLOGY LIMITED                                                                                       |                                                                                                                     |                  |
| <b>Address:</b>                                                                                                                                                                                              | No.9,Yincheng1st Road,Xiabian Village, Chang'an Town,<br>Dongguan City,Guangdong Province, China                  |                                                                                                                     |                  |
| <b>E.U.T:</b>                                                                                                                                                                                                | Alarm clock bluetooth speaker with FM radio                                                                       |                                                                                                                     |                  |
| <b>Model Number:</b>                                                                                                                                                                                         | S1-BT                                                                                                             |                                                                                                                     |                  |
| <b>Trade Name:</b>                                                                                                                                                                                           | -----                                                                                                             | <b>Serial No.:</b>                                                                                                  | -----            |
| <b>Date of Receipt:</b>                                                                                                                                                                                      | Nov. 6, 2014                                                                                                      | <b>Date of Test:</b>                                                                                                | Nov. 7~ 10, 2014 |
| <b>Test Specification:</b>                                                                                                                                                                                   | FCC Part 15, Subpart C Section 15.249: Oct. 1, 2014<br>ANSI C63.4:2009                                            |                                                                                                                     |                  |
| <b>Test Result:</b>                                                                                                                                                                                          | The equipment under test was found to be compliance with the requirements of the standards applied.               |                                                                                                                     |                  |
| <b>Issue Date: Nov. 11, 2014</b>                                                                                                                                                                             |                                                                                                                   |                                                                                                                     |                  |
| Tested by:                                                                                                                                                                                                   | Reviewed by:                                                                                                      | Approved by:                                                                                                        |                  |
| <br><hr style="width: 100%;"/>                                                                                            | <br><hr style="width: 100%;"/> | <br><hr style="width: 100%;"/> |                  |
| Jack Bu / Engineer                                                                                                                                                                                           | Andy Gao / Supervisor                                                                                             | Jade Yang / Supervisor                                                                                              |                  |
| <b>Other Aspects:</b>                                                                                                                                                                                        | None.                                                                                                             |                                                                                                                     |                  |
| Abbreviations: OK/P=passed    fail/F=failed    n.a/N=not applicable    E.U.T=equipment under tested                                                                                                          |                                                                                                                   |                                                                                                                     |                  |
| This test report is based on a single evaluation of one sample of above mentioned products. It is not permitted to be duplicated in extracts without written approval of Keyway Testing Technology Co., Ltd. |                                                                                                                   |                                                                                                                     |                  |

## 1. TEST SUMMARY

| Test Items                 | Test Requirement       | Result |
|----------------------------|------------------------|--------|
| Conducted Emissions        | 15.207                 | PASS   |
| Radiated Emissions         | 15.209<br>15.249(a)(d) | PASS   |
| 20dB Bandwidth             | 15.249                 | PASS   |
| Emissions from out of band | 15.249(d)              | PASS   |
| Antenna Requirement        | 15.203                 | PASS   |

## 2. GENERAL PRODUCT INFORMATION

### 2.1. Product Function

Refer to Technical Construction Form and User Manual.

### 2.2. Description of Device (EUT)

|                        |                                             |
|------------------------|---------------------------------------------|
| Product Name:          | Alarm clock bluetooth speaker with FM radio |
| Model No.:             | S1-BT                                       |
| Operation Frequency:   | 2402~2480MHz                                |
| Channel numbers:       | 79 Channels                                 |
| Channel separation:    | 1M                                          |
| Modulation technology: | GFSK, Pi/4DQPSK, 8-DPSK                     |
| Antenna Type:          | Integral Antenna                            |
| Antenna gain:          | 0dBi (declare by Applicant)                 |
| Power supply:          | DC 5V from adapter                          |

### 2.3. Difference between Model Numbers

None.

### 2.4. Independent Operation Modes

The basic operation modes are:

2.4.1. EUT work continues TX mode and frequency as below:

| Modulation | Channel | Frequency |
|------------|---------|-----------|
| GFSK       | Low     | 2402MHz   |
|            | Middle  | 2441MHz   |
|            | High    | 2480MHz   |

Note: Bluetooth signal has 3 packages DH1, DH3, DH5, DH5 package is largest; we are testing DH5 in the report.

### 2.5. Test Supporting System

|          |                                                                                               |
|----------|-----------------------------------------------------------------------------------------------|
| Adapter: | Provide: Eiessentials<br>M/N: CW0501500<br>Input : AC 100~240V 50-60Hz;<br>Output: DC 5V 1.5A |
|----------|-----------------------------------------------------------------------------------------------|

### 3. TEST SITES

#### 3.1. Test Facilities

Lab Qualifications : 944 Shielded Room built by ETS-Lindgren, USA  
Date of completion: March 28, 2011

966 Chamber built by ETS-Lindgren, USA  
Date of completion: March 28, 2011

Certificated by TUV Rheinland, Germany.  
Registration No.: UA 50207153  
Date of registration: July 13, 2011

Certificated by UL, USA  
Registration No.: 100567-237  
Date of registration: September 1, 2011

Certificated by Intertek  
Registration No.: 2011-RTL-L1-31  
Date of registration: October 11, 2011

Certificated by Industry Canada  
Registration No.: 9868A  
Date of registration: December 8, 2011

Certificated by FCC, USA  
Registration No.: 370994  
Date of registration: February 21, 2012

Certificated by CNAS China  
Registration No.: CNAS L5783  
Date of registration: August 8, 2012

Name of Firm : Keyway Testing Technology Co., Ltd.

Site Location : Baishun Industrial Zone, Zhangmutou Town,  
Dongguan, Guangdong, China

## 3.2. List of Test and Measurement Instruments

### 3.2.1. For conducted emission at the mains terminals test

| Equipment                      | Manufacturer  | Model No. | Serial No. | Last Cal.  | Next Cal.  |
|--------------------------------|---------------|-----------|------------|------------|------------|
| EMI Test Receiver              | Rohde&Schwarz | ESCI      | 101156     | Apr. 27,14 | Apr. 27,15 |
| Artificial Mains Network       | Rohde&Schwarz | ENV216    | 101315     | Apr. 27,14 | Apr. 27,15 |
| Artificial Mains Network (AUX) | Rohde&Schwarz | ENV216    | 101314     | Apr. 27,14 | Apr. 27,15 |
| RF Cable                       | FUJIKURA      | 3D-2W     | 944 Cable  | Apr. 27,14 | Apr. 27,15 |

### 3.2.2. For radiated emission test

| Equipment                             | Manufacturer  | Model No.          | Serial No.   | Last Cal.  | Next Cal.  |
|---------------------------------------|---------------|--------------------|--------------|------------|------------|
| EMI Test Receiver                     | Rohde&Schwarz | ESCI               | 101156       | Apr. 27,14 | Apr. 27,15 |
| System Simulator                      | Agilent       | E5515C             | GB43130245   | Apr. 30,14 | Apr. 30,15 |
| Power Splitter                        | Weinschel     | 1506A              | NW425        | Apr. 30,14 | Apr. 30,15 |
| Bilog Antenna                         | ETS-LINDGREEN | 3142D              | 135452       | Apr. 27,14 | Apr. 27,15 |
| Spectrum Analyzer                     | Agilent       | E4411B             | MY4511304    | Apr. 27,14 | Apr. 27,15 |
| 3m Semi-anechoic Chamber              | ETS-LINDGREEN | 966                | KW01         | Apr. 27,14 | Apr. 27,15 |
| Signal Amplifier                      | SONOMA        | 310                | 187016       | Apr. 27,14 | Apr. 27,15 |
| Signal Amplifier                      | Agilent       | 8449B              | 3008A00251   | Apr. 27,14 | Apr. 27,15 |
| RF Cable                              | IMRO          | IMRO-400           | 966 Cable 1# | N/A        | N/A        |
| MULTI-DEVICE Controller               | ETS-LINDGREEN | 2090               | 126913       | N/A        | N/A        |
| Horn Antenna                          | DAZE          | ZN30701            | 11003        | Apr. 27,14 | Apr. 27,15 |
| Horn Antenna                          | SCHWARZBECK   | BBHA9170           | 9170-068     | Apr. 27,14 | Apr. 27,15 |
| Spectrum Analyzer                     | Agilent       | 8593E              | 3911A04271   | Apr. 27,14 | Apr. 27,15 |
| Spectrum Analyzer                     | Agilent       | E4408B             | MY44211125   | Apr. 30,14 | Apr. 30,15 |
| Signal Amplifier                      | DAZE          | ZN3380C            | 11001        | Apr. 27,14 | Apr. 27,15 |
| High Pass filter                      | Micro         | HPM50111           | 324216       | Apr. 30,14 | Apr. 30,15 |
| Filter                                | COM-MW        | ZBSF-C836.5-25-X   | KW032        | Apr. 30,14 | Apr. 30,15 |
| Filter                                | COM-MW        | ZBSF-C1747.5-75-X2 | KW035        | Apr. 30,14 | Apr. 30,15 |
| Filter                                | COM-MW        | ZBSF-C1880-60-X2   | KW037        | Apr. 30,14 | Apr. 30,15 |
| DC Power Supply                       | LongWei       | PS-305D            | 010964729    | Apr. 27,14 | Apr. 27,15 |
| Constant temperature and humidity box | GF            | GTH-800-40-1P      | MAA9906-005  | Apr. 27,14 | Apr. 27,15 |
| Universal radio communication tester  | Rohde&Schwarz | CMU200             | 3215420      | Apr. 27,14 | Apr. 27,15 |
| Splitter                              | Agilent       | 11636B             | 0025164      | Apr. 27,14 | Apr. 27,15 |

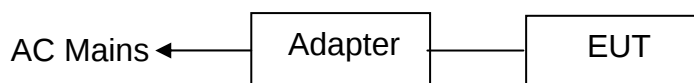
## 4. TEST SET-UP AND OPERATION MODES

### 4.1. Principle of Configuration Selection

**Emission:** The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the Operating Instructions.

### 4.2. Block Diagram of Test Set-up

System Diagram of Connections between EUT and Simulators



(EUT: Alarm clock bluetooth speaker with FM radio)

### 4.3. Test Operation Mode and Test Software

None.

### 4.4. Special Accessories and Auxiliary Equipment

None.

### 4.5. Countermeasures to Achieve EMC Compliance

None.

### 4.6. Test Environment:

Ambient conditions in the test laboratory:

| Items            | Actual |
|------------------|--------|
| Temperature (°C) | 21~23  |
| Humidity (%RH)   | 50~65  |

## 5. EMISSION TEST RESULTS

### 5.1. Conducted Emission at the Mains Terminals Test

#### 5.1.1. 15.207 limits

| FREQUENCY OF EMISSION (MHz) | CONDUCTED LIMIT (dB $\mu$ V) |          |
|-----------------------------|------------------------------|----------|
|                             | Quasi-peak                   | Average  |
| 0.15-0.5                    | 66 to 56                     | 56 to 46 |
| 0.5-5                       | 56                           | 46       |
| 5-30                        | 60                           | 50       |

#### 5.1.2. Test Setup

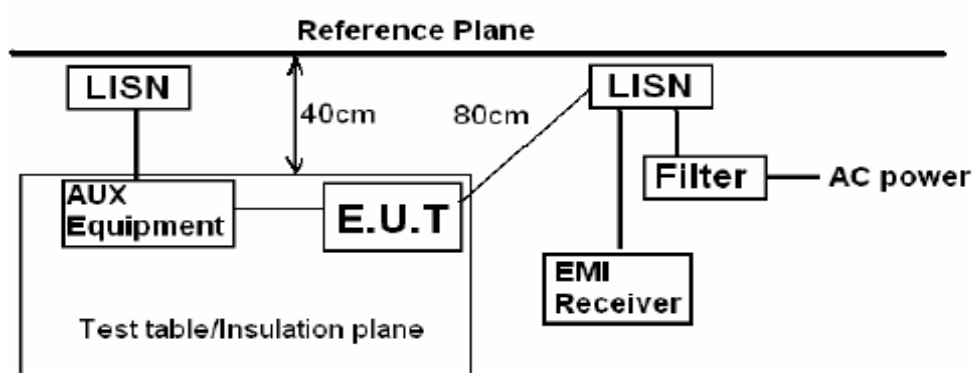
The EUT was put on a wooden table which was 0.8 m high above the ground and connected to the AC mains through the Artificial Mains Network (AMN). Where the mains cable supplied by the manufacture was longer than 0.8 m, the excess was folded back and forth parallel to the cable at the centre so as to form a bundle no longer than 0.4 m.

The EUT was kept 0.4 m from any other earthed conducting surface. Both sides of AC line were checked to find out the maximum conducted emission levels according to the test procedure during the conducted emission test.

The frequency range from 150 kHz to 30 MHz was investigated.

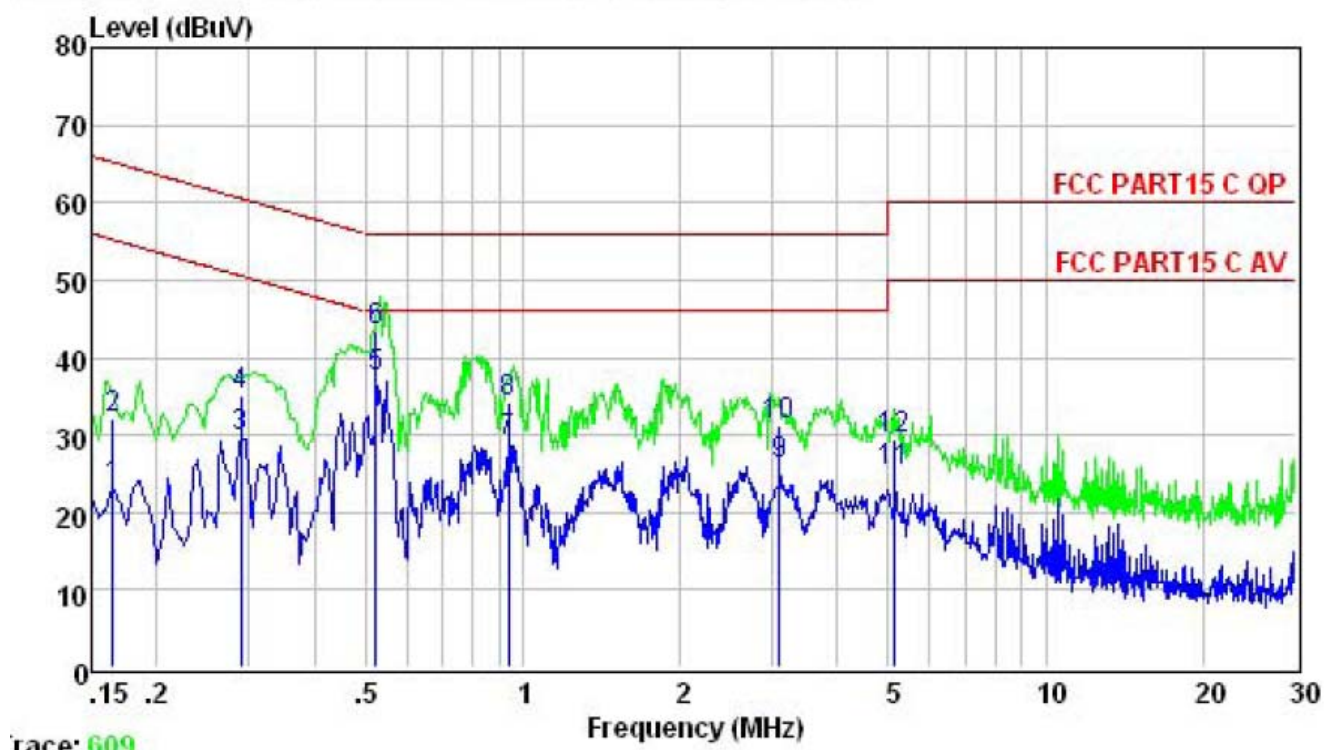
The bandwidth of the test receiver was set at 9 kHz.

Pretest for all mode, The test data of the worst case condition(s) was reported on the following page.



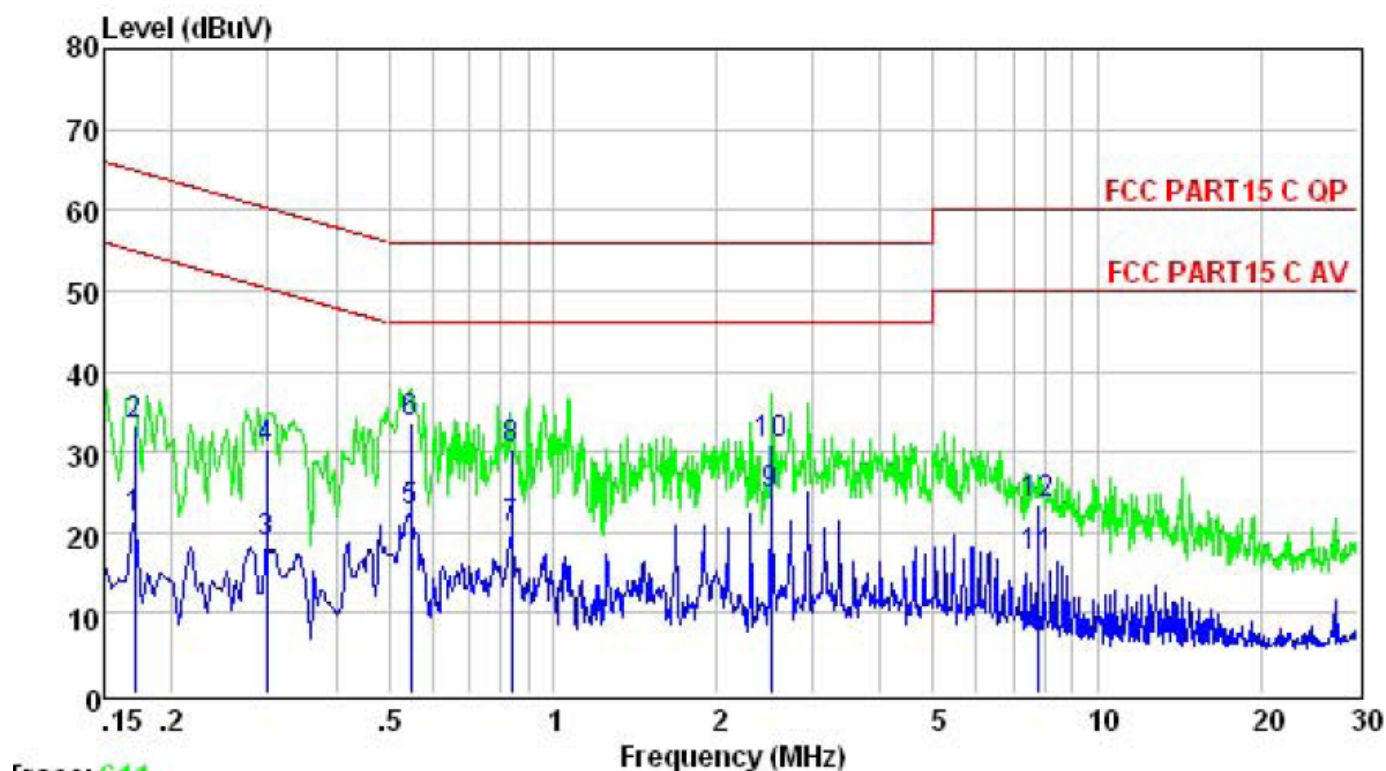
*Remark:*  
*E.U.T: Equipment Under Test*  
*LISN: Line Impedance Stabilization Network*  
*Test table height=0.8m*

Line:



|    | Freq  | Level | Limit | Over   |         |
|----|-------|-------|-------|--------|---------|
|    | MHz   | dBuV  | Line  | Limit  | Remark  |
|    | MHz   | dBuV  | dBuV  | dB     |         |
| 1  | 0.165 | 23.31 | 55.21 | -31.90 | Average |
| 2  | 0.165 | 32.23 | 65.21 | -32.98 | QP      |
| 3  | 0.289 | 29.84 | 50.54 | -20.70 | Average |
| 4  | 0.289 | 35.24 | 60.54 | -25.30 | QP      |
| 5  | 0.524 | 37.46 | 46.00 | -8.54  | Average |
| 6  | 0.524 | 43.35 | 56.00 | -12.65 | QP      |
| 7  | 0.938 | 29.23 | 46.00 | -16.77 | Average |
| 8  | 0.938 | 34.29 | 56.00 | -21.71 | QP      |
| 9  | 3.090 | 26.08 | 46.00 | -19.92 | Average |
| 10 | 3.090 | 31.21 | 56.00 | -24.79 | QP      |
| 11 | 5.139 | 25.30 | 50.00 | -24.70 | Average |
| 12 | 5.139 | 29.54 | 60.00 | -30.46 | QP      |

Neutral



|    | Freq  | Level | Limit | Over   | Remark  |
|----|-------|-------|-------|--------|---------|
|    | MHz   | dBuV  | Line  | Limit  |         |
|    |       |       | dBuV  | dB     |         |
| 1  | 0.170 | 21.85 | 54.94 | -33.09 | Average |
| 2  | 0.170 | 33.21 | 64.94 | -31.73 | QP      |
| 3  | 0.299 | 18.70 | 50.28 | -31.58 | Average |
| 4  | 0.299 | 30.24 | 60.28 | -30.04 | QP      |
| 5  | 0.549 | 22.47 | 46.00 | -23.53 | Average |
| 6  | 0.549 | 33.68 | 56.00 | -22.32 | QP      |
| 7  | 0.839 | 20.57 | 46.00 | -25.43 | Average |
| 8  | 0.839 | 30.28 | 56.00 | -25.72 | QP      |
| 9  | 2.513 | 24.64 | 46.00 | -21.36 | Average |
| 10 | 2.513 | 31.00 | 56.00 | -25.00 | QP      |
| 11 | 7.769 | 16.87 | 50.00 | -33.13 | Average |
| 12 | 7.769 | 23.54 | 60.00 | -36.46 | QP      |

## 5.2. Radiated Emission Test

### 5.2.1. Limit 15.209 limits

| FREQUENCY<br>MHz | DISTANCE<br>Meters | FIELD STRENGTHS LIMIT                                                                             |                                   |
|------------------|--------------------|---------------------------------------------------------------------------------------------------|-----------------------------------|
|                  |                    | $\mu\text{V}/\text{m}$                                                                            | $\text{dB}(\mu\text{V})/\text{m}$ |
| 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 $\text{dB}(\mu\text{V})/\text{m}$ (Peak)<br>54.0 $\text{dB}(\mu\text{V})/\text{m}$ (Average) |                                   |

### 5.2.2. Restricted bands of operation

| 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> ) |

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.

### 5.2.3. Test setup

The EUT was placed on a turn table which was 0.8 m above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was set 3 m away from the receiving antenna which was mounted on an antenna tower. The measuring antenna moved up and down to find out the maximum emission level. It moved from 1 m to 4 m for both horizontal and vertical polarizations.

The EUT was tested in the Chamber Site. It was pre-scanned with a Peak detector from the spectrum, and all the final readings from the test receiver were measured with the Quasi-Peak detector below 1GHz.

The bandwidth of the EMI test receiver is set at 120kHz for frequency range from 30MHz to 1000 MHz.

The bandwidth of the Spectrum's VBW is set at 3MHz and RBW is set at 1MHz for peak emissions measurement above 1GHz and 1MHz RBW, 10Hz VBW for average emissions measure above 1GHz. The detector is peak for all tests.

The frequency range from 30MHz to 10<sup>th</sup> harmonic (25GHz) are checked. and no any emissions were found from 18GHz to 25 GHz, So the radiated emissions from 18GHz to 25GHz were not record.

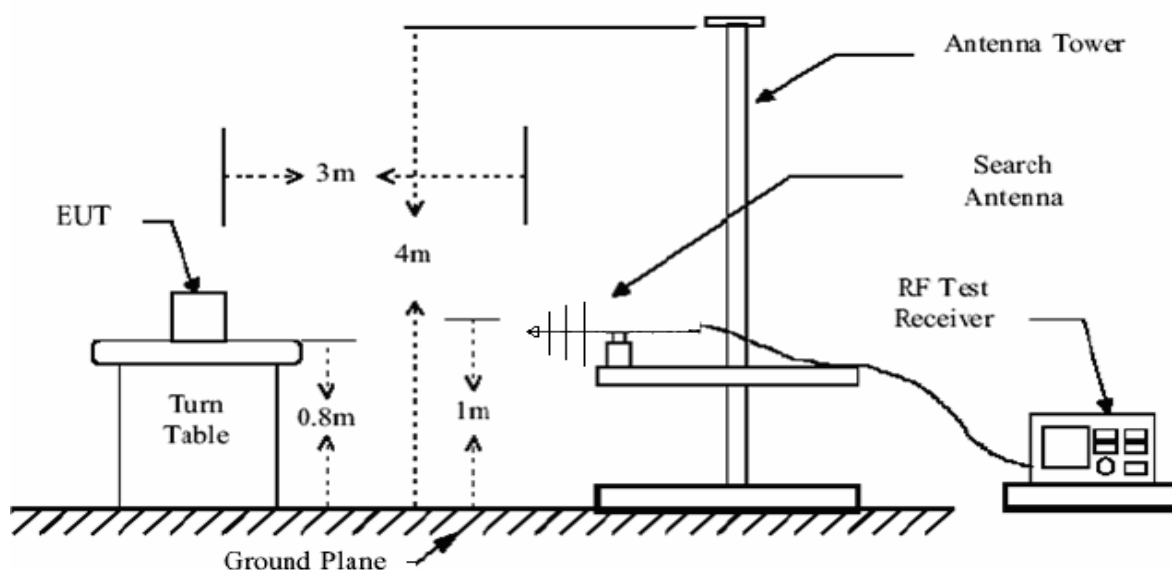
Notes: 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading-Preamp Factor.

2. Measurement Uncertainty:  $\pm 3.2$  dB at a level of confidence of 95%.

3. For emissions above 1GHz, if peak level comply with average limit, then the average level is deemed to comply with average limit.

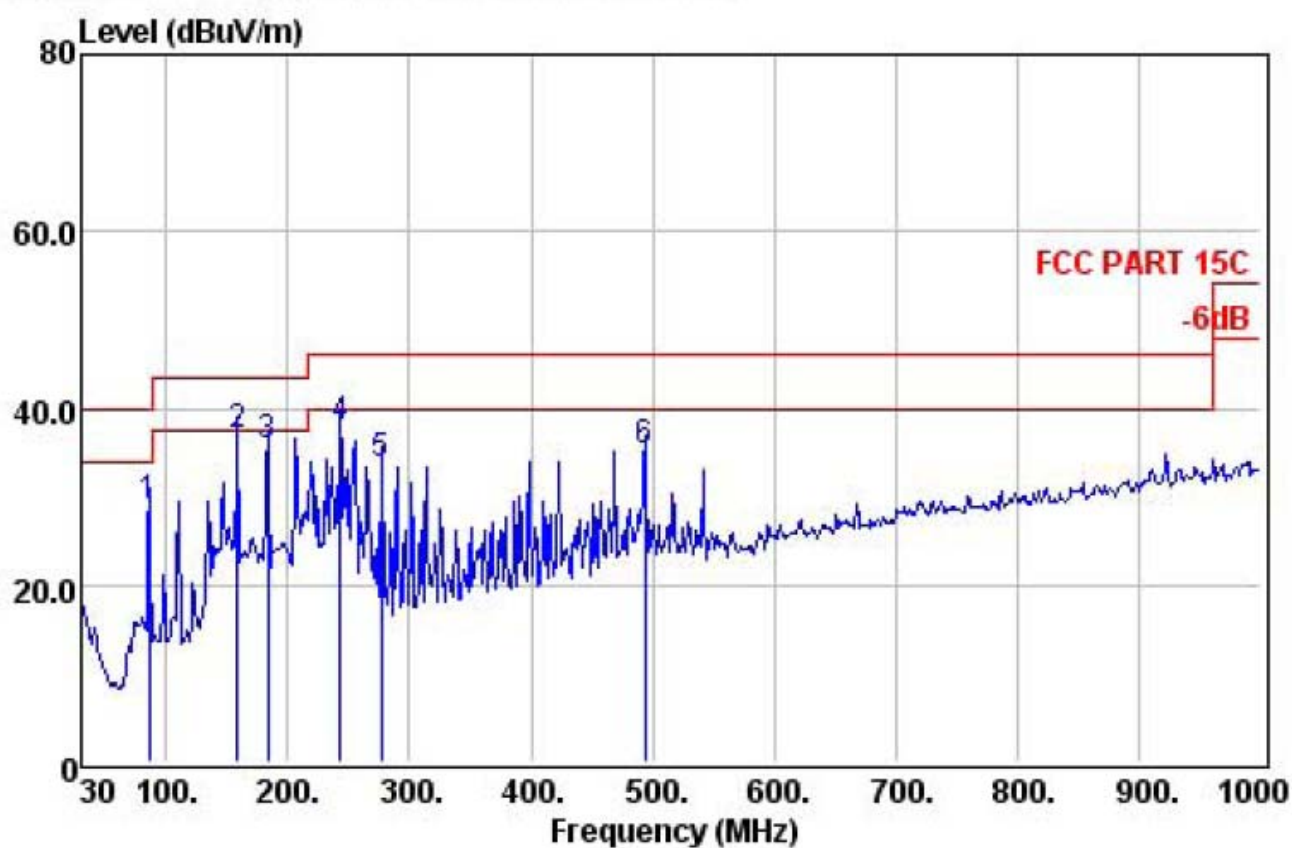
4. For emissions below 1GHz, pretest for all mode, The test data of the worst case condition(s) was reported on the following pages.

5. we pretest GFSK, Pi/4DQPSK, 8-DPSK, the worst mode was GFSK, the data show in the test report.



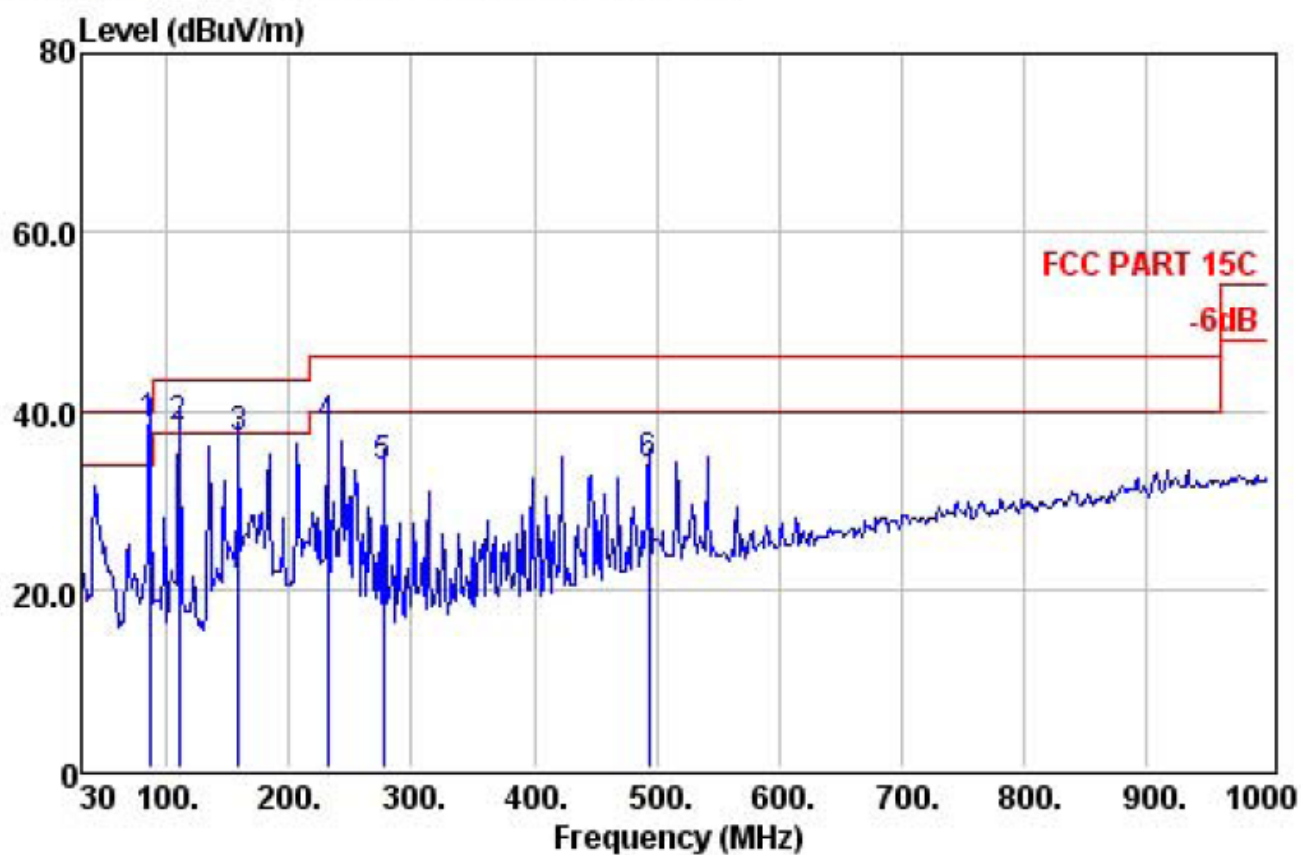
Below 1GHz

BT Mode Horizontal polarizations



|   | Preamp<br>Freq | Factor | Read<br>Level | Cable&Antenna<br>Loss | Factor | Level  | Limit<br>Line | Over<br>Limit | Remark |
|---|----------------|--------|---------------|-----------------------|--------|--------|---------------|---------------|--------|
|   | MHz            | dB     | dBuV          | dB                    | dB/m   | dBuV/m | dBuV/m        | dB            |        |
| 1 | 86.26          | 31.35  | 50.65         | 0.94                  | 8.69   | 28.93  | 40.00         | -11.07        | QP     |
| 2 | 158.04         | 31.23  | 57.71         | 1.30                  | 9.16   | 36.94  | 43.50         | -6.56         | QP     |
| 3 | 183.26         | 31.15  | 55.07         | 1.39                  | 10.30  | 35.61  | 43.50         | -7.89         | QP     |
| 4 | 243.40         | 30.95  | 54.47         | 1.61                  | 12.72  | 37.85  | 46.00         | -8.15         | QP     |
| 5 | 277.35         | 30.94  | 49.64         | 1.78                  | 13.08  | 33.56  | 46.00         | -12.44        | QP     |
| 6 | 493.66         | 30.59  | 44.21         | 2.77                  | 18.60  | 34.99  | 46.00         | -11.01        | QP     |

BT Mode    Vertical polarizations



|   |        | Preamp | Read  | CableAntenna |        | Limit  | Over   |           |
|---|--------|--------|-------|--------------|--------|--------|--------|-----------|
|   | Freq   | Factor | Level | Loss         | Factor | Line   | Limit  | Remark    |
|   | MHz    | dB     | dBuV  | dB           | dB/m   | dBuV/m | dBuV/m | dB        |
| 1 | 86.26  | 31.35  | 60.13 | 0.94         | 8.69   | 38.41  | 40.00  | -1.59 QP  |
| 2 | 109.54 | 31.31  | 58.96 | 1.03         | 9.31   | 37.99  | 43.50  | -5.51 QP  |
| 3 | 158.04 | 31.23  | 57.57 | 1.30         | 9.16   | 36.80  | 43.50  | -6.70 QP  |
| 4 | 231.76 | 30.93  | 54.90 | 1.61         | 12.39  | 37.97  | 46.00  | -8.03 QP  |
| 5 | 277.35 | 30.94  | 49.71 | 1.78         | 13.08  | 33.63  | 46.00  | -12.37 QP |
| 6 | 493.66 | 30.59  | 43.00 | 2.77         | 18.60  | 33.78  | 46.00  | -12.22 QP |

## Above 1GHz

## GFSK 2402MHz Horizontal

|   |          | Preamp | Read  | CableAntenna |        | Limit  | Over   |        |
|---|----------|--------|-------|--------------|--------|--------|--------|--------|
|   | Freq     | Factor | Level | Loss         | Factor | Level  | Line   | Limit  |
|   | MHz      | dB     | dBuV  | dB           | dB/m   | dBuV/m | dBuV/m | dB     |
| 1 | 2402.00  | 26.32  | 78.53 | 7.34         | 28.72  | 88.27  | 94.00  | -5.73  |
| 2 | 2402.00  | 26.32  | 93.66 | 7.34         | 28.72  | 103.40 | 114.00 | -10.60 |
| 3 | 4804.00  | 27.49  | 31.21 | 11.96        | 32.94  | 48.62  | 74.00  | -25.38 |
| 4 | 6950.00  | 27.89  | 17.97 | 16.60        | 37.07  | 43.75  | 74.00  | -30.25 |
| 5 | 8820.00  | 28.34  | 15.63 | 16.84        | 37.18  | 41.31  | 74.00  | -32.69 |
| 6 | 14719.00 | 29.51  | 14.30 | 19.83        | 39.69  | 44.31  | 74.00  | -29.69 |
|   |          |        |       |              |        |        |        | Remark |

## GFSK 2402MHz Vertical

|   |          | Preamp | Read  | CableAntenna |        | Limit  | Over   |        |
|---|----------|--------|-------|--------------|--------|--------|--------|--------|
|   | Freq     | Factor | Level | Loss         | Factor | Level  | Line   | Limit  |
|   | MHz      | dB     | dBuV  | dB           | dB/m   | dBuV/m | dBuV/m | dB     |
| 1 | 2402.00  | 26.32  | 79.13 | 7.34         | 28.72  | 88.87  | 94.00  | -5.13  |
| 2 | 2402.00  | 26.32  | 88.94 | 7.34         | 28.72  | 98.68  | 114.00 | -15.32 |
| 3 | 4804.00  | 27.49  | 30.53 | 11.96        | 32.94  | 47.94  | 74.00  | -26.06 |
| 4 | 6491.00  | 27.80  | 17.09 | 16.60        | 35.88  | 41.77  | 74.00  | -32.23 |
| 5 | 8344.00  | 28.20  | 16.88 | 16.73        | 36.68  | 42.09  | 74.00  | -31.91 |
| 6 | 12951.00 | 29.19  | 15.15 | 18.17        | 40.58  | 44.71  | 74.00  | -29.29 |
|   |          |        |       |              |        |        |        | Remark |

## GFSK 2441MHz Horizontal

|   |          | Preamp | Read  | CableAntenna |        | Limit  | Over   |        |
|---|----------|--------|-------|--------------|--------|--------|--------|--------|
|   | Freq     | Factor | Level | Loss         | Factor | Level  | Line   | Limit  |
|   | MHz      | dB     | dBuV  | dB           | dB/m   | dBuV/m | dBuV/m | dB     |
| 1 | 2441.00  | 26.33  | 78.82 | 7.48         | 28.76  | 88.73  | 94.00  | -5.27  |
| 2 | 2441.00  | 26.33  | 88.37 | 7.48         | 28.76  | 98.28  | 114.00 | -15.72 |
| 3 | 4880.00  | 27.53  | 30.95 | 12.14        | 33.11  | 48.67  | 74.00  | -25.33 |
| 4 | 9279.00  | 28.51  | 16.96 | 16.90        | 37.73  | 43.08  | 74.00  | -30.92 |
| 5 | 12169.00 | 29.03  | 16.58 | 17.52        | 39.43  | 44.50  | 74.00  | -29.50 |
| 6 | 14855.00 | 29.53  | 16.76 | 19.91        | 39.13  | 46.27  | 74.00  | -27.73 |
|   |          |        |       |              |        |        |        | Remark |

## GFSK 2441MHz Vertical

|   | Freq     | Preamp<br>Factor | Read<br>Level | Cable<br>Loss | Antenna<br>Factor | Level  | Limit<br>Line | Over<br>Limit | Remark  |
|---|----------|------------------|---------------|---------------|-------------------|--------|---------------|---------------|---------|
|   | MHz      | dB               | dBuV          | dB            | dB/m              | dBuV/m | dBuV/m        | dB            |         |
| 1 | 2441.00  | 26.33            | 78.68         | 7.48          | 28.76             | 88.59  | 94.00         | -5.41         | Average |
| 2 | 2441.00  | 26.33            | 89.00         | 7.48          | 28.76             | 98.91  | 114.00        | -15.09        | Peak    |
| 3 | 4880.00  | 27.53            | 30.34         | 12.14         | 33.11             | 48.06  | 74.00         | -25.94        | Peak    |
| 4 | 7341.00  | 27.97            | 16.69         | 16.62         | 37.34             | 42.68  | 74.00         | -31.32        | Peak    |
| 5 | 10146.00 | 28.82            | 18.45         | 16.99         | 38.64             | 45.26  | 74.00         | -28.74        | Peak    |
| 6 | 12237.00 | 29.05            | 19.77         | 17.56         | 39.45             | 47.73  | 74.00         | -26.27        | Peak    |

## GFSK 2480MHz Horizontal

|   | Freq     | Preamp<br>Factor | Read<br>Level | Cable<br>Loss | Antenna<br>Factor | Level  | Limit<br>Line | Over<br>Limit | Remark  |
|---|----------|------------------|---------------|---------------|-------------------|--------|---------------|---------------|---------|
|   | MHz      | dB               | dBuV          | dB            | dB/m              | dBuV/m | dBuV/m        | dB            |         |
| 1 | 2480.00  | 26.34            | 79.19         | 7.57          | 28.79             | 89.21  | 94.00         | -4.79         | Average |
| 2 | 2480.00  | 26.34            | 88.64         | 7.57          | 28.79             | 98.66  | 114.00        | -15.34        | Peak    |
| 3 | 4960.00  | 27.58            | 30.85         | 12.36         | 33.32             | 48.95  | 74.00         | -25.05        | Peak    |
| 4 | 7358.00  | 27.97            | 15.76         | 16.62         | 37.34             | 41.75  | 74.00         | -32.25        | Peak    |
| 5 | 10911.00 | 28.89            | 14.63         | 17.15         | 39.45             | 42.34  | 74.00         | -31.66        | Peak    |
| 6 | 14226.00 | 29.43            | 11.84         | 19.51         | 42.20             | 44.12  | 74.00         | -29.88        | Peak    |

## GFSK 2480MHz Vertical

|   | Freq     | Preamp<br>Factor | Read<br>Level | Cable<br>Loss | Antenna<br>Factor | Level  | Limit<br>Line | Over<br>Limit | Remark  |
|---|----------|------------------|---------------|---------------|-------------------|--------|---------------|---------------|---------|
|   | MHz      | dB               | dBuV          | dB            | dB/m              | dBuV/m | dBuV/m        | dB            |         |
| 1 | 2480.00  | 26.34            | 79.52         | 7.57          | 28.79             | 89.54  | 94.00         | -4.46         | Average |
| 2 | 2480.00  | 26.34            | 88.64         | 7.57          | 28.79             | 98.66  | 114.00        | -15.34        | Peak    |
| 3 | 4960.00  | 27.58            | 30.46         | 12.36         | 33.32             | 48.56  | 74.00         | -25.44        | Peak    |
| 4 | 7460.00  | 27.99            | 17.72         | 16.62         | 37.39             | 43.74  | 74.00         | -30.26        | Peak    |
| 5 | 11132.00 | 28.91            | 15.55         | 17.19         | 39.61             | 43.44  | 74.00         | -30.56        | Peak    |
| 6 | 13818.00 | 29.36            | 10.96         | 19.14         | 43.32             | 44.06  | 74.00         | -29.94        | Peak    |

## 6. 20DB OCCUPY BANDWIDTH

### 6.1. Limits

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.

### 6.2. Test setup

1. Set the RBW =30kHz.
2. Set the VBW = 100kHz
3. Span=3MHz
4. Detector = peak.
5. Sweep time = auto couple.
6. Allow trace to fully stabilize, and view the plot.
7. Measure and record the result in the test report.

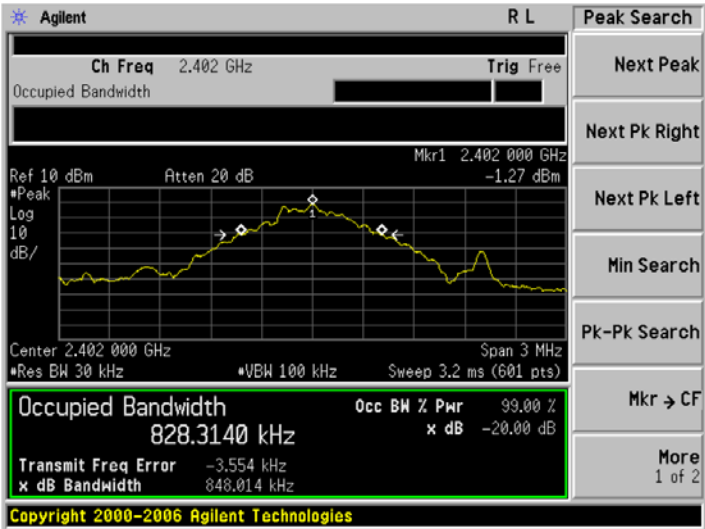
Test data:

|      | Channel Frequency<br>(MHz) | 20dB Bandwidth<br>(MHz) | Result |
|------|----------------------------|-------------------------|--------|
| GFSK | 2402                       | 0.85                    | Pass   |
|      | 2441                       | 0.85                    | Pass   |
|      | 2480                       | 0.83                    | Pass   |

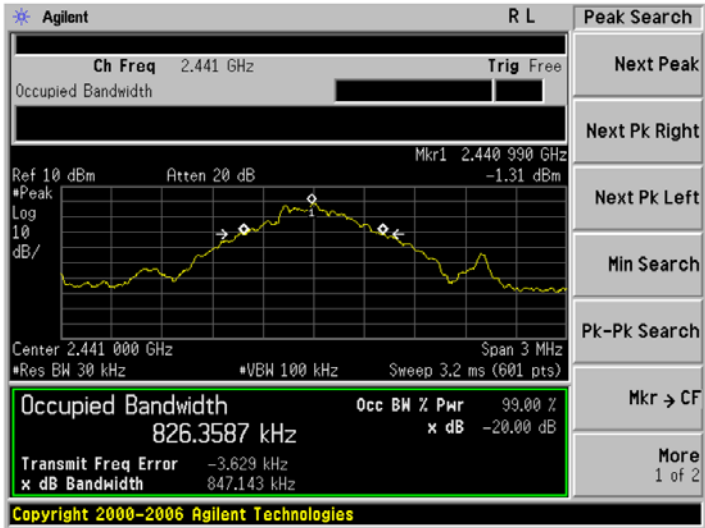
Test plot as follows:

GFSK

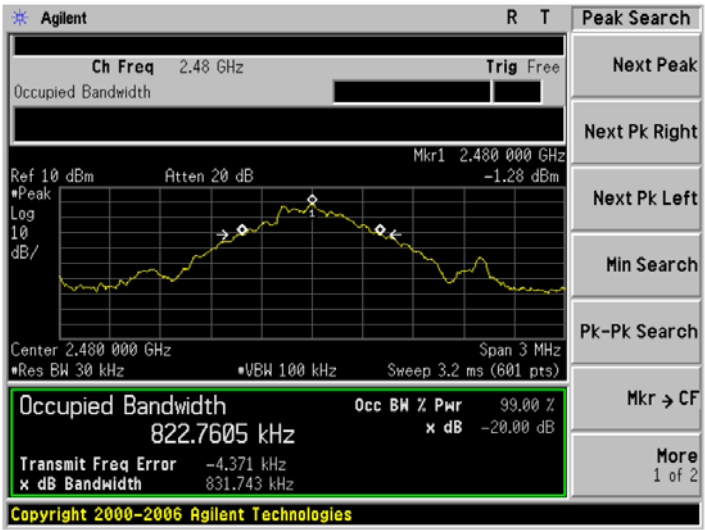
2402MHz



2441 MHz



2480 MHz



## 7. BAND EDGE COMPLIANCE TEST

### 7.1. Limits

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 shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

### 7.2. Test setup

The EUT was placed on a turn table which was 0.8 m above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was set 3 m away from the receiving antenna which was mounted on an antenna tower. The measuring antenna moved up and down to find out the maximum emission level. It moved from 1 m to 4 m for both horizontal and vertical polarizations.

The bandwidth of the Spectrum's VBW is set at 3MHz and RBW is set at 1MHz for peak emissions measurement above 1GHz and 1MHz RBW, 10Hz VBW for average emissions measure. The detector is peak for all tests.

Test plot as follows:

|           | Frequency<br>(MHz) | Antenna<br>polarization<br>(H/V) | Emission<br>(dBuV/m) | Band edge Limit<br>(dBuV/m) |       | Result |
|-----------|--------------------|----------------------------------|----------------------|-----------------------------|-------|--------|
|           |                    |                                  | PK                   | PK                          | AV    |        |
| Hopping   | <2400              | H                                | 50.17                | 74.00                       | 54.00 | Pass   |
|           | <2400              | V                                | 49.48                | 74.00                       | 54.00 | Pass   |
|           | >2483.5            | H                                | 49.87                | 74.00                       | 54.00 | Pass   |
|           | >2483.5            | V                                | 49.51                | 74.00                       | 54.00 | Pass   |
| Unhopping | <2400              | H                                | 49.50                | 74.00                       | 54.00 | Pass   |
|           | <2400              | V                                | 49.15                | 74.00                       | 54.00 | Pass   |
|           | >2483.5            | H                                | 50.26                | 74.00                       | 54.00 | Pass   |
|           | >2483.5            | V                                | 49.41                | 74.00                       | 54.00 | Pass   |

If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.

## 8. ANTENNA REQUIREMENTS

### 8.1. Limits

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.

### 8.2. Result

The antennas used for this product are integral 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 0dBi.

## 9. PHOTOGRAPHS OF TEST SET-UP

Conducted Emission



## Radiated Emission



## 10. PHOTOGRAPHS OF THE EUT



-----end-----