# FCC 47 CFR PART 90

# TEST REPORT

*For*

| | |
|---|---|
| **Applicant :** | **Tongdaxin Electronics Co., Ltd** |
| **Address :** | **Tongdaxin Ind. Bldg, Houting, Donghai, Quanzhou, Fujian, China** |
| **Product Name :** | **Two Way Radio** |
| **Model Name :** | **TD-Q5** |
| **Brand Name :** | **TDXone** |
| **FCC ID :** | **QGDTD-Q5** |
| **Report No. :** | **DPH120924F01** |
| **Date of Issue :** | **October 15, 2012** |


| | |
|---|---|
| **Issued by :** | **Shenzhen Top-cert Service Co., Ltd.** |
| **Address :** | **Room 506, Hongyu Commercial Building, Gushu 2nd Road, Baoan District, Shenzhen, China** |
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# CONTENTS

| Revision History | | |
|---|---|---|
| Issue | Date | Reason for Revision |
| 1.0 | October 01, 2012 | First edition |
| 2.0 | October 15, 2012 | Second edition |
| | | |

# 1. Test Result Certification

| | |
|---|---|
| **Equipment Under Test:** | Two Way Radio |
| **Brand Name:** | TDXone |
| **Model Number:** | TD-Q5 |
| **Series Model Name:** | N/A |
| **Difference description:** | N/A |
| **FCC ID：** | QGDTD-Q5 |
| **Applicant:** | Tongdaxin Electronics Co., Ltd |
| | Tongdaxin Ind. Bldg, Houting, Donghai, Quanzhou, Fujian, China |
| **Manufacturer:** | Tongdaxin Electronics Co., Ltd |
| | Tongdaxin Ind. Bldg, Houting, Donghai, Quanzhou, Fujian, China |
| **Test Standard** | FCC 47 CFR Part 90 |
| **File Number:** | DPH120924F01 |
| **Date of test:** | August 21, 2012 ~ October 15, 2012 |
| **Deviation:** | None |
| **Condition of Test Sample:** | Normal |
| **Test Result:** | PASS |

We, Top-cert, hereby certify that the test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4:2009 and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC Rules Part 90.

The test results of this report relate only to the tested sample identified in this report.

Tested by (+ signature):

Rex Luo

Rex Luo

Test Engineer

Top-cert Service Co., Ltd topcert

Approved by (+ signature):

Joe Jia

Joe Jia

Manager

# 2. Technical Information

Note: the following data is based on the information by the applicant.

## 2.1 EUT Description

| | |
|---|---|
| **Product Name:** | Two Way Radio |
| **Brand Name:** | TDXone |
| **Model Number:** | TD-Q5 |
| **Power Supply:** | DC 12.5V by AC/DC Adapter<br>DC 7.4V by battery |
| **Frequency Range:** | 136.000 MHz-174.000 MHz |
| **Channel Number:** | 128 Channels |
| **Channel Spacing:** | 12.5 KHz |
| **Modulation Technique:** | FM |
| **Antenna Type:** | External |
| **Temperature Range:** | -10℃-50℃ |

***Note:***

1. *This submittal(s) (test report) is intended for FCC ID: QGDTD-Q5 filing to comply with the FCC Part 90, Subpart I Rules.*
2. *Please refer to Appendix B for the photographs of the EUT. For more details, please refer to the User's manual of the EUT.*

## 2.2 Objective

The tests documented in this report were performed in accordance with ANSI C63.4 (2009) and FCC CFR 47 Rules Part 90 Subpart I.

| No. | Identity | Document Title |
|---|---|---|
| 1 | 47 CFR Part 2 (10-1-05 Edition) | Radio Frequency Devices |
| 2 | 47 CFR Part 90 (10-1-09 Edition) | Private Land Mobile Radio Services |

## 2.3 Test Standards and Results

Test items and the results are as bellow:

| № | Test Type | Para. Number | Limit | Result |
|---|---|---|---|---|
| 1 | Power and Antenna High Limits | 2.1046; 90.205 | Refer to 90.205 | PASS |
| 2 | Modulation Characteristic | 2.1047; 90.207 | Refer to 90.207 | PASS |
| 3 | Occupied Bandwidth | 2.1049; 90.209 | Refer to 90.209 | PASS |
| 4 | Emission Mask | 2.1053; 90.210 | Refer to 90.210 | PASS |
| 5 | Frequency Stability vs. Temperature | 2.1055; 90.213 | Refer to 90.213 | PASS |
| 6 | Frequency Stability vs. Voltage | 2.1055; 90.213 | Refer to 90.213 | PASS |
| 7 | Transmitter Frequency Behavior | 90.214 | Refer to 90.214 | PASS |
| 8 | Lined conducted emission | 15.207 | Refer to 15.207 | PASS |
| 9 | Radiated Emission | 15.109 | Refer to 15.109 | PASS |

## 2.4 Environmental Conditions

During the measurement the environmental conditions were within the listed ranges:

- Temperature: 15-35ºC
- Humidity: 30-60%
- Atmospheric pressure: 86-106 k Pa

# 3. Details of Test

## 3.1 Identification of the Responsible Testing Laboratory

| | |
|---|---|
| Company: | Shenzhen Top-cert Service Co., Ltd. |
| Address: | Room 506, Hongyu Commercial Building, Gushu 2nd Road, Baoan District, Shenzhen, China |

## 3.2 Identification of the Responsible Testing Location

| | |
|---|---|
| Test Site: | Most Technology Service Co., Ltd. |
| Location: | No.5, Langshan 2nd Rd., North Hi-Tech Industrial park, Nanshan, Shenzhen, Guangdong, China |
| Description: | There is one 3m semi-anechoic an area test sites and two line conducted labs for final test. The Open Area Test Sites and the Line Conducted labs are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4:2009 and CISPR 16 requirements.<br>The FCC Registration Number is **490827.** |
| Site Filing: | The site description is on file with the Federal Communications Commission, 7435 Oakland Mills Road, Columbia, MD 21046. |
| Instrument Tolerance: | All measuring equipment is in accord with ANSI C63.4:2009 and CISPR 16 requirements that meet industry regulatory agency and accreditation agency requirement. |
| Ground Plane: | Two conductive reference ground planes were used during the Line Conducted Emission, one in vertical and the other in horizontal. The dimensions of these ground planes are as below. The vertical ground plane was placed distancing 40 cm to the rear of the wooden test table on where the EUT and the support equipment were placed during test. The horizontal ground plane projected 50 cm beyond the footprint of the EUT system and distanced 80 cm to the wooden test table. For Radiated Emission Test, one horizontal conductive ground plane extended at least 1m beyond the periphery of the EUT and the largest measuring antenna, and covered the entire area between the EUT and the antenna. |

## 3.3 List of Test Equipments

| No. | Equipment | Manufacturer | Model No. | S/N | Calibration date | Calibration due date |
|---|---|---|---|---|---|---|
| 1 | Test Receiver | Rohde & Schwarz | ESCI | 100492 | 2012/4/22 | 2013/4/21 |
| 2 | Modulation Analyzer | HP | 8920B | 3104A03367 | 2012/4/22 | 2013/4/21 |
| 3 | Bi-Log Antenna | Sunol | JB3 | A121206 | 2012/3/15 | 2013/3/14 |
| 4 | Storage Oscilloscope | Tektronix | TDS3052 | B017447 | 2012/4/22 | 2013/4/21 |
| 5 | Test Antenna – Bi-Log | Schwarzbeck | VULB 9163 | --- | 2012/3/15 | 2013/3/14 |
| 6 | Horn Antenna | ETS | 3115 | --- | 2012/3/15 | 2013/3/14 |
| 7 | Test Antenna - Horn | Schwarzbeck | BBHA 9120C | -- | 2012/3/15 | 2013/3/14 |
| 8 | Cable | Resenberger | N/A | NO.1 | N/A | N/A |
| 9 | Cable | SchwarzBeck | N/A | NO.2 | N/A | N/A |
| 10 | Cable | SchwarzBeck | N/A | NO.3 | N/A | N/A |
| 11 | Power Splitter | Weinschel | 1506A | NW521 | N/A | N/A |
| 12 | Spectrum Analyzer | Agilent | 4408B | MY41440460 | 2012/4/22 | 2013/4/21 |
| 13 | Coaxial Switch | Anritsu Corp | MP59B | 6200283933 | N/A | N/A |
| 14 | Signal Generator | IFR | 2032 | 203002/100 | 2012/4/22 | 2013/4/21 |
| 15 | Telecommunication Antenna | European Antennas | PSA 75301R/170 | 0304213 | 2012/3/15 | 2013/3/14 |
| 16 | Temperature Chamber | Guangzhou Gongwen | GDS-250 | N/A | N/A | N/A |
| 17 | DC Power Supply | Good Will | GPS-3030DD | EF920938 | 2012/4/22 | 2013/4/21 |
|  | Full-Anechoic Chamber | Albatross | 9m*6m*6m | (n.a.) | 2012/4/16 | 2013/4/15 |

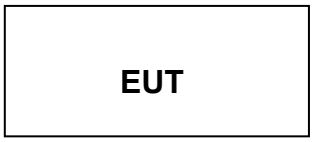
**NOTE:** Equipments listed above have been calibrated and are in the period of validation.

## 3.4 Environmental Conditions

During the measurement the environmental conditions were within the listed ranges:

- Temperature: 15-35ºC
- Humidity: 30-60%
- Atmospheric pressure: 86-106 k Pa

## 3.5 Configuration of Tested System




## 3.6 Equipment Used in Tested System

| Item | Equipment | Mfr/Brand | Model/Type No. | Identifier | Series No. | Note |
|---|---|---|---|---|---|---|
| 1 | AC Adapter | N/A | N/A | FCC DOC | N/A | EUT |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

# 4. Test Methodology

## 4.1 General Test Procedures

**Conducted Emissions**

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirement in Section 13.1.4.1 of ANSI C63.4:2009. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

**Radiated Emissions**

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4:2009.

## 4.2 Description of Test Modes

The EUT has been tested under normal operating condition.

Three channels (The top channel, the middle channel and the bottom channel) are chosen for testing.

## 4.3 FCC Part 15.205 Restricted Bands of Operations

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090 - 0.110 | 16.42 - 16.423 | 399.9 - 410 | 4.5 - 5.15 |
| [1]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 | 2655 - 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 | ([2]) |
| 13.36 - 13.41 | | | |

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

[2] Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

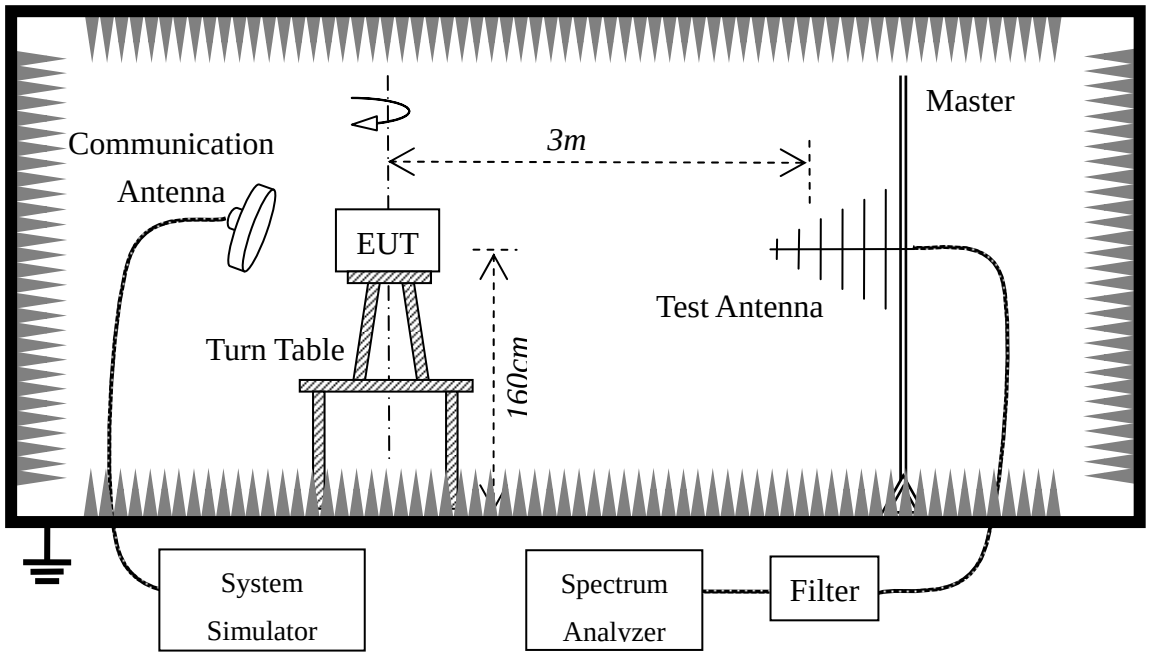
# 5. FCC Part 90 Requirements

## 5.1 Power and Antenna High Limits

## LIMIT

According to CFR 47 section 90.205, Maximum ERP is dependent upon the station's antenna HAAT and required service area.

## TEST CONFIGURATION




## TEST PROCEDURE

1. The test is performed in a full-Anechoic Chamber, the air loss of the site and the factors of the test system are using the substitution method.
2. The test antenna shall be located 3m from the EUT to correspond to the transmitter.
3. The output of the antenna shall be connected to the measuring receiver and either a peak or quasi-peak detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.
4. The transmitter shall be switched on; if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.
5. The test antenna shall be raised and lowered through the specified range of height until the measuring

receiver detects a maximum signal level.

6. The transmitter shall than be rotated through 360°in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
7. The test antenna shall be raised and lowered again through the specified range of height until the measuring receiver detects a maximum signal level.
8. The maximum signal level detected by the measuring receiver shall be noted.
9. The measurement shall be repeated with the test antenna set to horizontal polarization.
10. Replace the antenna with a proper Antenna (substitution antenna).
11. The substitution antenna shall be oriented for vertical polarization and, if necessary, the length of the substitution antenna shall be adjusted to correspond to the frequency of transmitting.
12. The substitution antenna shall be connected to a calibrated signal generator.
13. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
14. The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.
15. The input signal to substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.
16. The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
17. The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.

## TEST RESULTS

| Channel | Frequency (MHz) | Measured Power | |
|---|---|---|---|
| | | dBm | W |
| Low | 136.0125 | 33.38 | 2.178 |
| Middle | 155.0125 | 33.61 | 2.296 |
| High | 173.9875 | 32.89 | 1.945 |

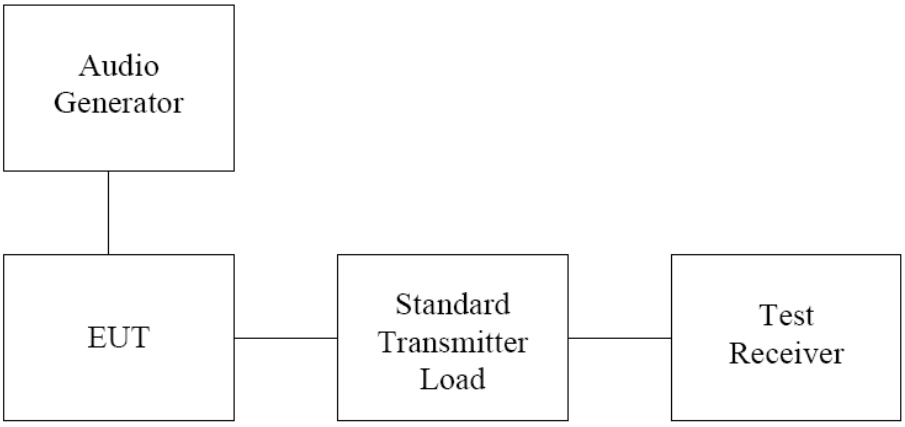
## 5.2 Modulation Characteristic

## LIMIT

According to CFR 47 section 2.1047 a, for Voice modulation communication equipment, the frequency response of the audio modulation circuit over a range of 100 to 5000 Hz shall be measured.

According to CFR 47 section 90.205, Equipment which employs modulation limiting, a curve showing the percentage of modulation versus the modulation input voltage shall be supplied.

## TEST CONFIGURATION




## TEST PROCEDURE

**Modulation limit:**

1. Configure the EUT as shown in test configuration, adjust the audio input for 60% of rated system deviation at 100Hz using this level as a reference (0dB) and vary the input level from –20 to +20dB. Record the frequency deviation obtained as a function of the input level.
2. Repeat step 1 with input frequency changing to 300, 500, 1000, 3000, 5000 and 15000Hz in sequence.

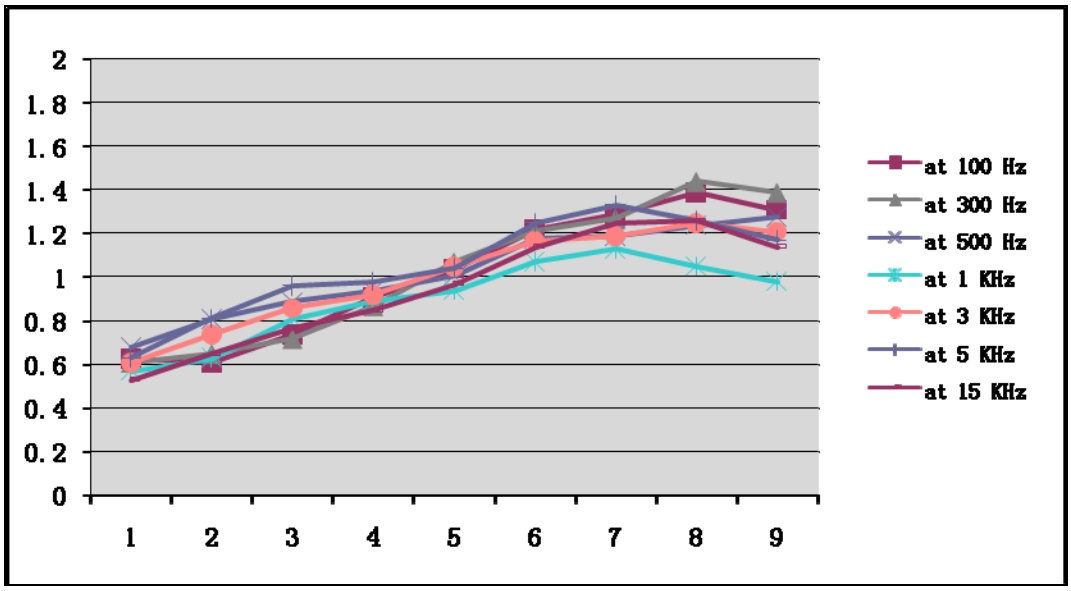
**Audio Frequency Response:**

1. Configure the EUT as shown in figure 1.
2. Adjust the audio input for 20% of rated system deviation at 1 KHz using this level as a reference (0dB).
3. Vary the Audio frequency from 100 Hz to 3 KHz and record the frequency deviation.
4. Audio Frequency Response =20log10 (Deviation of test frequency/Deviation of 1 KHz reference).

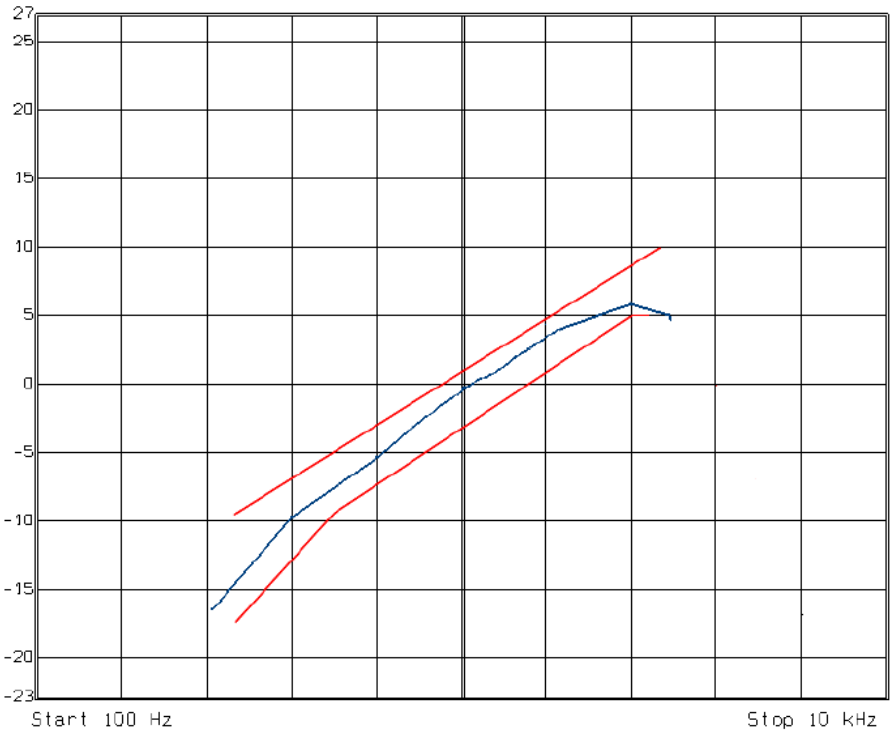
# TEST RESULTS

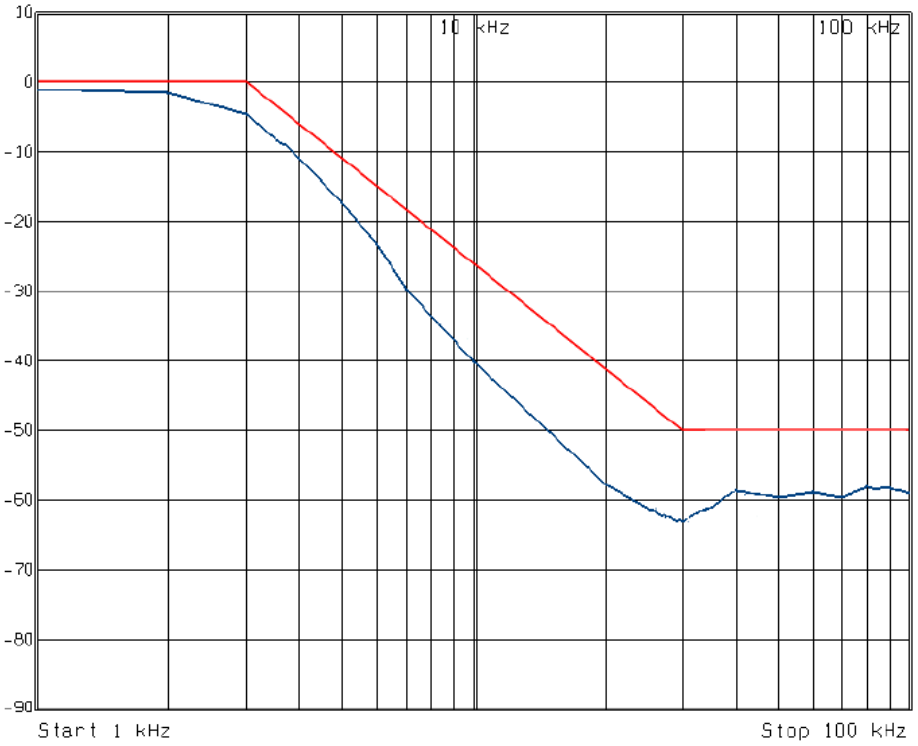
**Modulation limit:**

| Modulation Level (dB) | Peak Frequency Deviation | | | | | | |
|---|---|---|---|---|---|---|---|
| | at 100 Hz | at 300 Hz | at 500 Hz | at 1 KHz | at 3 KHz | at 5 KHz | at 15 KHz |
| -20 | 0.63 | 0.61 | 0.68 | 0.57 | 0.61 | 0.63 | 0.53 |
| -15 | 0.61 | 0.65 | 0.81 | 0.63 | 0.74 | 0.81 | 0.65 |
| -10 | 0.74 | 0.72 | 0.89 | 0.81 | 0.86 | 0.96 | 0.77 |
| -5 | 0.91 | 0.87 | 0.94 | 0.89 | 0.92 | 0.98 | 0.85 |
| 0 | 1.04 | 1.07 | 1.01 | 0.94 | 1.05 | 1.04 | 0.97 |
| +5 | 1.22 | 1.21 | 1.18 | 1.07 | 1.17 | 1.25 | 1.14 |
| +10 | 1.29 | 1.27 | 1.19 | 1.13 | 1.19 | 1.33 | 1.25 |
| +15 | 1.39 | 1.44 | 1.24 | 1.05 | 1.25 | 1.26 | 1.26 |
| +20 | 1.31 | 1.39 | 1.28 | 0.98 | 1.21 | 1.17 | 1.14 |



**Audio Frequency Response:**



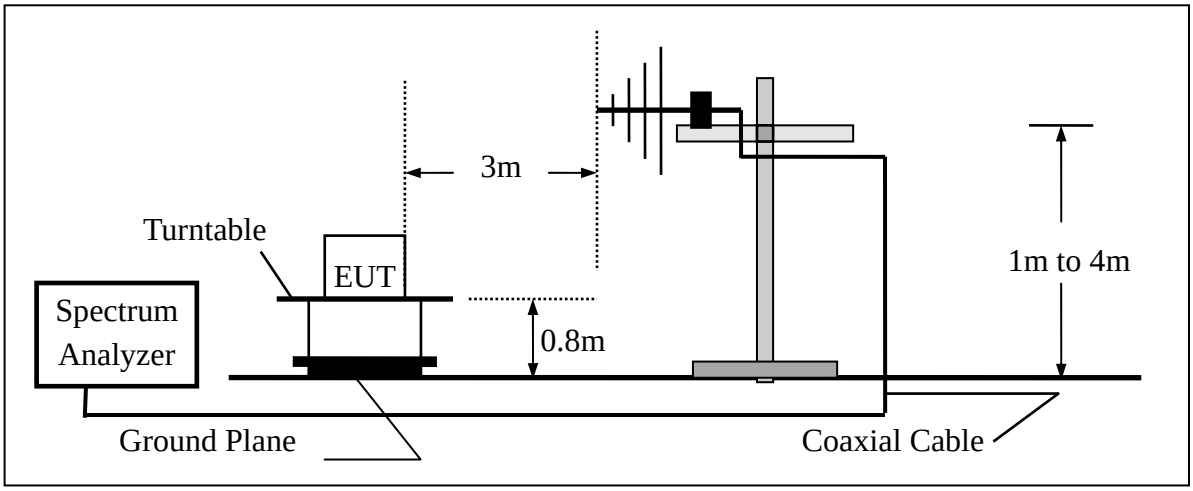



## 5.3 Occupied Bandwidth

### LIMIT

According to FCC CFR 47 Part 90 Section 90.209, for other types of emissions, the maximum authorized bandwidth shall be 11.25 KHz for 12.5 KHz.

### TEST CONFIGURATION



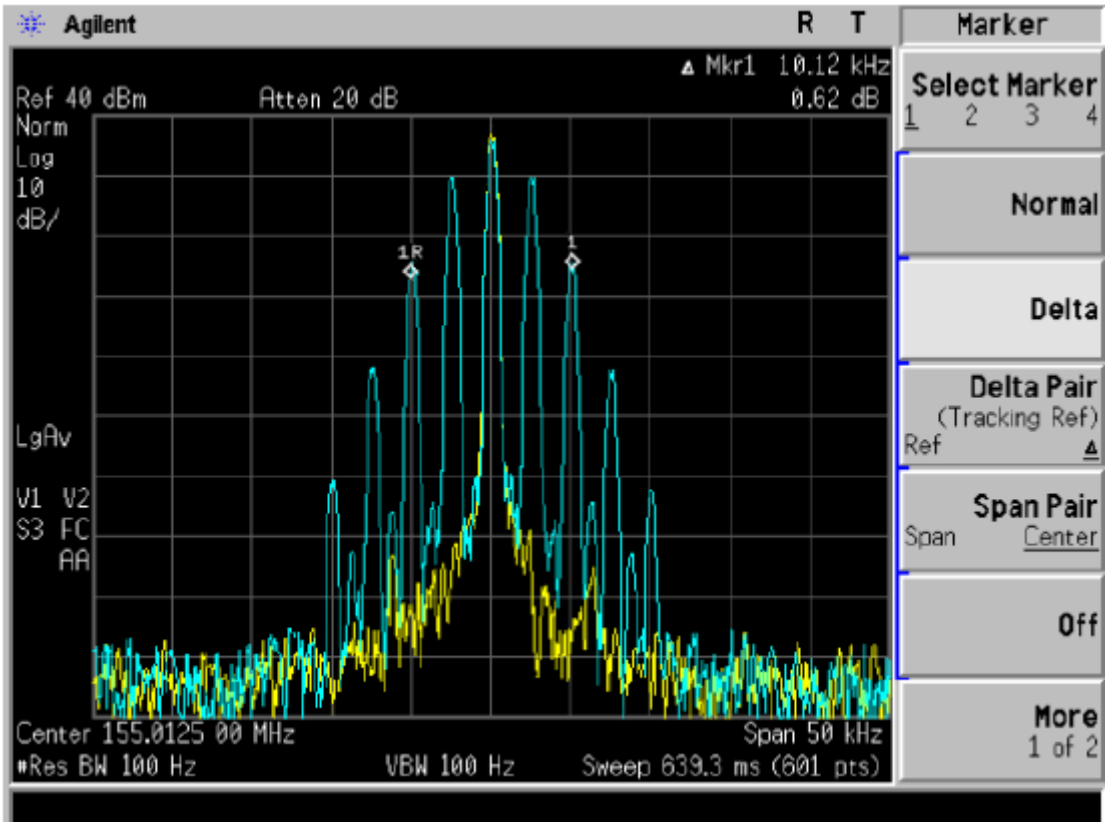

### TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. Set EUT as normal operation.
3. Set SPA center frequency=fundamental frequency, RBW=VBW=300 Hz, Span=200 KHz.
4. Set SPA max. Hold. Mark peak, -26dB.

# TEST RESULTS

| Channel | Frequency | Occupied Bandwidth | Limits | Result |
|---|---|---|---|---|
| Low | 136.0125 MHz | 10.12 KHz | 11.25 KHz | PASS |
| Middle | 155.0125 MHz | 10.12 KHz | 11.25 KHz | PASS |
| High | 173.9875 MHz | 10.11 KHz | 11.25 KHz | PASS |

**Maximum Occupied bandwidth**



## 5.4 Emission Mask

## LIMIT

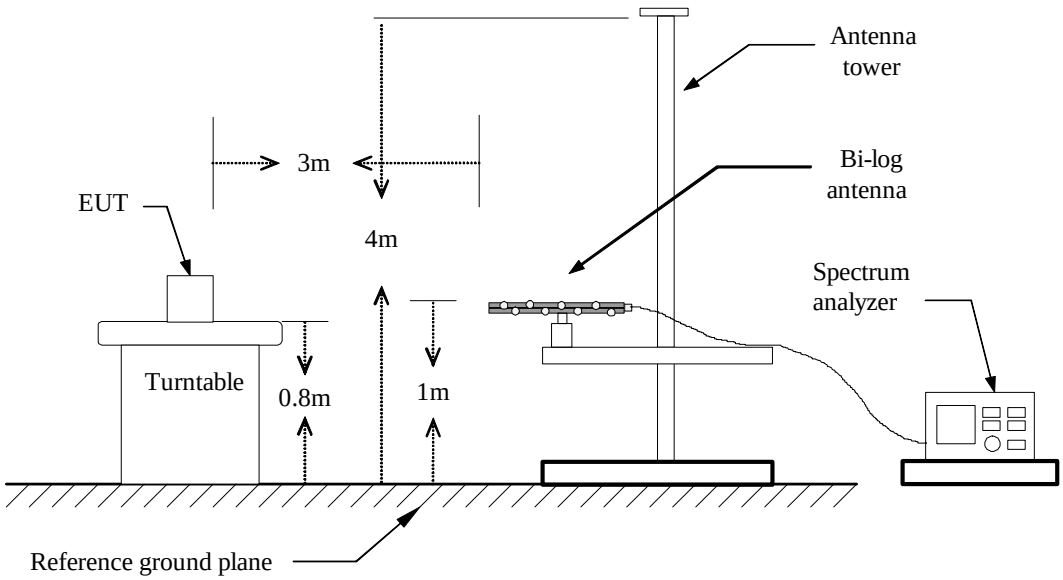
According to CFR 47 section 90.210, the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(1) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB;

(2) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB;

(3) On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least $43+10\log_{10}$ *(mean output power in watts) dB;

## TEST CONFIGURATION



## TEST PROCEDURE

1. On a test site, the EUT shall be placed on a turntable and in the position closest to the normal use as declared by the user.

2. The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the transmitter.

3. The output of the antenna shall be connected to the measuring receiver and either a peak or quasi-peak detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.

4. The transmitter shall be switched on; if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.

5. The test antenna shall be raised and lowered through the specified range of height until the measuring receiver detects a maximum signal level.

6. The transmitter shall than be rotated through 360°in the horizontal plane, until the maximum signal level is detected by the measuring receiver.

7. The test antenna shall be raised and lowered again through the specified range of height until the measuring receiver detects a maximum signal level.

8. The maximum signal level detected by the measuring receiver shall be noted.

9. The measurement shall be repeated with the test antenna set to horizontal polarization.

10. Replace the antenna with a proper Antenna (substitution antenna).

11. The substitution antenna shall be oriented for vertical polarization and, if necessary, the length of the substitution antenna shall be adjusted to correspond to the frequency of transmitting.

12. The substitution antenna shall be connected to a calibrated signal generator.

13. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.

14. The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.

15. The input signal to substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.

16. The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.

17. The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.

# TEST RESULTS

**The Unwanted Radiated Emission**

The Low Channel

| Frequency (MHz) | Antenna Polarization | S.G. (dBm) | Cable loss (dB) | Ant.Gain (dB) | Emission level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| 272.03 | V | -17.37 | 8.54 | 4.63 | -21.28 | -13 | -8.28 |
| Other | V | -- | -- | -- | -- | -13 | > 10 dB |
| -- | V | -- | -- | -- | -- | -13 | > 10 dB |
| -- | V | -- | -- | -- | -- | -13 | > 10 dB |
| | | | | | | | |
| | | | | | | | |
| 272.03 | H | -21.57 | 8.54 | 4.63 | -25.48 | -13 | -12.48 |
| Other | H | -- | -- | -- | -- | -13 | > 10 dB |
| -- | H | -- | -- | -- | -- | -13 | > 10 dB |
| -- | | | | | | | |

*Notes:*

*(1) "--" in the table above means that the emissions are too small to be measured and are at least 10 dB below the limit.*

*(2) Emisiion Level=S.G ourput power(dBm)-Cable loss(db)+Antenna Gain(dBi)*

The Middle Channel

| Frequency (MHz) | Antenna Polarization | S.G. (dBm) | Cable loss (dB) | Ant.Gain (dB) | Emission level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| 310.05 | V | -18.32 | 9.15 | 4.84 | -22.63 | -13 | -9.63 |
| 0ther | V | -- | -- | -- | -- | -13 | > 10 dB |
| -- | V | -- | -- | -- | -- | -13 | > 10 dB |
| -- | V | -- | -- | -- | -- | -13 | > 10 dB |
| -- | V | -- | -- | -- | -- | -13 | > 10 dB |
| -- | V | -- | -- | -- | -- | -13 | > 10 dB |
| | | | | | | | |
| 310.05 | H | -20.07 | 9.15 | 4.84 | -24.38 | -13 | -11.38 |
| Other | H | -- | -- | -- | -- | -13 | > 10 dB |
| -- | H | -- | -- | -- | -- | -13 | > 10 dB |
| -- | H | -- | -- | -- | -- | -13 | > 10 dB |
| -- | H | -- | -- | -- | -- | -13 | > 10 dB |
| -- | | | | | | | |

*Notes:*

*(1) "--" in the table above means that the emissions are too small to be measured and are at least 10 dB below the limit.*

*(2) Emisiion Level=S.G ourput power(dBm)-Cable loss(db)+Antenna Gain(dBi)*

The High Channel

| Frequency (MHz) | Antenna Polarzation | S.G. (dBm) | Cable loss (dB) | Ant.Gain (dB) | Emission level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| 347.95 | V | -17.74 | 10.06 | 4.92 | -22.88 | -13 | -9.88 |
| Other | V | -- | -- | -- | -- | -13 | > 10 dB |
| -- | V | -- | -- | -- | -- | -13 | > 10 dB |
| -- | V | -- | -- | -- | -- | -13 | > 10 dB |
| | | | | | | | |
| | | | | | | | |
| 347.95 | H | -19.63 | 10.06 | 4.92 | -24.77 | -13 | -11.77 |
| Other | H | -- | -- | -- | -- | -13 | > 10 dB |
| -- | H | -- | -- | -- | -- | -13 | > 10 dB |
| -- | H | -- | -- | -- | -- | -13 | > 10 dB |
| -- | H | -- | -- | -- | -- | -13 | > 10 dB |
| -- | | | | | | | |

*Notes:*

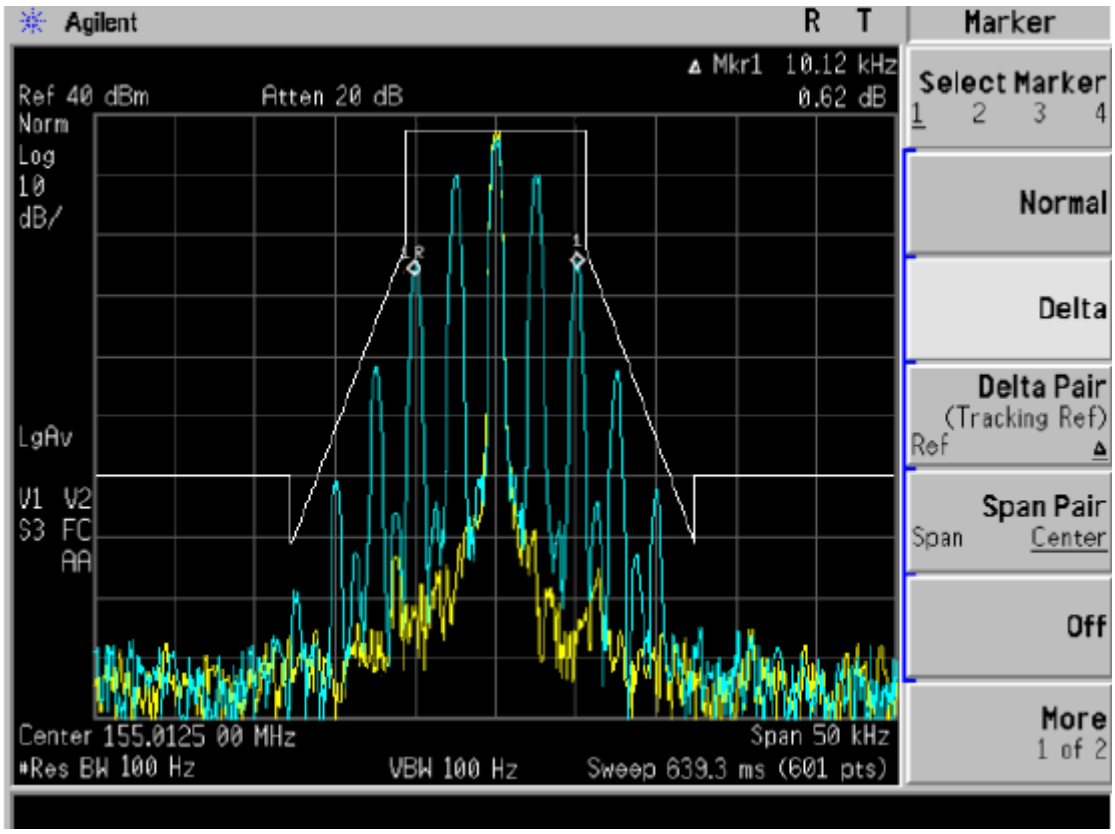
*(1) "--" in the table above means that the emissions are too small to be measured and are at least 10 dB below the limit.*

*(2) Emisiion Level=S.G ourput power(dBm)-Cable loss(db)+Antenna Gain(dBi)*

| | |
|---|---|
| Maximum Transmitter Power (P) | 36.16 dBm |
| Require attenuation | $43+10\log_{10}$ ( 4.130 )= 41.68 dB |
| Emission Limits | P-[$43+10\log_{10}$ (0.738)]= -13 dBm |

**Emission Mask:**

The Middle Channel



## 5.5 Frequency Stability vs. Temperature

## LIMIT

a). According to FCC Part 2 Section 2.1055(a)(1), the frequency stability shall be measured with variation of ambient temperature from －30℃ to +50℃ centigrade.

b). According to FCC Part 2 Section 2.1055(d)(1), vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

c). According to FCC Part 90 Section 90.213, for output power > 2Wats, the limits is 2.5 ppm.

## TEST PROCEDURE

The EUT power was supplied by DC power supply and the RF output was connected to a frequency counter via feed through attenuators. The EUT was placed inside the temperature chamber. The DC leads and the RF output cable, exited the chamber through an opening made for that purpose.

After the temperature stabilized the frequency output was recorded form the counter.

## RESULTS

| Temperature (℃) | Frequency Error ( K Hz) | Frequency Error ( %) | Frequency Error (ppm) | Limit ( ppm) |
|---|---|---|---|---|
| -30 | -7.062 | -0.000016 | -0.16 | ±2.5 |
| -20 | -5.156 | -0.000012 | -0.12 | ±2.5 |
| -10 | 3.525 | 0.000015 | 0.15 | ±2.5 |
| 0 | 1.309 | 0.000011 | 0.11 | ±2.5 |
| 10 | 3.580 | 0.000008 | 0.08 | ±2.5 |
| 20 | 4.561 | 0.000017 | 0.17 | ±2.5 |
| 30 | 5.090 | -0.000011 | -0.11 | ±2.5 |
| 40 | -6.650 | -0.000015 | -0.15 | ±2.5 |
| 50 | -7.150 | -0.000019 | -0.19 | ±2.5 |

## 5.6 Frequency Stability vs. Voltage

## LIMIT

a). According to FCC Part 2 Section 2.1055(a)(1), the frequency stability shall be measured with variation of ambient temperature from －30℃ to +50℃ centigrade.

b). According to FCC Part 2 Section 2.1055(d)(1), vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

c). According to FCC Part 90 Section 90.213, for output power > 2Wats, the limits is 2.5 ppm.

## TEST PROCEDURE

An external variable DC power supply was connected to the EUT.

For hand carried, The DC power equipment primary supply voltage was reduced to the end point as specified by the manufacturer. The output frequency was recorded for highest and lowest voltage.

## RESULTS

| Voltage (V) | Frequency Error ( Hz) | Frequency Error ( %) | Frequency Error (ppm) | Limit ( %) |
|---|---|---|---|---|
| 6.66 | 4065 | 0.000013 | 0.13 | ±2.5 |
| 7.4 | 4550 | 0.000010 | 0.10 | ±2.5 |
| 8.14 | 5152 | 0.000017 | 0.17 | ±2.5 |

## 5.7 Transmitter Frequency Behavior

### LIMIT

Section 90.214

Transient frequencies must be within the maximum frequency difference limits during the time intervals indicated:

| Time intervals [1, 2] | Maximum frequency difference [3] | All equipment | |
|---|---|---|---|
| | | 150 to 174 MHz | 421 to 512MHz |
| Transient Frequency Behavior for Equipment Designed to Operate on 25 KHz Channels | | | |
| $t_1$ [4] | ± 25.0 KHz | 5.0 ms | 10.0 ms |
| $t_2$ | ± 12.5 KHz | 20.0 ms | 25.0 ms |
| $t_3$ [4] | ± 25.0 KHz | 5.0 ms | 10.0 ms |
| Transient Frequency Behavior for Equipment Designed to Operate on 12.5 KHz Channels | | | |
| $t_1$ [4] | ± 12.5 KHz | 5.0 ms | 10.0 ms |
| $t_2$ | ± 6.25 KHz | 20.0 ms | 25.0 ms |
| $t_3$ [4] | ± 12.5 KHz | 5.0 ms | 10.0 ms |
| Transient Frequency Behavior for Equipment Designed to Operate on 6.25 KHz Channels | | | |
| $t_1$ [4] | ±6.25 KHz | 5.0 ms | 10.0 ms |
| $t_2$ | ±3.125 KHz | 20.0 ms | 25.0 ms |
| $t_3$ [4] | ±6.25 KHz | 5.0 ms | 10.0 ms |

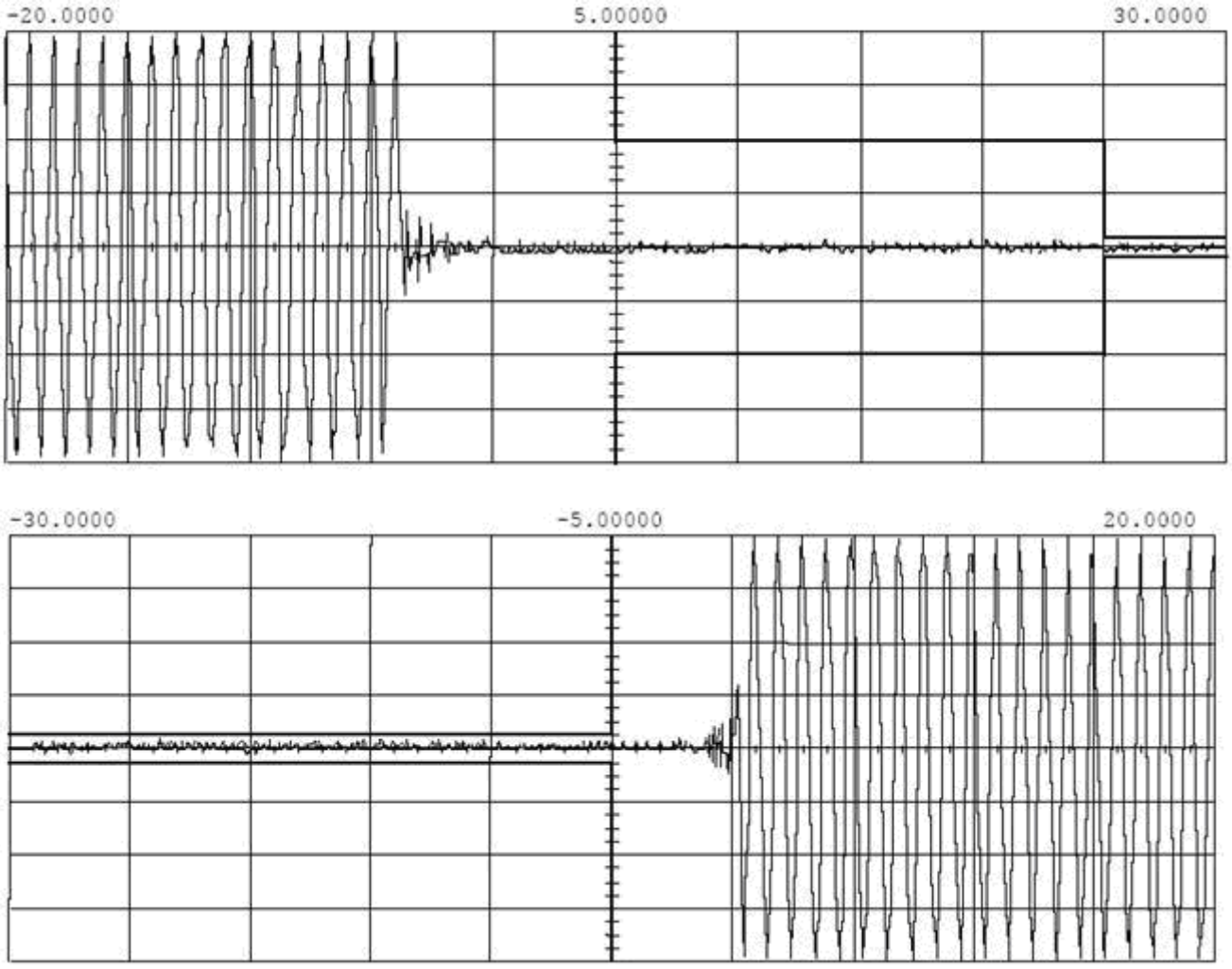
1. $t_{on}$ is the instant when a 1 KHz test signal is completely suppressed, including any capture time due to phasing.
   $t_1$ is the time period immediately following $t_{on}$.
   $t_2$ is the time period immediately following $t_1$.
   $t_3$ is the time period from the instant when the transmitter is turned off until $t_{off}$.
   $t_{off}$ is the instant when the 1 KHz test signal starts to rise.
2. During the time from the end of $t_2$ to the beginning of $t_3$, the frequency difference must not exceed the limits specified in § 90.213.
3. Difference between the actual transmitter frequency and the assigned transmitter frequency.
4. If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

### TEST PROCEDURE

TIA/EIA-603 2.2.19

### RESULTS

| Operation Frequency (MHz) | Channel Separation (kHz) | Transient Period (ms) | Transient Frequency |
|---|---|---|---|
| 155.0125 | 12.5 | <5 | +/-12.5 kHz |
| | | <20 | +/-6.25 kHz |
| | | <5 | +/-12.5kHz |




*No non-compliance noted*

**Conclusion: PASS**

## 5.8 Line Conducted Emission Test

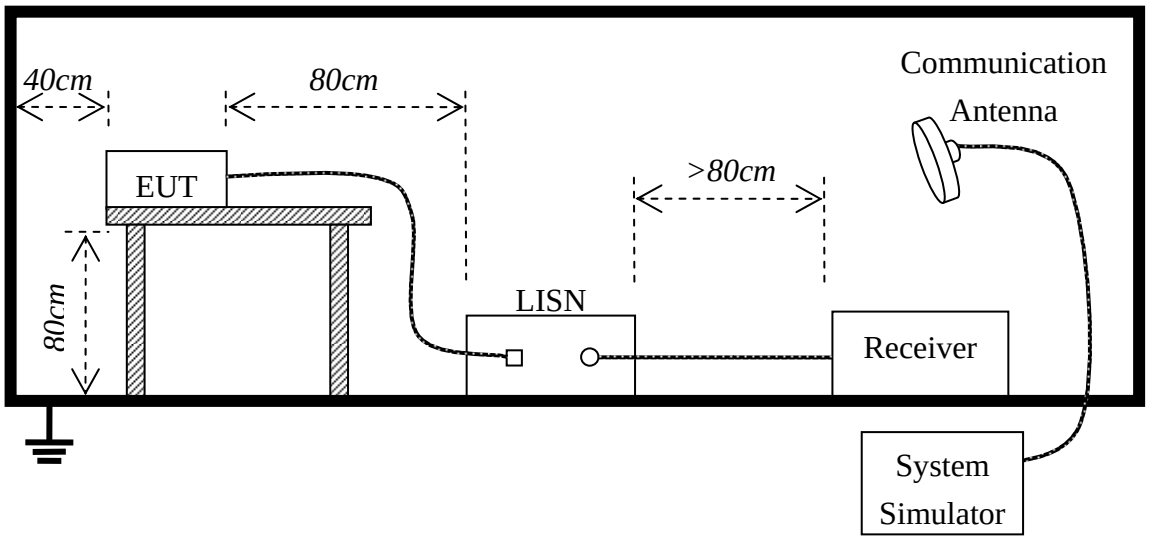
## LIMITS OF LINE CONDUCTED EMISSION TEST

| Frequency | Maximum RF Line Voltage | |
|---|---|---|
| | Q.P.( dBuV) | Average( dBuV) |
| 150kHz-500kHz | 66-56 | 56-46 |
| 500kHz-5MHz | 56 | 46 |
| 5MHz-30MHz | 60 | 50 |

***Note:** 1. the lower limit shall apply at the transition frequency.*

*2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz*

## BLOCK DIAGRAM OF TEST SETUP



## PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST

1) The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per FCC Part 15 (see Test Facility for the dimensions of the ground plane used). When the EUT is floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
2) Support equipment, if needed, was placed as per FCC Part 15.
3) All I/O cables were positioned to simulate typical actual usage as per FCC Part 15.
4) The EUT received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5) All support equipments received power from a second LISN supplying power of AC 120V/60Hz, if any.
6) The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7) Analyzer / Receiver scanned from 150 kHz to 30 MHz for emissions in each of the test modes.
8) During the above scans, the emissions were maximized by cable manipulation.
9) The following test mode(s) were scanned during the preliminary test:

| Preliminary Conducted Emission Test | | | | |
|---|---|---|---|---|
| Frequency Range Investigated | | 150KHz TO 30 MHz | | |
| Mode of operation | Date | Report No. | Data# | Worst Mode |
| TX Mode | 2012-09-28 | DPH120924F01 | 1_(L, N) | ☒ |
| RX Mode | 2012-09-28 | DPH120924F01 | 2_(L, N) | |

Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

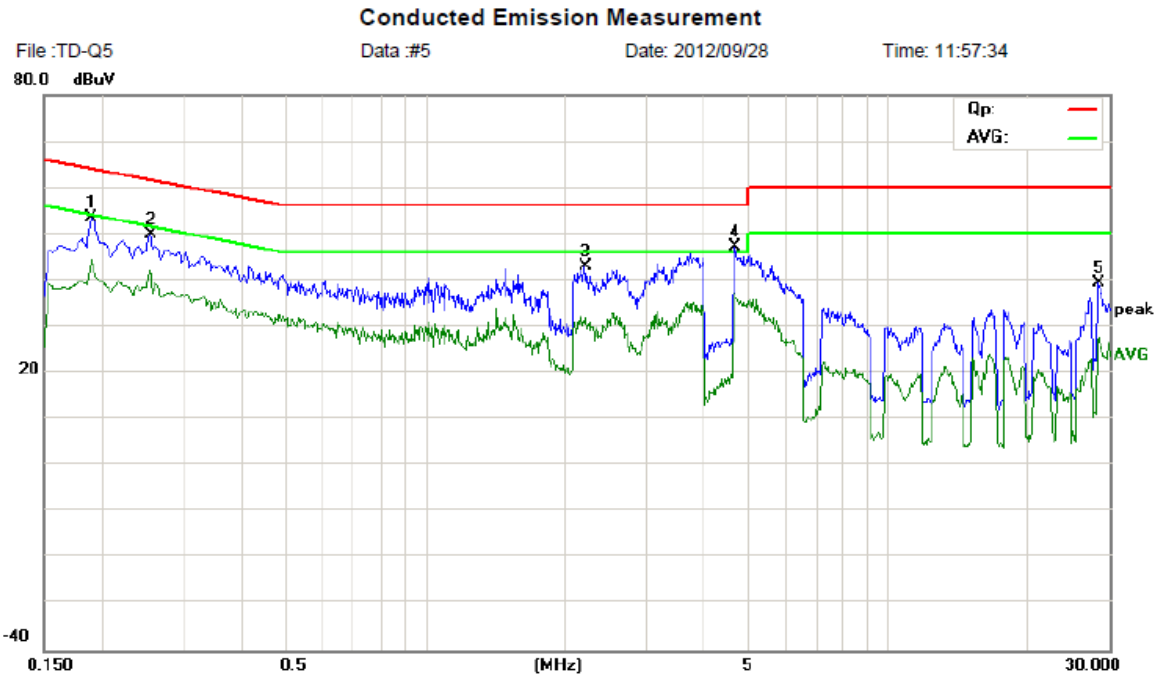
## FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST

EUT and support equipment was set up on the test bench as per step 9 of the preliminary test.

A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less –2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.

The test data of the worst case condition(s) was reported on the Summary Data page.

# TEST RESULT OF LINE CONDUCTED EMISSION TEST




Site site #1 Phase: *L1* Temperature: 26

Limit: FCC Part15 B Class B QP Power: AC 120V/60Hz Humidity: 60 %

EUT: Two way radio

M/N: TD-Q5

Mode:

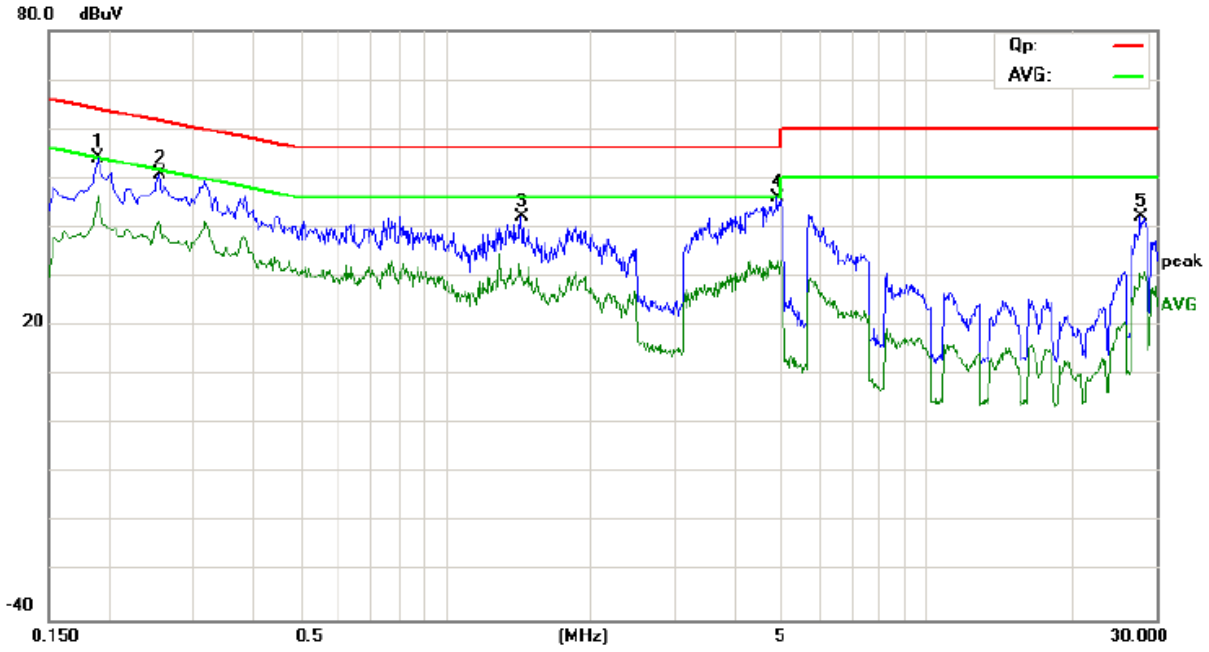
Note:

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | | 0.1900 | 42.01 | 11.40 | 53.41 | 64.04 | -10.63 | peak | |
| 2 | | 0.2540 | 38.34 | 11.64 | 49.98 | 61.63 | -11.65 | peak | |
| 3 | | 2.2020 | 33.69 | 9.20 | 42.89 | 56.00 | -13.11 | peak | |
| 4 | * | 4.6420 | 35.52 | 11.64 | 47.16 | 56.00 | -8.84 | peak | |
| 5 | | 28.4340 | 30.37 | 9.00 | 39.37 | 60.00 | -20.63 | peak | |

*:Maximum data x:Over limit !:over margin

## Conducted Emission Measurement

File :TD-Q5 Data :#6 Date: 2012/09/28 Time: 12:12:45




Site site #1 Phase: N Temperature: 26

Limit: FCC Part15 B Class B QP Power: AC 120V/60Hz Humidity: 60 %

EUT: Two way radio

M/N: TD-Q5

Mode:

Note:

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | | 0.1900 | 42.55 | 11.40 | 53.95 | 64.04 | -10.09 | peak | |
| 2 | | 0.2540 | 39.08 | 11.64 | 50.72 | 61.63 | -10.91 | peak | |
| 3 | | 1.4340 | 32.61 | 9.57 | 42.18 | 56.00 | -13.82 | peak | |
| 4 | * | 4.8820 | 34.17 | 11.88 | 46.05 | 56.00 | -9.95 | peak | |
| 5 | | 27.8540 | 33.09 | 9.00 | 42.09 | 60.00 | -17.91 | peak | |

*:Maximum data x:Over limit !:over margin

## 5.9 Radiated Emission

## LIMITS OF RADIATED DISTURBANCES AT 3M DISTANCES FOR CLASS B

According to FCC section 15.109, except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

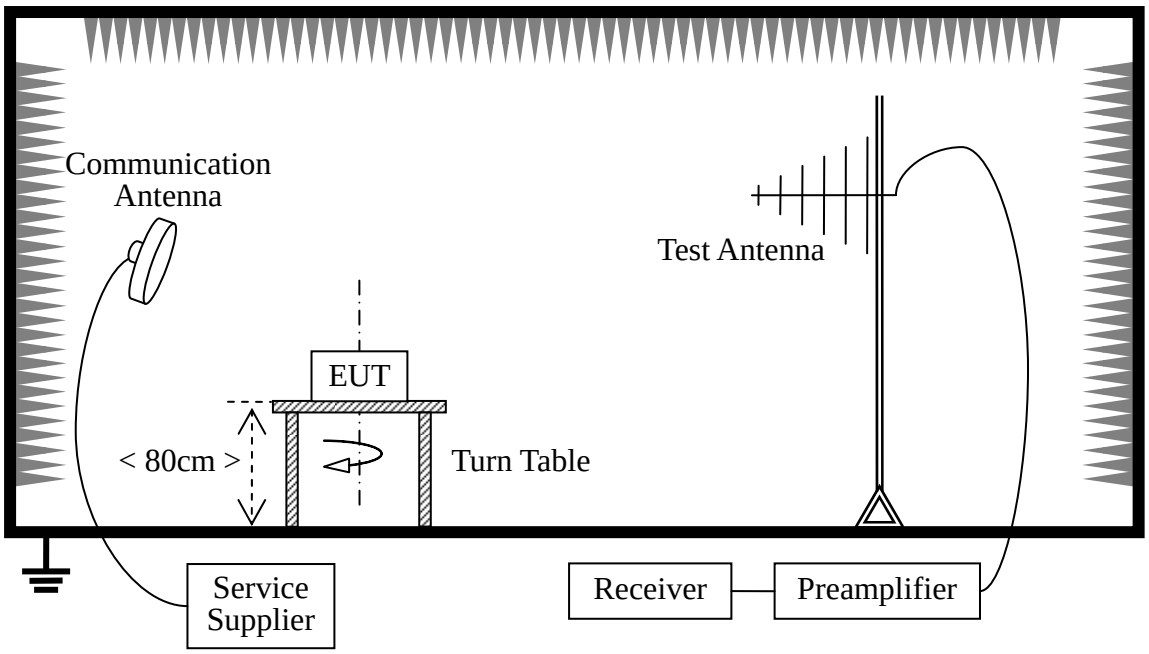
| Frequency (MHz) | Field Strength (μV/m) | Measurement Distance (m) |
|---|---|---|
| 30 - 88 | 100 | 3 |
| 88 - 216 | 150 | 3 |
| 216 - 960 | 200 | 3 |
| Above 960 | 500 | 3 |

**NOTE:**

1. Field Strength (dBμV/m) = 20*log[Field Strength (μV/m)].
2. In the emission tables above, the tighter limit applies at the band edges.

## TEST DESCRIPTION

**Test Setup:**




The EUT is powered by the Battery charged with the AC Adapter which is powered by 120V, 60Hz AC mains supply. The Module is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading. During the measurement, the EUT is activated and transmitting with the other Bluetooth device (Supply by the Applicant) during the test.

For the Test Antenna:

a) In the frequency range of 9 kHz to 30MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test

Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.

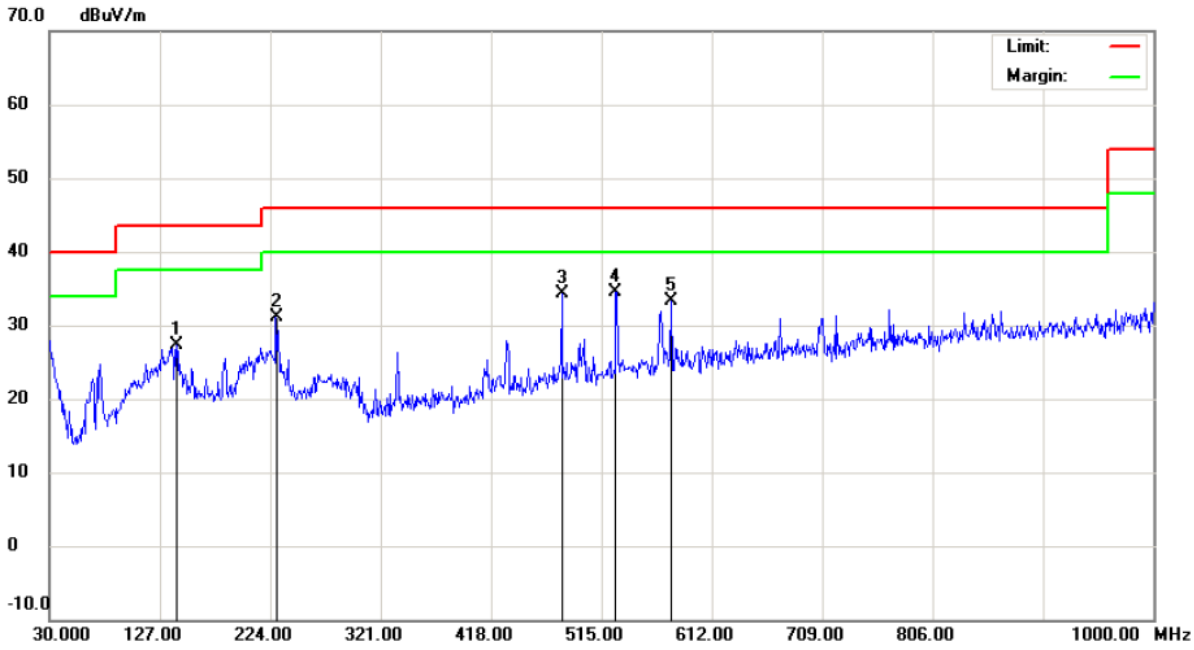
b) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

| Preliminary Radiated Emission Test | | | | |
|---|---|---|---|---|
| **Frequency Range Investigated** | | | **30 MHz TO 1000 MHz** | |
| **Mode of operation** | **Date** | **Report No.** | **Data#** | **Worst Mode** |
| TX Mode | 2012-09-28 | DPH120924F01 | RD70_1_(H, V) | ☐ |
| RX Mode | 2012-09-28 | DPH120924F01 | RD70_2_(H, V) | ☐ |

## TEST RESULT

## Radiated Emission Measurement

File :TD-Q5 Data :#7 Date: 2012-9-28 Time: 10:12:58




Site site MOST 3M
Limit: FCC Part15 B 3M Radiation
EUT: two way radio
M/N: TD-Q5
Mode: TX
Note:

Polarization: *Vertical*
Power: AC 120V/60Hz

Temperature: 26
Humidity: 61 %

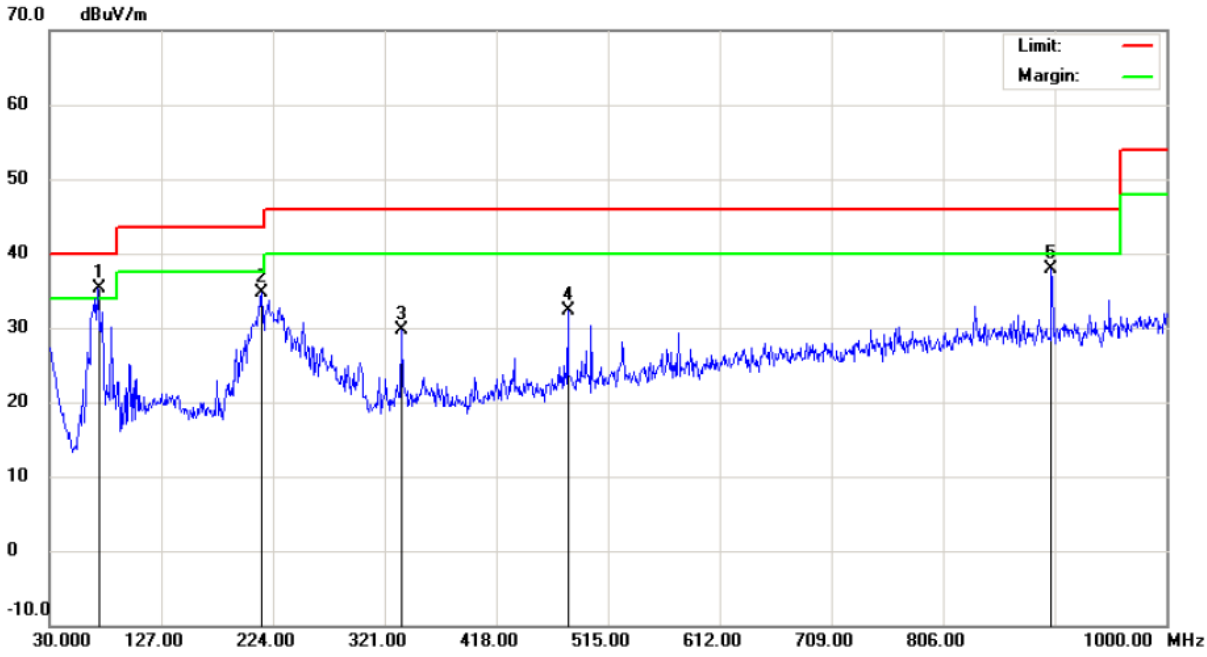
Distance:

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | Antenna Height | Table Degree | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | cm | degree | Comment |
| 1 | | 141.5500 | 10.29 | 17.11 | 27.40 | 43.50 | -16.10 | peak | | | |
| 2 | | 228.8500 | 14.55 | 16.48 | 31.03 | 46.00 | -14.97 | peak | | | |
| 3 | | 480.0800 | 12.70 | 21.70 | 34.40 | 46.00 | -11.60 | peak | | | |
| 4 | * | 527.6100 | 12.36 | 22.08 | 34.44 | 46.00 | -11.56 | peak | | | |
| 5 | | 576.1100 | 10.45 | 22.82 | 33.27 | 46.00 | -12.73 | peak | | | |

*:Maximum data x:Over limit !:over margin

## Radiated Emission Measurement

File :TD-Q5 Data :#8 Date: 2012-9-28 Time: 10:04:41




Site site MOST 3M Polarization: *Horizontal* Temperature: 26

Limit: FCC Part15 B 3M Radiation Power: AC 120V/60Hz Humidity: 61 %

EUT: two way radio Distance:

M/N: TD-Q5

Mode: TX

Note:

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | Antenna Height | Table Degree | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | cm | degree | Comment |
| 1 | * | 71.7100 | 23.64 | 11.68 | 35.32 | 40.00 | -4.68 | peak | | | |
| 2 | | 214.3000 | 18.62 | 16.08 | 34.70 | 43.50 | -8.80 | peak | | | |
| 3 | | 335.5500 | 12.73 | 17.06 | 29.79 | 46.00 | -16.21 | peak | | | |
| 4 | | 480.0800 | 10.57 | 21.70 | 32.27 | 46.00 | -13.73 | peak | | | |
| 5 | | 900.0900 | 10.43 | 27.40 | 37.83 | 46.00 | -8.17 | peak | | | |

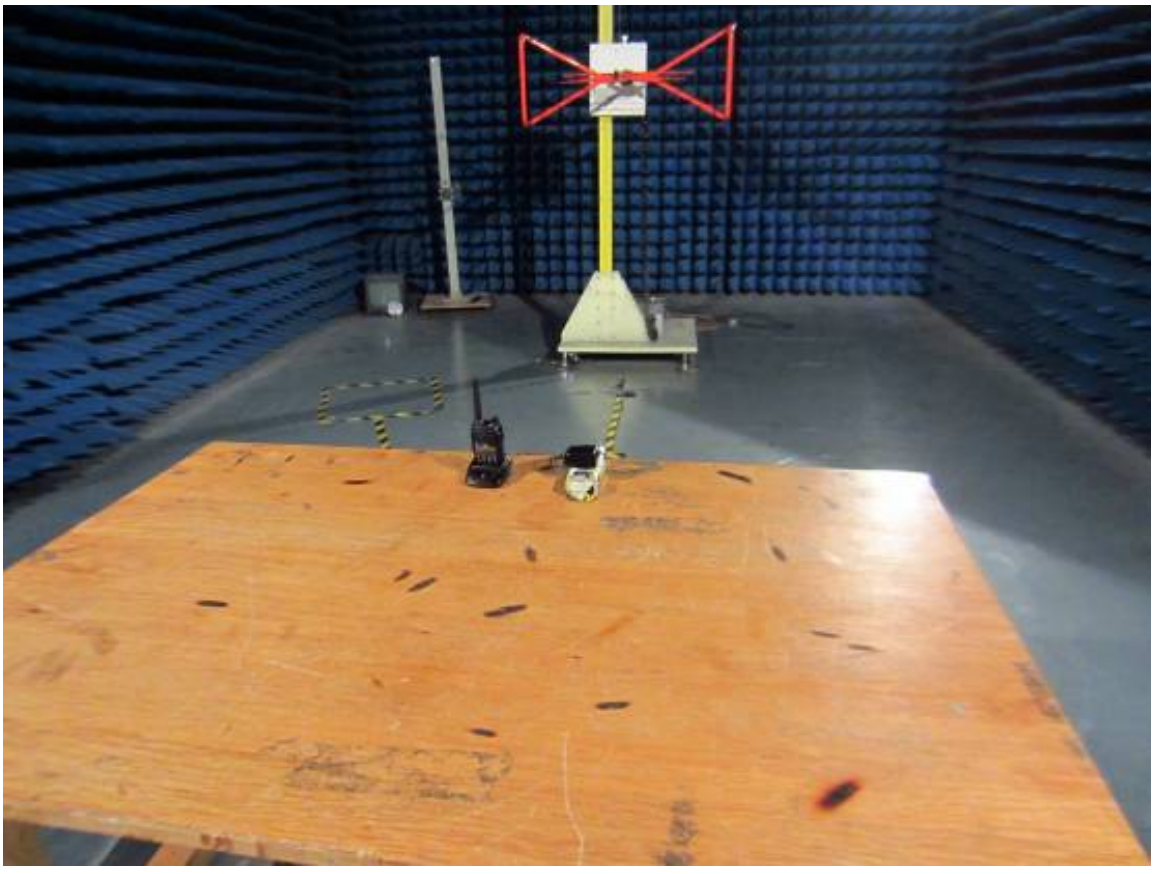
*:Maximum data x:Over limit !:over margin

# Annex A

# Photographs of the Test Setup

Conducted Emission Setup Photo

Radiated Emission Setup Photo



# Annex B

# Photographs of the EUT

FRONT VIEW OF SAMPLE


BACK VIEW OF SAMPLE

LEFT VIEW OF SAMPLE

RIGHT VIEW OF SAMPLE

UP VIEW OF SAMPLE

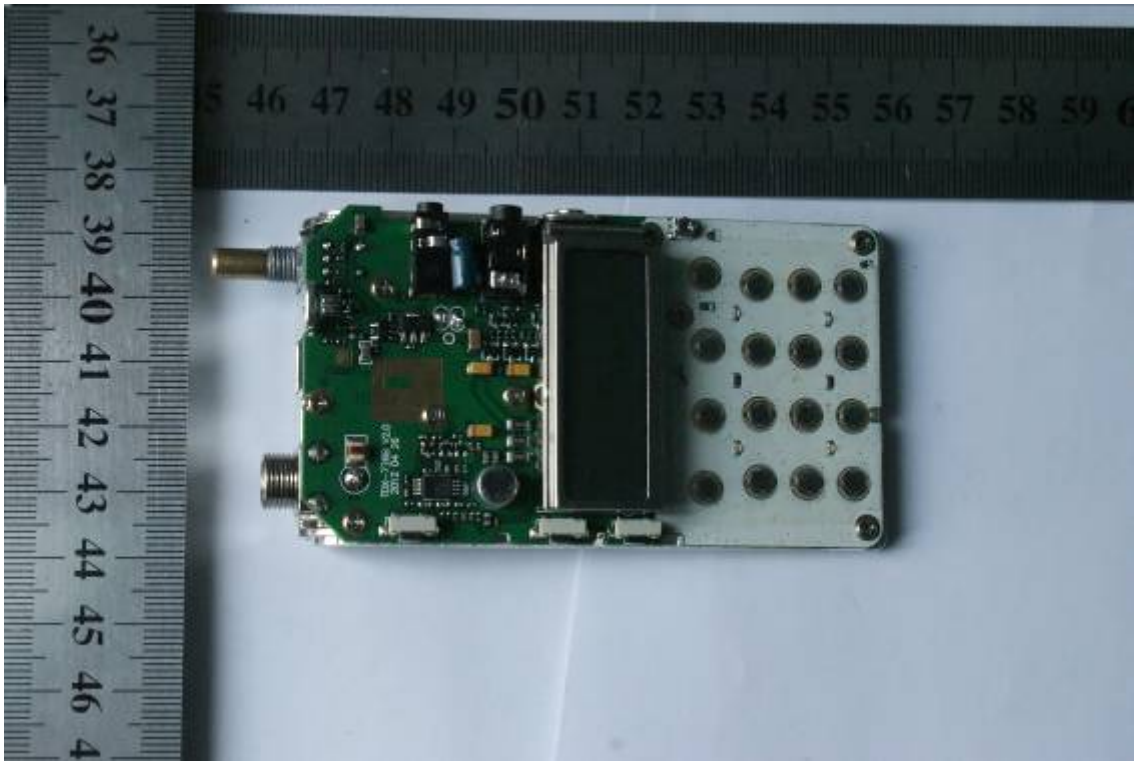
DOWN VIEW OF SAMPLE

PHOTO OF THE ENTIRE SAMPLE

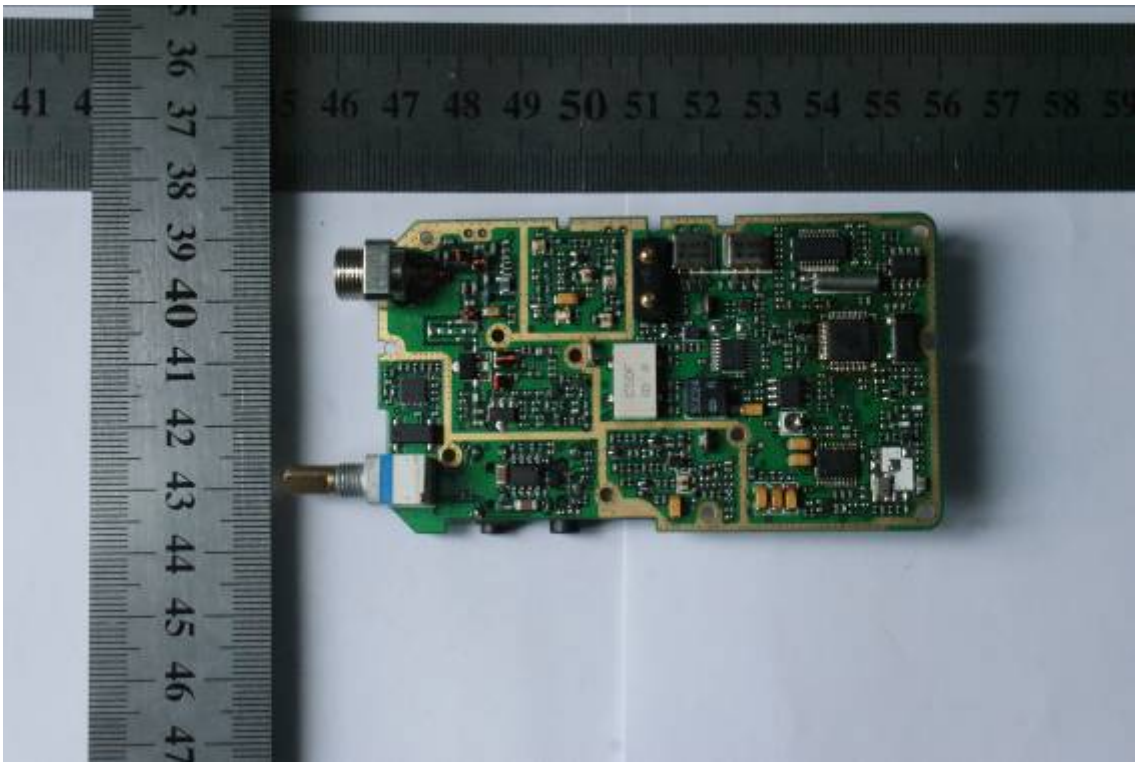

INTERNAL PHOTO OF SAMPLE-1

INTERNAL PHOTO OF SAMPLE-2

INTERNAL PHOTO OF SAMPLE-3



INTERNAL PHOTO OF SAMPLE-4



*** End of the Reports***