# FCC TEST REPORT

For

Nexersys Corporation

Cross Body Trainer

Model No.: CBTH-01

Additional Model NO. : CBTH-02, CBTH-03, CBTH-04, CBTH-05

| | | |
|---|---|---|
| Prepared for | : | Nexersys Corporation |
| Address | : | 1021 East 7th Street, Suite 100, Austin, TX 78702, United States |
| Prepared by | : | Shenzhen LCS Compliance Testing Laboratory Ltd. |
| Address | : | 1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China |
| Tel | : | (+86)755-82591330 |
| Fax | : | (+86)755-82591332 |
| Web | : | www.LCS-cert.com |
| Mail | : | webmaster@LCS-cert.com |
| Date of receipt of test sample | : | July 13, 2016 |
| Number of tested samples | : | 1 |
| Serial number | : | / |
| Date of Test | : | July 13, 2016 - August23, 2016 |
| Date of Report | : | August 23, 2016 |

**FCC TEST REPORT**
**FCC CFR 47 PART 15 C(15.247): 2015**

| | | |
|---|---|---|
| **Report Reference No. .....** | **:** | **LCS1608111013E** |
| Date of Issue..... | : | August 23, 2016 |
| **Testing Laboratory Name .....** | **:** | **Shenzhen LCS Compliance Testing Laboratory Ltd.** |
| Address..... | : | 1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China |
| Testing Location/ Procedure ..... | : | Full application of Harmonised standards ■<br>Partial application of Harmonised standards □<br>Other standard testing method □ |
| **Applicant's Name .....** | **:** | **Nexersys Corporation** |
| Address..... | : | 1021 East 7th Street, Suite 100, Austin, TX 78702, United States |
| **Test Specification** | | |
| Standard..... | : | FCC CFR 47 PART 15 C(15.247): 2015 |
| **Test Report Form No. .....** | **:** | LCSEMC-1.0 |
| TRF Originator..... | : | Shenzhen LCS Compliance Testing Laboratory Ltd. |
| Master TRF ..... | : | Dated 2011-03 |



| | | |
|---|---|---|
| **Test Item Description.....** | **:** | **Cross Body Trainer** |
| Trade Mark..... | : | Cross Body Trainer |
| Model/ Type reference ..... | : | CBTH-01 |
| Ratings..... | : | DC 3.0V by 2*AAA battery |
| Result ..... | : | **Positive** |

| **Compiled by:** | **Supervised by:** | **Approved by:** |
|---|---|---|
| Dick Su/ File administrators | Glin Lu / Technique principal | Gavin Liang/ Manager |

# FCC -- TEST REPORT

| **Test Report No. : LCS1608111013E** | August 23, 2016<br>Date of issue |
|---|---|

| | |
|---|---|
| Type / Model..... | : CBTH-01 |
| EUT..... | : Cross Body Trainer |
| **Applicant.....** | **: Nexersys Corporation** |
| Address..... | : 1021 East 7th Street, Suite 100, Austin, TX 78702, United States |
| Telephone..... | : 512-485-3040 |
| Fax..... | : / |
| **Manufacturer.....** | **: Nexersys Corporation** |
| Address..... | : 1021 East 7th Street, Suite 100, Austin, TX 78702, United States |
| Telephone..... | : 512-485-3040 |
| Fax..... | : / |
| **Factory.....** | **: Nexersys Corporation** |
| Address..... | : 1021 East 7th Street, Suite 100, Austin, TX 78702, United States |
| Telephone..... | : 512-485-3040 |
| Fax..... | : / |

| **Test Result** | **Positive** |
|---|---|

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

# Revision History

| Revision | Issue Date | Revisions | Revised By |
|---|---|---|---|
| 00 | August 23, 2016 | Initial Issue | Gavin Liang |
| | | | |
| | | | |

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Description ..... Page

# 1. GENERAL INFORMATION

## 1.1. Description of Device (EUT)

| | | |
|---|---|---|
| EUT | : | Cross Body Trainer |
| Model No. | : | CBTH-01 |
| Hardware Version | : | MODL-0126-1-PKG-R3 |
| Software Version | : | SW-0443-01 |
| Frequency Range | : | 2.402-2.480GHz |
| Channel Number | : | 40 channels |
| Channel frequency | : | 2402.00-2480.00MHz (Channel Number: 40,<br>Channel Frequency=2402+2(K-1), K=1, 2, 3 ……40); |
| Channel Spacing | : | 2MHz |
| Modulation Type | : | GFSK |
| Bluetooth Version | : | V4.0 |
| Antenna Gain | : | Internal antenna, 1.0 dBi(Max.) |
| Power Supply | : | DC 3.0 V by 2*AAA battery |

| **Additional models No.** | | | |
|---|---|---|---|
| *CBTH-02* | *CBTH-03* | *CBTH-04* | *CBTH-05* |
| *Remark: PCB board, structure and internal of these model(s) are the same, So no additional models were tested.* | | | |

## 1.2. Host System Configuration List and Details

| Manufacturer | Description | Model | Serial Number | Certificate |
|---|---|---|---|---|
| -- | -- | -- | -- | -- |

## 1.3. External I/O

| I/O Port Description | Quantity | Cable |
|---|---|---|
| -- | -- | N/A |

## 1.4. Description of Test Facility

| | | |
|---|---|---|
| Site Description EMC Lab. | : | CNAS Registration Number. is L4595.<br>FCC Registration Number. is 899208.<br>Industry Canada Registration Number. is 9642A-1.<br>VCCI Registration Number. is C-4260 and R-3804.<br>ESMD Registration Number. is ARCB0108.<br>UL Registration Number. is 100571-492.<br>TUV SUD Registration Number. is SCN1081.<br>TUV RH Registration Number. is UA 50296516-001 |
| Name of Firm | : | Shenzhen LCS Compliance Testing Laboratory Ltd. |
| Site Location | : | 1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China |

## 1.5. Statement of The Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

## 1.6. Measurement Uncertainty

| Test Item | | Frequency Range | Uncertainty | Note |
|---|---|---|---|---|
| Radiation Uncertainty | : | 9KHz~30MHz | 3.10dB | (1) |
| | | 30MHz~200MHz | 2.96dB | (1) |
| | | 200MHz~1000MHz | 3.10dB | (1) |
| | | 1GHz~26.5GHz | 3.80dB | (1) |
| | | 26.5GHz~40GHz | 3.90dB | (1) |
| Conduction Uncertainty | : | 170kHz~30MHz | 1.63dB | (1) |
| Power disturbance | : | 30MHz~300MHz | 1.60dB | (1) |

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

## 1.7. Description Of Test Modes

Bluetooth operates in the unlicensed ISM Band at 2.4GHz. The following operating modes were applied for the related test items.
This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position. During test, the EUT is set to transmit in 100% duty cycle.And its related average correction factor is 0.
All test modes were tested, only the result of the worst case was recorded in the report.

| Mode of Operations | Frequency Range (MHz) | Data Rate (Mbps) |
|---|---|---|
| GFSK | 2402 | 1 |
| | 2440 | 1 |
| | 2480 | 1 |
| For Conducted Emission | | |
| Test Mode | TX Mode | |
| For Radiated Emission | | |
| Test Mode | TX Mode | |

# 2. TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10-2013 and KDB558074 D01 v03r03, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Shenzhen LCS Compliance Testing Laboratory Ltd..

## 2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

## 2.2. EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C

## 2.3. General Test Procedures

### 2.3.1 Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements of ANSI C63.10:2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

### 2.3.2 Radiated Emissions

The EUT is placed on a turn table, The EUT was placed on the top of the turntable 0.8 meter above ground below 1GHz and above 1GHz test at 1.5 meter above ground. 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 of ANSI C63.10-2013.

# 3. SYSTEM TEST CONFIGURATION

## 3.1. Justification

The system was configured for testing in a continuous transmit condition.

## 3.2. EUT Exercise Software

N/A

## 3.3. Special Accessories

N/A

## 3.4. Block Diagram/Schematics

Please refer to the related document

## 3.5. Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

## 3.6. Test Setup

Please refer to the test setup photo.

# 4. SUMMARY OF TEST RESULTS

| Applied Standard: FCC Part 15 Subpart C | | |
|---|---|---|
| **FCC Rules** | **Description of Test** | **Result** |
| §15.247(b) | Maximum Conducted Output Power | Compliant |
| §15.247(e) | Power Spectral Density | Compliant |
| §15.247(a)(2) | 6dB Bandwidth | Compliant |
| §15.247(a) | Occupied Bandwidth | Compliant |
| §15.209, §15.247(d) | Radiated and Conducted Spurious Emissions | Compliant |
| §15.205 | Emissions at Restricted Band | Compliant |
| §15.207(a) | Line Conducted Emissions | N/A |
| §15.203 | Antenna Requirements | Compliant |

# 5. SUMMARY OF TEST EQUIPMENT

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Next Cal. |
|---|---|---|---|---|---|---|
| 1 | EMC Receiver | R&S | ESCS 30 | 100174 | 2016-06-18 | 2017-06-17 |
| 2 | Signal analyzer | Agilent | E4448A(External mixers to 40GHz) | US44300469 | 2016-07-16 | 2017-07-15 |
| 3 | LISN | MESS Tec | NNB-2/16Z | 99079 | 2016-06-18 | 2017-06-17 |
| 4 | LISN (Support Unit) | EMCO | 3819/2NM | 9703-1839 | 2016-06-18 | 2017-06-17 |
| 5 | RF Cable-CON | UTIFLEX | 3102-26886-4 | CB049 | 2016-06-18 | 2017-06-17 |
| 6 | ISN | SCHAFFNER | ISN ST08 | 21653 | 2016-06-18 | 2017-06-17 |
| 7 | 3m Semi Anechoic Chamber | SIDT FRANKONIA | SAC-3M | 03CH03-HY | 2016-06-18 | 2017-06-17 |
| 8 | Amplifier | SCHAFFNER | COA9231A | 18667 | 2016-06-18 | 2017-06-17 |
| 9 | Amplifier | Agilent | 8449B | 3008A02120 | 2016-07-16 | 2017-07-15 |
| 10 | Amplifier | MITEQ | AMF-6F-260400 | 9121372 | 2016-07-16 | 2017-07-15 |
| 11 | Spectrum Analyzer | Agilent | E4407B | MY41440292 | 2016-07-16 | 2017-07-15 |
| 12 | Loop Antenna | R&S | HFH2-Z2 | 860004/001 | 2016-06-18 | 2017-06-17 |
| 13 | By-log Antenna | SCHWARZBECK | VULB9163 | 9163-470 | 2016-06-10 | 2017-06-09 |
| 14 | Horn Antenna | EMCO | 3115 | 6741 | 2016-06-10 | 2017-06-09 |
| 15 | Horn Antenna | SCHWARZBECK | BBHA9170 | BBHA9170154 | 2016-06-10 | 2017-06-09 |
| 16 | RF Cable-R03m | Jye Bao | RG142 | CB021 | 2016-06-18 | 2017-06-17 |
| 17 | RF Cable-HIGH | SUHNER | SUCOFLEX 106 | 03CH03-HY | 2016-06-18 | 2017-06-17 |
| 18 | Spectrum Meter | R&S | FSP 30 | 100023 | 2016-07-16 | 2017-07-15 |
| 19 | Power Meter | R&S | NRVS | 100444 | 2016-06-18 | 2017-06-17 |
| 20 | Power Sensor | R&S | NRV-Z51 | 100458 | 2016-06-18 | 2017-06-17 |
| 21 | Power Sensor | R&S | NRV-Z32 | 10057 | 2016-06-18 | 2017-06-17 |
| 22 | AC Power Source | HPC | HPA-500E | HPA-9100024 | 2016-06-18 | 2017-06-17 |
| 23 | DC power Soure | GW | GPC-6030D | C671845 | 2016-06-18 | 2017-06-17 |
| 24 | Temp. and Humidigy Chamber | Giant Force | GTH-225-20-S | MAB0103-00 | 2016-06-18 | 2017-06-17 |
| 25 | RF CABLE-1m | JYE Bao | RG142 | CB034-1m | 2016-06-18 | 2017-06-17 |
| 26 | RF CABLE-2m | JYE Bao | RG142 | CB)35-2m | 2016-06-18 | 2017-06-17 |
| 27 | Vector signal Generator | R&S | SMU200A | 102098 | 2016-06-18 | 2017-06-17 |
| 28 | Signal Generator | R&S | SMR40 | 10016 | 2016-07-16 | 2017-07-15 |
| 29 | MXA Signal Analyzer | Agilent | N9020A | MY50510140 | 2015-10-27 | 2016-10-26 |
| 30 | Temporary Antenna Connector | ALT | E203950 | N/A | 2016-07-18 | 2017-07-17 |

# 6. TEST RESULT

## 6.1. Maximum Conducted Output Power Measurement

### 6.1.1. Standard Applicable

According to §15.247(b) 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 125mW.

According to §15.247(b)(3), for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 Watt.

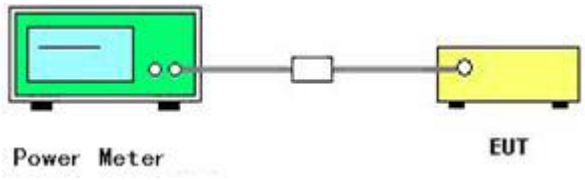
### 6.1.2. Measuring Instruments

Please refer to section 6 of equipments list in this report.

### 6.1.3. Test Procedures

The transmitter output (antenna port) was connected to the power meter.

### 6.1.4. Test Setup Layout




### 6.1.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

### 6.1.6. Test Result of Maximum Conducted Output Power(Peak)

| Modulation | Frequency (MHz) | Output Power (dBm) | Output Power (mW) | Limit (mW) | Result |
|---|---|---|---|---|---|
| GFSK | 2402 | -0.81 | 0.83 | 1000 | Pass |
| | 2440 | -0.09 | 0.98 | 1000 | Pass |
| | 2480 | -0.94 | 0.81 | 1000 | Pass |

## 6.2. Power Spectral Density Measurement

### 6.2.1. Standard Applicable

According to §15.247(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

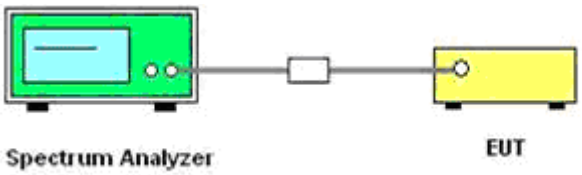
### 6.2.2. Measuring Instruments

Please refer to section 6 of equipments list in this report.

### 6.2.3. Test Procedures

1. The transmitter was connected directly to a Spectrum Analyzer through a directional couple.
2. The power was monitored at the coupler port with a Spectrum Analyzer. The power level was set to the maximum level.
3. Set the RBW = 3 kHz.
4. Set the VBW ≥ 3*RBW.
5. Set the span to 1.5 times the DTS channel bandwidth.
6. Detector = peak.
7. Sweep time = auto couple.
8. Trace mode = max hold.
9. Allow trace to fully stabilize.
10. Use the peak marker function to determine the maximum power level in any 3 kHz band segment within the fundamental EBW.

### 6.2.4. Test Setup Layout




### 6.2.5. EUT Operation during Test

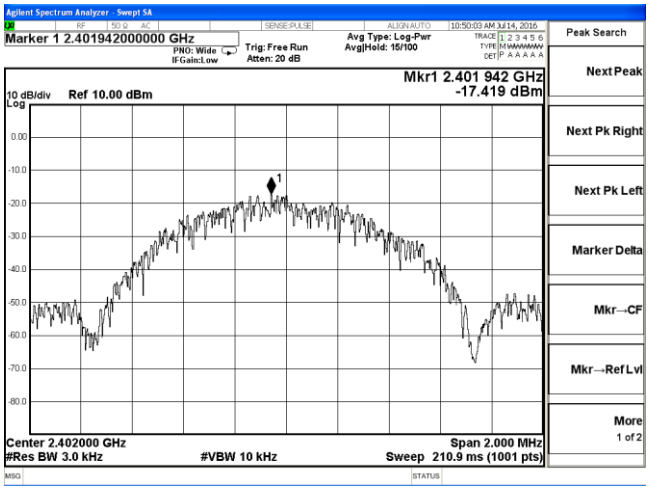
The EUT was programmed to be in continuously transmitting mode.

6.2.6. Test Result of Power Spectral Density

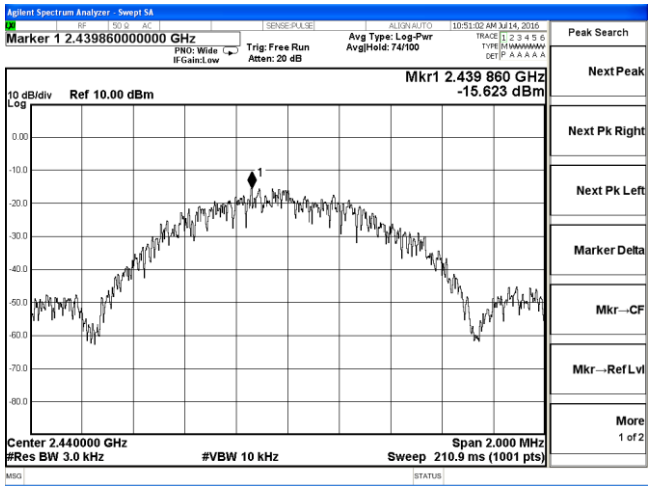
| Modulation | Frequency (MHz) | Reading Level (dBm/3KHz) | Max. Limit (dBm/3KHz) | Result |
|---|---|---|---|---|
| GFSK | 2402 | -17.419 | 8 | Pass |
| | 2440 | -15.623 | 8 | Pass |
| | 2480 | -14.235 | 8 | Pass |

*The test data refer to the following page.*

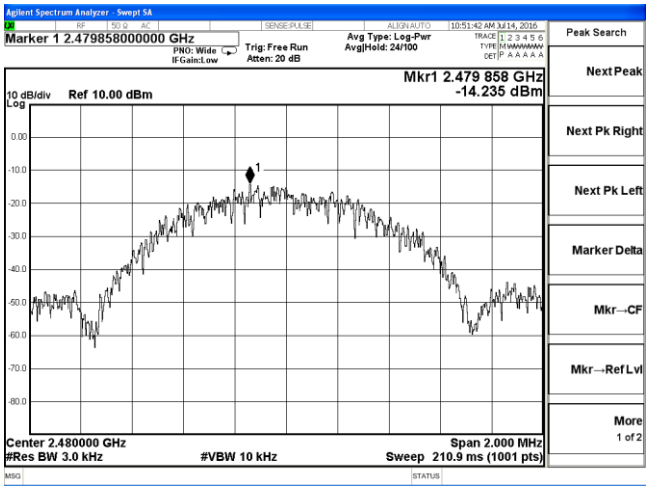
***Measurement of Power Spectral Density***




***Test frequency: 2402MHz***




***Test frequency: 2440MHz***




***Test frequency: 2480MHz***

## 6.3. 6 dB Spectrum Bandwidth Measurement

### 6.3.1. Standard Applicable

According to §15.247(a)(2) For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

### 6.3.2. Measuring Instruments and Setting

Please refer to section 6 of equipments list in this report. The following table is the setting of the Spectrum Analyzer.

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Span Frequency | > RBW |
| Detector | Peak |
| Trace | Max Hold |
| Sweep Time | 100ms |

### 6.3.3. Test Procedures

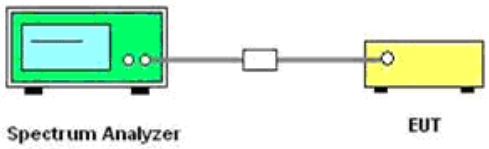
1. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.

2. The resolution bandwidth and the video bandwidth were set according to ANSI C63.10:2013 bandwidth measurement method .

RBW=1%-5% OBW, VBW≥3RBW

3. Measured the spectrum width with power higher than 6dB below carrier.

### 6.3.4. Test Setup Layout




### 6.3.5. EUT Operation during Test

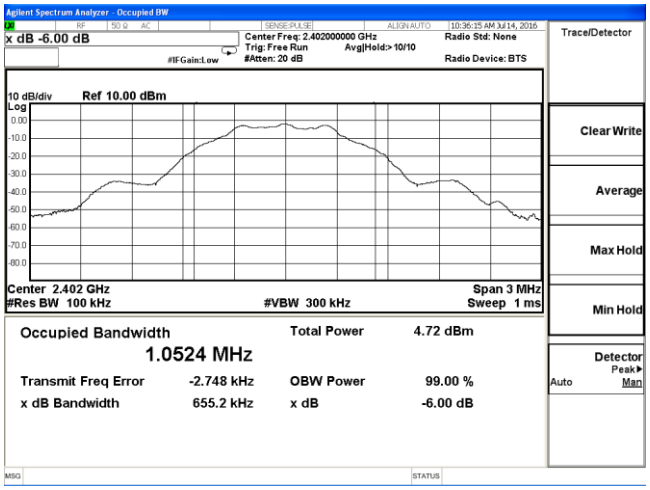
The EUT was programmed to be in continuously transmitting mode.

### 6.3.6. Test Result of 6dB Spectrum Bandwidth

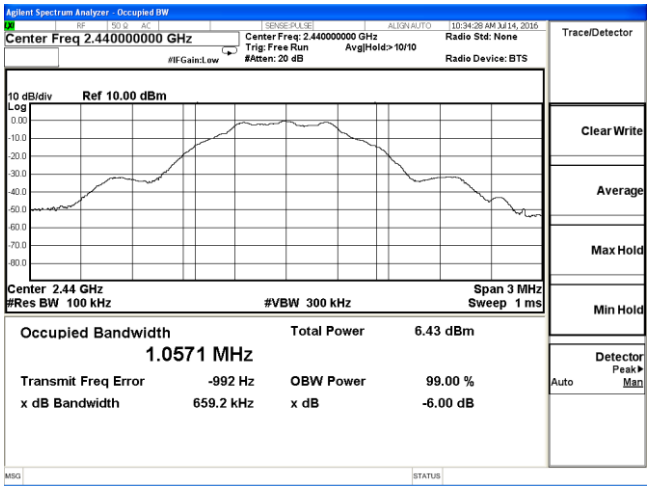
| Modulation | Frequency (MHz) | 6dB Bandwidth (KHz) | Min. Limit (KHz) | Result |
|---|---|---|---|---|
| GFSK | 2402 | 655.2 | 500 | Complies |
| | 2440 | 659.2 | 500 | Complies |
| | 2480 | 653.0 | 500 | Complies |

*The test data refer to the following page.*

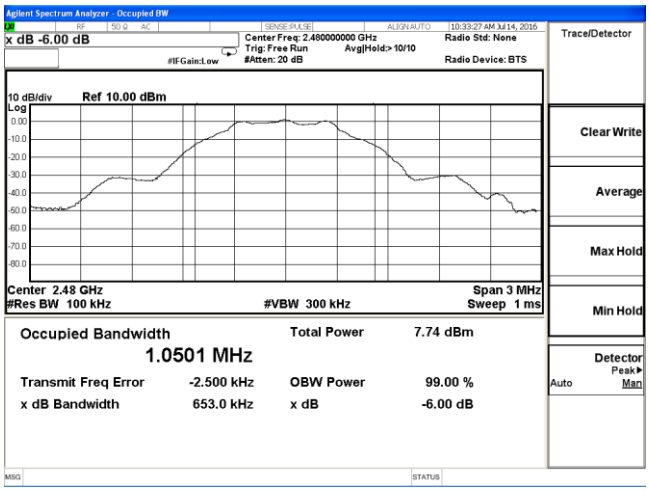
## *Measurement of 6dB Spectrum Bandwidth*




***Test frequency: 2402MHz***



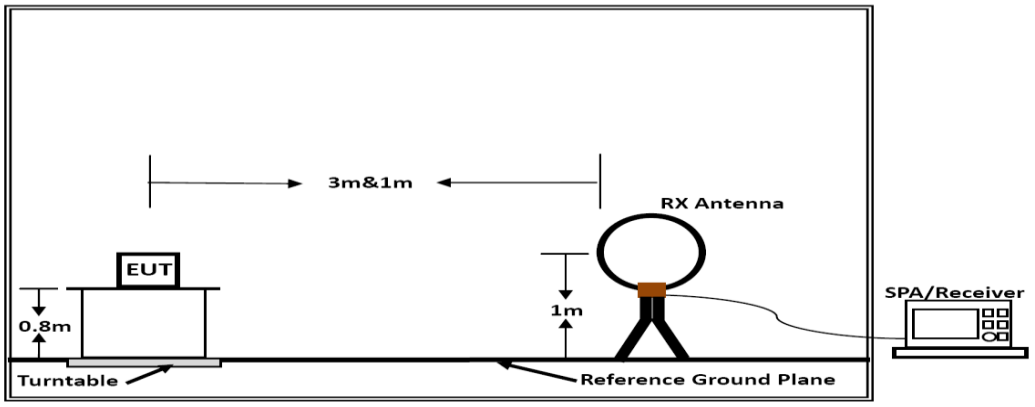

***Test frequency: 2440MHz***



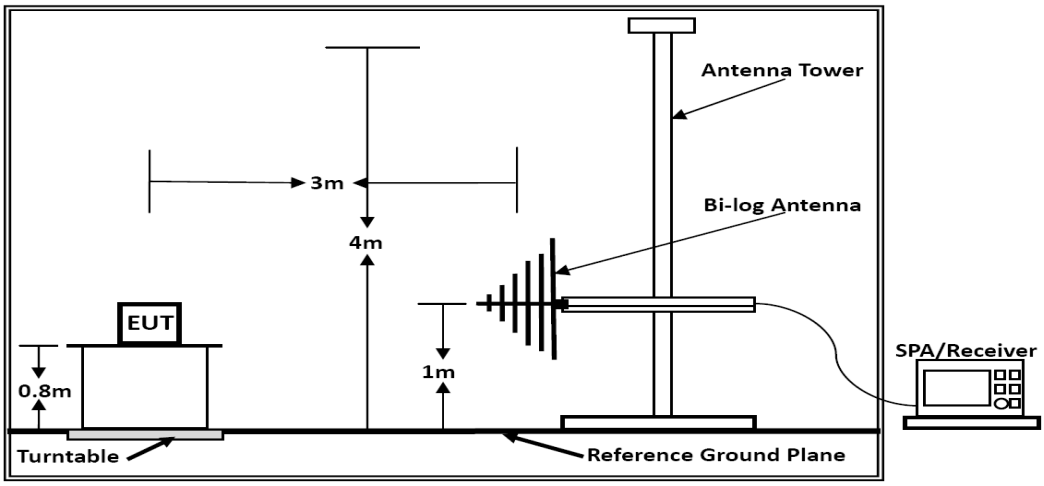

***Test frequency: 2480MHz***

## 6.4. Radiated Emissions Measurement

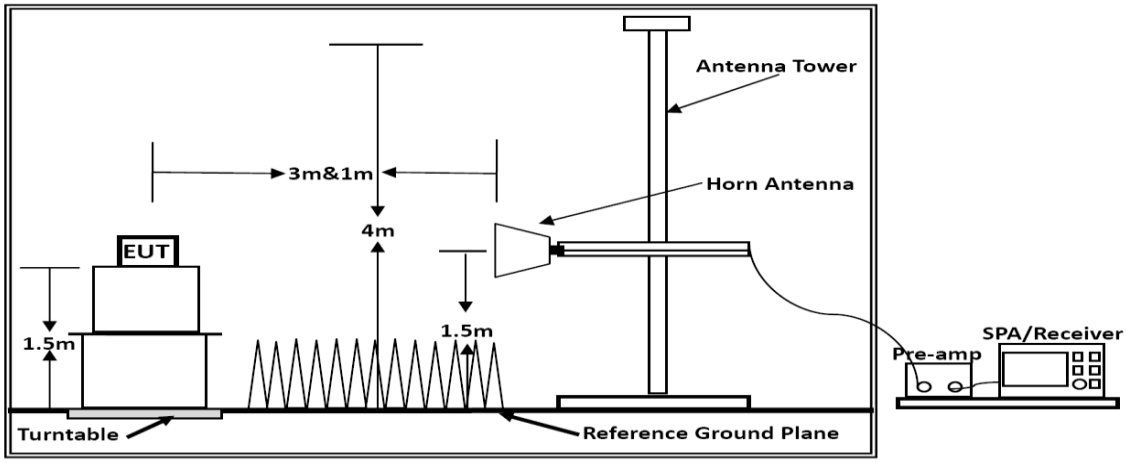
### 6.4.1. Test Setup Layout




**Below 30MHz**




**Below 1GHz**




**Above 1GHz**

Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1.5m.

Distance extrapolation factor = 20 log (specific distanc [3m] / test distance [1.5m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

6.4.2. Standard Applicable

According to §15.247 (d) 20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

| Frequencies(MHz) | Field Strength(microvolts/meter) | Measurement Distance(meters) |
|---|---|---|
| 0.009~0.490 | 2400/F(KHz) | 300 |
| 0.490~1.705 | 24000/F(KHz) | 30 |
| 1.705~30.0 | 30 | 30 |
| 30~88 | 100 | 3 |
| 88~216 | 170 | 3 |
| 216~960 | 200 | 3 |
| Above 960 | 500 | 3 |

6.4.3. Measuring Instruments and Setting

Please refer to section 6 of equipment's list in this report. The following table is the setting of spectrum analyzer and receiver.

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Start Frequency | 1000 MHz |
| Stop Frequency | 10th carrier harmonic |
| RB / VB (Emission in restricted band) | 1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average |
| RB / VB (Emission in non-restricted band) | 1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average |

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Start ~ Stop Frequency | 9kHz~170kHz / RB 200Hz for QP |
| Start ~ Stop Frequency | 170kHz~30MHz / RB 9kHz for QP |
| Start ~ Stop Frequency | 30MHz~1000MHz / RB 100kHz for QP |

6.4.4 Test Procedures

1) **Sequence of testing 9 kHz to 30 MHz**

**Setup:**

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

**Premeasurement:**

--- The turntable rotates from 0 °to 315 °using 45 °steps.

--- The antenna height is 1.5 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

**Final measurement:**

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0 °to 360 °) and by rotating the elevation axes (0 °to 360 °).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) **Sequence of testing 30 MHz to 1 GHz**

**Setup:**

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

**Premeasurement:**

--- The turntable rotates from 0 °to 315 °using 45 °steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

**Final measurement:**

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (±45 °) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) **Sequence of testing 1 GHz to 18 GHz**

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0 °to 315 °using 45 °steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height scan range is 1 meter to 2.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (±45 °) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) **Sequence of testing above 18 GHz**

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 1 meter.

--- The EUT was set into operation.

Premeasurement:

--- The antenna is moved spherical over the EUT in different polarizations of the antenna.

Final measurement:

--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

6.4.5 Results for Radiated Emissions

**PASS.**

*Only record the worst test result in this report.*
*The test data please refer to following page:*

6.4.6. Results of Radiated Emissions (9kHz~30MHz)

| | | | |
|---|---|---|---|
| Temperature | 25℃ | Humidty | 60% |
| Test Engineer | Dick | Configurations | BT V4.0 |

| Freq. (MHz) | Level (dBuV) | Over Limit (dB) | Over Limit (dBuV) | Remark |
|---|---|---|---|---|
| - | - | - | - | See Note |

Note:

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

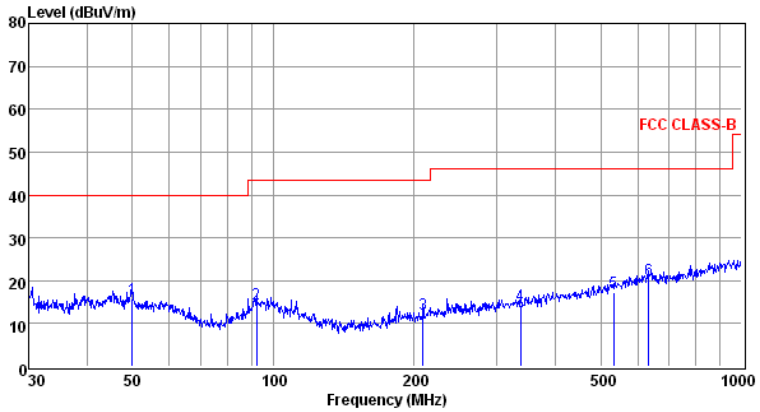
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

6.4.7. Results of Radiated Emissions (30MHz~1GHz)

**PASS.**

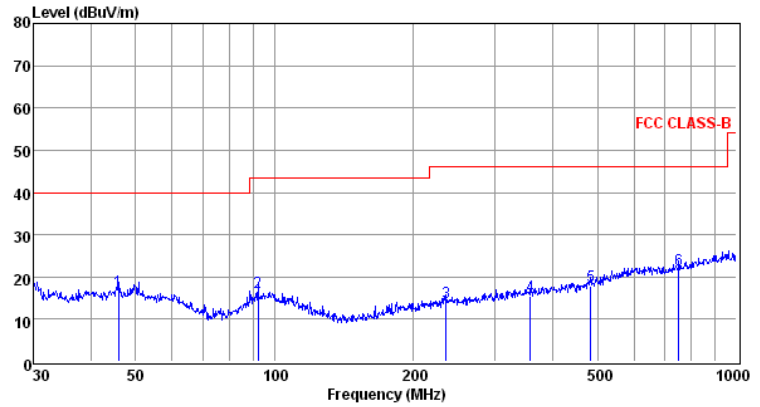
*The test data please refer to following page:*




Env./Ins: 24℃/56%
pol: VERTICAL

| | Freq | Reading | CabLos | Antfac | Measured | Limit | Over | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBm | dB | dB/m | dBm | dBm | dB | |
| 1 | 49.88 | 2.05 | 0.54 | 13.26 | 15.85 | 40.00 | -24.15 | QP |
| 2 | 92.14 | 1.86 | 0.56 | 12.30 | 14.72 | 43.50 | -28.78 | QP |
| 3 | 208.58 | 0.49 | 0.86 | 10.84 | 12.19 | 43.50 | -31.31 | QP |
| 4 | 337.22 | -0.88 | 1.09 | 14.01 | 14.22 | 46.00 | -31.78 | QP |
| 5 | 533.83 | -1.42 | 1.46 | 17.21 | 17.25 | 46.00 | -28.75 | QP |
| 6 | 633.91 | 0.22 | 1.50 | 18.57 | 20.29 | 46.00 | -25.71 | QP |

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported




Env./Ins: 24℃/56%
pol: HORIZONTAL

| | Freq | Reading | CabLos | Antfac | Measured | Limit | Over | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBm | dB | dB/m | dBm | dBm | dB | |
| 1 | 45.86 | 2.89 | 0.41 | 13.50 | 16.80 | 40.00 | -23.20 | QP |
| 2 | 92.14 | 3.63 | 0.56 | 12.30 | 16.49 | 43.50 | -27.01 | QP |
| 3 | 234.99 | 1.09 | 0.87 | 11.87 | 13.83 | 46.00 | -32.17 | QP |
| 4 | 357.93 | -0.22 | 1.18 | 14.40 | 15.36 | 46.00 | -30.64 | QP |
| 5 | 483.91 | 0.34 | 1.39 | 16.17 | 17.90 | 46.00 | -28.10 | QP |
| 6 | 750.11 | 0.56 | 1.65 | 19.44 | 21.65 | 46.00 | -24.35 | QP |

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported

****Note: Pre-scan all mode and recorded the worst case results in this report.*

6.4.8. Results for Radiated Emissions (Above 1GHz)

Channel 1

| Freq. MHz | Reading Level dBuV | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuV/m | Limit dBuV/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4804.00 | 43.82 | 33.06 | 35.04 | 3.94 | 45.78 | 74 | -28.22 | Peak | Horizontal |
| 4804.00 | 35.37 | 33.06 | 35.04 | 3.94 | 37.33 | 54 | -16.67 | Average | Horizontal |
| 4804.00 | 41.09 | 33.06 | 35.04 | 3.94 | 43.05 | 74 | -30.95 | Peak | Vertical |
| 4804.00 | 33.06 | 33.06 | 35.04 | 3.94 | 35.02 | 54 | -18.98 | Average | Vertical |

Channel 20

| Freq. MHz | Reading Level dBuV | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuV/m | Limit dBuV/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4880.00 | 44.23 | 33.16 | 35.15 | 3.96 | 46.20 | 74 | -27.80 | Peak | Horizontal |
| 4880.00 | 38.48 | 33.16 | 35.15 | 3.96 | 40.45 | 54 | -13.55 | Average | Horizontal |
| 4880.00 | 37.89 | 33.16 | 35.15 | 3.96 | 39.86 | 74 | -34.14 | Peak | Vertical |
| 4880.00 | 36.71 | 33.16 | 35.15 | 3.96 | 38.68 | 54 | -15.32 | Average | Vertical |

Channel 40

| Freq. MHz | Reading Level dBuV | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuV/m | Limit dBuV/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4960.00 | 38.68 | 33.26 | 35.14 | 3.98 | 40.78 | 74 | -33.22 | Peak | Horizontal |
| 4960.00 | 27.72 | 33.26 | 35.14 | 3.98 | 29.82 | 54 | -24.18 | Average | Horizontal |
| 4960.00 | 47.26 | 33.26 | 35.14 | 3.98 | 49.36 | 74 | -24.64 | Peak | Vertical |
| 4960.00 | 38.37 | 33.26 | 35.14 | 3.98 | 40.47 | 54 | -13.53 | Average | Vertical |

***Notes:***

1. *Measuring frequencies from 9k~10th harmonic (ex. 26GHz), No emission found between lowest internal used/generated frequency to 30 MHz.*
2. *Radiated emissions measured in frequency range from 9k~10th harmonic (ex. 26GHz) were made with an instrument using Peak detector mode.*
3. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*

6.4.9. Results for Band edge Testing (Radiated)

Tx-2402

| Freq. MHz | Reading Level dBuV | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuV/m | Limit dBuV/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 2365.05 | 46.26 | 32.89 | 35.16 | 3.51 | 47.50 | 74 | -26.50 | Peak | Horizontal |
| 2364.66 | 31.88 | 32.90 | 35.16 | 3.51 | 33.13 | 54 | -20.87 | Average | Horizontal |
| 2400.00 | 47.55 | 32.92 | 35.16 | 3.54 | 48.85 | 74 | -25.15 | Peak | Horizontal |
| 2400.00 | 36.84 | 32.92 | 35.16 | 3.54 | 38.14 | 54 | -15.86 | Average | Horizontal |
| 2380.07 | 40.58 | 32.89 | 35.16 | 3.51 | 41.82 | 74 | -32.18 | Peak | Vertical |
| 2381.71 | 32.97 | 32.90 | 35.16 | 3.51 | 34.22 | 54 | -19.78 | Average | Vertical |
| 2400.00 | 48.93 | 32.92 | 35.16 | 3.54 | 50.23 | 74 | -23.77 | Peak | Vertical |
| 2400.00 | 40.12 | 32.92 | 35.16 | 3.54 | 41.42 | 54 | -12.58 | Average | Vertical |

Tx-2480

| Freq. MHz | Reading Level dBuV | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuV/m | Limit dBuV/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 2483.50 | 53.35 | 33.06 | 35.18 | 3.60 | 54.83 | 74 | -19.17 | Peak | Horizontal |
| 2483.50 | 34.56 | 33.08 | 35.18 | 3.60 | 36.06 | 54 | -17.94 | Average | Horizontal |
| 2490.60 | 43.83 | 33.08 | 35.18 | 3.62 | 45.35 | 74 | -28.65 | Peak | Horizontal |
| 2490.68 | 35.59 | 33.08 | 35.18 | 3.62 | 37.11 | 54 | -16.89 | Average | Horizontal |
| 2483.50 | 50.16 | 33.06 | 35.18 | 3.60 | 51.64 | 74 | -22.36 | Peak | Vertical |
| 2483.50 | 33.54 | 33.08 | 35.18 | 3.60 | 35.04 | 54 | -18.96 | Average | Vertical |
| 2497.62 | 42.00 | 33.08 | 35.18 | 3.62 | 43.52 | 74 | -30.48 | Peak | Vertical |
| 2497.76 | 33.30 | 33.08 | 35.18 | 3.62 | 34.82 | 54 | -19.18 | Average | Vertical |

## 6.5. Conducted Spurious Emissions And Band Edges Test

### 6.5.1. Standard Applicable

According to §15.247 (d) & A8.5: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

### 6.5.2. Measuring Instruments and Setting

Please refer to section 6 of equipments list in this report. The following table is the setting of the spectrum analyzer.

| Spectrum Parameter | Setting |
|---|---|
| Detector | Peak |
| Attenuation | Auto |
| RB / VB (Emission in restricted band) | 100KHz/300KHz |
| RB / VB (Emission in non-restricted band) | 100KHz/300KHz |

### 6.5.3. Test Procedures

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

### 6.5.4. Test Setup Layout

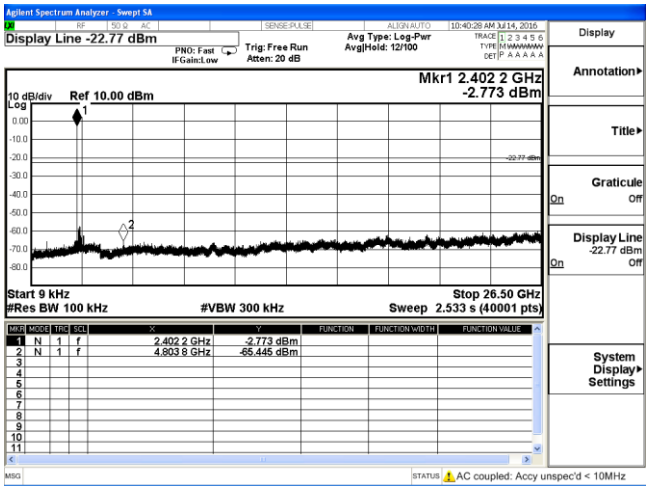
This test setup layout is the same as that shown in section 5.4.4.

### 6.5.5. EUT Operation during Test

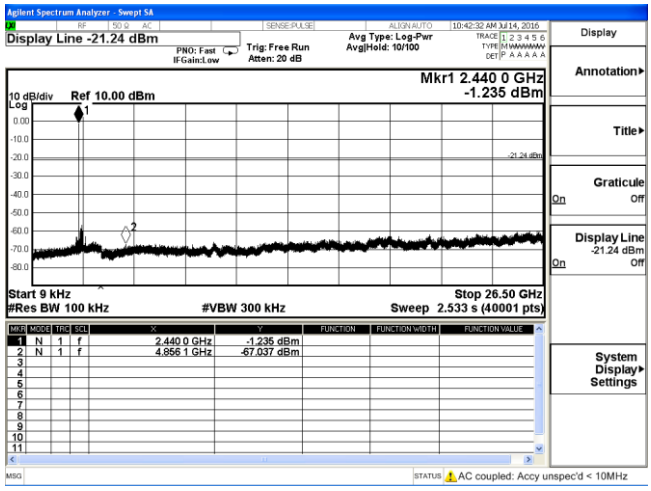
The EUT was programmed to be in continuously transmitting mode.

### 6.5.6. Test Results of Conducted Spurious Emissions

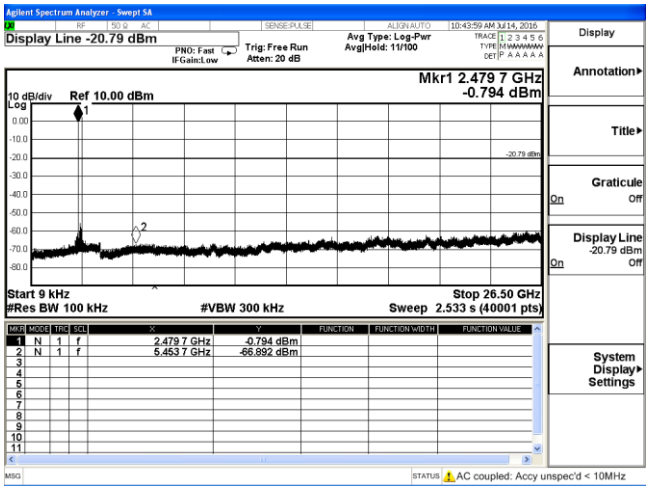
## *Measurement of Conducted Spurious Emissions*




*Test frequency: 2402MHz*



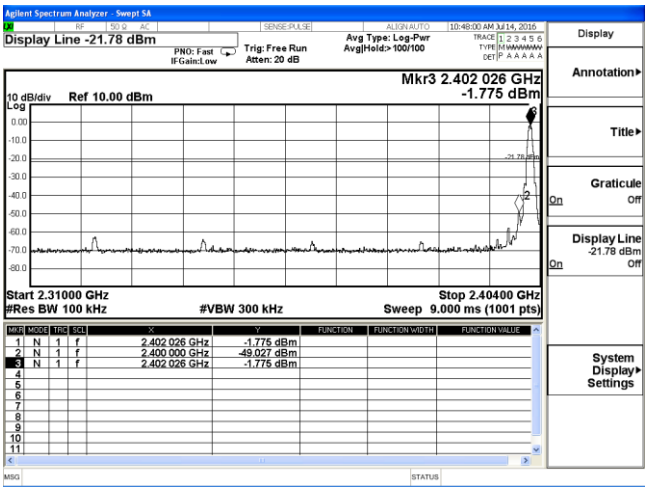

*Test frequency: 2440MHz*

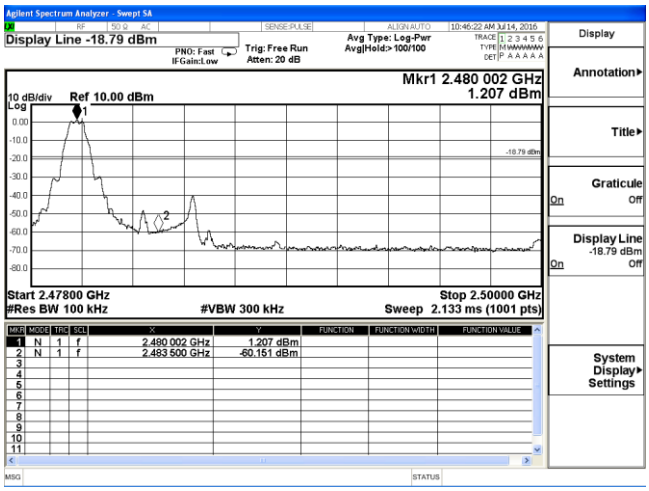



*Test frequency: 2480MHz*

## 6.5.7. Test Results of Band Edges Test

**Test Results of Band Edges Test**



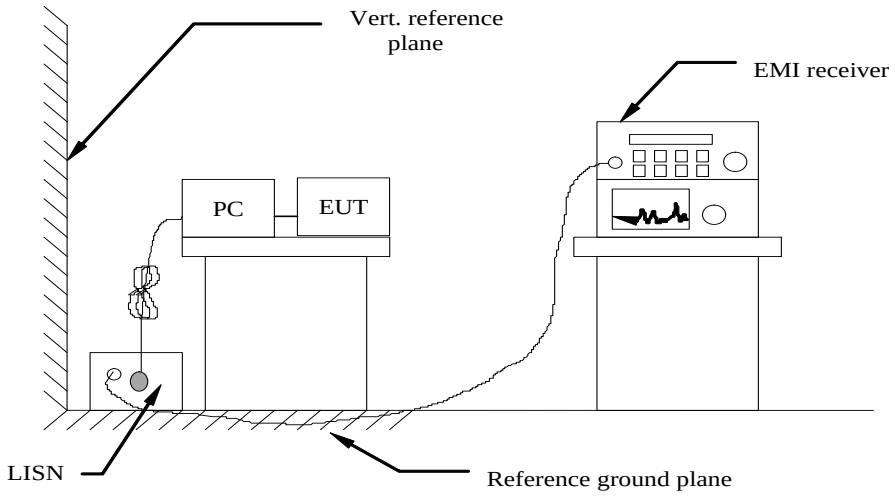
## 6.6. Power line conducted emissions

### 6.6.1 Standard Applicable

According to §15.207 (a): For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 170 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

| Frequency Range (MHz) | Limits (dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 to 0.50 | 66 to 56 | 56 to 46 |
| 0.50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

### 6.6.2 Block Diagram of Test Setup




### 6.6.3 Test Results

N/A.

# 7. ANTENNA REQUIREMENT

## 7.1 Standard Applicable

According to antenna requirement of §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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be re-placed by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

And according to §15.247(4)(1), system operating in the 2400-2483.5MHz bands that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

## 7.2 Antenna Connected Construction

7.2.1. Standard Applicable

According to §15.203 & RSS-Gen, 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.

7.2.2. Antenna Connector Construction

The directional gains of antenna used for transmitting is 1.0dBi, and the antenna is connect to PCB board and no consideration of replacement. Please see EUT photo for details.

7.2.3. Results: Compliance.

**Measurement**

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module.

Conducted power refers ANSI C63.10:2013 Output power test procedure for DTS devices.

Radiated power refers to ANSI C63.10:2013 Radiated emissions tests

## Measurement parameters:

| Measurement parameter | |
|---|---|
| Detector: | Peak |
| Sweep time: | Auto |
| Resolution bandwidth: | 3 MHz |
| Video bandwidth: | 3 MHz |
| Trace-Mode: | Max hold |

Note: The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module.

## Limits:

| FCC | IC |
|---|---|
| Antenna Gain | |
| 6dBi | |

| Tnom | Vnom | lowest channel 2402 MHz | middle channel 2440 MHz | highest channel 2480 MHz |
|---|---|---|---|---|
| Conducted power [dBm] Measured with DSSS | | -0.81 | -0.09 | -0.94 |
| Radiated power [dBm] Measured with DSSS | | 0.11 | 0.84 | 0.02 |
| Gain [dBi] Calculated | | 0.92 | 0.95 | 0.96 |
| Measurement uncertainty | | | ± 1.6 dB (cond.) / ± 3.8 dB (rad.) | |

**Result:** -/-

----------THE END OF REPORT----------