

FCC TEST REPORT
FOR
AEOTEC LIMITED
Range Extender 7
Test Model: ZW189-A01

Prepared for : AEOTEC LIMITED
Address : OFFICE 4 10/F KWAN CHART TOWER NO. 6 TONNOCHY
ROAD WANCHAI HK

Prepared by : Shenzhen LCS Compliance Testing Laboratory Ltd
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Date of receipt of test sample : August 01, 2019
Number of tested samples : 1
Serial number : Prototype
Date of Test : August 01, 2019 ~ August 12, 2019
Date of Report : August 14, 2019

FCC TEST REPORT
FCC CFR 47 PART 15 C(15.249)

Report Reference No. : **LCS190711053AEA**

Date of Issue : August 14, 2019

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

Full application of Harmonised standards

Testing Location/ Procedure..... : Partial application of Harmonised standards

Other standard testing method

Applicant's Name : **AEOTEC LIMITED**

Address : OFFICE 4 10/F KWAN CHART TOWER NO. 6 TONNOCHY
 ROAD WANCHAI HK

Test Specification

Standard..... : FCC CFR 47 PART 15 C(15.249)

Test Report Form No..... : LCSEMC-1.0

TRF Originator : Shenzhen LCS Compliance Testing Laboratory Ltd.

Master TRF..... : Dated 2011-03

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Test Item Description..... : **Range Extender 7**

Trade Mark : Aeotec

Model/ Type reference..... : ZW189-A01

Ratings..... : AC 120V, 60Hz, Max 0.1A

Result : **Positive**

Compiled by:



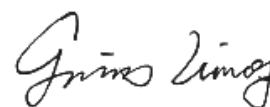
Linda He/ File administrators

Supervised by:



Aking Jin / Technique principal

Approved by:



Gavin Liang/ Manager

FCC -- TEST REPORT

| | |
|--|---|
| Test Report No. : LCS190711053AEA | <u>August 14, 2019</u> Date of issue |
|--|---|

| |
|---|
| Type / Model..... : ZW189-A01 EUT..... : Range Extender 7 |
| Applicant..... : AEOTEC LIMITED Address..... : OFFICE 4 10/F KWAN CHART TOWER NO. 6 TONNOCHY ROAD WANCHAI HK Telephone..... : / Fax..... : / |
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| Factory..... : Fantem Technologies(Shenzhen) Co., Ltd. Address..... : North,3/F, Yitao Technology Industrial Park, Baihua Yuan Rd., The Second Industrial Area, Guangming Sub-district Office, Guangming District, Shenzhen, Guangdong, China Telephone..... : / 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 |
|----------|-----------------|---------------|-------------|
| 000 | August 14, 2019 | Initial Issue | Gavin Liang |
| | | | |
| | | | |

TABLE OF CONTENTS

| | |
|---|-----------|
| 1. GENERAL INFORMATION | 7 |
| 1.1. Description of Device (EUT) | 7 |
| 1.2. Host System Configuration List and Details | 7 |
| 1.3. External I/O | 7 |
| 1.4. Description of Test Facility | 7 |
| 1.5. Statement of the measurement uncertainty..... | 8 |
| 1.6. Measurement Uncertainty | 8 |
| 1.7. Description of Test Modes | 8 |
| 2. TEST METHODOLOGY | 9 |
| 2.1. EUT Configuration | 9 |
| 2.2. EUT Exercise..... | 9 |
| 2.3. General Test Procedures..... | 9 |
| 3. CONNECTION DIAGRAM OF TEST SYSTEM..... | 10 |
| 3.1. Justification | 10 |
| 3.2. EUT Exercise Software | 10 |
| 3.3. Special Accessories | 10 |
| 3.4. Block Diagram/Schematics | 10 |
| 3.5. Equipment Modifications | 10 |
| 3.6. Test Setup | 10 |
| 4. SUMMARY OF TEST RESULTS | 11 |
| 5. SUMMARY OF TEST EQUIPMENT..... | 12 |
| 6. ANTENNA REQUIREMENT | 13 |
| 6.1. Standard Applicable | 13 |
| 6.2. Antenna Connected Construction..... | 13 |
| 7. RADIATED EMISSION MEASUREMENT | 14 |
| 7.1. Standard Applicable | 14 |
| 7.2. Measuring Instruments and Setting | 15 |
| 7.3. Test Procedure | 15 |
| 7.4. Block Diagram of Test Setup | 19 |
| 7.5. EUT Operation during Test | 19 |
| 7.6. Test Results | 20 |
| 8. BANDEDGES MEASUREMENT | 25 |
| 8.1. Standard Applicable | 25 |
| 8.2. Block Diagram of Test Setup | 25 |
| 8.3. Test Procedure | 25 |
| 8.4. Test Results | 26 |
| 9. 20 DB BANDWIDTH MEASUREMENT | 28 |
| 9.1. Standard Applicable | 28 |
| 9.2. Block Diagram of Test Setup | 28 |
| 9.3. Test Procedure | 28 |
| 9.4. Test Results | 28 |
| 10.AC POWER LINE CONDUCTED EMISSIONS..... | 30 |
| 10.1 Standard Applicable | 30 |
| 10.2. Block Diagram of Test Setup | 30 |
| 10.3. Test Results | 30 |
| 11. TEST SETUP PHOTOGRAPHS OF EUT..... | 32 |
| 12. EXTERIOR PHOTOGRAPHS OF THE EUT..... | 32 |

13. INTERIOR PHOTOGRAPHS OF THE EUT 32

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

| | |
|----------------------------|--------------------------------|
| EUT | Range Extender 7 |
| Test Model | ZW189-A01 |
| Additional Model No. | / |
| Model Declaration | / |
| Power Supply | AC 120V, 60Hz, Max 0.1A |
| Hardware version | N/A |
| Software version | N/A |
| Z-wave Operation frequency | : 908.4MHz, 916MHz |
| Modulation Type | : FSK |
| Antenna Description | : Internal Antenna, 0dBi(Max.) |

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 |
|----------------------|----------|-------|
| --- | --- | --- |

1.4. Description of Test Facility

FCC Registration Number is 254912.
Industry Canada Registration Number is 9642A-1.
EMSD Registration Number is ARCB0108.
UL Registration Number is 100571-492.
TUV SUD Registration Number is SCN1081.
TUV RH Registration Number is UA 50296516-001.
NVLAP Accreditation Code is 600167-0.
FCC Designation Number is CN5024.
CAB identifier is CN0071.

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 | ± 4.00dB | (1) |
| Conduction Uncertainty | 150kHz~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

The EUT operates in the unlicensed ISM band at 902~928MHz. The following operating modes were applied for the related test items. And the new battery is used during the measurement.

The EUT received AC 120V, 60Hz, Max 0.1A .

All test modes were tested, only the result of the worst case was recorded in the report.

The EUT is considered a portable unit; it was pre-tested on the positioned of each 3 axis. The worst case was found positioned on X-plane. Therefore only the test data of this X-plane was used for radiated emission measurement test.

| Mode of Operations | Transmitting Frequency (MHz) |
|------------------------|------------------------------|
| Z-wave | 908.4MHz, 916MHz |
| For Conducted Emission | |
| Test Mode | TX Mode |
| For Radiated Emission | |
| Test Mode | TX Mode |

***Note: Using a temporary antenna connector for the EUT when the conducted measurements(Band Edges Measurement and 20 dB Bandwidth) are performed.

2. TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

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 15.249 under the FCC Rules Part 15 Subpart C.

2.3. General Test Procedures

2.3.1 Conducted Emissions (N/A)

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2.1 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, 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 6.3 of ANSI C63.10-2013

3. CONNECTION DIAGRAM OF TEST SYSTEM

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

| FCC Rules | Description Of Test | Result |
|---|--------------------------------|-----------|
| §15.203 | Antenna Requirement | Compliant |
| §15.207(a) | Conduction Emissions | Compliant |
| §15.205(a), §15.209(a), §15.249(a), §15.249(c) | Radiated Emissions Measurement | Compliant |
| §15.249 | Band Edges Measurement | Compliant |
| §15.249, §15.215 | 20 dB Bandwidth | Compliant |

5. SUMMARY OF TEST EQUIPMENT

| Item | Equipment | Manufacturer | Model No. | Serial No. | Cal Date | Due Date |
|------|--------------------------------|-------------------|--------------|-----------------|------------|------------|
| 1 | MXA Signal Analyzer | Agilent | N9020A | MY49100060 | 2018-11-15 | 2019-11-14 |
| 2 | DC Power Supply | Agilent | E3642A | N/A | 2018-11-15 | 2019-11-14 |
| 3 | Temperature & Humidity Chamber | GUANGZHOU GOGNWEN | GDS-100 | 70932 | 2018-10-10 | 2019-10-09 |
| 4 | EMI Test Software | AUDIX | E3 | / | N/A | N/A |
| 5 | 3m Semi Anechoic Chamber | SIDT FRANKONIA | SAC-3M | 03CH03-HY | 2019-06-12 | 2020-06-11 |
| 6 | Positioning Controller | MF | MF-7082 | / | 2019-06-12 | 2020-06-11 |
| 7 | Active Loop Antenna | SCHWARZBEC K | FMZB 1519B | 00005 | 2019-07-25 | 2020-07-24 |
| 8 | By-log Antenna | SCHWARZBEC K | VULB9163 | 9163-470 | 2019-07-25 | 2020-07-24 |
| 9 | Horn Antenna | SCHWARZBEC K | BBHA 9120D | 9120D-1925 | 2019-07-01 | 2020-06-30 |
| 10 | EMI Test Receiver | R&S | ESR 7 | 101181 | 2019-06-12 | 2020-06-11 |
| 11 | RS SPECTRUM ANALYZER | R&S | FSP40 | 100503 | 2018-11-15 | 2019-11-14 |
| 12 | Broadband Preamplifier | / | BP-01M18G | P190501 | 2019-07-01 | 2020-06-30 |
| 13 | RF Cable-R03m | Jye Bao | RG142 | CB021 | 2019-06-12 | 2020-06-11 |
| 14 | RF Cable-HIGH | SUHNER | SUCOFLEX 106 | 03CH03-HY | 2019-06-12 | 2020-06-11 |
| 15 | EMI Test Receiver | R&S | ESPI | 101840 | 2019-06-11 | 2020-06-10 |
| 16 | Artificial Mains | R&S | ENV216 | 101288 | 2019-06-12 | 2020-06-11 |
| 17 | 10dB Attenuator | SCHWARZBEC K | MTS-IMP-136 | 261115-001-0032 | 2019-06-11 | 2020-06-10 |

Note: All equipment is calibrated through CHINA CEPREI LABORATORY and GUANGZHOU LISAI CALIBRATION AND TEST CO., LTD.

6. ANTENNA REQUIREMENT

6.1. 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.

6.2. Antenna Connected Construction

6.2.1. Standard Applicable

According to § 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.

6.2.2. Antenna Connector Construction

The directional gains of antenna used for transmitting is 0 dBi, and the antenna is connect to PCB board and no consideration of replacement. Please see EUT photo for details.

6.2.3. Results: Compliance.

7. RADIATED EMISSION MEASUREMENT

7.1. Standard Applicable

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

| MHz | M Hz | M Hz | GH z |
|------------------|--------------------|---------------|-------------|
| 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 | 156.52475-156.5252 | 2483.5-2500 | 17.7-21.4 |
| 8.37625-8.38675 | 5 | 2690-2900 | 22.01-23.12 |
| 8.41425-8.41475 | 156.7-156.9 | 3260-3267 | 23.6-24.0 |
| 12.29-12.293 | 162.0125-167.17 | 3332-3339 | 31.2-31.8 |
| 12.51975-12.5202 | 167.72-173.2 | 3345.8-3358 | 36.43-36.5 |
| 5 | 240-285 | 3600-4400 | (\2) |
| 12.57675-12.5772 | 322-335.4 | | |
| 5 | | | |
| 13.36-13.41 | | | |

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

\2\ Above 38.6

According to §15.249 (a): Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

| Fundamental frequency | Field strength of fundamental (millivolts/meter) | Field strength of harmonics (microvolts/meter) |
|-----------------------|---|---|
| 902-928 MHz | 50 | 500 |
| 2400-2483.5 MHz | 50 | 500 |
| 5725-5875 MHz | 50 | 500 |
| 24.0-24.25 GHz | 250 | 2500 |

* Field strength limits are specified at a distance of 3 meters.

* As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

* Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

7.2. Measuring Instruments and Setting

Please refer to equipment 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 | 10 th carrier harmonic |
| RB / VB (Emission in restricted band) | 1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average |
| RB / VB (Emission in non-restricted band) | 1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average |

| Receiver Parameter | Setting |
|------------------------|--|
| Attenuation | Auto |
| Start ~ Stop Frequency | 9kHz~150kHz / RB/VB 200Hz/1KHz for QP/AVG |
| Start ~ Stop Frequency | 150kHz~30MHz / RB/VB 9kHz/30KHz for QP/AVG |
| Start ~ Stop Frequency | 30MHz~1000MHz / RB/VB 120kHz/1MHz for QP |

7.3. Test Procedure

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 0.8 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 ($\pm 45^\circ$) 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 ($\pm 45^\circ$) 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.

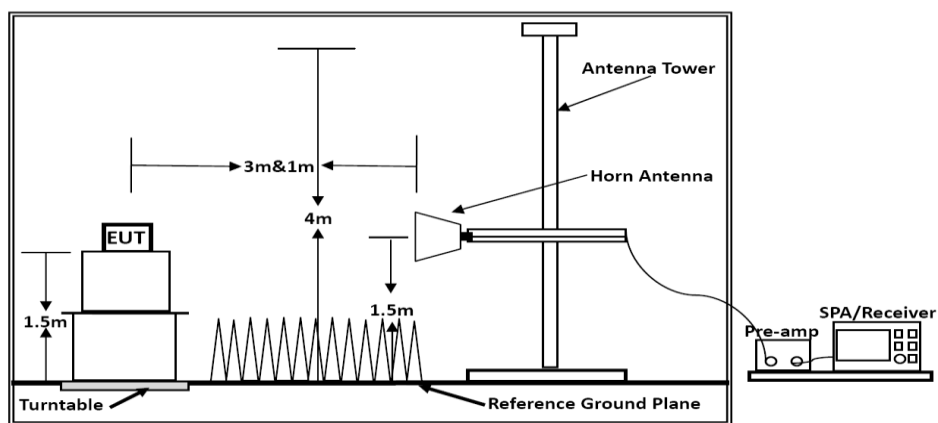
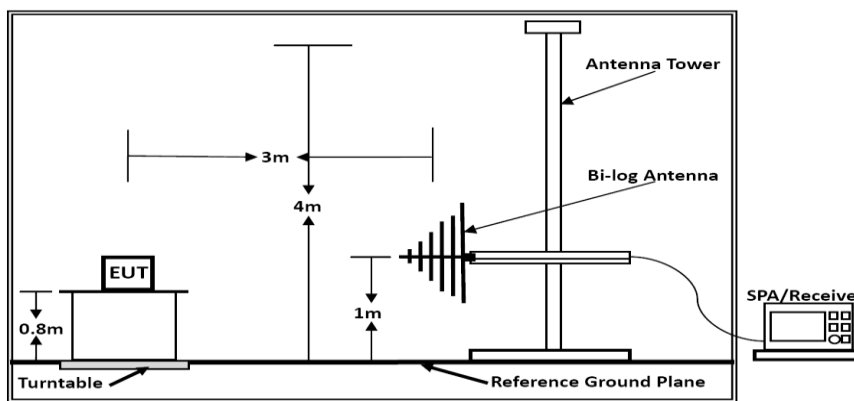
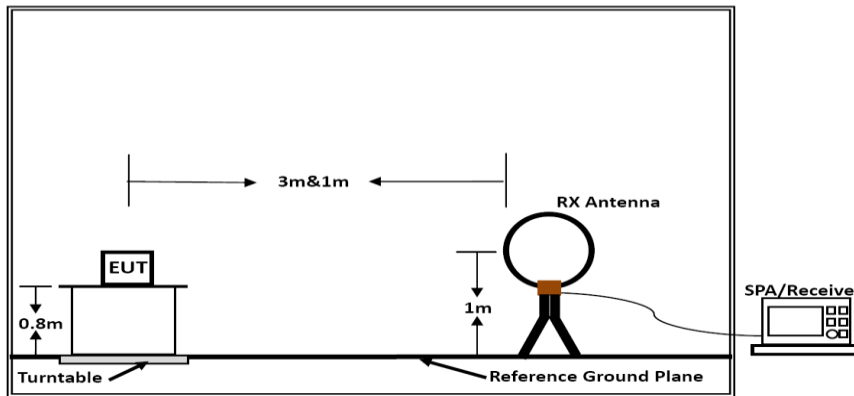
Premeasurement:

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

7.4. Block Diagram of Test Setup



Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m.

Distance extrapolation factor = $20 \log(\text{specific distance [3m]} / \text{test distance [1m]})$ (dB);
 Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

7.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

7.6. Test Results

Results of Radiated Emissions (9 KHz~30MHz)

| | | | |
|---------------|------------|----------|-------|
| Temperature | 23.6°C | Humidity | 52.3% |
| Test Engineer | Diamond Lu | | |

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

Note:

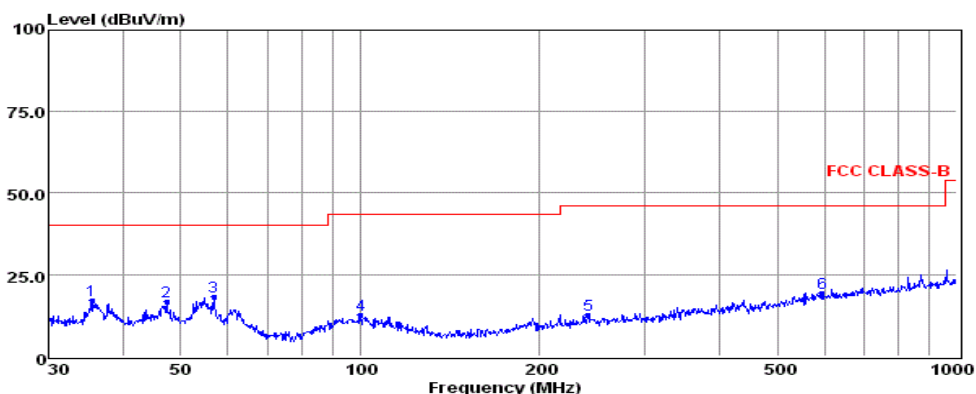
The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

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

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

Results of Radiated Emissions (30MHz~1000MHz)

Horizontal

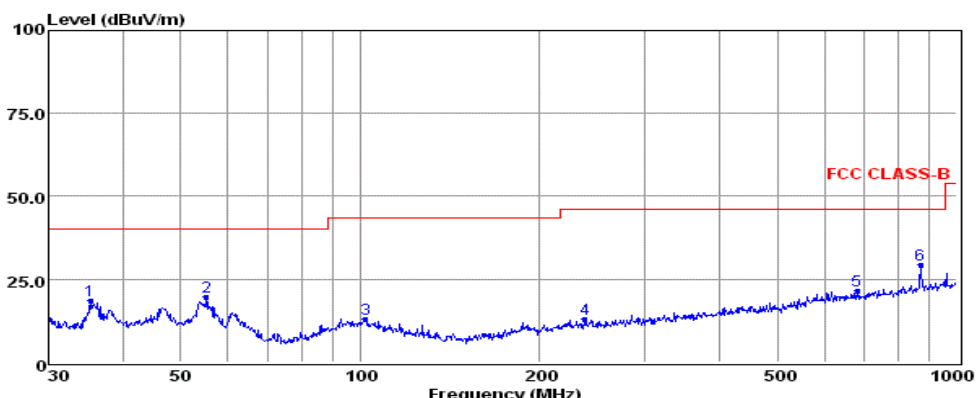


Env./Ins: 23.6°C/52.3%
 pol: HORIZONTAL

| | Freq | Reading | CabLos | Antfac | Measured | Limit | Over | Remark |
|---|--------|---------|--------|--------|----------|--------|--------|--------|
| | MHz | dBuV | dB | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 35.50 | 4.33 | 0.41 | 12.43 | 17.17 | 40.00 | -22.83 | QP |
| 2 | 47.33 | 3.08 | 0.35 | 13.41 | 16.84 | 40.00 | -23.16 | QP |
| 3 | 56.79 | 4.78 | 0.47 | 12.90 | 18.15 | 40.00 | -21.85 | QP |
| 4 | 100.23 | -1.16 | 0.60 | 13.14 | 12.58 | 43.50 | -30.92 | QP |
| 5 | 240.83 | -0.59 | 1.01 | 12.09 | 12.51 | 46.00 | -33.49 | QP |
| 6 | 595.13 | -0.44 | 1.51 | 18.36 | 19.43 | 46.00 | -26.57 | QP |

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

Vertical



Env./Ins: 23.6°C/52.3%
 pol: VERTICAL

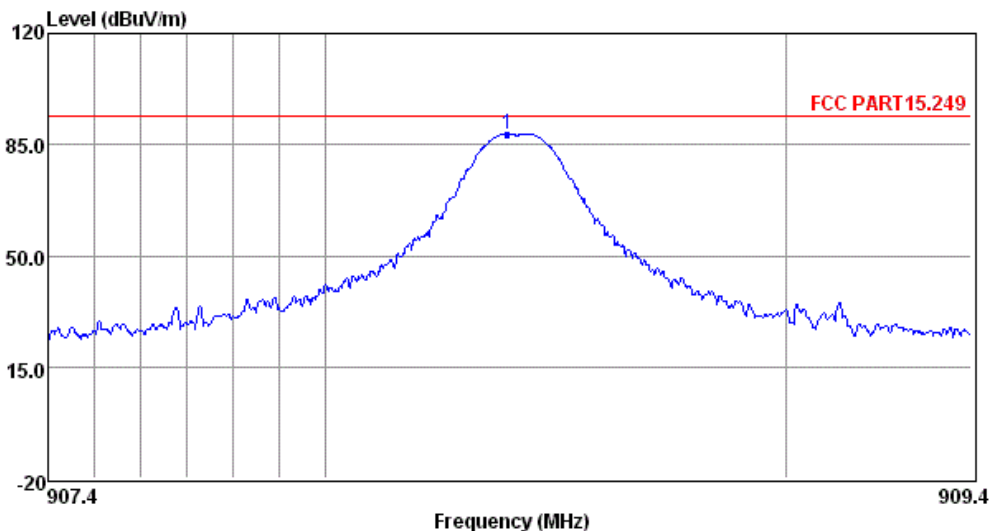
| | Freq | Reading | CabLos | Antfac | Measured | Limit | Over | Remark |
|---|--------|---------|--------|--------|----------|--------|--------|--------|
| | MHz | dBuV | dB | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 35.25 | 5.93 | 0.41 | 12.36 | 18.70 | 40.00 | -21.30 | QP |
| 2 | 55.22 | 6.20 | 0.46 | 13.01 | 19.67 | 40.00 | -20.33 | QP |
| 3 | 102.00 | -0.39 | 0.60 | 12.98 | 13.19 | 43.50 | -30.31 | QP |
| 4 | 238.31 | -0.13 | 0.96 | 12.01 | 12.84 | 46.00 | -33.16 | QP |
| 5 | 679.96 | 1.12 | 1.61 | 18.74 | 21.47 | 46.00 | -24.53 | QP |
| 6 | 869.13 | 6.72 | 1.87 | 20.77 | 29.36 | 46.00 | -16.64 | QP |

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

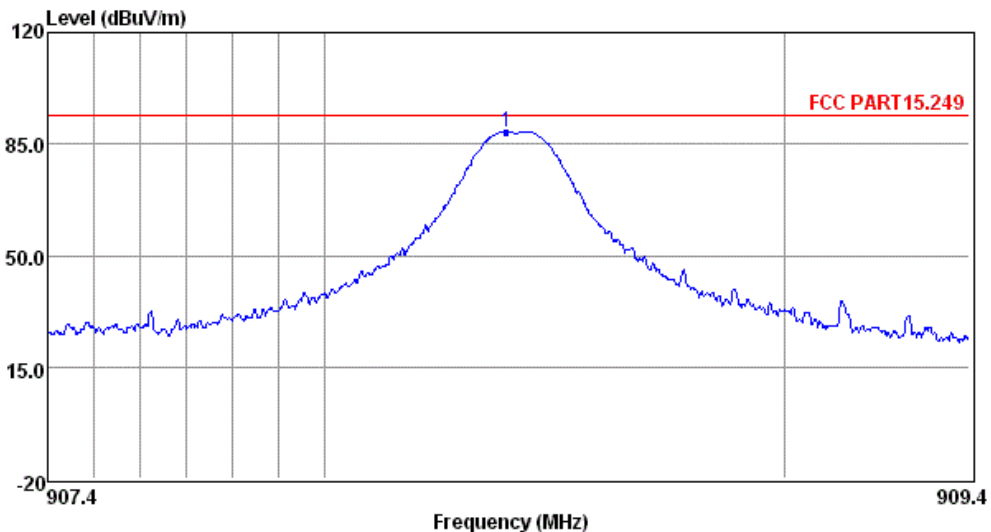
Field strength of fundamental:

| Frequency (MHz) | Pol. | Measure Result (PK, dBuV/m) | Limit (dBuV/m) | Result |
|-----------------|------|-----------------------------|----------------|--------|
| 908.40 | H | 88.41 | 94 | Pass |
| 908.40 | V | 88.87 | 94 | Pass |

Horizontal



Vertical



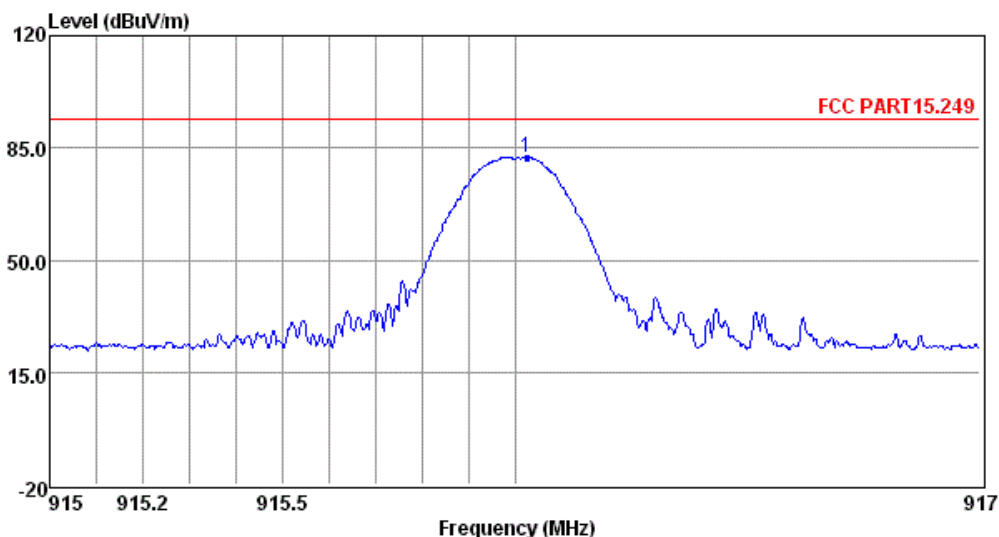
Note:

Because the test value of PK is less than the AV limit, the AV test value does not need to be provided.

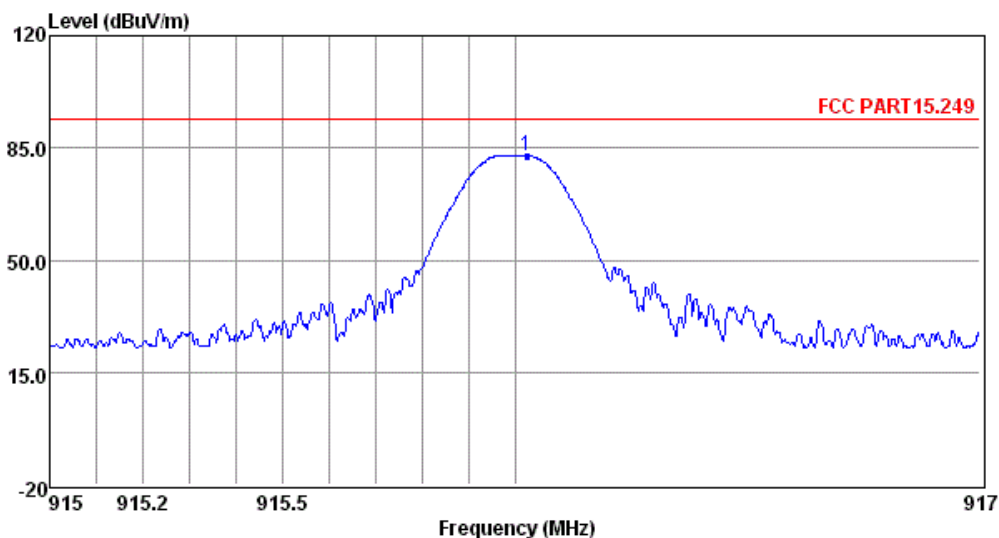
Field strength of fundamental:

| Frequency (MHz) | Pol. | Measure Result (PK, dBuV/m) | Limit (dBuV/m) | Result |
|-----------------|------|-----------------------------|----------------|--------|
| 916.00 | H | 81.91 | 94 | Pass |
| 916.00 | V | 82.53 | 94 | Pass |

Horizontal



Vertical



Note:

Because the test value of PK is less than the AV limit, the AV test value does not need to be provided.

Above 1G (The worst test result for Tx) :

| Freq. MHz | Reading dBu | Ant. Fac dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBu/m | Limit dBu/m | Margin dB | Remark | Pol. |
|-----------|-------------|---------------|--------------|--------------|----------------|-------------|-----------|---------|------------|
| 908.40MHz | | | | | | | | | |
| 1816.80 | 48.70 | 33.01 | 35 | 3.86 | 50.57 | 74.00 | -23.43 | Peak | Horizontal |
| 1816.80 | 30.98 | 33.01 | 35 | 3.86 | 32.85 | 54.00 | -21.15 | Average | Horizontal |
| 2725.20 | 47.77 | 33.03 | 35.02 | 3.91 | 49.69 | 74.00 | -24.31 | Peak | Horizontal |
| 2725.20 | 33.94 | 33.03 | 35.02 | 3.91 | 35.86 | 54.00 | -18.14 | Average | Horizontal |
| 1816.80 | 45.15 | 33.01 | 35 | 3.86 | 47.02 | 74.00 | -26.98 | Peak | Vertical |
| 1816.80 | 32.04 | 33.01 | 35 | 3.86 | 33.91 | 54.00 | -20.09 | Average | Vertical |
| 2725.20 | 48.37 | 33.03 | 35.02 | 3.91 | 50.29 | 74.00 | -23.71 | Peak | Vertical |
| 2725.20 | 36.83 | 33.03 | 35.02 | 3.91 | 38.75 | 54.00 | -15.25 | Average | Vertical |
| 916.00MHz | | | | | | | | | |
| 1832.00 | 49.97 | 33.01 | 35 | 3.86 | 51.84 | 74.00 | -22.16 | Peak | Horizontal |
| 1832.00 | 30.58 | 33.01 | 35 | 3.86 | 32.45 | 54.00 | -21.55 | Average | Horizontal |
| 2748.00 | 47.53 | 33.03 | 35.02 | 3.91 | 49.45 | 74.00 | -24.55 | Peak | Horizontal |
| 2748.00 | 34.09 | 33.03 | 35.02 | 3.91 | 36.01 | 54.00 | -17.99 | Average | Horizontal |
| 1832.00 | 47.65 | 33.01 | 35 | 3.86 | 49.52 | 74.00 | -24.48 | Peak | Vertical |
| 1832.00 | 32.79 | 33.01 | 35 | 3.86 | 34.66 | 54.00 | -19.34 | Average | Vertical |
| 2748.00 | 50.65 | 33.03 | 35.02 | 3.91 | 52.57 | 74.00 | -21.43 | Peak | Vertical |
| 2748.00 | 49.05 | 33.03 | 35.02 | 3.91 | 50.97 | 54.00 | -3.03 | Average | Vertical |

Notes:

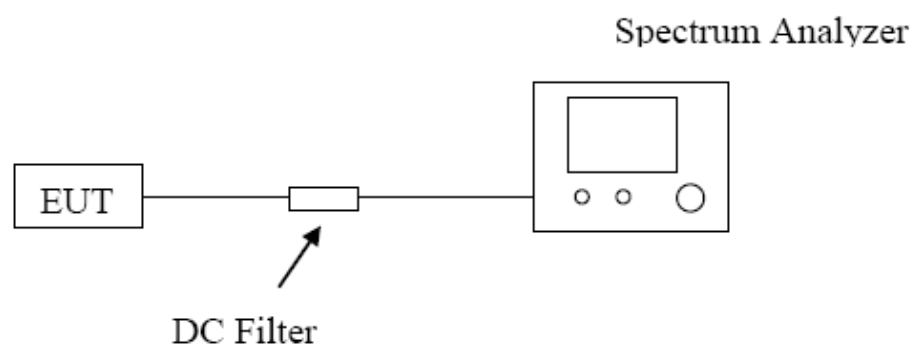
1. Measuring frequencies from 9k~10th harmonic (ex. 10GHz), No emission found between lowest internal used/generated frequency to 30 MHz.
2. Radiated emissions measured in frequency range from 9k~10th harmonic (ex. 10GHz) were made with an instrument using Peak detector mode.

8. BANDEDGES MEASUREMENT

8.1. Standard Applicable

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

8.2. Block Diagram of Test Setup



8.3. Test Procedure

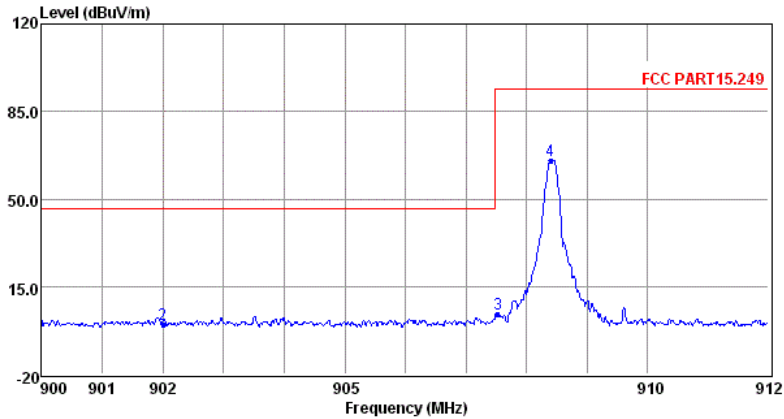
The EUT is placed on a turntable, which is 0.8m above the ground plane. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:

Peak: RBW=120MHz, RBW=300MHz / Sweep=AUTO

Repeat the procedures until the peak versus polarization are measured.

8.4. Test Results

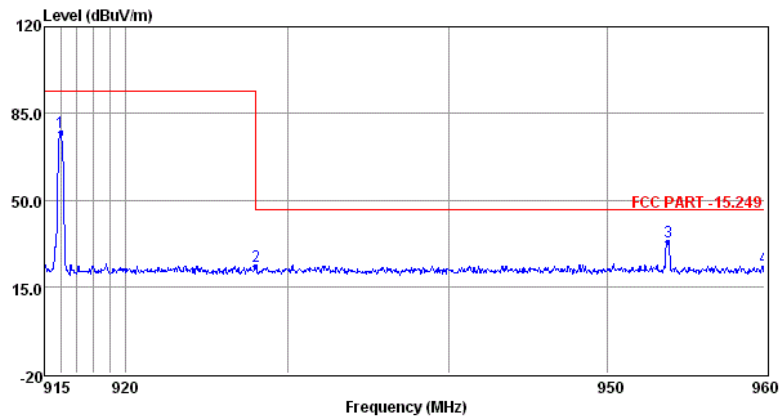
Horizontal :



Env./Ins: 22.4°C/55.2%
 pol: HORIZONTAL

| | Freq | Reading | CabLos | Antfac | Measured | Limit | Over | Remark |
|---|--------|---------|--------|--------|----------|--------|--------|--------|
| | MHz | dBuV | dB | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 900.00 | -21.98 | 1.88 | 21.09 | 0.99 | 46.00 | -45.01 | QP |
| 2 | 902.00 | -23.01 | 1.87 | 21.10 | -0.04 | 46.00 | -46.04 | QP |
| 3 | 907.52 | -19.01 | 2.03 | 21.14 | 4.16 | 46.00 | -89.84 | QP |
| 4 | 908.40 | 42.46 | 1.88 | 21.14 | 65.48 | 94.00 | -28.52 | QP |

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

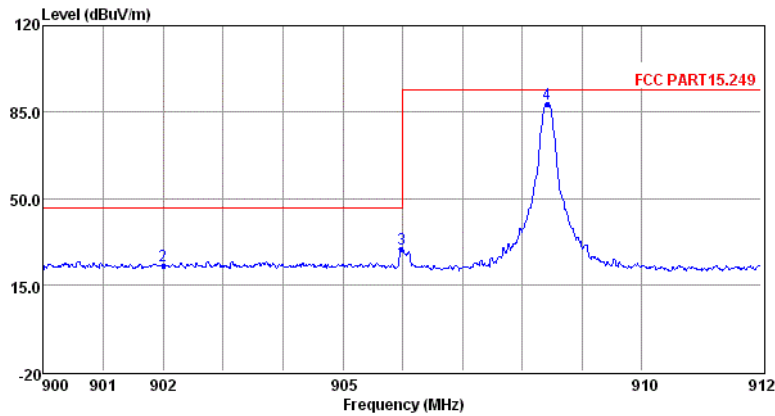


Env./Ins: 22.4°C/55.2%
 pol: HORIZONTAL

| | Freq | Reading | CabLos | Antfac | Measured | Limit | Over | Remark |
|---|--------|---------|--------|--------|----------|--------|--------|--------|
| | MHz | dBuV | dB | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 916.01 | 53.85 | 2.04 | 21.19 | 77.08 | 94.00 | -16.92 | QP |
| 2 | 928.00 | 0.26 | 1.90 | 21.27 | 23.43 | 46.00 | -70.57 | QP |
| 3 | 953.84 | 9.58 | 2.03 | 21.44 | 33.05 | 46.00 | -12.95 | QP |
| 4 | 960.00 | -0.52 | 1.90 | 21.48 | 22.86 | 46.00 | -23.14 | QP |

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

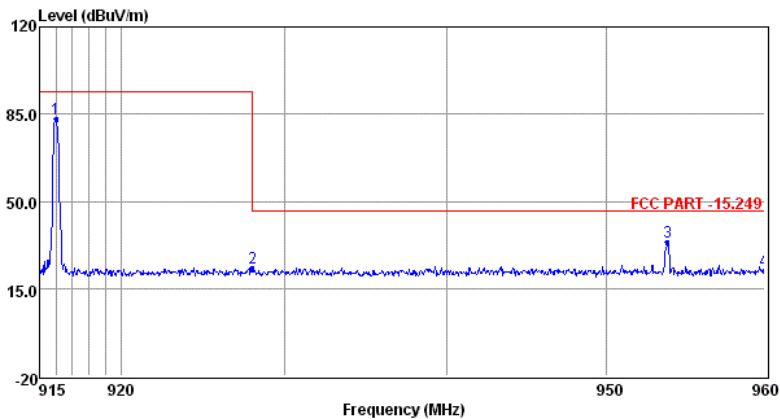
Vertical:



Env./Ins: 22.4°C/55.2%
 pol: VERTICAL

| | Freq | Reading | CabLos | Antfac | Measured | Limit | Over | Remark |
|---|--------|---------|--------|--------|----------|--------|--------|--------|
| | MHz | dBuV | dB | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 900.00 | -0.89 | 1.88 | 21.09 | 22.08 | 46.00 | -23.92 | QP |
| 2 | 902.00 | -0.24 | 1.87 | 21.10 | 22.73 | 46.00 | -23.27 | QP |
| 3 | 905.98 | 6.35 | 2.03 | 21.13 | 29.51 | 46.00 | -64.49 | QP |
| 4 | 908.42 | 65.47 | 1.88 | 21.14 | 88.49 | 94.00 | -5.51 | QP |

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



Env./Ins: 22.4°C/55.2%
 pol: VERTICAL

| | Freq | Reading | CabLos | Antfac | Measured | Limit | Over | Remark |
|---|--------|---------|--------|--------|----------|--------|--------|--------|
| | MHz | dBuV | dB | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 916.01 | 59.96 | 2.04 | 21.19 | 83.19 | 94.00 | -10.81 | QP |
| 2 | 928.00 | 0.02 | 1.90 | 21.27 | 23.19 | 46.00 | -70.81 | QP |
| 3 | 953.84 | 10.10 | 2.03 | 21.44 | 33.57 | 46.00 | -12.43 | QP |
| 4 | 960.00 | -1.11 | 1.90 | 21.48 | 22.27 | 46.00 | -23.73 | QP |

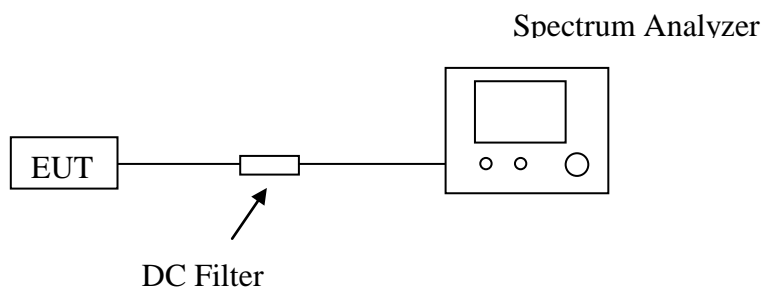
Note: 1. All readings are Quasi-peak values.
 2. Measured= Reading + Antenna Factor + Cable Loss
 3. The emission that are 20db below the official limit are not reported

9. 20 DB BANDWIDTH MEASUREMENT

9.1. Standard Applicable

According to §15.215

9.2. Block Diagram of Test Setup



9.3. Test Procedure

Use the following spectrum analyzer settings:

Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel

RBW = 1% to 5% of the 20 dB bandwidth

VBW = 3 RBW

Sweep = auto

Detector function = peak

Trace = max hold

The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

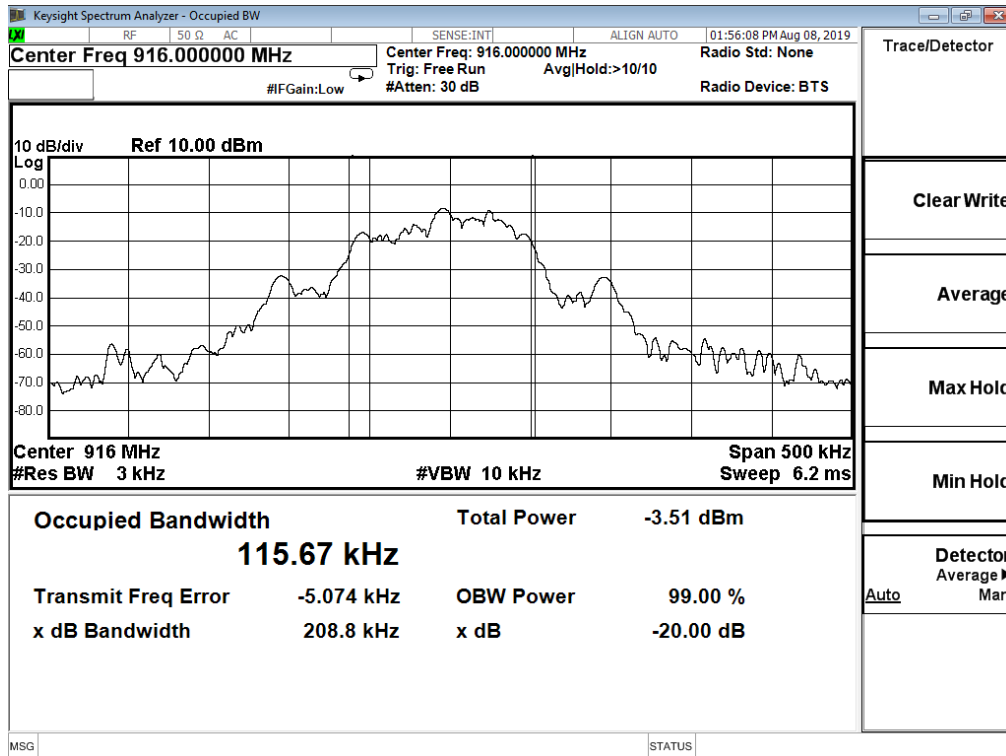
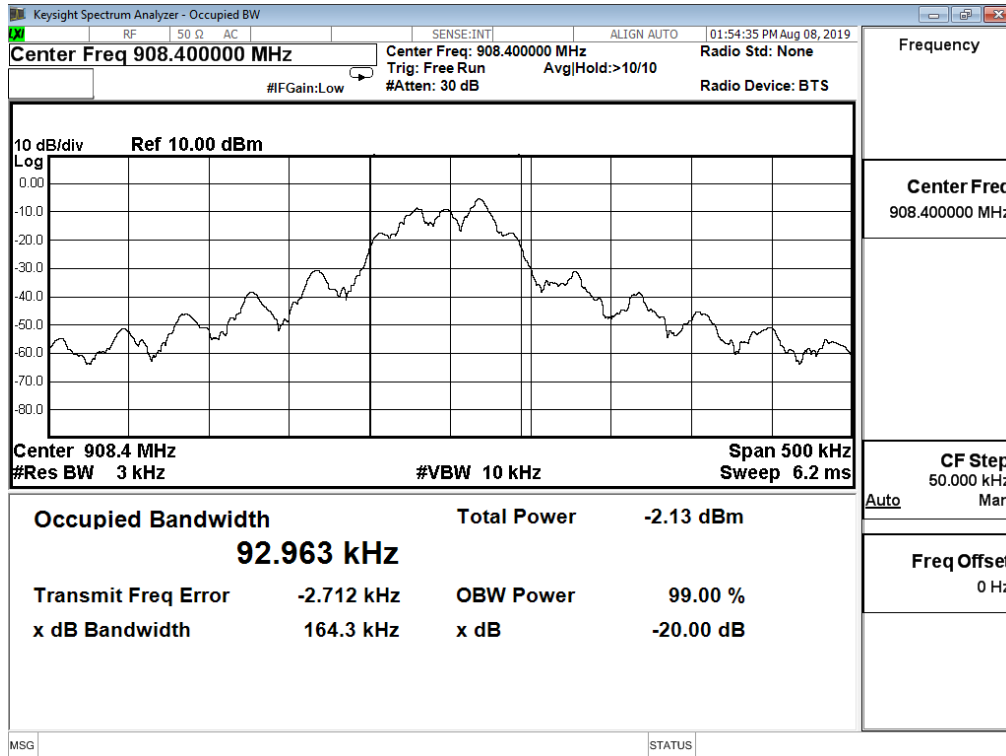
9.4. Test Results

Please refer to the following page.

Result: Pass

| | | | |
|---------------|------------|----------|-------|
| Temperature | 25.1°C | Humidity | 54.2% |
| Test Engineer | Diamond Lu | | |

| Test Result Of 20dB Bandwidth Measurement | | |
|---|----------------------|---------------|
| Test Frequency (MHz) | 20dB Bandwidth (kHz) | Limit (MHz) |
| 908.40 | 164.3 | Non-Specified |
| 916.00 | 208.8 | Non-Specified |



10.AC Power line conducted emissions

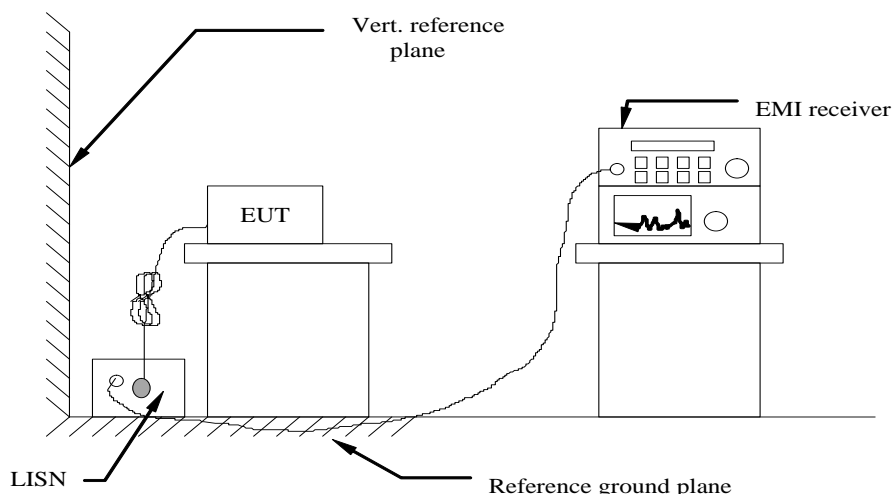
10.1 Standard Applicable

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 150 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 |

* Decreasing linearly with the logarithm of the frequency

10.2. Block Diagram of Test Setup



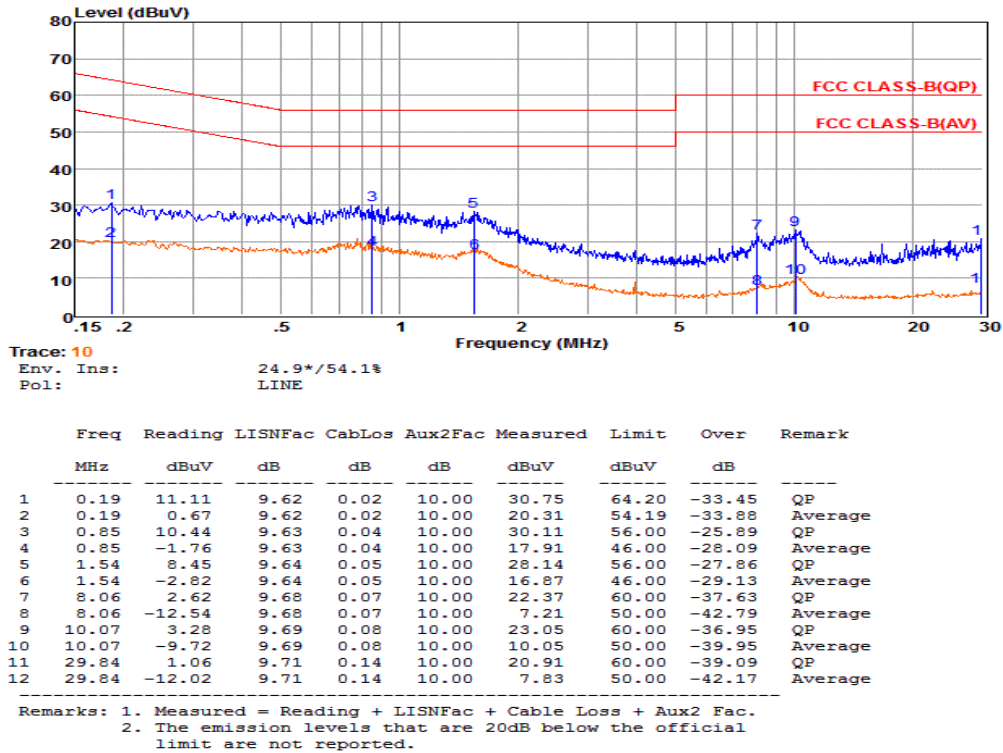
10.3. Test Results

PASS.

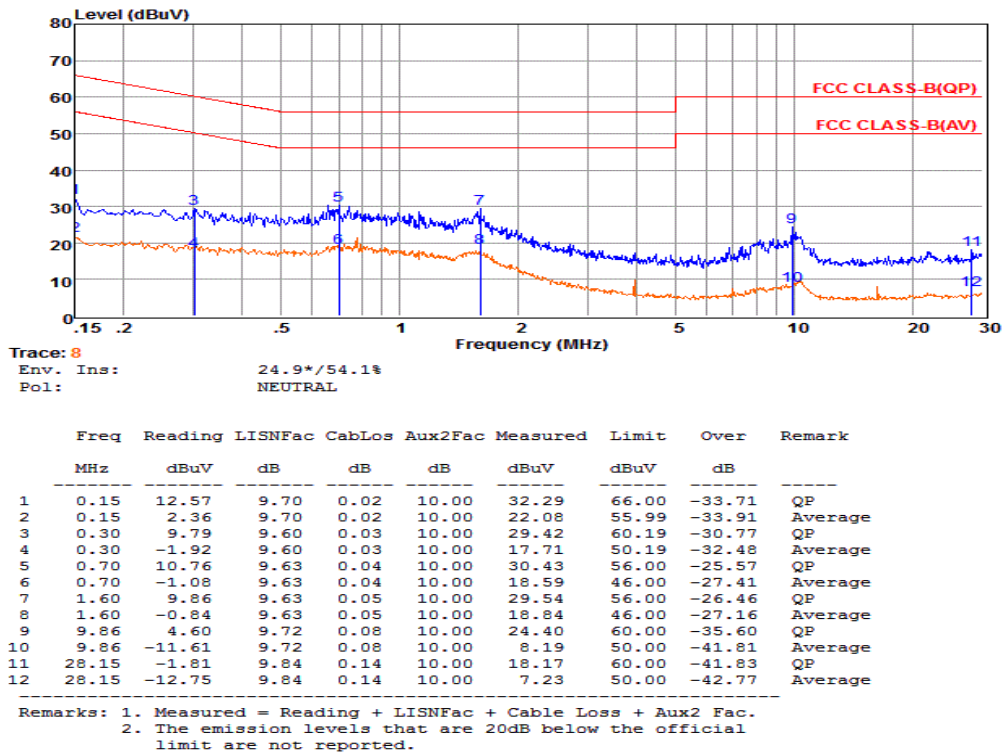
The test data please refer to following page.

| | | | |
|---------------|------------|----------------|--------|
| Temperature | 24.9°C | Humidity | 54.1% |
| Test Engineer | Diamond Lu | Configurations | Z-wave |

Line



Neutral



11. TEST SETUP PHOTOGRAPHS OF EUT

Please refer to separated files for Test Setup Photographs of the EUT.

12. EXTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for External Photographs of the EUT.

13. INTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for Internal Photographs of the EUT.

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