

FCC TEST REPORT
FOR
GUANGZHOU BOSMA TECHNOLOGY CO.,LTD.
Smart Doorbell
Test Model: Sentry Pro

| | | |
|--------------------------------|---|---|
| Prepared for | : | GUANGZHOU BOSMA TECHNOLOGY CO.,LTD. |
| Address | : | Floor 3nd, Building A5, No.11, Kaiyuan Avenue, Guangzhou Hi-tech Industrial Development Zone, Guangzhou, China |
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| Date of receipt of test sample | : | September 29, 2020 |
| Number of tested samples | : | 2 |
| Sample number | : | 200921145A-1, 200921145A-2 |
| Serial number | : | Prototype |
| Date of Test | : | September 29, 2020 ~ October 15, 2020 |
| Date of Report | : | October 16, 2020 |

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

Report Reference No. : LCS200921145AEC

Date of Issue..... : October 16, 2020

Testing Laboratory Name : Shenzhen LCS Compliance Testing Laboratory Ltd.

Address..... : 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Shajing Street, Baoan District, Shenzhen, China

Testing Location/ Procedure : Full application of Harmonised standards ■
Partial application of Harmonised standards □
Other standard testing method □

Applicant's Name : GUANGZHOU BOSMA TECHNOLOGY CO.,LTD.

Address..... : Floor 3nd, Building A5, No.11, Kaiyuan Avenue, Guangzhou Hi-tech Industrial Development Zone, Guangzhou, China

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..... : Smart Doorbell

Trade Mark : BOSMA

Model/ Type reference : Sentry Pro

Ratings..... : Input: DC 5V/AC 24V

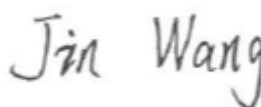
Result : Positive

Compiled by:



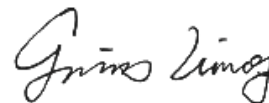
Linda He/ File administrators

Supervised by:



Jin Wang/ Technique principal

Approved by:



Gavin Liang/ Manager

FCC -- TEST REPORT

| | |
|--|-----------------------------------|
| Test Report No. : LCS200921145AEC | October 16, 2020 Date of issue |
|--|-----------------------------------|

| | |
|--------------------------|---|
| Type / Model..... | : Sentry Pro |
| EUT..... | : Smart Doorbell |
| Applicant..... | : GUANGZHOU BOSMA TECHNOLOGY CO.,LTD. |
| Address..... | : Floor 3nd, Building A5, No.11, Kaiyuan Avenue, Guangzhou Hi-tech Industrial Development Zone, Guangzhou, China |
| Telephone..... | : / |
| Fax..... | : / |
| Manufacturer..... | : GUANGZHOU BOSMA TECHNOLOGY CO.,LTD. |
| Address..... | : Floor 3nd, Building A5, No.11, Kaiyuan Avenue, Guangzhou Hi-tech Industrial Development Zone, Guangzhou, China |
| Telephone..... | : / |
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| Factory..... | : GUANGZHOU BOSMA TECHNOLOGY CO.,LTD. |
| Address..... | : Floor 3nd, Building A5, No.11, Kaiyuan Avenue, Guangzhou Hi-tech Industrial Development Zone, Guangzhou, 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 | October 16, 2020 | Initial Issue | Gavin Liang |
| | | | |
| | | | |

TABLE OF CONTENTS

| | |
|---|-----------|
| 1. GENERAL INFORMATION | 6 |
| 1.1. Description of Device (EUT)..... | 6 |
| 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 | 7 |
| 1.6. Measurement Uncertainty..... | 7 |
| 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 |
| 2.4. Test Sample | 10 |
| 3. CONNECTION DIAGRAM OF TEST SYSTEM..... | 11 |
| 3.1. Justification..... | 11 |
| 3.2. EUT Exercise Software | 11 |
| 3.3. Special Accessories | 11 |
| 3.4. Block Diagram/Schematics | 11 |
| 3.5. Equipment Modifications | 11 |
| 3.6. Test Setup | 11 |
| 4. SUMMARY OF TEST RESULTS | 12 |
| 5. TEST RESULTS | 13 |
| 5.1. ANTENNA REQUIREMENT | 13 |
| 5.2. RADIATED EMISSION MEASUREMENT | 14 |
| 5.3. Band Edges Measurement | 24 |
| 5.4. 20 DB BANDWIDTH MEASUREMENT | 29 |
| 5.5. AC Power line conducted emissions | 31 |
| 6. SUMMARY OF TEST EQUIPMENT | 34 |
| 7. TEST SETUP PHOTOGRAPHS OF EUT..... | 35 |
| 8. EXTERIOR PHOTOGRAPHS OF THE EUT | 35 |
| 9. INTERIOR PHOTOGRAPHS OF THE EUT | 35 |

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

| | |
|-------------------|---------------------|
| EUT | Smart Doorbell |
| Test Model | Sentry Pro |
| Serial Model No. | / |
| Model Declaration | / |
| Power Supply | Input: DC 5V/AC 24V |

Bluetooth

| | |
|---------------------------|--|
| Frequency Range | 2402MHz-2480MHz |
| Bluetooth Version | V4.0 |
| Bluetooth Channel Number | 40 channels for Bluetooth V4.0 (BT LE) |
| Bluetooth Channel Spacing | 2MHz for Bluetooth V4.0 (BT LE) |
| Bluetooth Modulation Type | GFSK for Bluetooth V4.0 (BT LE) |
| Antenna Description | Ceramic Antenna, 3dBi(Max.) |
| Hardware Version | DR0002_BLE_P06 |
| Software Version | CC2541_ML-FPM-013_FP0001_V1.0.0.1 |

2.4G WLAN

| | |
|---------------------|--|
| Frequency Range | : 2412 – 2462 MHz |
| Channel Number | : 11 Channels for 20MHz bandwidth (2412~2462MHz) : 7 Channels for 40MHz bandwidth (2422~2452MHz) |
| Channel Spacing | : 5MHz |
| Modulation Type | : IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) : IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) : IEEE 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK) |
| Antenna Description | : FPC Antenna, 3dBi(Max.) |
| Hardware Version | : DR0002_MAIN_P06 |
| Software Version | : 3516EV300_IMX307_DR0002_V1.0.2.2 |

SRD(915MHz)

| | |
|-----------------------|--------------------------------|
| Channel Number | : 1 |
| Modulation Technology | : FSK |
| Antenna Description | : Spring Antenna, 1dBi(Max.) |
| Hardware Version | : DR0002_Sub_1g_P05 |
| Software Version | : CC1310F64_915_DR0002_1.0.0.1 |

1.2. Host System Configuration List and Details

| Manufacturer | Description | Model | Serial Number | Certificate |
|--|-------------|------------------|---------------|-------------|
| DONGGUAN GANGQI ELECTRONICS CO.,LTD | Adapter | GQ06A-050150-ZUU | --- | SDOC |

Note: Adapter is supplied by lab and only use tested.

1.3. External I/O

| I/O Port Description | Quantity | Cable |
|----------------------|----------|-------|
| Micro USB port | 1 | -- |

1.4. Description of Test Facility

NVLAP Accreditation Code is 600167-0.

FCC Designation Number is CN5024.

CAB identifier is CN0071.

CNAS Registration Number is L4595.

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 DC 5V.

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) |
|------------------------|------------------------------|
| FSK | 915MHz |
| 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

2.4. Test Sample

The application provides 2 samples to meet requirement;

| Sample Number | Description |
|------------------------|---------------------------------------|
| Sample 1(200921145A-1) | Engineer sample – continuous transmit |
| Sample 2(200921145A-2) | Normal sample – Intermittent transmit |

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

EUT will transmit while power on.

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 | Test sample | Result | Remark |
| §15.203 | Antenna Requirement | / | Compliant | Note 1 |
| §15.207(a) | Conduction Emissions | Sample 2 | Compliant | Note 1 |
| §15.205(a), §15.209(a), §15.249(a), §15.249(c) | Radiated Emissions Measurement | Sample 1 Sample 2 | Compliant | Note 1 |
| §15.249 | Band Edges Measurement | Sample 1 | Compliant | Note 1 |
| §15.249, §2.1049 | 99% and 20dB Bandwidth | Sample 1 | Compliant | Note 1 |

Remark:

Note 1 --- Test results inside test report.

Note 2 – N/A: Not Applicable!

5.TEST RESULTS

5.1. ANTENNA REQUIREMENT

5.1.1 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.

5.1.2 Antenna Connected Construction

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.

2) Antenna Connector Construction

The directional gains of antenna used for transmitting is 1 dBi, and the antenna is connect to PCB board and no consideration of replacement. Please see EUT photo for details.

3) Results: Compliance.

5.2. RADIATED EMISSION MEASUREMENT

5.2.1 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 | G Hz |
|-------------------|---------------------|---------------|-------------|
| 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 | 2690-2900 | 22.01-23.12 |
| 8.41425-8.41475 | 162.0125-167.17 | 3260-3267 | 23.6-24.0 |
| 12.29-12.293 | 167.72-173.2 | 3332-3339 | 31.2-31.8 |
| 12.51975-12.52025 | 240-285 | 3345.8-3358 | 36.43-36.5 |
| 12.57675-12.57725 | 322-335.4 | 3600-4400 | (\2\) |
| 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.

5.2.2 Measuring Instruments and Setting

This report shall not be reproduced except in full, without the written approval of Shenzhen LCS Compliance Testing Laboratory Ltd.

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 |

5.2.3 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.

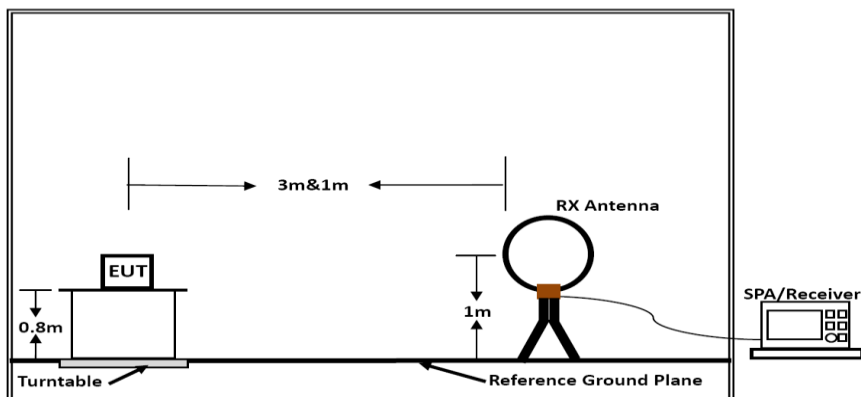
Premeasurement:

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

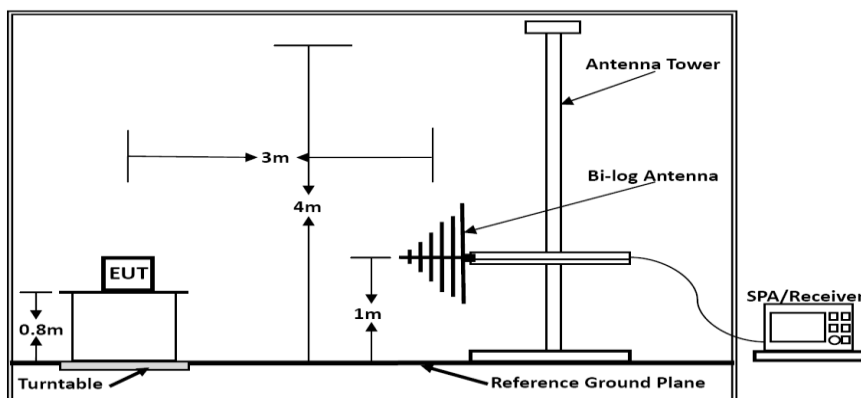
Final measurement:

- 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.

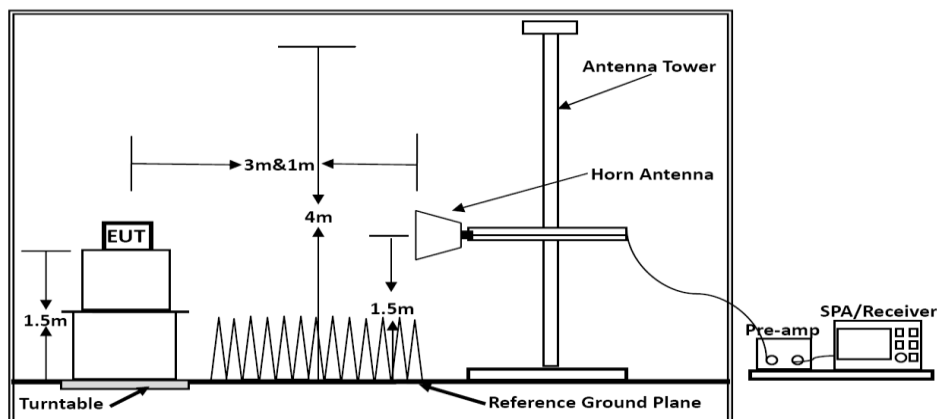
5.2.4 Block Diagram of Test Setup



Below 30MHz



Below 1GHz



Above 1GHz

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].

5.2.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.2.6 Test Results

Results of Radiated Emissions (9 KHz~30MHz)

| | | | |
|---------------|--------|----------------|--------|
| Temperature | 24.2°C | Humidity | 53.1% |
| Test Engineer | Kay Hu | Configurations | 915MHz |

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

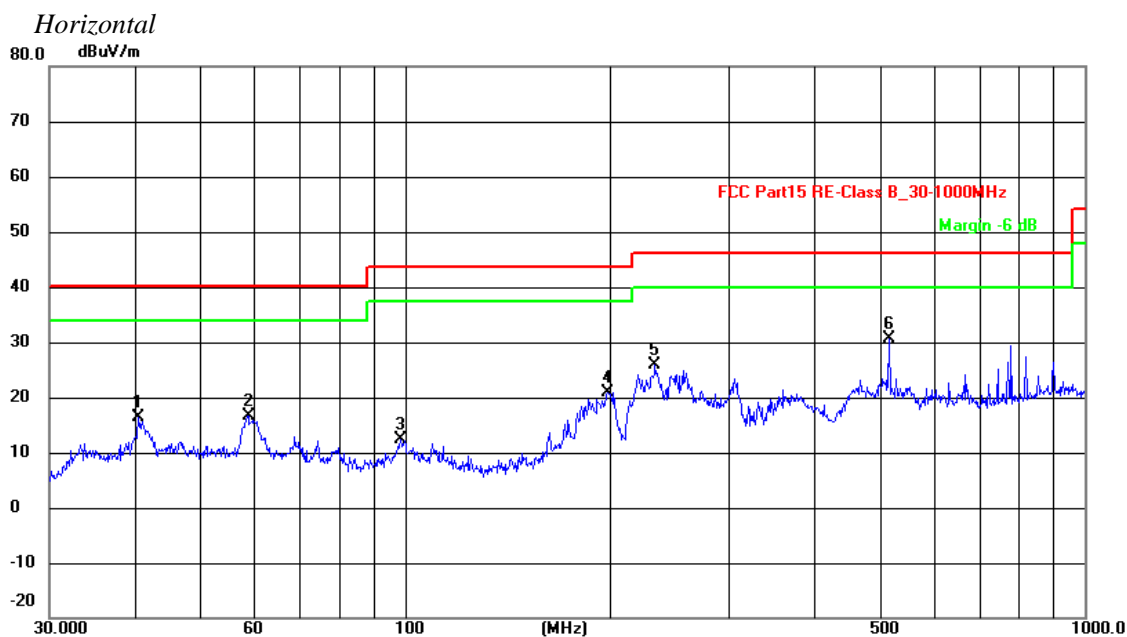
Note:

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

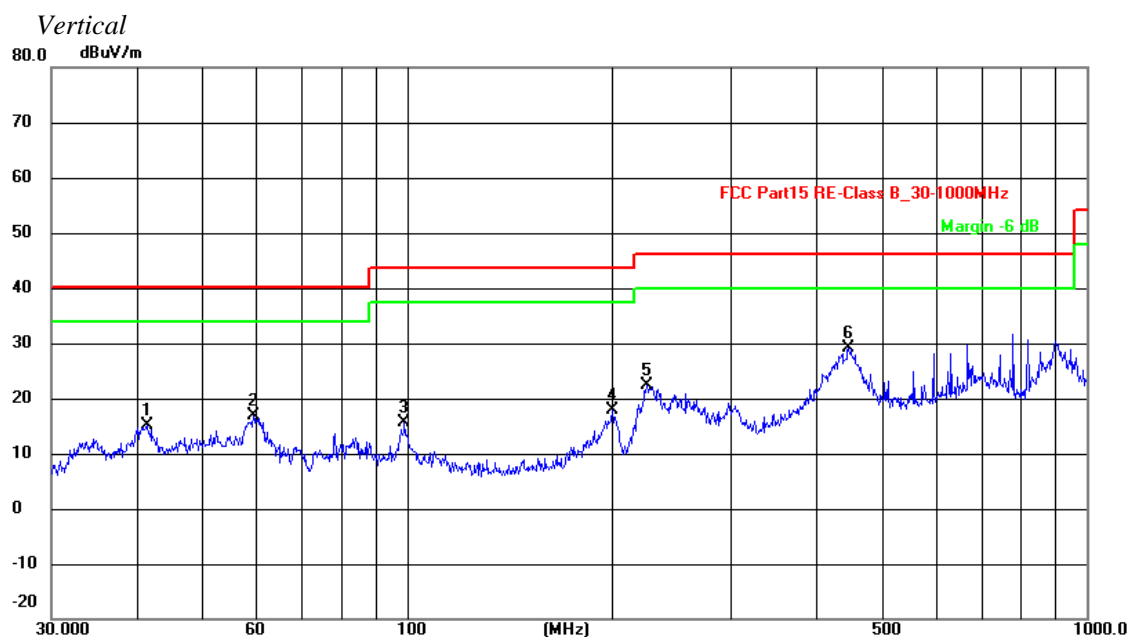
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

Results of Radiated Emissions (30MHz~1000MHz)



| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|----------|
| 1 | 40.5591 | 32.63 | -16.28 | 16.35 | 40.00 | -23.65 | QP |
| 2 | 58.8185 | 33.43 | -16.69 | 16.74 | 40.00 | -23.26 | QP |
| 3 | 98.4865 | 30.00 | -17.69 | 12.31 | 43.50 | -31.19 | QP |
| 4 | 198.5877 | 38.61 | -17.67 | 20.94 | 43.50 | -22.56 | QP |
| 5 | 233.3486 | 42.34 | -16.50 | 25.84 | 46.00 | -20.16 | QP |
| 6 | 515.4373 | 42.41 | -11.68 | 30.73 | 46.00 | -15.27 | QP |



| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|----------|
| 1 | 41.4215 | 31.36 | -16.14 | 15.22 | 40.00 | -24.78 | QP |
| 2 | 59.4405 | 33.64 | -16.76 | 16.88 | 40.00 | -23.12 | QP |
| 3 | 99.1795 | 33.11 | -17.56 | 15.55 | 43.50 | -27.95 | QP |
| 4 | 200.6879 | 35.36 | -17.48 | 17.88 | 43.50 | -25.62 | QP |
| 5 | 225.3077 | 39.16 | -16.74 | 22.42 | 46.00 | -23.58 | QP |
| 6 | 446.4139 | 41.69 | -12.59 | 29.10 | 46.00 | -16.90 | QP |

Note:

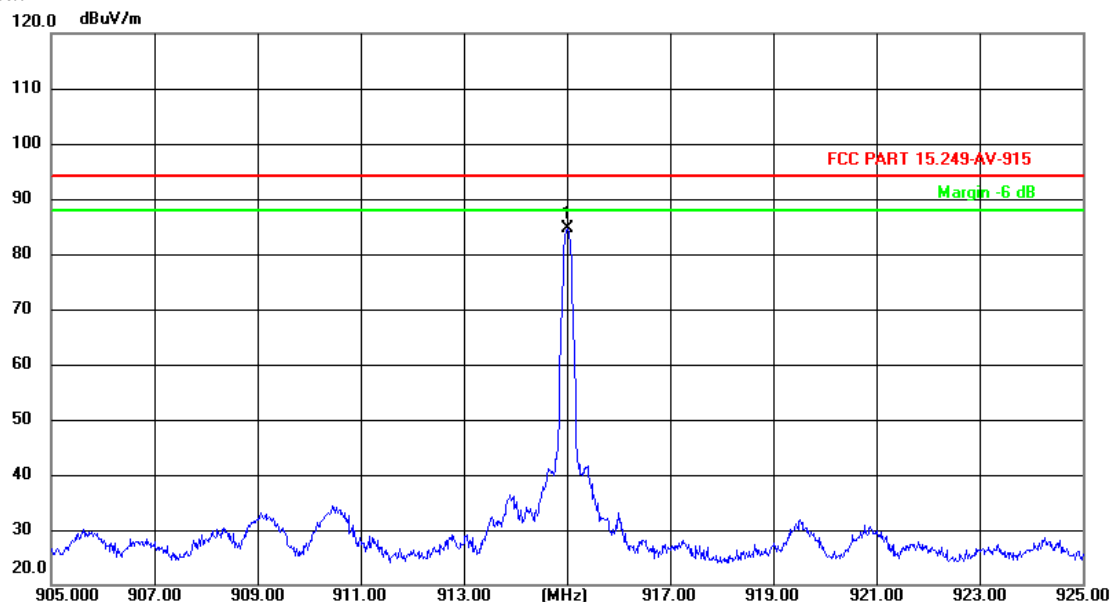
Emission level (dBuV/m) = 20 log Emission level (uV/m).

Margin=Reading level + Factor- Limit

Field strength of fundamental:

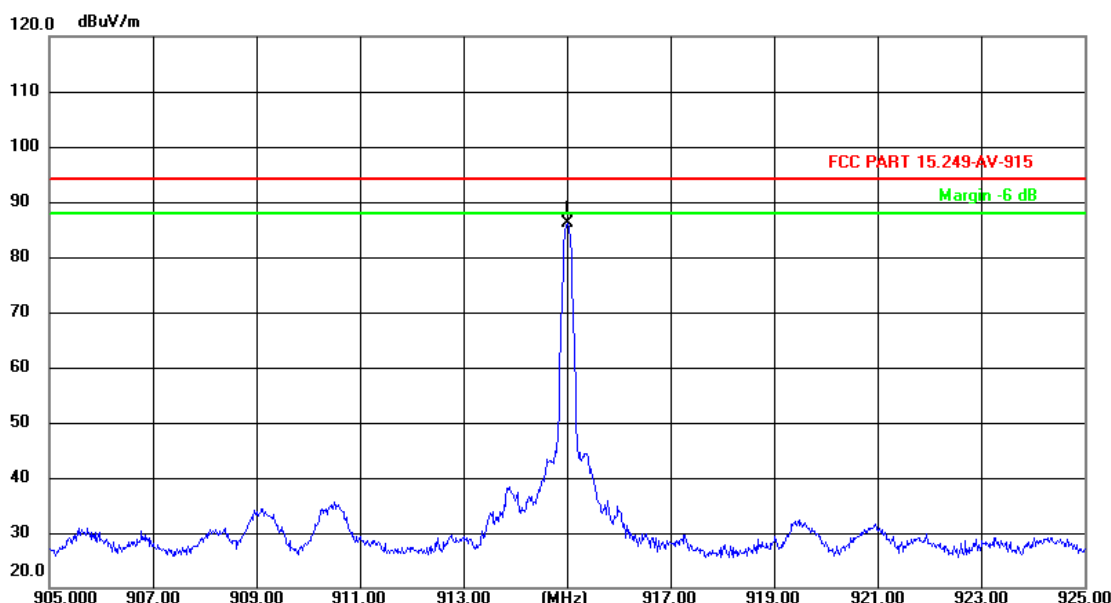
| Frequency (MHz) | Pol. | Measure Result (QP, dBuV/m) | Limit (dBuV/m) | Result |
|-----------------|------|-----------------------------|----------------|--------|
| 915 | H | 84.68 | 94 | Pass |
| 915 | V | 86.03 | 94 | Pass |

Horizontal



| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|----------|
| 1 | 915.0000 | 91.82 | -7.14 | 84.68 | 94.00 | -9.32 | QP |

Vertical



| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|----------|
| 1 | 915.0000 | 93.17 | -7.14 | 86.03 | 94.00 | -7.97 | QP |

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

| Freq. MHz | Reading dBuv | Ant. Fac dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|--------------|-----------------|---------------------|--------------------|--------------------|--------------------|-----------------|--------------|---------|------------|
| 1830.0 | 50.23 | 33.01 | 35.00 | 3.86 | 52.10 | 74.00 | -21.90 | Peak | Horizontal |
| 1830.0 | 32.04 | 33.01 | 35.00 | 3.86 | 33.91 | 54.00 | -20.09 | Average | Horizontal |
| 2745.0 | 48.87 | 33.03 | 35.02 | 3.91 | 50.79 | 74.00 | -23.21 | Peak | Horizontal |
| 2745.0 | 34.48 | 33.03 | 35.02 | 3.91 | 36.40 | 54.00 | -17.60 | Average | Horizontal |
| 1830.0 | 48.93 | 33.01 | 35.00 | 3.86 | 50.80 | 74.00 | -23.20 | Peak | Vertical |
| 1830.0 | 33.12 | 33.01 | 35.00 | 3.86 | 34.99 | 54.00 | -19.01 | Average | Vertical |
| 2745.0 | 50.04 | 33.03 | 35.02 | 3.91 | 51.96 | 74.00 | -22.04 | Peak | Vertical |
| 2745.0 | 34.06 | 33.03 | 35.02 | 3.91 | 35.98 | 54.00 | -18.02 | Average | Vertical |

Notes:

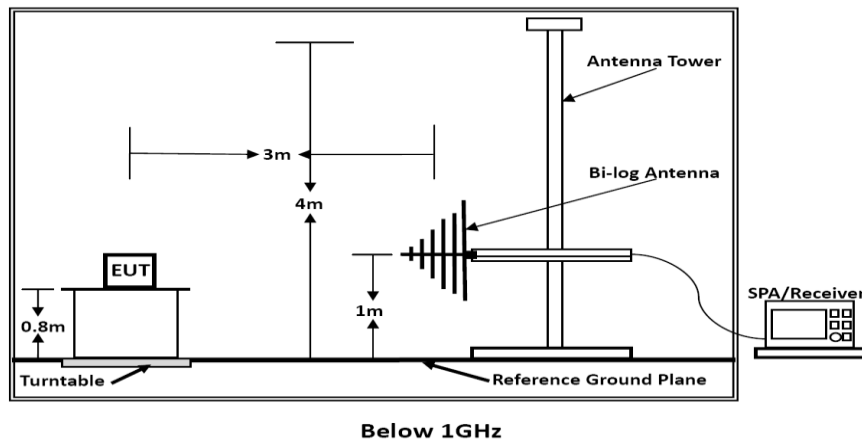
1. Measuring frequencies from 9k~10th harmonic (ex. 10GHz), No emission found between lowest internal used/generated frequency to 30 MHz.
2. Radiated emissions measured in frequency range from 9k~10th harmonic (ex. 10GHz) were made with an instrument using Peak detector mode.
3. Measured radiated emission below 1 GHz adopt 915 MHz band-reject filter in order avoid test receiver overload.
4. Margin=Reading Level+Ant Fac+Cab Loss-Pre Fac-Limit

5.3. Band Edges Measurement

5.3.1 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.

5.3.2 Block Diagram of Test Setup



5.3.3 Test Procedure

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.

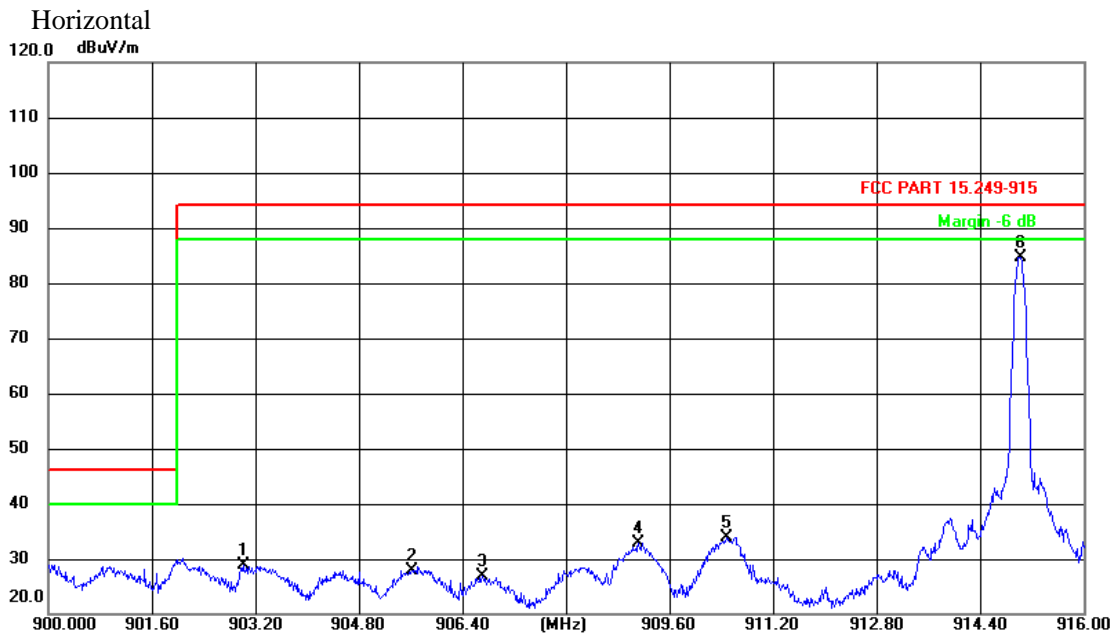
Final measurement:

- 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

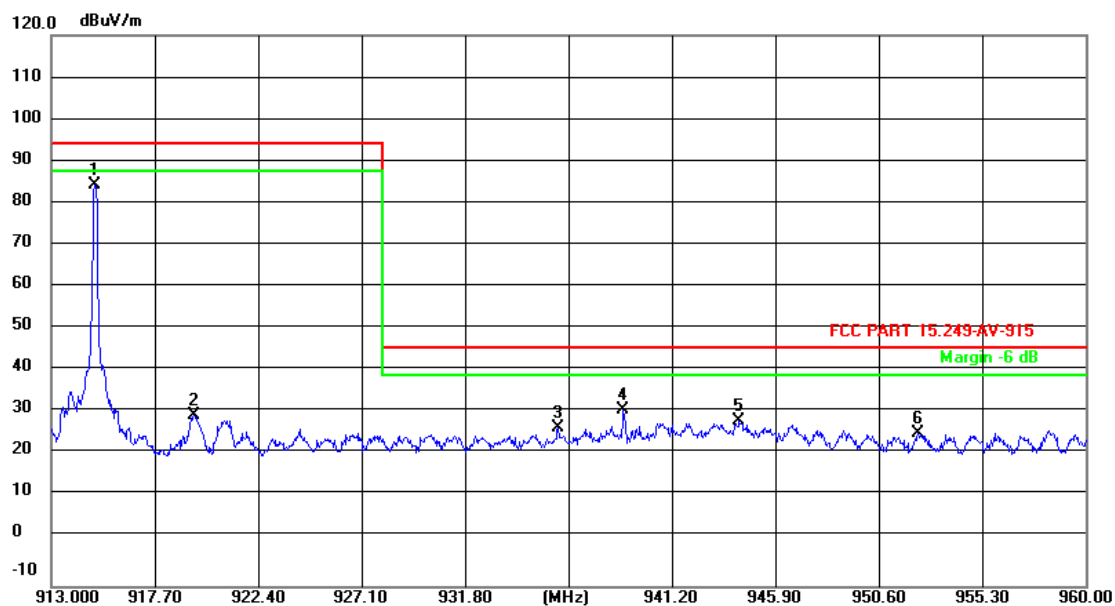
premeasurement with marked maximum final measurements and the limit will be stored.

5.3.4 Test Results

PASS

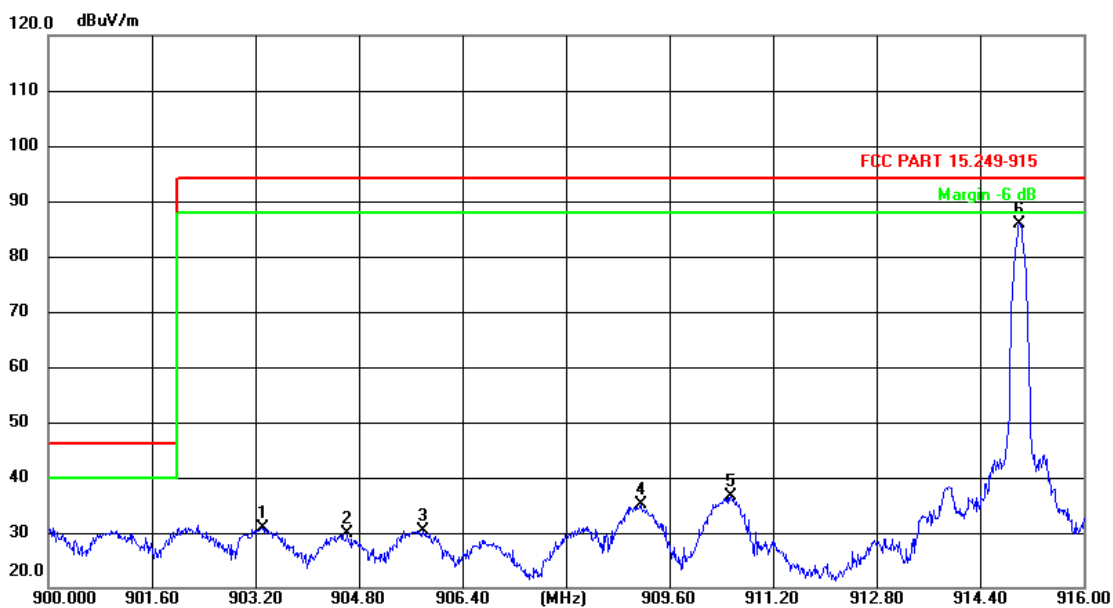


| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|----------|
| 1 | 903.0080 | 36.17 | -7.18 | 28.99 | 94.00 | -65.01 | QP |
| 2 | 905.6160 | 35.17 | -7.17 | 28.00 | 94.00 | -66.00 | QP |
| 3 | 906.7040 | 33.96 | -7.16 | 26.80 | 94.00 | -67.20 | QP |
| 4 | 909.1200 | 39.98 | -7.16 | 32.82 | 94.00 | -61.18 | QP |
| 5 | 910.4800 | 40.95 | -7.15 | 33.80 | 94.00 | -60.20 | QP |
| 6 | 915.0240 | 91.78 | -7.14 | 84.64 | 94.00 | -9.36 | QP |

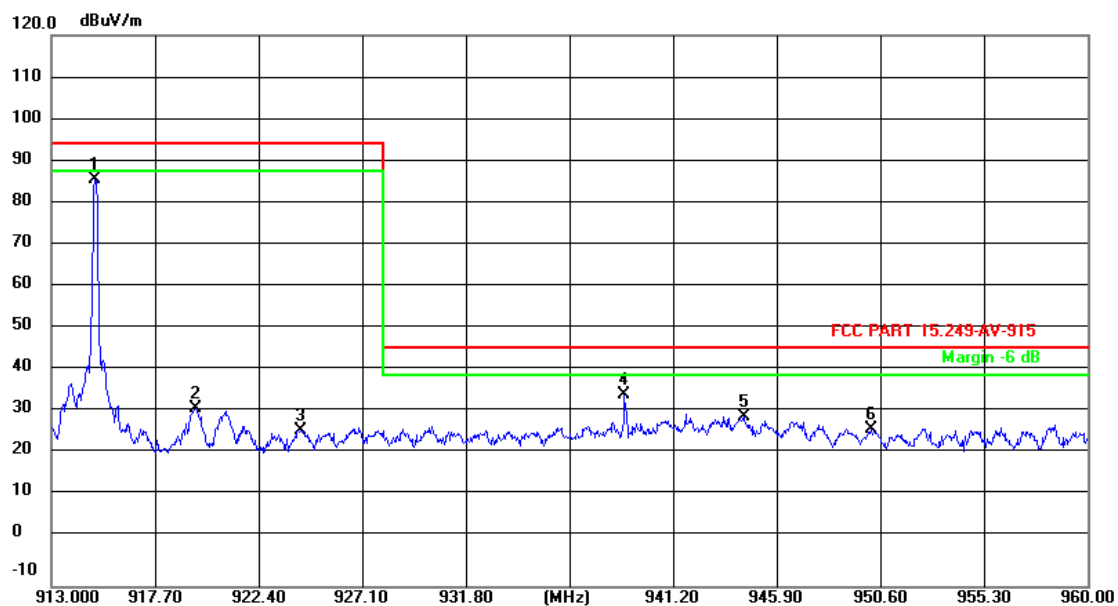


| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|----------|
| 1 | 914.9740 | 91.74 | -7.14 | 84.60 | 94.00 | -9.40 | QP |
| 2 | 919.4860 | 37.63 | -7.12 | 30.51 | 94.00 | -63.49 | QP |
| 3 | 936.0300 | 34.65 | -7.05 | 27.60 | 46.00 | -18.40 | QP |
| 4 | 938.9910 | 38.82 | -7.06 | 31.76 | 46.00 | -14.24 | QP |
| 5 | 944.2550 | 36.23 | -7.03 | 29.20 | 46.00 | -16.80 | QP |
| 6 | 952.3860 | 33.14 | -7.00 | 26.14 | 46.00 | -19.86 | QP |

Vertical



| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|----------|
| 1 | 903.3120 | 38.14 | -7.18 | 30.96 | 94.00 | -63.04 | QP |
| 2 | 904.6240 | 37.09 | -7.17 | 29.92 | 94.00 | -64.08 | QP |
| 3 | 905.7920 | 37.55 | -7.17 | 30.38 | 94.00 | -63.62 | QP |
| 4 | 909.1520 | 42.37 | -7.16 | 35.21 | 94.00 | -58.79 | QP |
| 5 | 910.5440 | 43.81 | -7.15 | 36.66 | 94.00 | -57.34 | QP |
| 6 | 915.0080 | 93.00 | -7.14 | 85.86 | 94.00 | -8.14 | QP |



| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|----------|
| 1 | 914.9740 | 93.02 | -7.14 | 85.88 | 94.00 | -8.12 | QP |
| 2 | 919.5330 | 39.12 | -7.12 | 32.00 | 94.00 | -62.00 | QP |
| 3 | 924.3270 | 34.03 | -7.10 | 26.93 | 94.00 | -67.07 | QP |
| 4 | 938.9910 | 42.28 | -7.06 | 35.22 | 46.00 | -10.78 | QP |
| 5 | 944.3960 | 37.21 | -7.03 | 30.18 | 46.00 | -15.82 | QP |
| 6 | 950.1770 | 34.19 | -7.01 | 27.18 | 46.00 | -18.82 | QP |

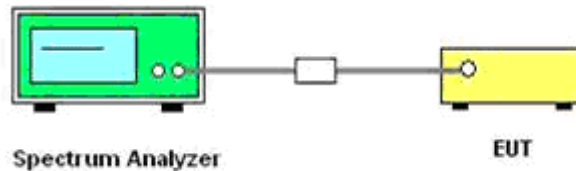
Note: Margin=Reading level + Factor - Limit

5.4. 20 DB BANDWIDTH MEASUREMENT

5.4.1 Standard Applicable

According to §2.1049: The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable.

5.4.2 Block Diagram of Test Setup



5.4.3 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

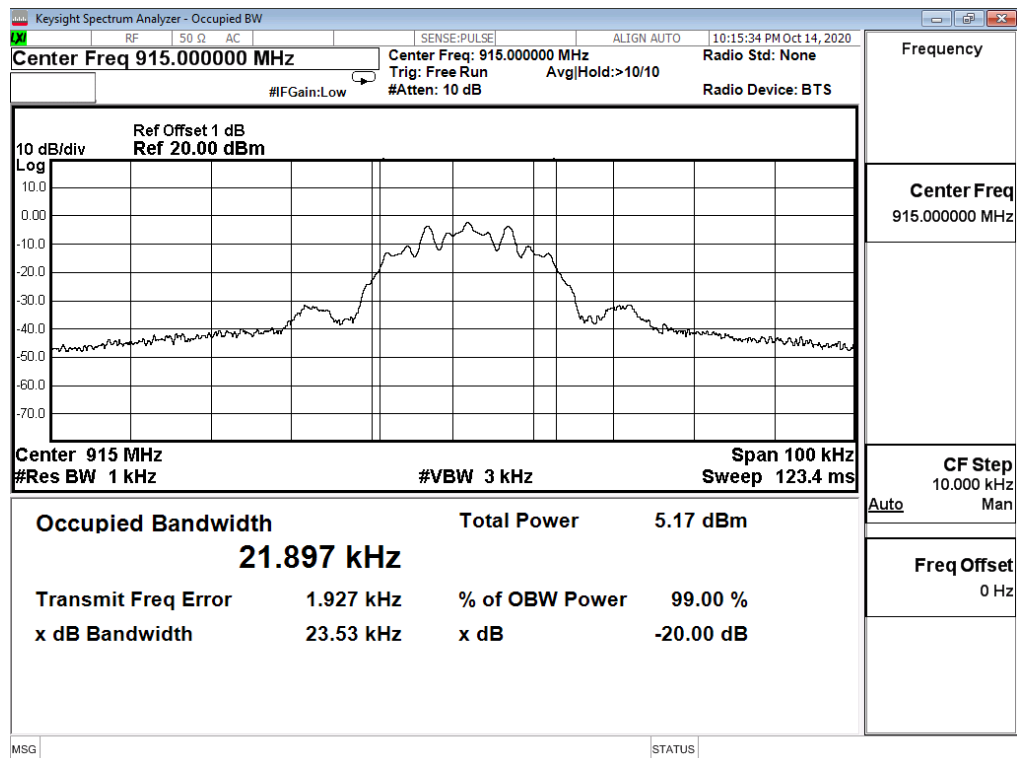
The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the 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).

5.4.4 Test Results

Please refer to the following page.

Result: Pass

| Test Result Of 20dB Bandwidth Measurement | | |
|---|-------------------------|----------------|
| Test Frequency (MHz) | 20dB Bandwidth (kHz) | Limit (MHz) |
| 915.0 | 23.53 | Non-Specified |



5.5.AC Power line conducted emissions

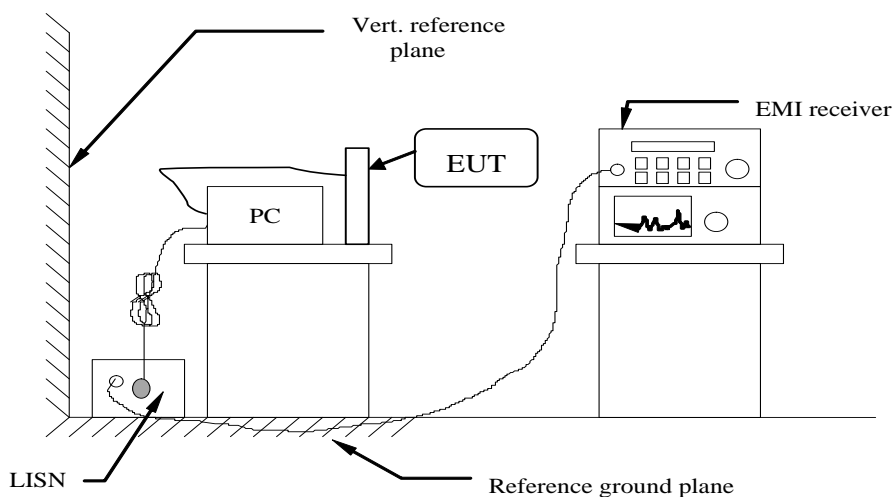
5.5.1 Standard Applicable

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

5.5.2 Block Diagram of Test Setup



5.5.3 Test Results

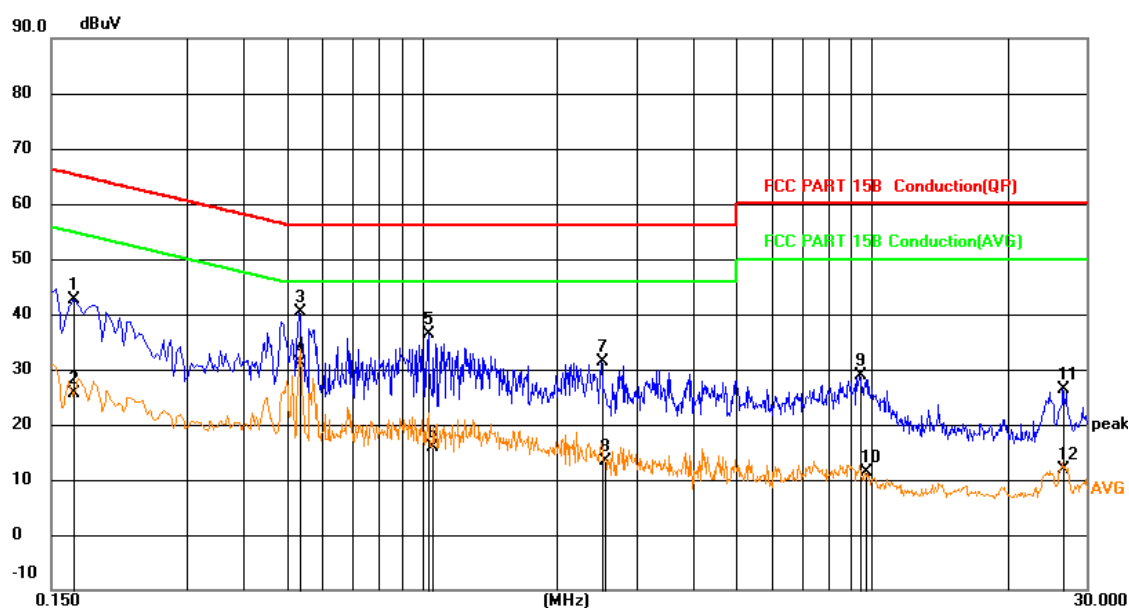
PASS.

The test data please refer to following page.

| | | | |
|---------------|--------|----------------|--------|
| Temperature | 23.3℃ | Humidity | 53.7% |
| Test Engineer | Kay Hu | Configurations | 915MHz |

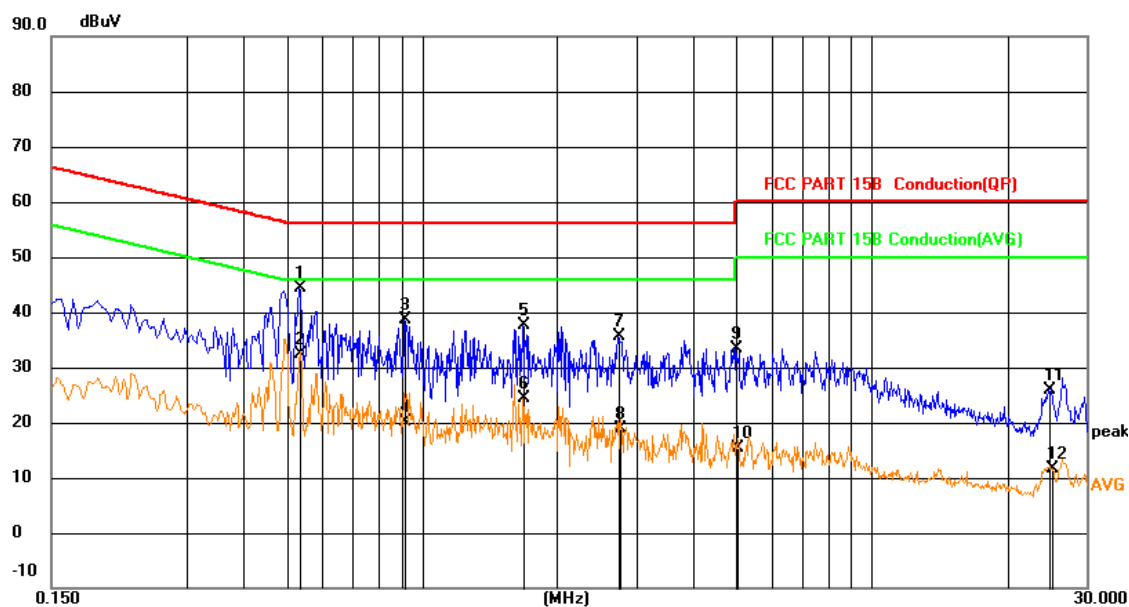
AC Conducted Emission of power @ AC 120V/60Hz @ IEEE 802.11n20 (worst case)

Line



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | | |
|-----|-----|---------|---------------|----------------|-------------|-------|--------|----------|---------|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | | 0.1680 | 23.57 | 19.16 | 42.73 | 65.06 | -22.33 | QP | |
| 2 | | 0.1685 | 6.45 | 19.16 | 25.61 | 55.03 | -29.42 | AVG | |
| 3 | | 0.5323 | 21.05 | 19.32 | 40.37 | 56.00 | -15.63 | QP | |
| 4 | * | 0.5323 | 11.92 | 19.32 | 31.24 | 46.00 | -14.76 | AVG | |
| 5 | | 1.0363 | 17.22 | 19.26 | 36.48 | 56.00 | -19.52 | QP | |
| 6 | | 1.0500 | -3.33 | 19.27 | 15.94 | 46.00 | -30.06 | AVG | |
| 7 | | 2.5080 | 11.93 | 19.45 | 31.38 | 56.00 | -24.62 | QP | |
| 8 | | 2.5440 | -6.16 | 19.45 | 13.29 | 46.00 | -32.71 | AVG | |
| 9 | | 9.4245 | 9.20 | 19.68 | 28.88 | 60.00 | -31.12 | QP | |
| 10 | | 9.6899 | -8.38 | 19.68 | 11.30 | 50.00 | -38.70 | AVG | |
| 11 | | 26.6100 | 6.19 | 20.14 | 26.33 | 60.00 | -33.67 | QP | |
| 12 | | 26.6100 | -8.26 | 20.14 | 11.88 | 50.00 | -38.12 | AVG | |

Neutral



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | | |
|-----|-----|---------|---------------|----------------|-------------|-------|--------|----------|---------|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | * | 0.5324 | 24.96 | 19.31 | 44.27 | 56.00 | -11.73 | QP | |
| 2 | | 0.5378 | 13.05 | 19.31 | 32.36 | 46.00 | -13.64 | AVG | |
| 3 | | 0.9149 | 19.23 | 19.28 | 38.51 | 56.00 | -17.49 | QP | |
| 4 | | 0.9149 | 0.75 | 19.28 | 20.03 | 46.00 | -25.97 | AVG | |
| 5 | | 1.6800 | 18.30 | 19.36 | 37.66 | 56.00 | -18.34 | QP | |
| 6 | | 1.6800 | 4.94 | 19.36 | 24.30 | 46.00 | -21.70 | AVG | |
| 7 | | 2.7239 | 16.19 | 19.44 | 35.63 | 56.00 | -20.37 | QP | |
| 8 | | 2.7600 | -0.44 | 19.44 | 19.00 | 46.00 | -27.00 | AVG | |
| 9 | | 5.0010 | 13.92 | 19.49 | 33.41 | 60.00 | -26.59 | QP | |
| 10 | | 5.0145 | -4.17 | 19.49 | 15.32 | 50.00 | -34.68 | AVG | |
| 11 | | 24.7830 | 5.70 | 20.12 | 25.82 | 60.00 | -34.18 | QP | |
| 12 | | 25.0665 | -8.46 | 20.13 | 11.67 | 50.00 | -38.33 | AVG | |

***Note: 1. Margin=Reading level + Correct - Limit

6. SUMMARY OF TEST EQUIPMENT

| Item | Equipment | Manufacturer | Model No. | Serial No. | Cal Date | Due Date |
|--|--------------------------------|-------------------|--------------|-----------------|------------|------------|
| 1 | MXA Signal Analyzer | Agilent | N9020A | MY49100060 | 2019-11-22 | 2020-11-21 |
| 2 | DC Power Supply | Agilent | E3642A | N/A | 2019-11-14 | 2020-11-13 |
| 3 | Temperature & Humidity Chamber | GUANGZHOU GOGNWEN | GDS-100 | 70932 | 2020-10-08 | 2021-10-07 |
| 4 | EMI Test Software | EZ | EZ-EMC | / | N/A | N/A |
| 5 | 3m Semi Anechoic Chamber | SIDT FRANKONIA | SAC-3M | 03CH03-HY | 2020-06-11 | 2021-06-10 |
| 6 | Positioning Controller | MF | MF-7082 | / | 2020-06-22 | 2021-06-21 |
| 7 | Active Loop Antenna | SCHWARZBECK | FMZB 1519B | 00005 | 2018-07-26 | 2021-07-25 |
| 8 | By-log Antenna | SCHWARZBECK | VULB9163 | 9163-470 | 2018-07-26 | 2021-07-25 |
| 9 | Horn Antenna | SCHWARZBECK | BBHA 9120D | 9120D-1925 | 2018-07-02 | 2021-07-01 |
| 10 | EMI Test Receiver | R&S | ESR 7 | 101181 | 2020-06-22 | 2021-06-21 |
| 11 | RS SPECTRUM ANALYZER | R&S | FSP40 | 100503 | 2019-11-14 | 2020-11-13 |
| 12 | Broadband Preamplifier | / | BP-01M18G | P190501 | 2020-06-22 | 2021-06-21 |
| 13 | RF Cable-R03m | Jye Bao | RG142 | CB021 | 2020-06-22 | 2021-06-21 |
| 14 | RF Cable-HIGH | SUHNER | SUCOFLEX 106 | 03CH03-HY | 2020-06-22 | 2021-06-21 |
| 15 | EMI Test Receiver | R&S | ESPI | 101840 | 2020-06-22 | 2021-06-21 |
| 16 | Artificial Mains | R&S | ENV216 | 101288 | 2020-06-22 | 2021-06-21 |
| 17 | 10dB Attenuator | SCHWARZBECK | MTS-IMP-136 | 261115-001-0032 | 2020-06-22 | 2021-06-21 |
| 18 | RF Filter | Micro-Tronics | BRC50718 | S/N-017 | 2019-11-22 | 2020-11-21 |
| Note: All equipment is calibrated through CHINA CEPREI LABORATORY and GUANGZHOU LISAI CALIBRATION AND TEST CO., LTD. | | | | | | |

7. TEST SETUP PHOTOGRAPHS OF EUT

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

8. EXTERIOR PHOTOGRAPHS OF THE EUT

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

9. INTERIOR PHOTOGRAPHS OF THE EUT

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

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