**Shenzhen Global Test Service Co.,Ltd.**
No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

# FCC PART 15 SUBPART C TEST REPORT

## FCC PART 15.239

| | |
|---|---|
| **Report Reference No.** ..... : | **GTS20200221009-1-11** |
| **FCC ID.** ..... : | **2AJ5B-BT90** |
| Compiled by ( position+printed name+signature) . : | File administrators Peter Xiao |
| Supervised by ( position+printed name+signature) . : | Test Engineer Moon Tan |
| Approved by ( position+printed name+signature) . : | Manager Simon Hu |
| Date of issue ..... : | Mar. 11, 2020 |

| | |
|---|---|
| **Representative Laboratory Name** : | **Shenzhen Global Test Service Co.,Ltd.** |
| Address ..... : | No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong |

| | |
|---|---|
| **Applicant's name** ..... : | **SAGE HUMAN ELECTRONICS INTERNATIONAL CO.,LTD.** |
| Address ..... : | 4F.,A Building,Rongli Industrial Park,No.2 Guiyuan Rd.Guihua Community,Guanlan Town,Longhua New Dist, Shenzhen, China |

| | |
|---|---|
| **Test specification** ..... : | |
| Standard ..... : | FCC CFR 47 PART 15.239 / ANSI C63.10: 2013 |
| TRF Originator ..... : | Shenzhen Global Test Service Co.,Ltd. |
| Master TRF ..... : | Dated 2014-12 |



| | |
|---|---|
| **Test item description** ..... : | **Bluetooth FM transmitter for car** |
| Trade Mark ..... : | N/A |
| Manufacturer ..... : | SAGE HUMAN ELECTRONICS INTERNATIONAL CO.,LTD. |
| Model/Type reference ..... : | BT90 |
| Listed Models ..... : | N/A |
| Modulation Type ..... : | FM |
| Operation Frequency ..... : | From 88MHz to 108MHz |
| Hardware Version ..... : | V1.0 |
| Software Version ..... : | V1.0 |
| Rating ..... : | Input :DC 12V-24V<br>Output:DC 5V/3A, DC 5V/2.4A |
| Result ..... : | **PASS** |

# T E S T  R E P O R T

| **Test Report No. :** | **GTS20200221009-1-11** | Mar.11, 2020<br>Date of issue |
|---|---|---|

| | | |
|---|---|---|
| Equipment under Test | : | Bluetooth FM transmitter for car |
| Model /Type | : | BT90 |
| Listed Models | : | N/A |
| **Applicant** | : | **SAGE HUMAN ELECTRONICS INTERNATIONAL CO.,LTD.** |
| Address | : | 4F.,A Building,Rongli Industrial Park,No.2 Guiyuan Rd.Guihua Community,Guanlan Town,Longhua New Dist, Shenzhen, China |
| **Manufacturer** | : | **SAGE HUMAN ELECTRONICS INTERNATIONAL CO.,LTD.** |
| Address | : | 4F.,A Building,Rongli Industrial Park,No.2 Guiyuan Rd.Guihua Community,Guanlan Town,Longhua New Dist, Shenzhen, China |

| **Test Result**: | **PASS** |
|---|---|

# Contents

# 1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.239: Operation in the band 88-108 MHz
ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices

# 2. SUMMARY

## 2.1. General Remarks

| | | |
|---|---|---|
| Date of receipt of test sample | : | Feb. 24, 2020 |
| | | |
| Testing commenced on | : | Feb. 24, 2020 |
| | | |
| Testing concluded on | : | Mar.11, 2020 |

## 2.2. Product Description

| | |
|---|---|
| Product Name | Bluetooth FM transmitter for car |
| Trade Mark | N/A |
| Model/Type reference | BT90 |
| List Models | N/A |
| Model Declaration | N/A |
| Power supply: | Input :DC 12V-24V<br>Output:DC 5V/3A, DC 5V/2.4A |
| Bluetooth | |
| Operation frequency | 2402-2480MHz |
| Channel Number | 79 channels for Bluetooth (DSS)<br>40 channels for Bluetooth (DTS) |
| Channel Spacing | 1MHz for Bluetooth (DSS)<br>2MHz for Bluetooth (DTS) |
| Modulation Type | GFSK, π/4-DQPSK, 8DPSK for Bluetooth (DSS)<br>GFSK for Bluetooth (DTS) |
| Antenna Description | Internal Antenna , 0dBi(Max.) |
| FM Transmitter | |
| Frequency Range | 88 MHz~108 MHz |
| Channel Spacing | 100KHz |
| Channel Number | 199 Channel |
| Modulation Type | FM |
| Antenna Description | External Antenna , 0dBi(Max.) |

## 2.3. Equipment Under Test

## Power supply system utilised

| | | | | | |
|---|---|---|---|---|---|
| Power supply voltage | : | ○ | 230V / 50 Hz | ○ | 120V / 60Hz |
| | | ● | 12 V DC | ○ | 24 V DC |
| | | ○ | Other (specified in blank below) | | |

DC 12V

## 2.4. Short description of the Equipment under Test (EUT)

This is a Bluetooth FM transmitter for car

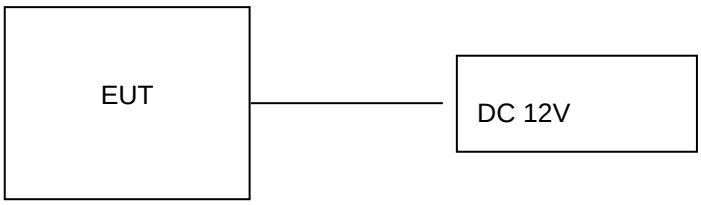
For more details, refer to the user's manual of the EUT.

## 2.5. EUT operation mode

The Applicant provides communication tools software to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing .There are 79 channels provided to the EUT. Channel 00/38/78 was selected to test.

| Channel | Frequency(MHz) | Channel | Frequency(MHz) |
|---|---|---|---|
| **00** | **88.1** | 100 | 98.1 |
| 01 | 88.2 | 101 | 98.2 |
| 02 | 88.3 | 102 | 98.3 |
| -- | -- | -- | -- |
| -- | -- | -- | -- |
| 98 | 97.9 | **198** | **107.9** |
| **99** | **98.0** | | |

## 2.6. Block Diagram of Test Setup




## 2.7. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: 2AJ5B-BT90** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

## 2.8. Special Accessories

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

The Computer and Displayer is provided by the laboratory.

## 2.9. Modifications

No modifications were implemented to meet testing criteria.

# 3. TEST ENVIRONMENT

## 3.1. Address of the test laboratory

**Shenzhen Global Test Service Co.,Ltd.**
No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

## 3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

CNAS (No. CNAS L8169)
Shenzhen Global Test Service Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2019 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA (Certificate No. 4758.01)
Shenzhen Global Test Service Co., Ltd. has been assessed by the American Association for Laboratory Accreditation (A2LA). Certificate No. 4758.01.

## 3.3. Environmental conditions

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

| | |
|---|---|
| Temperature: | 15-35 ° C |
| | |
| Humidity: | 30-60 % |
| | |
| Atmospheric pressure: | 950-1050mbar |

## 3.4. 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 Shenzhen Global Test Service Co.,Ltd. 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.
Hereafter the best measurement capability for Shenzhen GTS laboratory is reported:

| Test | Range | Measurement Uncertainty | Notes |
|---|---|---|---|
| Radiated Emission | 30~1000MHz | 4.10 dB | (1) |
| Radiated Emission | 1~18GHz | 4.32 dB | (1) |
| Radiated Emission | 18-40GHz | 5.54 dB | (1) |
| Conducted Disturbance | 0.15~30MHz | 3.12 dB | (1) |

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

## 3.5. Summary of measurement results

| **Applied Standard: FCC CFR 47 PART 15.239** | | |
|---|---|---|
| FCC Rules | Description of Test | Result |
| 15.239 (a) | Occupied Bandwidth | Compliant |
| 15.239 (b) | Field Strength of Fundamental frequency | Compliant |
| 15.239 (b) | Radiated Spurious Emissions | Compliant |
| 15.207 (a) | AC Conducted Emissions | N/A |
| 15.203 | Antenna Requirements | Compliant |

Remark:
1. The measurement uncertainty is not included in the test result.
2. NA = Not Applicable; NP = Not Performed
3. We tested all test mode and recorded worst case in report

## 3.6. Equipments Used during the Test

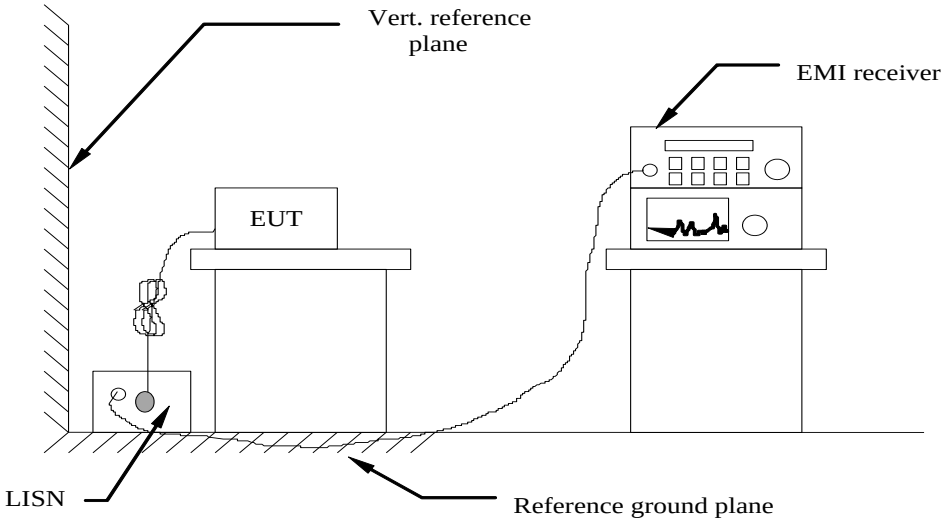
| Test Equipment | Manufacturer | Model No. | Serial No. | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| LISN | R&S | ENV216 | 3560.6550.08 | 2019/09/20 | 2020/09/19 |
| LISN | R&S | ESH2-Z5 | 893606/008 | 2019/09/20 | 2020/09/19 |
| EMI Test Receiver | R&S | ESPI3 | 101841-cd | 2019/09/20 | 2020/09/19 |
| EMI Test Receiver | R&S | ESCI7 | 101102 | 2019/09/20 | 2020/09/19 |
| Spectrum Analyzer | Agilent | N9020A | MY48010425 | 2019/09/20 | 2020/09/19 |
| Spectrum Analyzer | R&S | FSV40 | 100019 | 2019/09/20 | 2020/09/19 |
| Vector Signal generator | Agilent | N5181A | MY49060502 | 2019/09/20 | 2020/09/19 |
| Signal generator | Agilent | E4421B | 3610AO1069 | 2019/09/20 | 2020/09/19 |
| Climate Chamber | ESPEC | EL-10KA | A20120523 | 2019/09/20 | 2020/09/19 |
| Controller | EM Electronics | Controller EM 1000 | N/A | N/A | N/A |
| Horn Antenna | Schwarzbeck | BBHA 9120D | 01622 | 2019/09/23 | 2020/09/22 |
| Active Loop Antenna | Beijing Da Ze Technology Co.,Ltd. | ZN30900C | 15006 | 2019/10/12 | 2020/10/11 |
| Bilog Antenna | Schwarzbeck | VULB9163 | 000976 | 2019/05/26 | 2020/05/25 |
| Broadband Horn Antenna | SCHWARZBECK | BBHA 9170 | 791 | 2019/09/20 | 2020/09/19 |
| Amplifier | Schwarzbeck | BBV 9743 | #202 | 2019/09/20 | 2020/09/19 |
| Amplifier | Schwarzbeck | BBV9179 | 9719-025 | 2019/09/20 | 2020/09/19 |
| Amplifier | EMCI | EMC051845B | 980355 | 2019/09/20 | 2020/09/19 |
| Temperature/Humidity Meter | Gangxing | CTH-608 | 02 | 2019/09/20 | 2020/09/19 |
| High-Pass Filter | K&L | 9SH10-2700/X12750-O/O | KL142031 | 2019/09/20 | 2020/09/19 |
| High-Pass Filter | K&L | 41H10-1375/U12750-O/O | KL142032 | 2019/09/20 | 2020/09/19 |
| RF Cable(below 1GHz) | HUBER+SUHNER | RG214 | RE01 | 2019/09/20 | 2020/09/19 |
| RF Cable(above 1GHz) | HUBER+SUHNER | RG214 | RE02 | 2019/09/20 | 2020/09/19 |
| Data acquisition card | Agilent | U2531A | TW53323507 | 2019/09/20 | 2020/09/19 |
| Power Sensor | Agilent | U2021XA | MY5365004 | 2019/09/20 | 2020/09/19 |
| Test Control Unit | Tonscend | JS0806-1 | 178060067 | 2019/06/20 | 2020/06/19 |
| Automated filter bank | Tonscend | JS0806-F | 19F8060177 | 2019/06/20 | 2020/06/19 |
| EMI Test Software | Tonscend | JS1120-1 | Ver 2.6.8.0518 | / | / |
| EMI Test Software | Tonscend | JS1120-3 | Ver 2.5.77.0418 | / | / |
| EMI Test Software | Tonscend | JS32-CE | Ver 2.5 | / | / |
| EMI Test Software | Tonscend | JS32-RE | Ver 2.5.1.8 | / | / |

Note: The Cal.Interval was one year.

# 4. TEST CONDITIONS AND RESULTS

## 4.1. AC Power Conducted Emission

**TEST CONFIGURATION**




**TEST PROCEDURE**

1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
2 Support equipment, if needed, was placed as per ANSI C63.10-2013.
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013.
4 The EUT received DC 12V power form battery.
5 All support equipments received AC power from a second LISN, if any.
6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8 During the above scans, the emissions were maximized by cable manipulation.

**AC Power Conducted Emission Limit**

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following：

| Frequency range (MHz) | Limit (dBuV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |
| * Decreases with the logarithm of the frequency. | | |

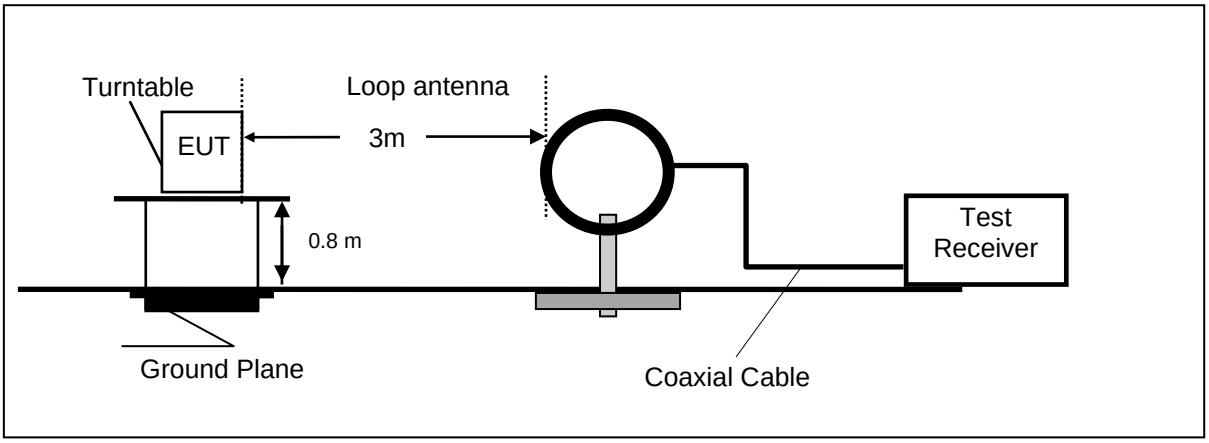
**TEST RESULTS**

Not Applicable.

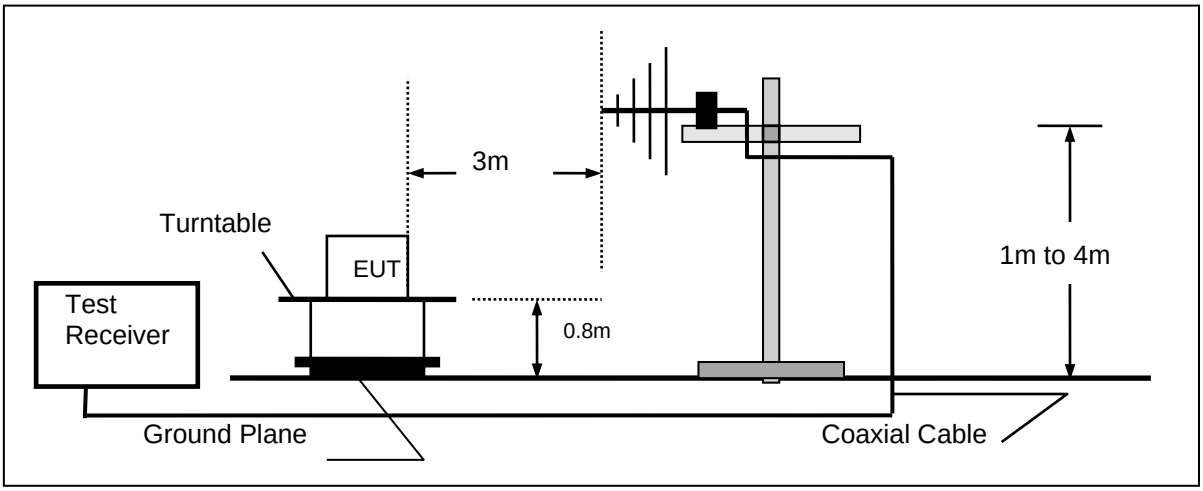
## 4.2. Radiated Emission

**TEST CONFIGURATION**

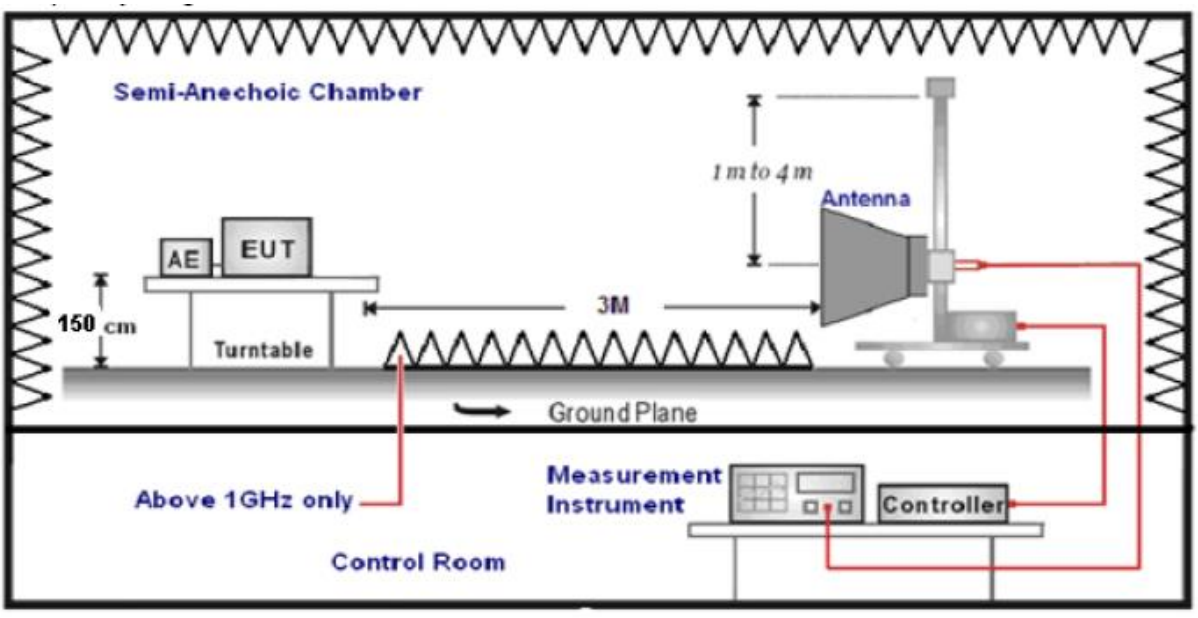
Frequency range 9 KHz – 30MHz




Frequency range 30MHz – 1000MHz




Frequency range above 1GHz-25GHz



## TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz –1GHz;the EUT was placed on a turn table which is 1.5m above ground plane when testing frequency range 1GHz – 25GHz.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. The EUT minimum operation frequency was 32.768KHz and maximum operation frequency was 108MHz.so radiated emission test frequency band from 9KHz to 25GHz.
6. The distance between test antenna and EUT as following table states:

| Test Frequency range | Test Antenna Type | Test Distance |
|---|---|---|
| 9KHz-30MHz | Active Loop Antenna | 3 |
| 30MHz-1GHz | Ultra-Broadband Antenna | 3 |
| 1GHz-18GHz | Double Ridged Horn Antenna | 3 |
| 18GHz-25GHz | Horn Anternna | 1 |

7. Setting test receiver/spectrum as following table states:

| Test Frequency range | Test Receiver/Spectrum Setting | Detector |
|---|---|---|
| 9KHz-150KHz | RBW=200Hz/VBW=3KHz,Sweep time=Auto | QP |
| 150KHz-30MHz | RBW=9KHz/VBW=100KHz,Sweep time=Auto | QP |
| 30MHz-1GHz | RBW=120KHz/VBW=1000KHz,Sweep time=Auto | QP |
| 1GHz-40GHz | Peak Value: RBW=1MHz/VBW=3MHz,<br>Sweep time=Auto<br>Average Value: RBW=1MHz/VBW=10Hz,<br>Sweep time=Auto | Peak |

## Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

**FS = RA + AF + CL - AG**

| | |
|---|---|
| Where FS = Field Strength | CL = Cable Attenuation Factor (Cable Loss) |
| RA = Reading Amplitude | AG = Amplifier Gain |
| AF = Antenna Factor | |

Transd=AF +CL-AG

## RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the100kHz bandwidth within the band that contains the highest level of desired power.
The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

| Frequency (MHz) | Distance (Meters) | Radiated (dBμV/m) | Radiated (μV/m) |
|---|---|---|---|
| 0.009-0.49 | 3 | 20log(2400/F(KHz))+40log(300/3) | 2400/F(KHz) |
| 0.49-1.705 | 3 | 20log(24000/F(KHz))+ 40log(30/3) | 24000/F(KHz) |
| 1.705-30 | 3 | 20log(30)+ 40log(30/3) | 30 |
| 30-88 | 3 | 40.0 | 100 |
| 88-216 | 3 | 43.5 | 150 |
| 216-960 | 3 | 46.0 | 200 |
| Above 960 | 3 | 54.0 | 500 |

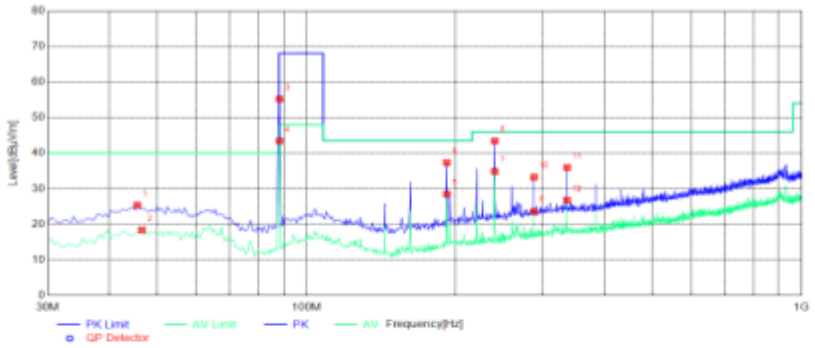
## TEST RESULTS

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

**For 30MHz-1GHz**

Horizontal(TX-88.1MHz)

**Test Graph**




Suspected List

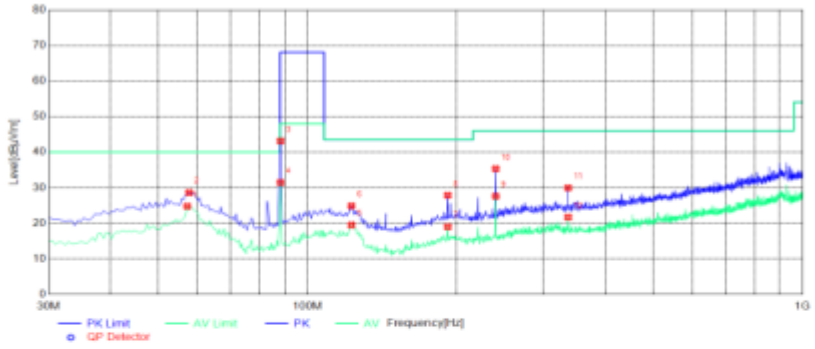
| NO. | Frequency [MHz] | Reading [dBµV/m] | Factor [dB] | Result [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Detector | Polarity | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 45.5200 | 31.81 | -6.44 | 25.37 | 40.00 | 14.63 | 100 | 243 | PK | Horizonta | PASS |
| 2 | 46.4900 | 24.85 | -6.45 | 18.40 | 40.00 | 21.60 | 100 | 97 | AV | Horizonta | PASS |
| 3 | 88.2000 | 66.18 | -10.97 | 55.21 | 68.00 | 12.79 | 100 | 358 | PK | Horizonta | PASS |
| 4 | 88.2000 | 54.38 | -10.97 | 43.41 | 48.00 | 4.59 | 100 | 356 | AV | Horizonta | PASS |
| 5 | 191.9900 | 38.57 | -10.08 | 28.49 | 43.50 | 15.01 | 100 | 60 | AV | Horizonta | PASS |
| 6 | 191.9900 | 47.39 | -10.08 | 37.31 | 43.50 | 6.19 | 100 | 60 | PK | Horizonta | PASS |
| 7 | 240.0050 | 43.47 | -8.62 | 34.85 | 46.00 | 11.15 | 100 | 13 | AV | Horizonta | PASS |
| 8 | 240.0050 | 52.02 | -8.62 | 43.40 | 46.00 | 2.60 | 100 | 34 | PK | Horizonta | PASS |
| 9 | 288.0200 | 31.24 | -7.62 | 23.62 | 46.00 | 22.38 | 100 | 340 | AV | Horizonta | PASS |
| 10 | 288.0200 | 40.88 | -7.62 | 33.26 | 46.00 | 12.74 | 100 | 18 | PK | Horizonta | PASS |
| 11 | 336.0350 | 42.30 | -6.33 | 35.97 | 46.00 | 10.03 | 100 | 8 | PK | Horizonta | PASS |
| 12 | 336.0350 | 33.09 | -6.33 | 26.76 | 46.00 | 19.24 | 100 | 8 | AV | Horizonta | PASS |

Note:1. Result (dBµV/m) = Reading(dBµV/m) + Factor (dB) .

2. Factor (dB) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB).

Vertical (TX-88.1MHz)

**Test Graph**




Suspected List

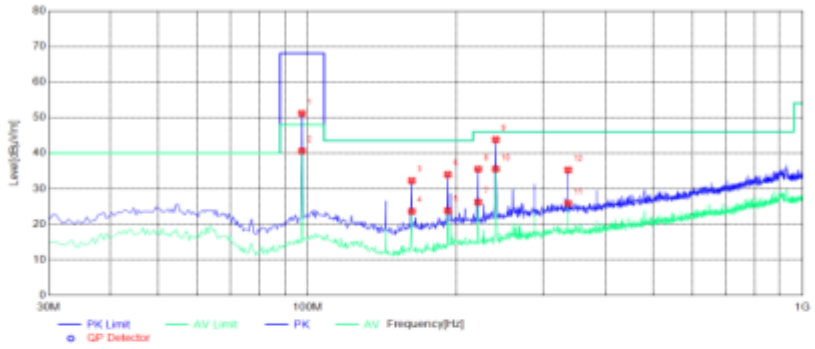
| NO. | Frequency [MHz] | Reading [dBµV/m] | Factor [dB] | Result [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Detector | Polarity | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 57.1600 | 31.83 | -7.05 | 24.78 | 40.00 | 15.22 | 100 | 272 | AV | Vertical | PASS |
| 2 | 57.6450 | 36.19 | -7.58 | 28.61 | 40.00 | 11.39 | 100 | 294 | PK | Vertical | PASS |
| 3 | 88.2000 | 54.08 | -10.97 | 43.11 | 68.00 | 24.89 | 100 | 82 | PK | Vertical | PASS |
| 4 | 88.2000 | 42.42 | -10.97 | 31.45 | 48.00 | 16.55 | 100 | 80 | AV | Vertical | PASS |
| 5 | 122.6350 | 30.45 | -10.92 | 19.53 | 43.50 | 23.97 | 100 | 94 | AV | Vertical | PASS |
| 6 | 122.6350 | 35.79 | -10.92 | 24.87 | 43.50 | 18.63 | 100 | 75 | PK | Vertical | PASS |
| 7 | 191.9900 | 29.09 | -10.08 | 19.01 | 43.50 | 24.49 | 100 | 195 | AV | Vertical | PASS |
| 8 | 191.9900 | 37.95 | -10.08 | 27.87 | 43.50 | 15.63 | 100 | 195 | PK | Vertical | PASS |
| 9 | 240.0050 | 36.22 | -8.62 | 27.60 | 46.00 | 18.40 | 100 | 85 | AV | Vertical | PASS |
| 10 | 240.0050 | 43.94 | -8.62 | 35.32 | 46.00 | 10.68 | 100 | 85 | PK | Vertical | PASS |
| 11 | 336.0350 | 36.27 | -6.33 | 29.94 | 46.00 | 16.06 | 100 | 251 | PK | Vertical | PASS |
| 12 | 336.0350 | 28.04 | -6.33 | 21.71 | 46.00 | 24.29 | 100 | 251 | AV | Vertical | PASS |

Note:1. Result (dBµV/m) = Reading(dBµV/m) + Factor (dB) .

2. Factor (dB) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB).

## Horizontal (TX-98.0MHz)

**Test Graph**




**Suspected List**

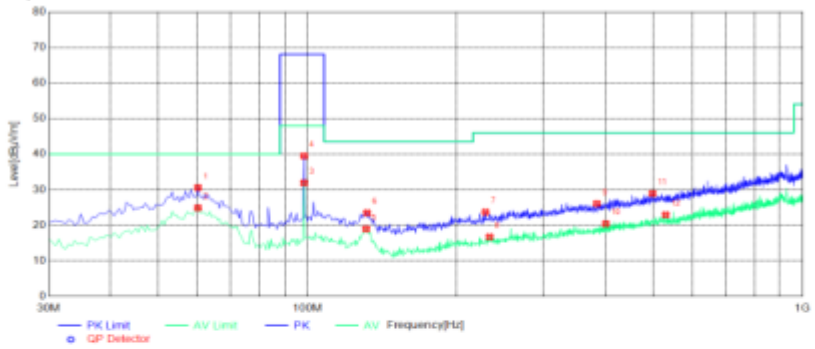
| NO. | Frequency [MHz] | Reading [dBµV/m] | Factor [dB] | Result [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Detector | Polarity | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 97.4150 | 60.01 | -8.85 | 51.16 | 68.00 | 16.84 | 100 | 25 | PK | Horizonta | PASS |
| 2 | 97.4150 | 49.45 | -8.85 | 40.60 | 48.00 | 7.40 | 100 | 25 | AV | Horizonta | PASS |
| 3 | 162.4050 | 43.74 | -11.51 | 32.23 | 43.50 | 11.27 | 100 | 51 | PK | Horizonta | PASS |
| 4 | 162.4050 | 35.14 | -11.51 | 23.63 | 43.50 | 19.87 | 100 | 41 | AV | Horizonta | PASS |
| 5 | 191.9900 | 33.88 | -10.08 | 23.80 | 43.50 | 19.70 | 100 | 85 | AV | Horizonta | PASS |
| 6 | 191.9900 | 44.06 | -10.08 | 33.98 | 43.50 | 9.52 | 100 | 196 | PK | Horizonta | PASS |
| 7 | 221.0900 | 35.45 | -9.23 | 26.22 | 46.00 | 19.78 | 100 | 54 | AV | Horizonta | PASS |
| 8 | 221.0900 | 44.71 | -9.23 | 35.48 | 46.00 | 10.52 | 100 | 54 | PK | Horizonta | PASS |
| 9 | 240.0050 | 52.40 | -8.62 | 43.78 | 46.00 | 2.22 | 100 | 354 | PK | Horizonta | PASS |
| 10 | 240.0050 | 44.15 | -8.62 | 35.53 | 46.00 | 10.47 | 100 | 354 | AV | Horizonta | PASS |
| 11 | 336.0350 | 32.20 | -6.33 | 25.87 | 46.00 | 20.13 | 100 | 186 | AV | Horizonta | PASS |
| 12 | 336.0350 | 41.58 | -6.33 | 35.25 | 46.00 | 10.75 | 100 | 20 | PK | Horizonta | PASS |

Note:1. Result (dBµV/m) = Reading(dBµV/m) + Factor (dB) .

2. Factor (dB) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB).

## Vertical (TX-98.0MHz)

**Test Graph**




**Suspected List**

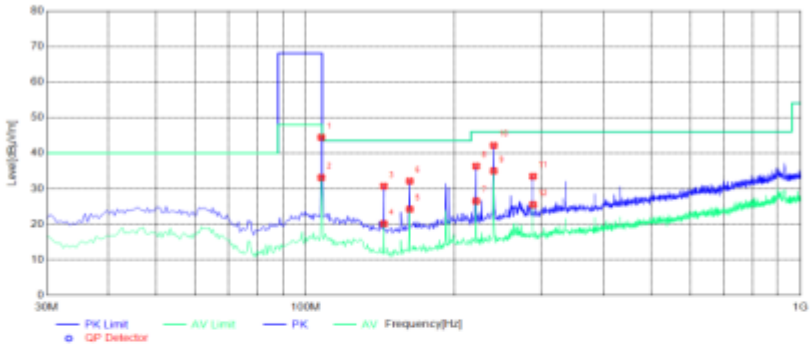
| NO. | Frequency [MHz] | Reading [dBµV/m] | Factor [dB] | Result [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Detector | Polarity | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 60.0700 | 39.21 | -8.66 | 30.55 | 40.00 | 9.45 | 100 | 250 | PK | Vertical | PASS |
| 2 | 60.0700 | 33.55 | -8.66 | 24.89 | 40.00 | 15.11 | 100 | 250 | AV | Vertical | PASS |
| 3 | 98.3850 | 40.50 | -8.60 | 31.90 | 48.00 | 16.10 | 100 | 222 | AV | Vertical | PASS |
| 4 | 98.3850 | 48.07 | -8.60 | 39.47 | 68.00 | 28.53 | 100 | 224 | PK | Vertical | PASS |
| 5 | 131.3650 | 31.43 | -12.47 | 18.96 | 43.50 | 24.54 | 100 | 89 | AV | Vertical | PASS |
| 6 | 131.8500 | 35.97 | -12.47 | 23.50 | 43.50 | 20.00 | 100 | 94 | PK | Vertical | PASS |
| 7 | 228.8500 | 32.67 | -8.98 | 23.69 | 46.00 | 22.31 | 100 | 306 | PK | Vertical | PASS |
| 8 | 233.2150 | 25.48 | -8.75 | 16.73 | 46.00 | 29.27 | 100 | 63 | AV | Vertical | PASS |
| 9 | 384.0500 | 31.88 | -5.81 | 26.07 | 46.00 | 19.93 | 100 | 27 | PK | Vertical | PASS |
| 10 | 400.5400 | 25.71 | -5.30 | 20.41 | 46.00 | 25.59 | 100 | 45 | AV | Vertical | PASS |
| 11 | 497.5400 | 32.51 | -3.60 | 28.91 | 46.00 | 17.09 | 100 | 17 | PK | Vertical | PASS |
| 12 | 529.0650 | 26.12 | -3.19 | 22.93 | 46.00 | 23.07 | 100 | 84 | AV | Vertical | PASS |

Note:1. Result (dBµV/m) = Reading(dBµV/m) + Factor (dB) .

2. Factor (dB) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB).

## Horizontal (TX-107.9MHz)

**Test Graph**




**Suspected List**

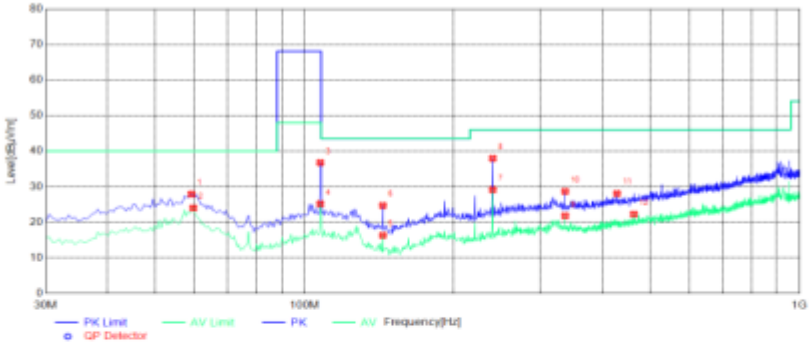
| NO. | Frequency [MHz] | Reading [dBµV/m] | Factor [dB] | Result [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Detector | Polarity | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 107.6000 | 52.80 | -8.37 | 44.43 | 68.00 | 23.57 | 100 | 358 | PK | Horizonta | PASS |
| 2 | 107.6000 | 41.49 | -8.37 | 33.12 | 48.00 | 14.88 | 100 | 358 | AV | Horizonta | PASS |
| 3 | 143.9750 | 43.26 | -12.57 | 30.69 | 43.50 | 12.81 | 100 | 77 | PK | Horizonta | PASS |
| 4 | 143.9750 | 32.74 | -12.57 | 20.17 | 43.50 | 23.33 | 100 | 77 | AV | Horizonta | PASS |
| 5 | 162.4050 | 35.75 | -11.51 | 24.24 | 43.50 | 19.26 | 100 | 50 | AV | Horizonta | PASS |
| 6 | 162.4050 | 43.64 | -11.51 | 32.13 | 43.50 | 11.37 | 100 | 50 | PK | Horizonta | PASS |
| 7 | 221.0900 | 35.74 | -9.23 | 26.51 | 46.00 | 19.49 | 100 | 56 | AV | Horizonta | PASS |
| 8 | 221.0900 | 45.56 | -9.23 | 36.33 | 46.00 | 9.67 | 100 | 56 | PK | Horizonta | PASS |
| 9 | 240.0050 | 43.62 | -8.62 | 35.00 | 46.00 | 11.00 | 100 | 74 | AV | Horizonta | PASS |
| 10 | 240.0050 | 50.75 | -8.62 | 42.13 | 46.00 | 3.87 | 100 | 71 | PK | Horizonta | PASS |
| 11 | 288.0200 | 41.08 | -7.62 | 33.46 | 46.00 | 12.54 | 100 | 35 | PK | Horizonta | PASS |
| 12 | 288.0200 | 33.11 | -7.62 | 25.49 | 46.00 | 20.51 | 100 | 24 | AV | Horizonta | PASS |

Note:1. Result (dBµV/m) = Reading(dBµV/m) + Factor (dB) .

2. Factor (dB) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB).

## Vertical (TX-107.9MHz)

**Test Graph**




**Suspected List**

| NO. | Frequency [MHz] | Reading [dBµV/m] | Factor [dB] | Result [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Detector | Polarity | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 59.1000 | 36.03 | -8.12 | 27.91 | 40.00 | 12.09 | 100 | 313 | PK | Vertical | PASS |
| 2 | 59.5850 | 32.42 | -8.41 | 24.01 | 40.00 | 15.99 | 100 | 293 | AV | Vertical | PASS |
| 3 | 107.6000 | 45.13 | -8.37 | 36.76 | 68.00 | 31.24 | 100 | 152 | PK | Vertical | PASS |
| 4 | 107.6000 | 33.57 | -8.37 | 25.20 | 48.00 | 22.80 | 100 | 152 | AV | Vertical | PASS |
| 5 | 143.9750 | 28.90 | -12.57 | 16.33 | 43.50 | 27.17 | 100 | 110 | AV | Vertical | PASS |
| 6 | 143.9750 | 37.27 | -12.57 | 24.70 | 43.50 | 18.80 | 100 | 100 | PK | Vertical | PASS |
| 7 | 240.0050 | 37.79 | -8.62 | 29.17 | 46.00 | 16.83 | 100 | 31 | AV | Vertical | PASS |
| 8 | 240.0050 | 46.57 | -8.62 | 37.95 | 46.00 | 8.05 | 100 | 80 | PK | Vertical | PASS |
| 9 | 336.0350 | 28.15 | -6.33 | 21.82 | 46.00 | 24.18 | 100 | 260 | AV | Vertical | PASS |
| 10 | 336.0350 | 35.00 | -6.33 | 28.67 | 46.00 | 17.33 | 100 | 140 | PK | Vertical | PASS |
| 11 | 427.7000 | 32.77 | -4.69 | 28.08 | 46.00 | 17.92 | 100 | 62 | PK | Vertical | PASS |
| 12 | 462.6200 | 26.60 | -4.33 | 22.27 | 46.00 | 23.73 | 100 | 77 | AV | Vertical | PASS |

Note:1. Result (dBµV/m) = Reading(dBµV/m) + Factor (dB) .

2. Factor (dB) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB).

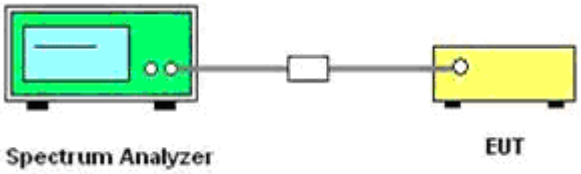
Note: The result below 30MHz and above 1GHz is too low so there is no record. The test setup show in the test setup photograph is the worst case.

## 4.3. 99% Bandwidth

**Limit**

According to §15.239 (a) Emissions from the intentional radiator shall be confined within a band 200 kHz wide centered on the operating frequency. The 200 kHz band shall lie wholly within the frequency range of 88-108MHz.

**Block Diagram of Test Setup**




**Test Procedure**

1) The transmitter shall be operated at its maximum carrier power measured under normal test conditions

2) The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

3) The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

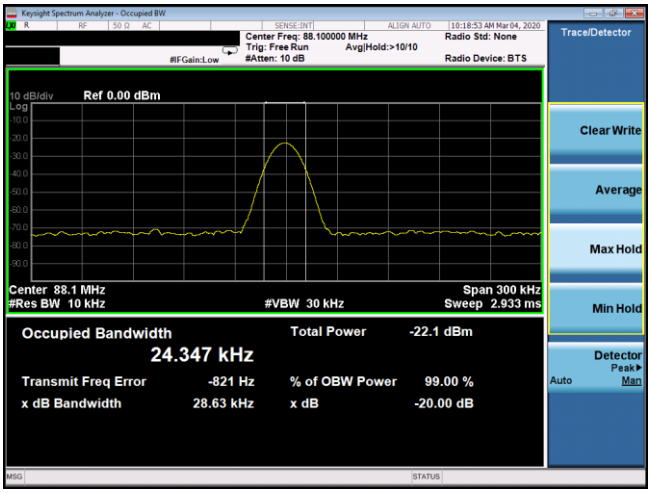
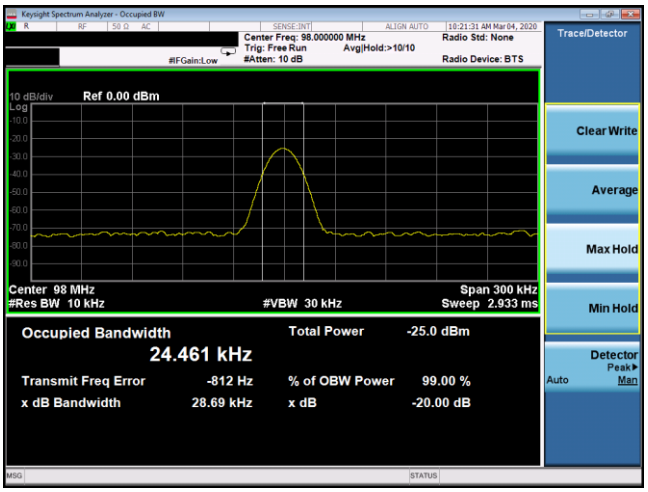
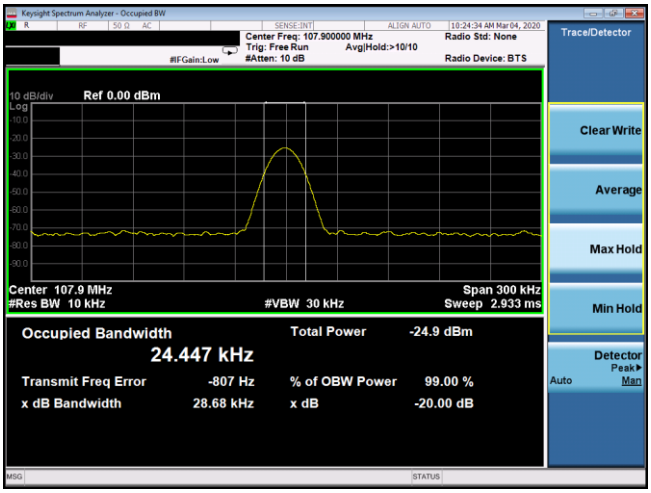
4) Detector function = peak.

5) Trace = max hold.

**Test Results**

| Frequency (MHz) | 20dB Bandwidth (KHz) | 99% Bandwidth (KHz) | Limit (KHz) | Conclusion |
|---|---|---|---|---|
| 88.1 | 28.63 | 24.35 | 200.00 | PASS |
| 98.0 | 28.69 | 24.46 | 200.00 | PASS |
| 107.9 | 28.68 | 24.45 | 200.00 | PASS |

Remark:
1. Test results including cable loss;
2. Please refer to the following page.

| 99% and 20dB Bandwidth | |
|---|---|
|  |  |
| Low Channel / 88.1 MHz | Middle Channel / 89.0 MHz |
|  | |
| High Channel / 107.9 MHz | |

## 4.4. Antenna Requirement

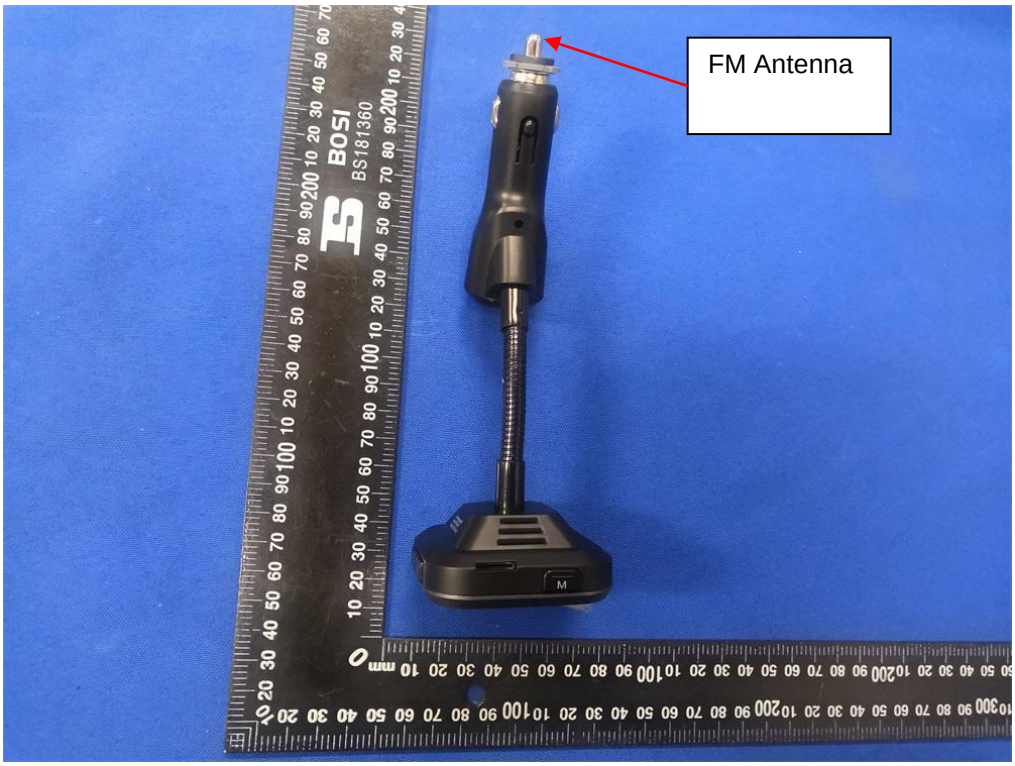
**Standard Applicable**

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

**Test Result**

The antenna used for this product is External Antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 0.0dBi.



# 5. TEST SETUP PHOTOS OF THE EUT

Reference to the test report No. **GTS20200221009-1-9**

# 6. EXTERNAL AND INTERNAL PHOTOS OF THE EUT

Reference to the test report No. **GTS20200221009-1-9**

**.....End of Report.....**