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# TEST REPORT

| | | |
|---|---|---|
| **Report Reference No. ..... :** | **TRE18110197** | R/C…….: 68830 |
| **IC ..... :** | **906A-MRHH150** | |
| **Applicant's name ..... :** | **Cobra Electronics Corporation** | |
| Address.....: | 6500 West Cortland Street Chicago, IL 60707, USA | |
| Manufacturer.....: | Cobra Electronics Corporation | |
| Address.....: | 6500 West Cortland Street Chicago, IL 60707, USA | |
| **Test item description ..... :** | **VHF Marine Radio** | |
| Trade Mark .....: | Cobra | |
| Model/Type reference.....: | MRHH150FLT | |
| Listed Model(s) .....: | - | |
| **Standard ..... :** | **RSS-182/RSS-Gen Issue 5** | |
| Date of receipt of test sample……: | Nov. 26, 2018 | |
| Date of testing……..: | Nov. 26, 2018- Dec.09, 2018 | |
| Date of issue……: | Dec.10, 2018 | |
| **Result ……..:** | **PASS** | |

| | | |
|---|---|---|
| Compiled by ( position+printedname+signature)...: | File administrators Fanghui Zhu | Fanghui Zhu |
| Supervised by (position+printedname+signature)....: | Project Engineer Jerry Wang | Jerry Wang |
| Approved by (position+printedname+signature)....: | RF Manager Hans Hu | Hans Hu |

| | |
|---|---|
| **Testing Laboratory Name ..... :** | **Shenzhen Huatongwei International Inspection Co., Ltd** |
| Address.....: | 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China |

# Contents

# 1. TEST STANDARDS AND TEST DESCRIPTION

## 1.1. Test Standards

The tests were performed according to following standards:
RSS-182 Issue 5 January 2012: Maritime Radio Transmitters and Receivers in the Band 156-162.5 MHz
RSS-Gen Issue 5, April 2018: General Requirements for compliance of Radio Apparatus
TIA/EIA 603 D:June 2010 Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

## 1.2. Report version

| Revised No. | Date of issue | Description |
|---|---|---|
| N/A | 2018-12-10 | Original |
| | | |
| | | |
| | | |
| | | |

# 2. Test Description

| Transmitter Requirement | | | |
|---|---|---|---|
| Test item | Standards requirement | Result | Test Engineer |
| Frequency Plan and Channel Spacing | RSS-182 § 7.1 | PASS | Gaosheng Pan |
| Required Operating Frequencies | RSS-182 § 7.2 | PASS | Gaosheng Pan |
| Types of Modulation and Equipment Characteristics | RSS-182 § 7.3 | PASS | Gaosheng Pan |
| Frequency Stability Test V.S. Temperature<br>Frequency Stability Test V.S. Voltage | RSS-182 § 7.4 | PASS | Gaosheng Pan |
| Transmitter Output Powers | RSS-182 § 7.5 | PASS | Gaosheng Pan |
| Transport Canada Specifications | RSS-182 § 7.6 | PASS | Gaosheng Pan |
| VHF AIS Transponders | RSS-182 § 7.7 | PASS | Gaosheng Pan |
| FM Modulation Limiting and Audio Low-Pass Filter for Coast Station Equipment (Voice Modulation) | RSS-182 § 7.8 | PASS | Gaosheng Pan |
| Transmitter Radiated Spurious Emssion | RSS-182 § 7.9 | PASS | Gaosheng Pan |
| Spurious Emssion On Antenna Port | RSS-182 § 7.9 | PASS | Gaosheng Pan |
| Emission Mask | RSS-182 § 7.9 | PASS | Shower Dai |
| **Receiver Requirement** | | | |
| Test item | Standards requirement | Result | Test Engineer |
| Radiated Emssion | RSS-Gen | PASS | Shower Dai |
| Conducted Emission | RSS-Gen | N/A | N/A |

Note:
N/A means not applicable

# 3. SUMMARY

## 3.1. Client Information

| | |
|---|---|
| Applicant: | Cobra Electronics Corporation |
| Address: | 6500 West Cortland Street Chicago, IL 60707, USA |
| Manufacturer: | Cobra Electronics Corporation |
| Address: | 6500 West Cortland Street Chicago, IL 60707, USA |

## 3.2. Product Description

| | | |
|---|---|---|
| Name of EUT: | VHF Marine Radio | |
| Trade mark: | Cobra | |
| Mode No.: | MRHH150FLT | |
| Listed Model(s): | - | |
| Power supply: | DC 6.0V | |
| Hardware Version: | V1.2 | |
| Software Version: | V0.28 | |
| Radio Specification | | |
| Operation Frequency Range: | TX: 156.025MHz to 157.425MHz | |
| | RX: 156.05MHz to 162MHz | |
| Rated Output Power: | ☒ High Power: 3W (43.98dBm) ☒ Low Power 0.5W (30.00dBm) | |
| Modulation Type: | Analog Voice: | FM |
| Channel Separation: | Analog Voice: | ☐ 12.5kHz ☒ 25kHz |
| Emission Designator: | Analog Voice: | ☐12.5kHz Channel Separation:<br>☒25kHz Channel Separation: 16K0G3E |
| Antenna Type: | External | |

## 3.3. Test frequency list

| Mode | Modulation | Operation Frequency Range | Test Frequency (MHz) | |
|---|---|---|---|---|
| Analog | PM | Tx: 156.025MHz to 157.425MHz<br>Rx: 156.05MHz to 162MHz | $CH_L$ | Tx: 156.025(CH60)<br>Rx: 160.625(CH60) |
| | | | $CH_{M2}$ | Tx: 156.8(CH16)<br>Rx: 156.8(CH16) |
| | | | $CH_H$ | Tx: 157.425(CH88)<br>Rx: 157.425(CH88) |

Note:

In section RSS-Gen Table1, regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, please see the above listed frequency for testing.

Tx means transmitting mode, Rx means receiving mode.

## 3.4. EUT operation mode

| Test mode | Transmitting | Receiving | Power level | | Analog Voice/FM |
|---|---|---|---|---|---|
| | | | High | Low | 25kHz |
| TX-AWH- | √ | | √ | | √ |
| TX-AWL | √ | | | √ | √ |
| RX-AW | | √ | | | √ |

√ : is operation mode.

| Modulation Type | Description |
|---|---|
| UM | Un-modulation |
| AM2 | Apply a 1000 Hz tone and adjust the audio frequency generator to produce 20% of the rated system deviation. |
| AM6 | Apply a 1000 Hz modulating signal to the transmitter from the audio frequency generator, and adjust the level to obtain 60% of full rated system deviation, then increase the level from the audio generator by 20 dB |
| AM5 | Modulate the transmitter with a 2500 Hz sine wave at an input level 16 dB greater than that necessary to produce 50% of rated system deviation. |
| DM | A 511 bit binary pseudo-random bit sequence based on ITU-T Rec. O.153 |

Pre-scan above all test mode, found below test mode which it was worse case mode, so only show the test data for worse case mode on the test report.

| Test item | Modulation Type | Test mode (Worse case mode) |
|---|---|---|
| Conducted Output Power | UM | TX-AWH, TX-AWL |
| 99% Occupied Bandwidth & 26dB bandwidth | AM6 | TX-AWH, TX-AWL |
| Emission Mask | AM5 | TX-AWH, TX-AWL |
| Modulation Limit | AM6 | TX-AWH |
| Audio Frequency Response | AM2 | TX-AWH |
| Audio Frequency Response | AM2 | TX-AWH |
| Frequency Stability VS Temperature | UM | TX-AWH, TX-AWL |
| Frequency Stability VS Voltage | UM | TX-AWH, TX-AWL |
| Transmit Conducted Spurious Emission | AM5 | TX-AWH |
| Transmit Radiated Spurious Emission | AM5 | TX-AWH |
| AC Power Line Conducted Emission | - | RX-GPS |
| Radiated Emission | - | RX-GPS |

## 3.5. EUT configuration

**The following peripheral devices and interface cables were connected during the measurement:**

● - supplied by the manufacturer
○ - supplied by the lab

| | | | |
|---|---|---|---|
| ● | DC Power Cable | Length (m) : | / |
| | | Shield : | Unshielded |
| | | Detachable : | Undetachable |
| ○ | Multimeter | Manufacturer : | / |
| | | Model No. : | / |

# 4. TEST ENVIRONMENT

## 4.1. Address of the test laboratory

Laboratory: Shenzhen Huatongwei International Inspection Co., Ltd.
Address: 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China
Phone: 86-755-26748019 Fax: 86-755-26748089

## 4.2. Test Facility

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

**CNAS-Lab Code: L1225**

Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

**A2LA-Lab Cert. No. 3902.01**

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

**FCC-Registration No.: 762235**

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 762235.

**IC-Registration No.: 5377B-1**

Two 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered byCertification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377B-1.

**ACA**

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

## 4.3. Environmental conditions

| Normal Conditon | |
|---|---|
| Relative humidity: | 25 % to 75 %. |
| Air Pressure: | 86~106kPa |
| Ambient temperature : | 15℃～35℃ |

## 4.4. 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 Huatongwei International Inspection 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 Huatongwei laboratory is reported:

| Test Items | Measurement Uncertainty | Notes |
|---|---|---|
| Frequency stability & Occupied Bandwidth | 18Hz for <1GHz<br>69Hz for >1GHz | (1) |
| Conducted Output Power | 0.63dB | (1) |
| ERP / EIRP / RSE | 2.38dB for <1GHz<br>3.45dB for >1GHz | (1) |
| Conducted Emission 9KHz-30MHz | 3.35 dB | (1) |
| Radiated Emission 30~1000MHz | 4.80 dB | (1) |
| Radiated Emission 1~18GHz | 5.16 dB | (1) |
| Radiated Emission 18-40GHz | 5.54 dB | (1) |
| FM deviation | 25 Hz | (1) |
| Audio level | 0.62 dB | (1) |
| Low Pass Filter Response | 0.76 dB | (1) |
| Modulation Limiting | 0.42 % | (1) |
| Transient Frequency Behavior | 6.8 % | (1) |

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

## 4.5. Equipments Used during the Test

| ● Conducted Emission | | | | | | |
|---|---|---|---|---|---|---|
| Used | Test Equipment | Manufacturer | Model No. | Serial No. | Last Cal. Date (YY-MM-DD) | Next Cal. Date (YY-MM-DD) |
| ● | Shielded Room | Albatross projects | N/A | N/A | 2018/09/28 | 2023/09/27 |
| ● | EMI Test Receiver | R&S | ESCI | 101247 | 2018/10/27 | 2019/10/26 |
| ● | Artificial Mains | SCHWARZBECK | NNLK 8121 | 573 | 2018/10/27 | 2019/10/26 |
| ● | Pulse Limiter | R&S | ESH3-Z2 | 100499 | 2018/10/27 | 2019/10/26 |
| ● | RF Connection Cable | HUBER+SUHNER | EF400 | N/A | 2018/11/15 | 2019/11/14 |
| ● | Test Software | R&S | ES-K1 | N/A | N/A | N/A |
| ○ | Single Balanced Telecom Pair ISN | FCC | FCC-TLISN-T2-02 | 20371 | 2018/10/28 | 2019/10/27 |
| ○ | Two Balanced Telecom Pairs ISN | FCC | FCC-TLISN-T4-02 | 20373 | 2018/10/28 | 2019/10/27 |
| ○ | Four Balanced Telecom Pairs ISN | FCC | FCC-TLISN-T8-02 | 20375 | 2018/10/28 | 2019/10/27 |
| ○ | V-Network | R&S | ESH3-Z6 | 100211 | 2018/10/27 | 2019/10/26 |
| ○ | V-Network | R&S | ESH3-Z6 | 100210 | 2018/10/27 | 2019/10/26 |
| ○ | 2-Line V-Network | R&S | ESH3-Z5 | 100049 | 2018/10/27 | 2019/10/26 |

| ● Radiated Emission-6th test site | | | | | | |
|---|---|---|---|---|---|---|
| Used | Test Equipment | Manufacturer | Model No. | Serial No. | Last Cal. Date (YY-MM-DD) | Next Cal. Date (YY-MM-DD) |
| ● | Semi-Anechoic Chamber | Albatross projects | SAC-3m-02 | N/A | 2018/09/30 | 2021/09/29 |
| ● | EMI Test Receiver | R&S | ESCI | 100900 | 2018/10/28 | 2019/10/27 |
| ○ | Loop Antenna | R&S | HFH2-Z2 | 100020 | 2017/11/20 | 2020/11/19 |
| ● | Ultra-Broadband Antenna | SCHWARZBECK | VULB9163 | 546 | 2017/04/05 | 2020/04/04 |
| ● | Pre-Amplifer | SCHWARZBECK | BBV 9742 | N/A | 2018/11/15 | 2019/11/14 |
| ● | RF Connection Cable | HUBER+SUHNER | N/A | N/A | 2018/09/28 | 2019/09/27 |
| ● | RF Connection Cable | HUBER+SUHNER | SUCOFLEX104 | 501184/4 | 2018/09/28 | 2019/09/27 |
| ● | Test Software | R&S | ES-K1 | N/A | N/A | N/A |
| ● | Turntable | Maturo Germany | TT2.0-1T | N/A | N/A | N/A |
| ● | Antenna Mast | Maturo Germany | CAM-4.0-P-12 | N/A | N/A | N/A |

| ● TS8613 Test system | | | | | | |
|---|---|---|---|---|---|---|
| Used | Test Equipment | Manufacturer | Model No. | Serial No. | Last Cal. Date (YY-MM-DD) | Next Cal. Date (YY-MM-DD) |
| ● | Spectrum Analyzer | Agilent | N9020A | MY50510187 | 2018/09/29 | 2019/09/28 |
| ● | Signal & Spectrum Analyzer | R&S | FSW26 | 103440 | 2018/10/28 | 2019/10/27 |
| ● | RF Communication Test Set | HP | 8920A | 3813A10206 | 2018/10/28 | 2019/10/27 |
| ● | Digital intercom communication tester | Aeroflex | 3920B | 1001682041 | 2018/10/28 | 2019/10/27 |
| ● | Signal Generator | R&S | SML02 | 100507 | 2018/10/27 | 2019/10/26 |
| ● | Signal Generator | IFR | 2032 | 203002\100 | 2018/11/11 | 2019/11/10 |
| ● | RF Control Unit | Tonscend | JS0806-2 | N/A | N/A | N/A |
| ● | Fliter-VHF | Microwave | N26460M1 | 498702 | 2018/03/19 | 2019/03/18 |

| | | | | | | |
|---|---|---|---|---|---|---|
| ○ | Fliter-UHF | Microwave | N25155M2 | 498704 | 2018/03/19 | 2019/03/18 |
| ○ | Power Divider | Microwave | OPD1040-N-4 | N/A | 2018/11/15 | 2019/11/14 |
| ○ | Attenuator | JFW | 50FH-030-100 | N/A | 2018/11/15 | 2019/11/14 |
| ○ | Attenuator | JFW | 50-A-MFN-20 | 0322 | 2018/11/15 | 2019/11/14 |
| ● | Test software | HTW | Radio ATE | N/A | N/A | N/A |

| ● | Auxiliary Equipment | | | | | |
|---|---|---|---|---|---|---|
| Used | Test Equipment | Manufacturer | Model No. | Serial No. | Last Cal. Date (YY-MM-DD) | Next Cal. Date (YY-MM-DD) |
| ● | Climate chamber | ESPEC | GPL-2 | N/A | 2018/11/08 | 2019/11/07 |
| ● | DC Power Supply | Gwinstek | SPS-2415 | GER835793 | 2018/10/28 | 2019/10/27 |

| ● | Radiated Spurious Emission | | | | | |
|---|---|---|---|---|---|---|
| Used | Test Equipment | Manufacturer | Model No. | Serial No. | Last Cal. Date (YY-MM-DD) | Next Cal. Date (YY-MM-DD) |
| ● | Semi-Anechoic Chamber | Albatross projects | SAC-3m-01 | N/A | 2018/09/30 | 2021/09/29 |
| ● | Spectrum Analyzer | R&S | FSP40 | 100597 | 2018/10/27 | 2019/10/26 |
| ● | Loop Antenna | R&S | HFH2-Z2 | 100020 | 2017/11/20 | 2020/11/19 |
| ● | Ultra-Broadband Antenna | SCHWARZBECK | VULB9163 | 538 | 2017/04/05 | 2020/04/04 |
| ● | Horn Antenna | SCHWARZBECK | 9120D | 1011 | 2017/04/01 | 2020/03/31 |
| ○ | Horn Antenna | SCHWARZBECK | BBHA9170 | 25841 | 2017/03/27 | 2020/03/26 |
| ○ | Pre-amplifier | BONN | BLWA0160-2M | 1811887 | 2018/11/14 | 2019/11/13 |
| ● | Pre-amplifier | CD | PAP-0102 | 12004 | 2018/11/14 | 2019/11/13 |
| ● | Broadband Preamplifier | SCHWARZBECK | BBV 9718 | 9718-248 | 2018/04/28 | 2019/04/27 |
| ● | RF Connection Cable | HUBER+SUHNER | RE-7-FH | N/A | 2018/11/15 | 2019/11/14 |
| ● | RF Connection Cable | HUBER+SUHNER | RE-7-FL | N/A | 2018/11/15 | 2019/11/14 |
| ● | EMI Test Software | Audix | E3 | N/A | N/A | N/A |
| ● | Turntable | MATURO | TT2.0 | N/A | N/A | N/A |
| ● | Antenna Mast | MATURO | TAM-4.0-P | N/A | N/A | N/A |

| ● | Auxiliary Equipment | | | | | |
|---|---|---|---|---|---|---|
| Used | Test Equipment | Manufacturer | Model No. | Serial No. | Last Cal. Date (YY-MM-DD) | Next Cal. Date (YY-MM-DD) |
| ○ | Radio communication tester | R&S | CMW500 | 137688-Lv | 2018/09/29 | 2019/09/28 |
| ○ | Universal Radio Communication | R&S | CMU200 | 112012 | 2018/10/28 | 2019/10/27 |
| ○ | High pass filter | Wainwright | WHKX3.0/18G-10SS | 38 | 2018/11/14 | 2019/11/13 |
| ○ | Band rejection filter | Microwave | N/A | N/A | 2018/11/14 | 2019/11/13 |

# 5. TEST CONDITIONS AND RESULTS

## 5.1. Frequency Plan and Channel Spacing

According to RSS-182 Section 7.1
The channel spacing for maritime VHF radio communication is 25 kHz. However, equipment with a spacing of 12.5 kHz is permitted provided that the equipment has a mode which can inter-operate with the 25 kHz standard channel spacing and that the equipment complies with all technical requirements of this RSS.
The channel frequency plan for Canadian maritime radiocommunications, based on the 25 kHz channel spacing, is set forth in RBR-2 and the frequency plan for international maritime radiocommunications is set forth in Appendix 18 of the ITU's Radio Regulations.

**Result:** Complies

## 5.2. Required Operating Frequencies

According to RSS-182 Section 7.2
Equipment for radiotelephony used in survival craft stations shall be able to transmit and receive standard IMO class G3E emissions on the 156.8 MHz (channel 16, distress) frequency and at least one other frequency in the band 156- 162.5 MHz.

Equipment for radiotelephony used in ships other than survival craft shall be able to transmit and receive standard IMO class G3E emissions on the 156.8 MHz (channel 16, distress), 156.3 MHz (channel 6, inter-ship safety) and 156.65 MHz (channel 13, bridge-to-bridge) frequencies, as well as on all the frequencies necessary for their service.

VHF radiotelephone equipment designated with a "D" shall be able to transmit and receive standard IMO class G3E/F3E emissions on the 156.8 MHz (channel 16, distress), 156.3 MHz (channel 6, inter-ship safety) and 156.65 MHz (channel 13, bridge-to-bridge) frequencies, as well as on all the frequencies necessary for their service.

DSC equipment shall be able to transmit and receive standard IMO class G2B emissions on the 156.525 MHz (channel 70) frequency.

**Result:** Complies

## 5.3. Transmitter Output Powers

The conducted carrier power output rating for a transmitter is the power available at the output terminals of the transmitter when the output terminals are connected to the standard transmitter load.

**LIMIT**

**RSS-182 Section 7.5**

The output power shall be within ±1.0 dB of the manufacturer's rated power and not exceed the limits listed in Table 3, unless indicated otherwise.
Table 3 lists typical transmitter output powers for equipment certified under this standard.

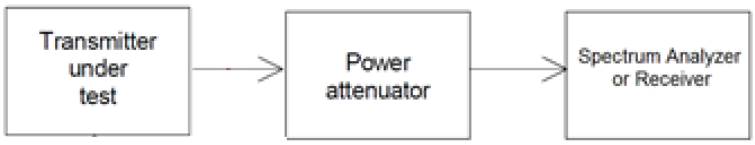
**Table 3 — Transmitter Power**

| Stations | Typical Power |
|---|---|
| Coast stations | 50 W |
| Ship stations | |
| Minimum | 6 W |
| Maximum | 25 W |
| Hand-held portable transmitters | 5 W |
| Survival two-way radiotelephones | Should have a minimum e.i.r.p. of 0.25 watts |

**TEST PROCEDURE**

Measurements shall be made to establish the radio frequency power delivered by the transmitter the standard output termination. The power output shall be monitored and recorded and no adjustment shall be made to the transmitter after the test has begun, except as noted bellow:
If the power output is adjustable, measurements shall be made for the highest and lowest power levels.
Connect the equipment as illustrated.

**TEST CONFIGURATION**




**TEST MODE:**

Please reference to the section 2.4

**TEST RESULTS**

☒ **Passed** ☐ **Not Applicable**

Please refer to appendix A on the section 8 appendix report

## 5.4. Types of Modulation and Equipment Characteristics

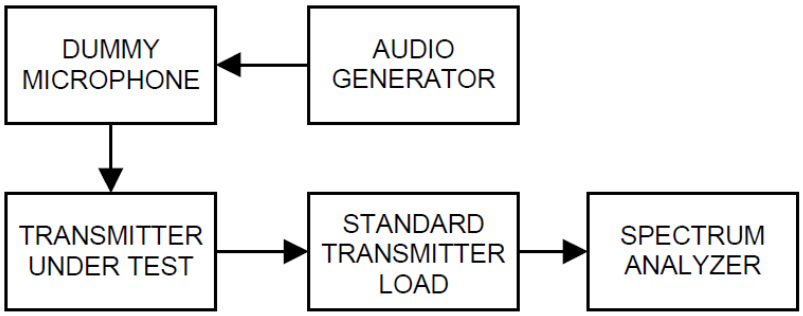
VHF radiocommunication shall employ G3E or F3E modulation for voice communication and G2B for DSC signals.

**LIMIT**

**RSS-182 Section 7.3**

Maritime VHF transceivers shall have the following characteristics:
(a) 25 kHz channel spacing;
(b) frequency modulation with a pre-emphasis of 6 dB/octave (phase modulation (PM)) shall be used;
(c) the frequency deviation corresponding to 100% modulation shall approach ±5 kHz as nearly as practicable and in no event shall the frequency deviation exceed ±5 kHz;
(d) the audio-frequency band shall be 3000 Hz;
(e) the authorized channel bandwidth for voice shall be 16 kHz; and
(f) the authorized channel bandwidth for data shall be 20 kHz.

**TEST CONFIGURATION**




**TEST PROCEDURE**

1 The EUT was modulated by 2.5kHz Sine wave audio signal; the level of the audio signal employed is 16 dB greater than that necessary to produce 50% of rated system deviation. Rated system deviation is 2.5 kHz (12.5kHz channel spacing) and 5 kHz (25 kHz channel spacing).
2 Set EUT as normal operation.
1)Set SPA Center Frequency = fundamental frequency, RBW=100Hz, VBW=300Hz,span=50kHz for 12.5kHz channel spacing.
2)Set SPA Center Frequency = fundamental frequency, RBW=300Hz, VBW=1kHz,span=50kHz for 25kHz channel spacing.
3 Set SPA Max hold. Mark peak, Set 99% Occupied Bandwidth and 26dB Occupied Bandwidth.
4 Set SPA Center Frequency=fundamental frequency, set =100Hz, VBW=300Hz, span=50kHz for 12.5kHz channel spacing.
Set SPA Center Frequency=fundamental frequency, set =300Hz,VBW=1kHz,span=50kHz for 25kHz channel spacing.

**TEST MODE:**

Please reference to the section 2.4

**TEST RESULTS**

☒ **Passed** ☐ **Not Applicable**

Please refer to appendix B on the section 8 appendix report

## 5.5. Emission Mask

Transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section.

**LIMIT**

**RSS-182 Section 7.9.1 and 7.9.2**

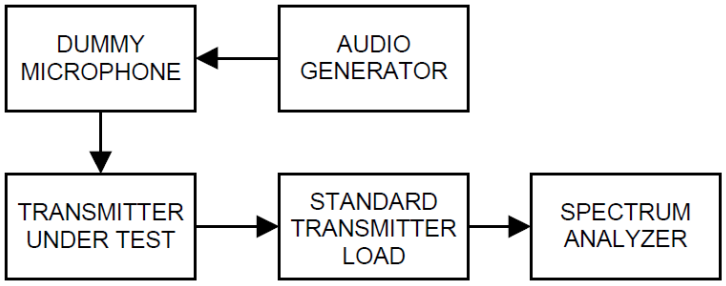
Emission Mask B for Equipment with 25 kHz Channel Spacing
This mask is for FM or PM modulation equipment with 25 kHz channel spacing, an authorized bandwidth of 16 kHz for voice or 20 kHz for data, and equipped with or without an audio low-pass filter. The power of any emission shall be attenuated below the transmitter output power (P, in dBW) as follows:

(a) on any frequency removed from the carrier frequency by more than 50%, but not more than 100% of the authorized bandwidth: at least 25 dB, measured with a bandwidth of 300 Hz;
(b) on any frequency removed from the carrier frequency by more than 100%, but not more than 250% of the authorized bandwidth: at least 35 dB, measured with a bandwidth of 300 Hz; and
(c) on any frequency removed from the carrier frequency by more than 250% of the authorized bandwidth: at least 43 + 10 log10 p(watts) dB, measured with a bandwidth of 30 kHz.

Emission Mask C for equipment with 12.5 kHz Channel Spacing
This mask is for equipment with channel spacing of 12.5 kHz, an authorized bandwidth of 11.25 kHz, equipped with or without an audio low-pass filter. The power of any emission shall be attenuated below the transmitter power (P, in dBW) as follows:

(a) on any frequency removed from the carrier frequency fc up to a displacement frequency of 5.625 kHz: 0 dB, measured with a bandwidth of 100 Hz;
(b) on any frequency removed from the carrier frequency by a displacement frequency (fd in kHz) of more than 5.625 kHz, but no more than 12.5 kHz: at least 7.27 (fd − 2.88 kHz) dB, measured with a bandwidth of 100 Hz; and
(c) on any frequency removed from the carrier frequency by a displacement frequency (fd in kHz) of more than 12.5 kHz: at least 50 + 10 log10 p(watts) dB or 70 dB, whichever is the lesser attenuation, measured with a bandwidth of 100 Hz for a displacement frequency of more than 12.5 kHz, but no more than 50 kHz, and measured with a bandwidth of 10 kHz for a displacement frequency of more than 50 kHz.

**TEST CONFIGURATION**




**TEST PROCEDURE**

1. The EUT was modulated by 2.5kHz Sine wave audio signal; the level of the audio signal employed is 16 dB greater than that necessary to produce 50% of rated system deviation. Rated system deviation is 2.5 kHz (12.5kHz channel spacing) and 5kHz (25 kHz channel spacing).
2. Set EUT as normal operation.
   1)Set SPA Center Frequency = fundamental frequency, RBW=100Hz, VBW=300Hz,span=120kHz for 12.5kHz channel spacing.
   2)Set SPA Center Frequency = fundamental frequency, RBW=300Hz, VBW=1kHz,span=150kHz for 25kHz channel spacing.

**TEST MODE:**

Please reference to the section 2.4

**TEST RESULTS**

☒ **Passed** ☐ **Not Applicable**

Please refer to appendix C on the section 8 appendix report

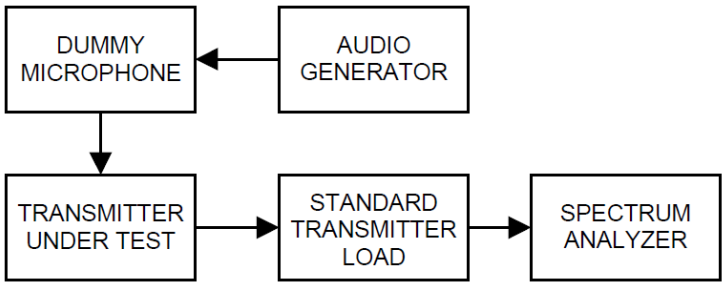
## 5.6. FM Modulation Limiting and Audio Low-Pass Filter for Coast Station Equipment

**LIMIT**

**RSS-182 Section 7.8**

Coast station transmitters shall be equipped with a limiter followed by an audio low-pass filter. A 6 dB pre-emphasis network is required; it is to be connected before the deviation limiter in the transmit path

**TEST CONFIGURATION**




**TEST PROCEDURE**

1) Configure the EUT as shown in figure .
2) Adjust the audio input for 20% of rated system deviation at 1kHz using this level as a reference.
3) Vary the Audio frequency from 300Hz to 3 kHz and record the frequency deviation.
4) Audio Frequency Response =20log10 (VFREQ/VREF).

**TEST MODE:**

Please reference to the section 2.4

**TEST RESULTS**

☒ **Passed** ☐ **Not Applicable**

Please refer to appendix D on the section 8 appendix report

## 5.7. Frequency Stability Test VS Temperature

The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

**LIMIT**

**RSS-182 Section 7.4**

With the exception of DSC emissions, the RF carrier frequency shall not depart from the reference frequency in excess of the limits listed in Table 2.

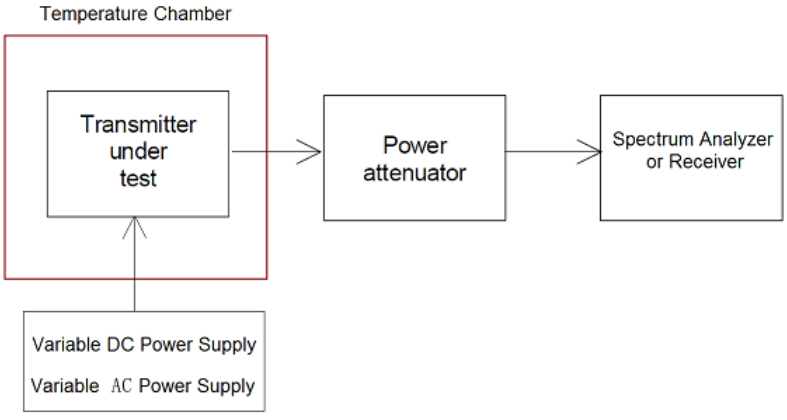
| Table 2 — Frequency Stability Limits | |
|---|---|
| **Type of Equipment** | **Frequency Stability Limit** |
| Coast stations | ±10.0 ppm for transmitter power less than 3 watts<br>±5.0 ppm for transmitter power between 3 and 100 watts<br>±2.5 ppm for transmitter power exceeding 100 watts |
| Ship stations | ±10 ppm |

**TEST PROCEDURE**

According to RSS-182 Section 5.1
In addition to the measurement method described in RSS-Gen, the equipment's unmodulated carrier frequency shall be measured under the conditions specified in Table 1. A sufficient stabilization period at each temperature shall be used prior to each frequency measurement.

| Table 1 — Environmental Conditions for Frequency Stability Test | | | |
|---|---|---|---|
| | **Voltage Conditions** | | |
| **Equipment Type** | **$V_{nom}$−10%** | **nominal voltage ($V_{nom}$)** | **$V_{nom}$+10%** |
| Type G protected from weather | −15°C | +20°C | +55°C |
| Type G portable equipment | −20°C | +20°C | +55°C |
| Type G exposed to weather | −25°C | +20°C | +55°C |
| Type D equipment | +20°C | −15°C, +20°C, +55°C | +20°C |

**TEST CONFIGURATION**



**TEST MODE:**

Please reference to the section 2.4

**TEST RESULTS**

☒ **Passed** ☐ **Not Applicable**

Please refer to appendix E on the section 8 appendix report

## 5.8. Frequency Stability Test VS Voltage

The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

**LIMIT**

**RSS-182 Section 7.4**

With the exception of DSC emissions, the RF carrier frequency shall not depart from the reference frequency in excess of the limits listed in Table 2.

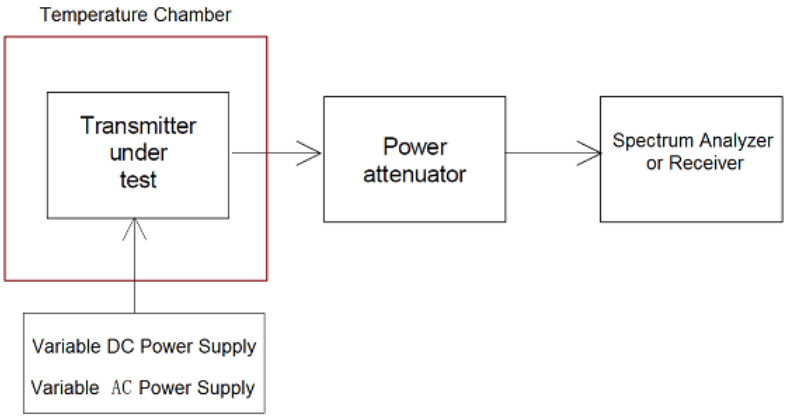
| Table 2 — Frequency Stability Limits | |
|---|---|
| **Type of Equipment** | **Frequency Stability Limit** |
| Coast stations | ±10.0 ppm for transmitter power less than 3 watts<br>±5.0 ppm for transmitter power between 3 and 100 watts<br>±2.5 ppm for transmitter power exceeding 100 watts |
| Ship stations | ±10 ppm |

**TEST PROCEDURE**

According to RSS-182 Section 5.1
In addition to the measurement method described in RSS-Gen, the equipment's unmodulated carrier frequency shall be measured under the conditions specified in Table 1. A sufficient stabilization period at each temperature shall be used prior to each frequency measurement.

| Table 1 — Environmental Conditions for Frequency Stability Test | | | |
|---|---|---|---|
| | **Voltage Conditions** | | |
| **Equipment Type** | **$V_{nom}$−10%** | **nominal voltage ($V_{nom}$)** | **$V_{nom}$+10%** |
| Type G protected from weather | −15°C | +20°C | +55°C |
| Type G portable equipment | −20°C | +20°C | +55°C |
| Type G exposed to weather | −25°C | +20°C | +55°C |
| Type D equipment | +20°C | −15°C, +20°C, +55°C | +20°C |

**TEST CONFIGURATION**



**TEST MODE:**

Please reference to the section 2.4

**TEST RESULTS**

☒ **Passed** ☐ **Not Applicable**

Please refer to appendix F on the section 8 appendix report

## 5.9. Spurious Emission on Antenna Port

Conducted spurious emissions are emissions at the antenna terminals on a frequency or frequencies that are outside a band sufficient to ensure transmission of information of required quality for the class of communication desired

**LIMIT**

RSS Gen, (12.5 kHz bandwidth only): On any frequency removed from the center of the authorized bandwidth by a displacement frequency ($f_d$ in kHz) of more than 12.5 kHz at least:
50 + 10 log (Pwatts)
Note: In general, the worse case attenuation requirement shown above was applied.
Calculation: Limit (dBm) =EL-50-10log10 (TP)

Notes: EL is the emission level of the Output Power expressed in dBm,
In this application, the EL is P( dBm).
Limit (dBm) = P( dBm)-50-10 log (Pwatts) = -20dBm

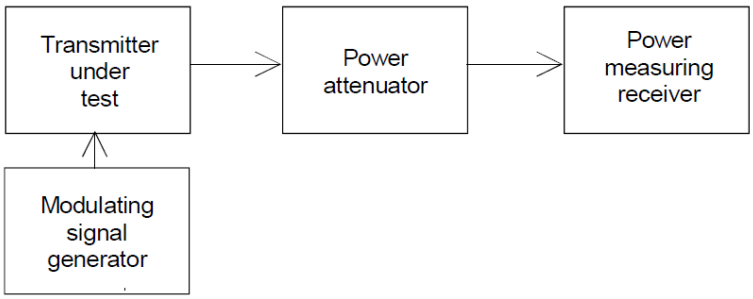
RSS Gen, (25 kHz bandwidth only):
On any frequency removed from the center of the assigned channel by more than 250 percent at least:
43 + 10 log (Pwatts)
Calculation: Limit (dBm) =EL-43-10log10 (TP)

Notes: EL is the emission level of the Output Power expressed in dBm,
In this application, the EL is P( dBm).
Limit (dBm) = P( dBm)-43-10 log (Pwatts) = -13 dBm

**TEST PROCEDURE**

1. The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation.
2. The resolution bandwidth of the spectrum analyzer was set to 100 kHz. Sufficient scans were taken to show any out of band emission up to 10th. Harmonic for the lower and the highest frequency range. Set RBW 100 kHz, VBW 300 kHz in the frequency band 30MHz to 1GHz,while set RBW=1MHz.VBW=3MHz from the 1GHz to 10th Harmonic.
3. The audio input was set to 0 to get the unmodulated carrier, the resulting picture is print out for each channel separation.

**TEST CONFIGURATION**




**TEST MODE:**
Please reference to the section 2.4

**TEST RESULTS**

☒ **Passed** ☐ **Not Applicable**

Please refer to appendix G on the section 8 appendix report

## 5.10. Transmitter Radiated Spurious Emission

Conducted spurious emissions are emissions at the antenna terminals on a frequency or frequencies that are outside a band sufficient to ensure transmission of information of required quality for the class of communication desired

**LIMIT**

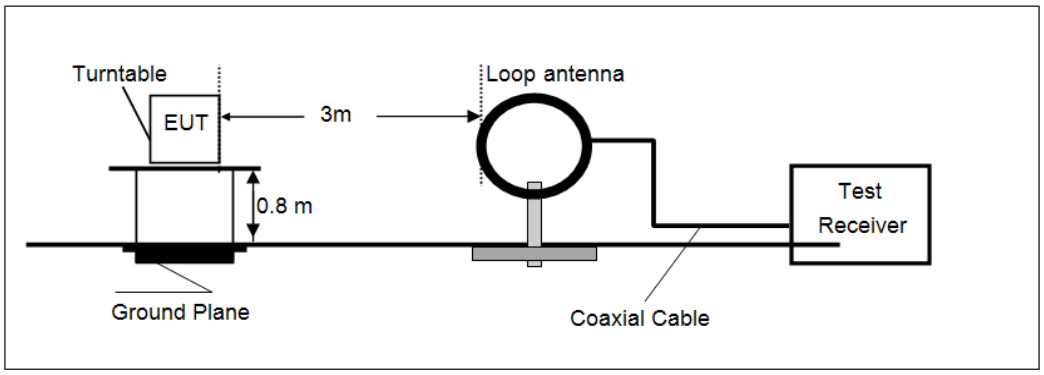
RSS Gen, (12.5 kHz bandwidth only): On any frequency removed from the center of the authorized bandwidth by a displacement frequency ($f_d$ in kHz) of more than 12.5 kHz at least:
50 + 10 log (Pwatts)
Note: In general, the worse case attenuation requirement shown above was applied.
Calculation: Limit (dBm) =EL-50-10log10 (TP)

Notes: EL is the emission level of the Output Power expressed in dBm,
In this application, the EL is P( dBm).
Limit (dBm) = P( dBm)-50-10 log (Pwatts) = -20dBm

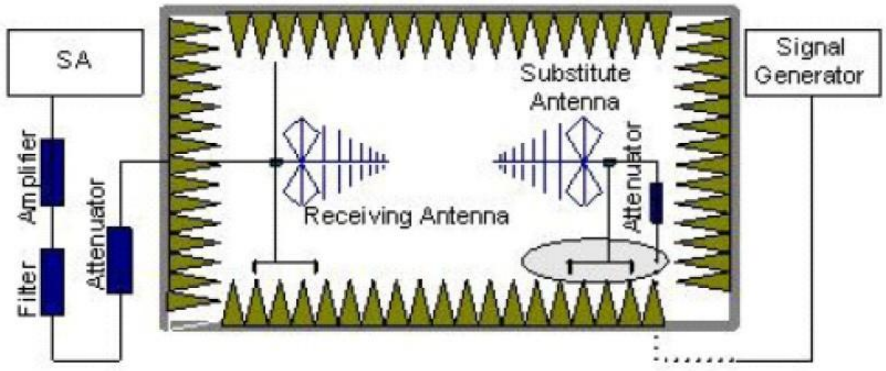
RSS Gen, (25 kHz bandwidth only):
On any frequency removed from the center of the assigned channel by more than 250 percent at least:
43 + 10 log (Pwatts)
Calculation: Limit (dBm) =EL-43-10log10 (TP)

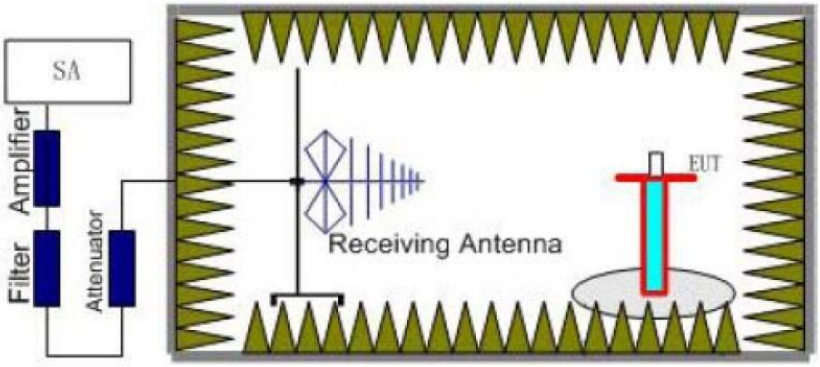
Notes: EL is the emission level of the Output Power expressed in dBm,
In this application, the EL is P( dBm).
Limit (dBm) = P( dBm)-43-10 log (Pwatts) = -13 dBm

**TEST CONFIGURATION**
**9kHz ~30MHz:**

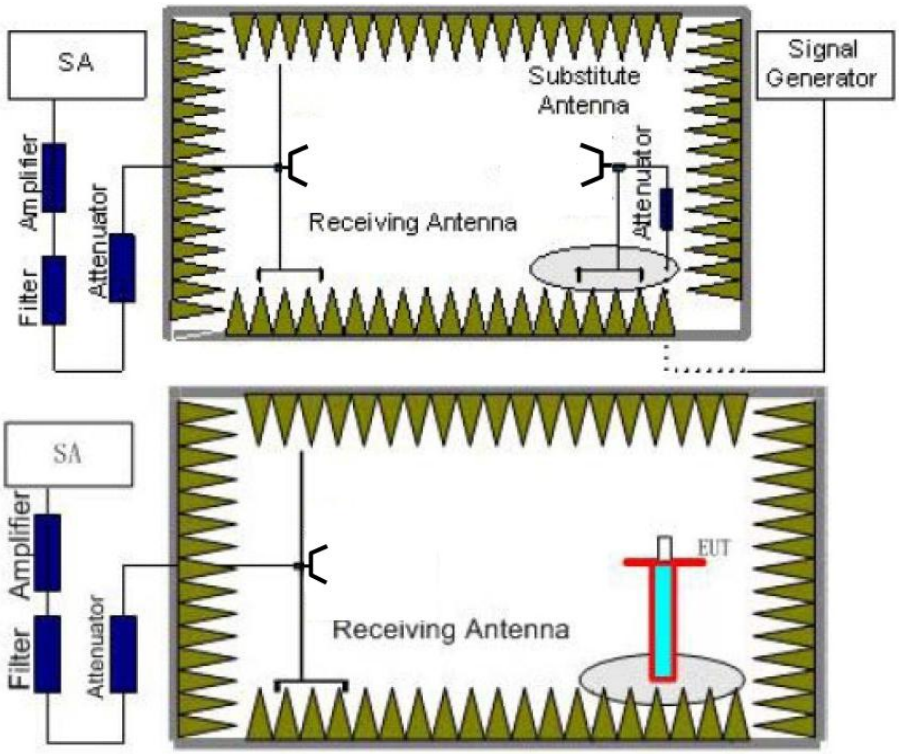



**Below 1GHz:**






**Above 1GHz:**




**TEST PROCEDURE**

1. EUT was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1. 0 m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in six channels were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test.Set Test Receiver or Spectrum RBW=1MHz,VBW=3MHz for above 1GHz ,RBW=100kHz,VBW=300kHz for 30MHz to 1GHz, RBW=1kHz,VBW=3kHz for 9kHzHz to 150kHz and RBW=10kHz,VBW=30kHz for 150kHz to 30MHz.And the maximum value of the receiver should be recorded as ($P_r$).
4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power ($P_{Mea}$) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded ($P_r$). The power of signal source ($P_{Mea}$) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss ($P_{cl}$) ,the Substitution Antenna Gain ($G_a$) and the Amplifier Gain ($P_{Ag}$) should be recorded after test.
   The measurement results are obtained as described below:
   Power(EIRP)=$P_{Mea}$- $P_{Ag}$ - $P_{cl}$ - $G_a$
   We used SMF100A micowave signal generator which signal level can up to 33dBm,so we not used power Amplifier for substituation test; The measurement results are amend as described below:
   Power(EIRP)=$P_{Mea}$- $P_{cl}$ - $G_a$
6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

**TEST MODE:**

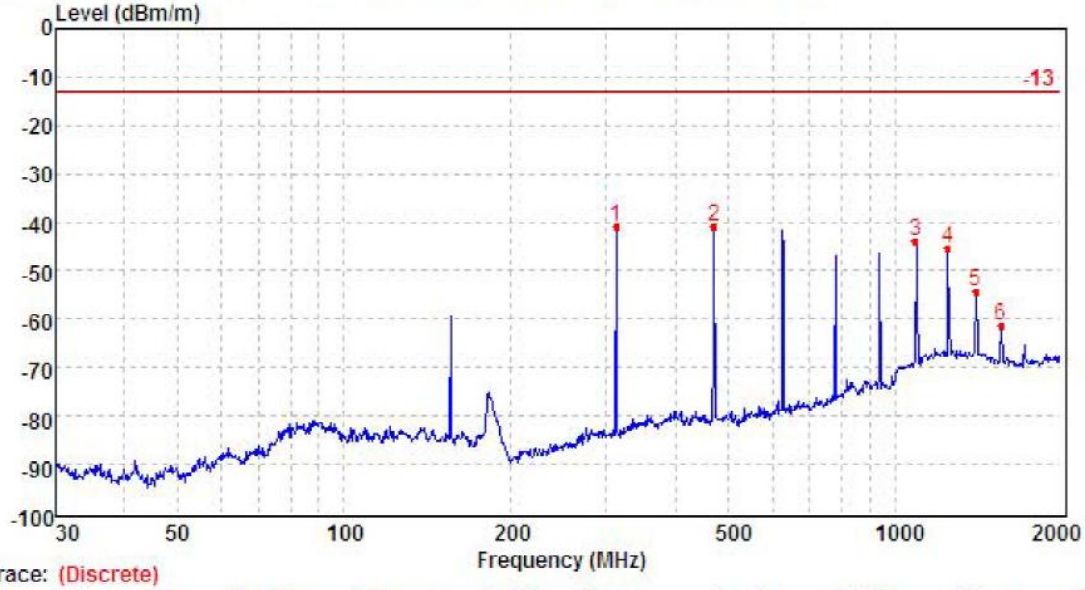
Please reference to the section 2.4

**TEST RESULTS**

☒ **Passed** ☐ **Not Applicable**

Note:
1. In general, the worse case attenuation requirement shown above was applied.
2. The measurement frequency range from 30MHz to 2 GHz.
3.We tested TX-AWH and TX-AWL, recorded worst case TX-AWH mode.

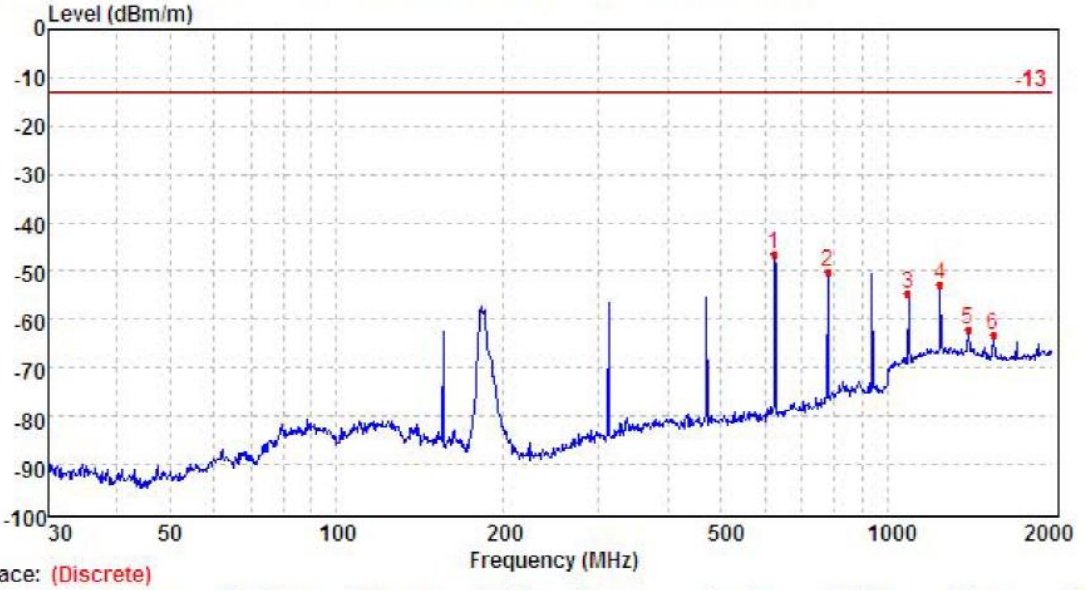
| TX-AWH | | | |
|---|---|---|---|
| Test Frequency: | $CH_L$ | Polarity: | Horizontal |




Trace: (Discrete)

| Mark | Frequency MHZ | Reading dBm | Antenna dB | Cable dB | Preamp dB | Level dBm | Limit dBm | Over limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 312.06 | -37.76 | 24.94 | 2.02 | 30.27 | -41.07 | -13.00 | -28.07 | Peak |
| 2 | 469.24 | -40.14 | 27.45 | 2.54 | 30.59 | -40.74 | -13.00 | -27.74 | Peak |
| 3 | 1092.02 | -45.68 | 34.79 | 4.42 | 37.29 | -43.76 | -13.00 | -30.76 | Peak |
| 4 | 1248.33 | -49.83 | 37.08 | 4.74 | 37.20 | -45.21 | -13.00 | -32.21 | Peak |
| 5 | 1404.45 | -59.89 | 37.72 | 5.01 | 37.12 | -54.28 | -13.00 | -41.28 | Peak |
| 6 | 1560.49 | -65.84 | 36.32 | 5.46 | 37.14 | -61.20 | -13.00 | -48.20 | Peak |

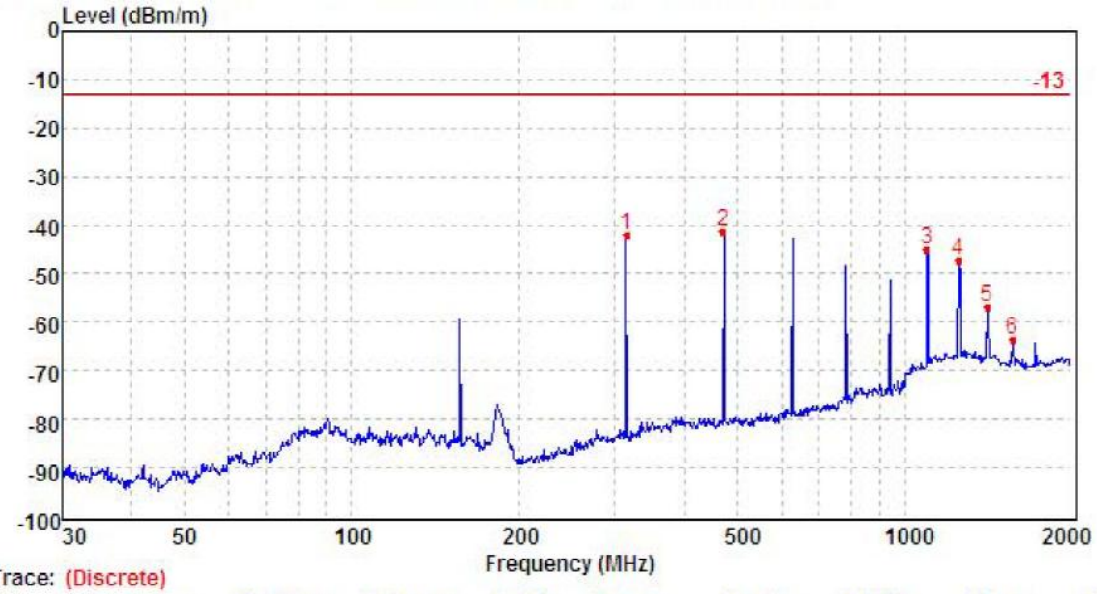
| Test Frequency: | $CH_L$ | Polarity: | Vertical |
|---|---|---|---|




Trace: (Discrete)

| Mark | Frequency MHZ | Reading dBm | Antenna dB | Cable dB | Preamp dB | Level dBm | Limit dBm | Over limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 623.87 | -47.71 | 29.56 | 3.00 | 31.24 | -46.39 | -13.00 | -33.39 | Peak |
| 2 | 781.33 | -54.41 | 31.13 | 3.42 | 30.23 | -50.09 | -13.00 | -37.09 | Peak |
| 3 | 1092.02 | -56.48 | 34.79 | 4.42 | 37.29 | -54.56 | -13.00 | -41.56 | Peak |
| 4 | 1248.33 | -57.59 | 37.08 | 4.74 | 37.20 | -52.97 | -13.00 | -39.97 | Peak |
| 5 | 1404.45 | -67.86 | 37.72 | 5.01 | 37.12 | -62.25 | -13.00 | -49.25 | Peak |
| 6 | 1560.49 | -67.84 | 36.32 | 5.46 | 37.14 | -63.20 | -13.00 | -50.20 | Peak |

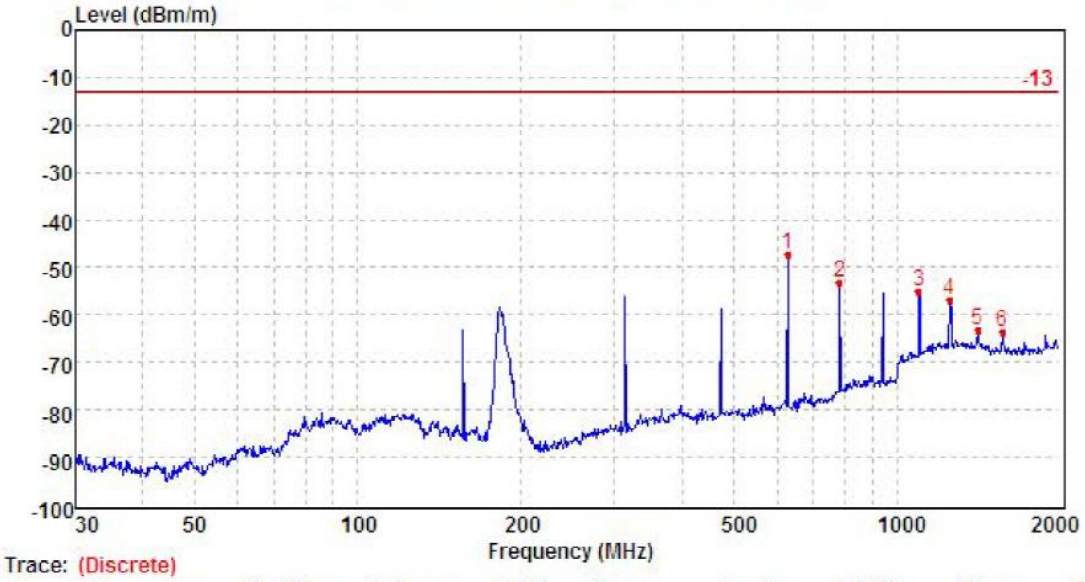
| TX-AWH | | | |
|---|---|---|---|
| Test Frequency: | $CH_M$ | Polarity: | Horizontal |




Trace: (Discrete)

| Mark | Frequency MHZ | Reading dBm | Antenna dB | Cable dB | Preamp dB | Level dBm | Limit dBm | Over limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 314.26 | -38.85 | 24.94 | 2.03 | 30.26 | -42.14 | -13.00 | -29.14 | Peak |
| 2 | 470.89 | -40.90 | 27.56 | 2.54 | 30.61 | -41.41 | -13.00 | -28.41 | Peak |
| 3 | 1097.33 | -47.11 | 34.90 | 4.43 | 37.29 | -45.07 | -13.00 | -32.07 | Peak |
| 4 | 1254.40 | -52.06 | 37.10 | 4.75 | 37.19 | -47.40 | -13.00 | -34.40 | Peak |
| 5 | 1411.28 | -62.47 | 37.65 | 5.03 | 37.11 | -56.90 | -13.00 | -43.90 | Peak |
| 6 | 1568.08 | -68.26 | 36.26 | 5.48 | 37.15 | -63.67 | -13.00 | -50.67 | Peak |

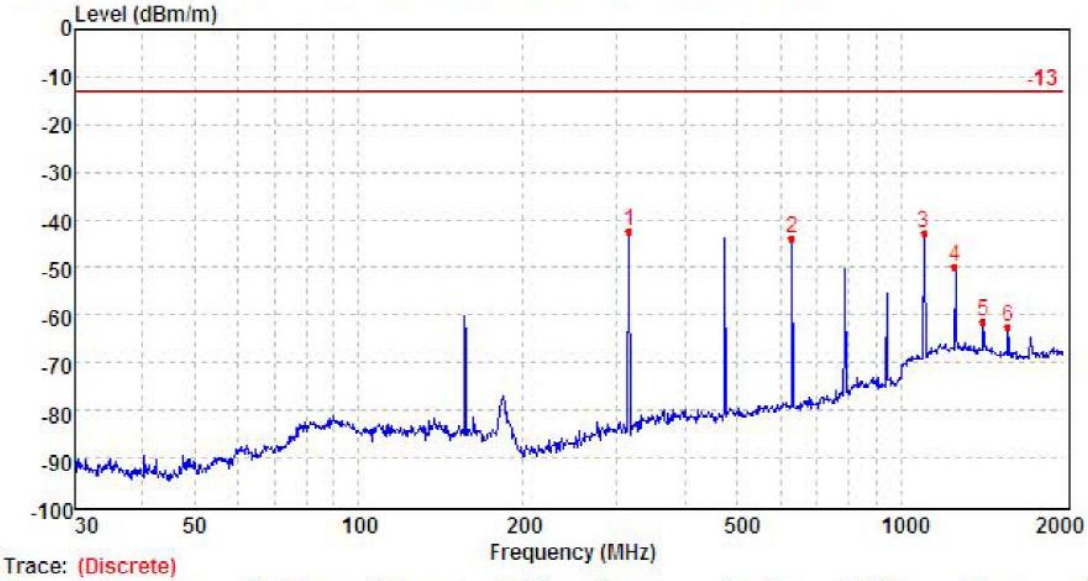
| Test Frequency: | $CH_M$ | Polarity: | Vertical |
|---|---|---|---|




Trace: (Discrete)

| Mark | Frequency MHZ | Reading dBm | Antenna dB | Cable dB | Preamp dB | Level dBm | Limit dBm | Over limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 628.27 | -48.69 | 29.68 | 3.02 | 31.25 | -47.24 | -13.00 | -34.24 | Peak |
| 2 | 784.08 | -57.60 | 31.12 | 3.43 | 30.13 | -53.18 | -13.00 | -40.18 | Peak |
| 3 | 1097.33 | -57.02 | 34.90 | 4.43 | 37.29 | -54.98 | -13.00 | -41.98 | Peak |
| 4 | 1254.40 | -61.42 | 37.10 | 4.75 | 37.19 | -56.76 | -13.00 | -43.76 | Peak |
| 5 | 1411.28 | -68.66 | 37.65 | 5.03 | 37.11 | -63.09 | -13.00 | -50.09 | Peak |
| 6 | 1568.08 | -68.00 | 36.26 | 5.48 | 37.15 | -63.41 | -13.00 | -50.41 | Peak |

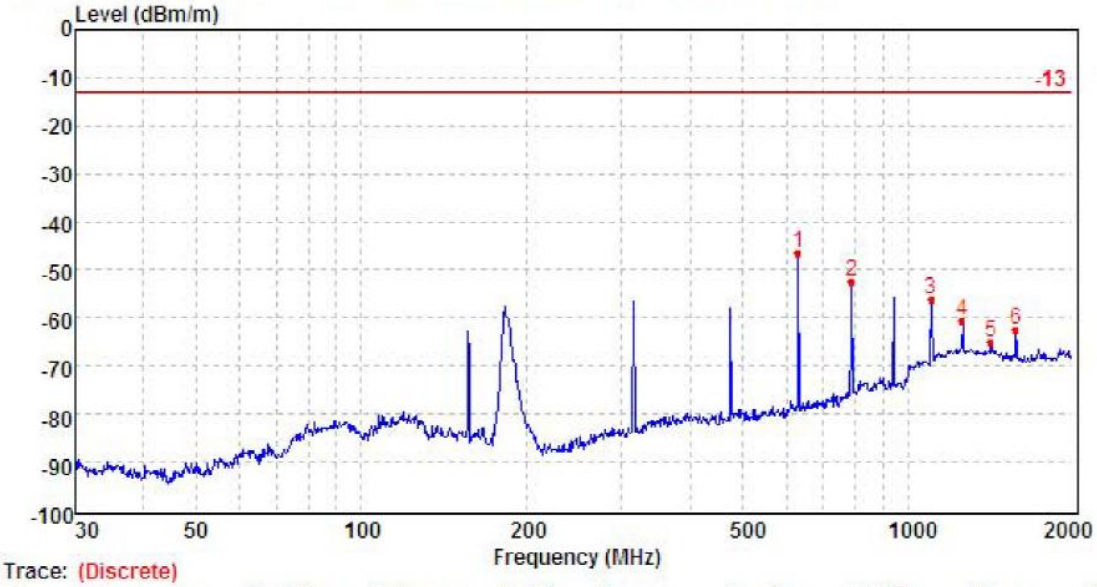
| TX-AWH | | | |
|---|---|---|---|
| Test Frequency: | $CH_H$ | Polarity: | Horizontal |




Trace: (Discrete)

| Mark | Frequency MHZ | Reading dBm | Antenna dB | Cable dB | Preamp dB | Level dBm | Limit dBm | Over limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 315.37 | -39.04 | 24.95 | 2.03 | 30.26 | -42.32 | -13.00 | -29.32 | Peak |
| 2 | 630.49 | -45.21 | 29.74 | 3.03 | 31.26 | -43.70 | -13.00 | -30.70 | Peak |
| 3 | 1101.91 | -44.95 | 34.99 | 4.44 | 37.28 | -42.80 | -13.00 | -29.80 | Peak |
| 4 | 1258.76 | -54.43 | 37.13 | 4.76 | 37.19 | -49.73 | -13.00 | -36.73 | Peak |
| 5 | 1417.16 | -66.72 | 37.60 | 5.05 | 37.11 | -61.18 | -13.00 | -48.18 | Peak |
| 6 | 1574.62 | -67.15 | 36.20 | 5.50 | 37.16 | -62.61 | -13.00 | -49.61 | Peak |

| Test Frequency: | $CH_H$ | Polarity: | Vertical |
|---|---|---|---|




Trace: (Discrete)

| Mark | Frequency MHZ | Reading dBm | Antenna dB | Cable dB | Preamp dB | Level dBm | Limit dBm | Over limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 630.49 | -48.12 | 29.74 | 3.03 | 31.26 | -46.61 | -13.00 | -33.61 | Peak |
| 2 | 789.62 | -56.88 | 31.09 | 3.45 | 29.94 | -52.28 | -13.00 | -39.28 | Peak |
| 3 | 1101.91 | -58.22 | 34.99 | 4.44 | 37.28 | -56.07 | -13.00 | -43.07 | Peak |
| 4 | 1259.63 | -65.35 | 37.13 | 4.76 | 37.19 | -60.65 | -13.00 | -47.65 | Peak |
| 5 | 1417.16 | -70.61 | 37.60 | 5.05 | 37.11 | -65.07 | -13.00 | -52.07 | Peak |
| 6 | 1574.62 | -66.84 | 36.20 | 5.50 | 37.16 | -62.30 | -13.00 | -49.30 | Peak |

## 5.11. Radiated Emission

**LIMIT**

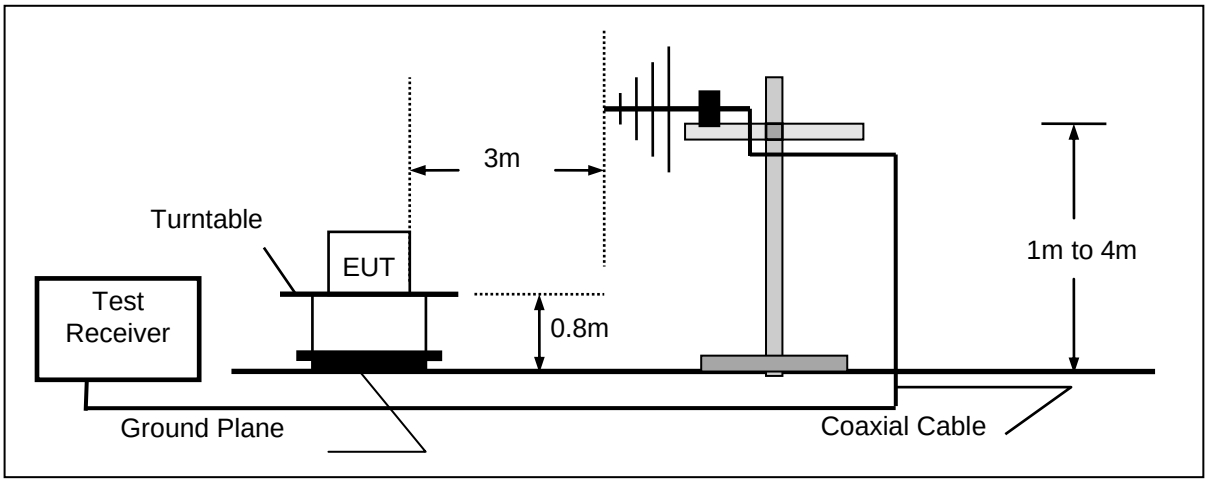
For unintentional device, according to RSS-Gen, except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values：

| Frequency (MHz) | Distance (Meters) | Radiated (dBμV/m) | Radiated (μV/m) |
|---|---|---|---|
| 30-88 | 3 | 40.0 | 100 |
| 88-216 | 3 | 43.5 | 150 |
| 216-960 | 3 | 46.0 | 200 |
| Above 960 | 3 | 54.0 | 500 |

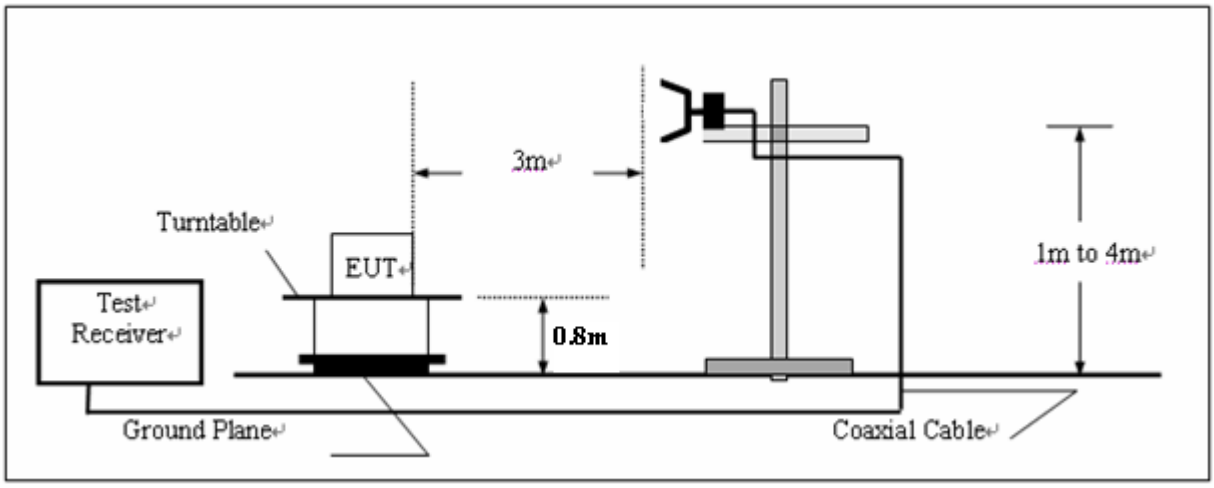
For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

**TEST CONFIGURATION**

(A) Radiated Emission Test Set-Up, Frequency below 1000MHz




(B) Radiated Emission Test Set-Up, Frequency above 1000MHz




**TEST PROCEDURE**

1 The EUT was placed on a turn table which is 0.8m above ground plane.
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.

**TEST MODE:**

Please reference to the section 2.4

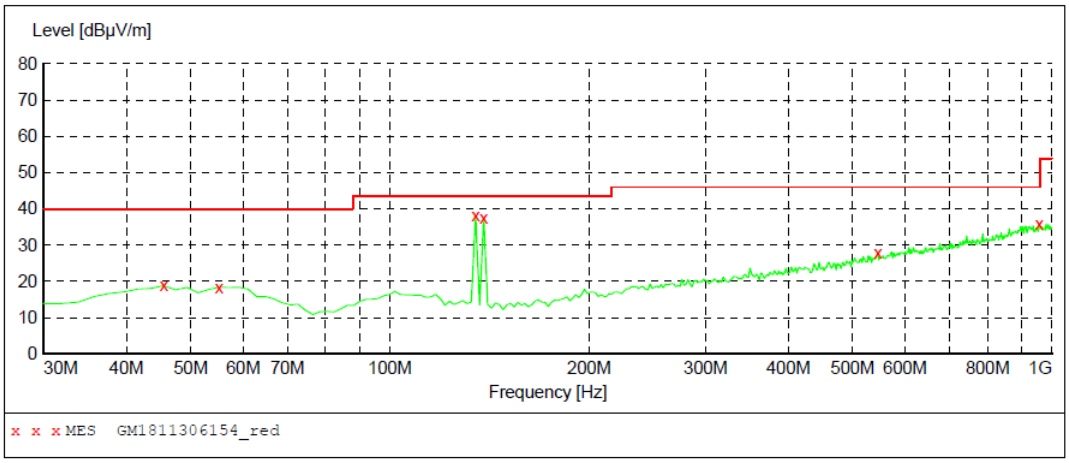
**TEST RESULTS**

☒ **Passed** ☐ **Not Applicable**

Note:
The Radiated Measurement (Standby mode /Receiver mode) are performed to the three channels (the high channel, the middle channel and the low channel), the datum recorded below is the worst case for each channel separation ;and the EUT shall be scanned from 30 MHz to the 5th harmonic of the highest oscillator frequency in the digital devices or 1 GHz whichever is higher.

Please refer to the below test data:

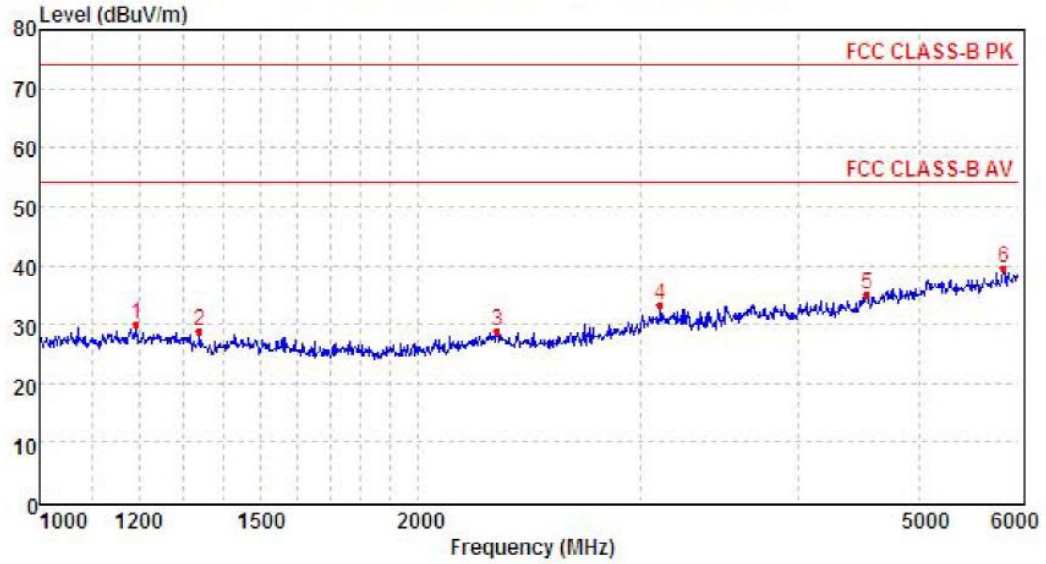
| Test Mode: | RX-GPS | Polarity: | *Horizontal* |
|---|---|---|---|




***MEASUREMENT RESULT: "GM1811306154_red"***

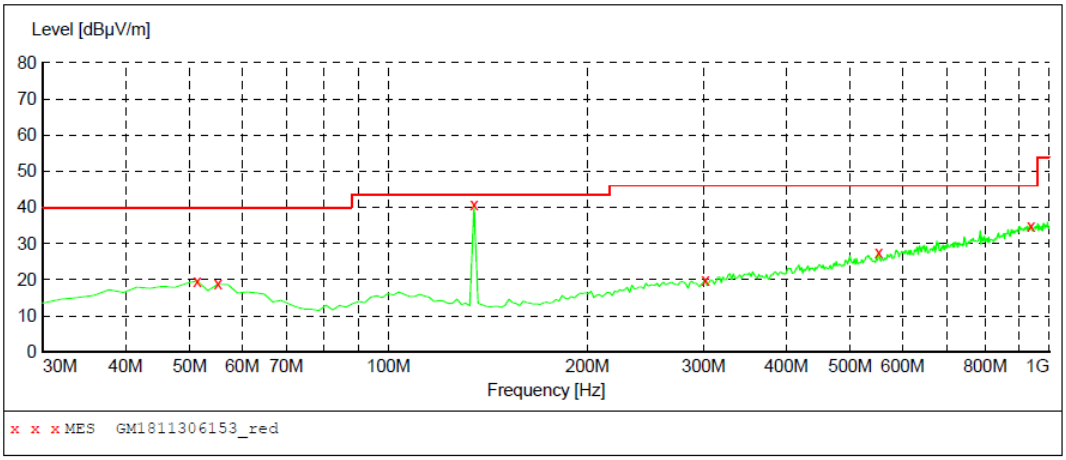
12/1/2018 1:11AM

| Frequency MHz | Level dBµV/m | Transd dB | Limit dBµV/m | Margin dB | Det. | Height cm | Azimuth deg | Polarization |
|---|---|---|---|---|---|---|---|---|
| 45.520000 | 18.80 | -8.7 | 40.0 | 21.2 | QP | 100.0 | 76.00 | HORIZONTAL |
| 55.220000 | 18.40 | -9.1 | 40.0 | 21.6 | QP | 100.0 | 76.00 | HORIZONTAL |
| 134.760000 | 38.20 | -13.5 | 43.5 | 5.3 | QP | 300.0 | 22.00 | HORIZONTAL |
| 138.640000 | 37.60 | -13.6 | 43.5 | 5.9 | QP | 100.0 | 152.00 | HORIZONTAL |
| 546.040000 | 27.90 | -0.2 | 46.0 | 18.1 | QP | 100.0 | 152.00 | HORIZONTAL |
| 957.320000 | 36.00 | 8.2 | 46.0 | 10.0 | QP | 100.0 | 359.00 | HORIZONTAL |




| Mark | Frequency MHZ | Reading dBuv/m | Antenna dB/m | Cable dB | Preamp dB | Level dBuv/m | Limit dBuv/m | Over limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1194.09 | 36.3 | 26.3 | 4.6 | 37.2 | 30.0 | 74.0 | -44.0 | Peak |
| 2 | 1339.18 | 35.0 | 26.1 | 4.9 | 37.1 | 28.9 | 74.0 | -45.1 | Peak |
| 3 | 2308.86 | 31.6 | 28.1 | 6.6 | 37.6 | 28.7 | 74.0 | -45.3 | Peak |
| 4 | 3114.21 | 34.3 | 28.8 | 7.6 | 37.5 | 33.2 | 74.0 | -40.8 | Peak |
| 5 | 4545.04 | 31.2 | 30.8 | 9.4 | 36.2 | 35.2 | 74.0 | -38.8 | Peak |
| 6 | 5830.43 | 31.0 | 32.2 | 10.6 | 34.2 | 39.6 | 74.0 | -34.4 | Peak |

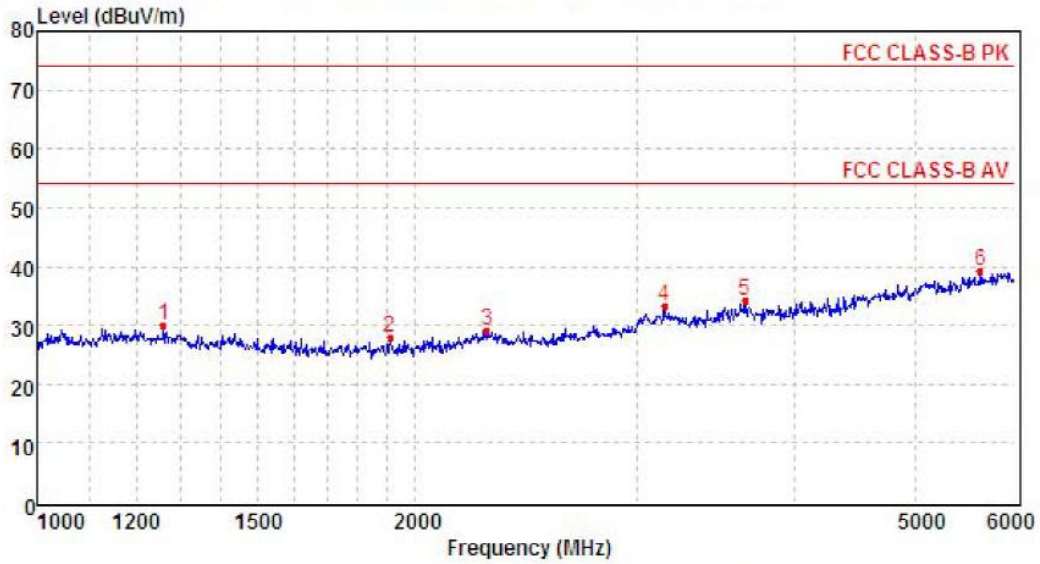
| Test Mode: | RX-GPS | Polarity: | Vertical |
|---|---|---|---|




***MEASUREMENT RESULT: "GM1811306153_red"***

12/1/2018 1:07AM

| Frequency MHz | Level dBµV/m | Transd dB | Limit dBµV/m | Margin dB | Det. | Height cm | Azimuth deg | Polarization |
|---|---|---|---|---|---|---|---|---|
| 51.340000 | 19.70 | -8.8 | 40.0 | 20.3 | QP | 100.0 | 342.00 | VERTICAL |
| 55.220000 | 18.80 | -9.1 | 40.0 | 21.2 | QP | 100.0 | 261.00 | VERTICAL |
| 134.760000 | 40.70 | -13.5 | 43.5 | 2.8 | QP | 100.0 | 36.00 | VERTICAL |
| 301.600000 | 20.10 | -6.9 | 46.0 | 25.9 | QP | 100.0 | 238.00 | VERTICAL |
| 551.860000 | 27.40 | 0.0 | 46.0 | 18.6 | QP | 100.0 | 135.00 | VERTICAL |
| 937.920000 | 35.00 | 8.1 | 46.0 | 11.0 | QP | 100.0 | 36.00 | VERTICAL |




| Mark | Frequency MHZ | Reading dBuv/m | Antenna dB/m | Cable dB | Preamp dB | Level dBuv/m | Limit dBuv/m | Over limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1260.03 | 36.1 | 26.2 | 4.8 | 37.2 | 29.9 | 74.0 | -44.1 | Peak |
| 2 | 1909.47 | 34.0 | 25.4 | 6.1 | 37.5 | 28.0 | 74.0 | -46.0 | Peak |
| 3 | 2280.08 | 32.1 | 28.0 | 6.6 | 37.6 | 29.1 | 74.0 | -44.9 | Peak |
| 4 | 3159.17 | 34.2 | 28.8 | 7.7 | 37.4 | 33.3 | 74.0 | -40.7 | Peak |
| 5 | 3659.16 | 33.5 | 29.3 | 8.3 | 37.0 | 34.1 | 74.0 | -39.9 | Peak |
| 6 | 5635.29 | 31.7 | 31.7 | 10.3 | 34.3 | 39.4 | 74.0 | -34.6 | Peak |

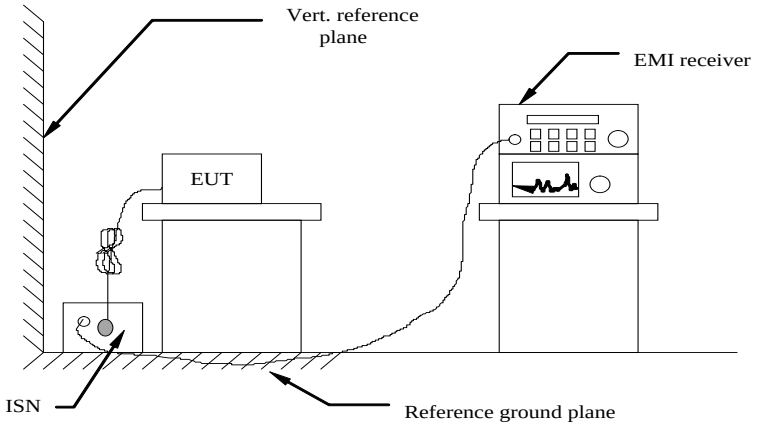
## 5.12. Conducted Emissions

The frequency spectrum from 0.15 MHz to 30 MHz was investigated. The LISN used was 50 ohm / 50 u Henry as specified by section 5.1 of ANSI C63.4-2014. Cables and peripherals were moved to find the maximum emission levels for each frequency.

**Limit**
**RSS-Gen:**

| Frequency of Emission (MHz) | Conducted Limit (dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56 * | 56 to 46 * |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

**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 C63.4-2014.
2 Support equipment, if needed, was placed as per ANSI C63.4-2014.
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4-2014.
4 If a EUT received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5 All support equipments received 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.

**TEST MODE:**

Please reference to the section 2.4

**TEST RESULTS**

☐ **Passed** ☒ **Not Applicable**

# 6. APPENDIX Report

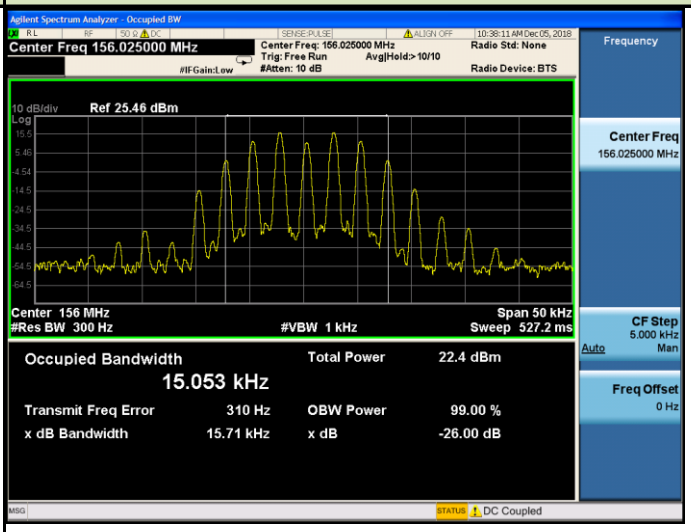
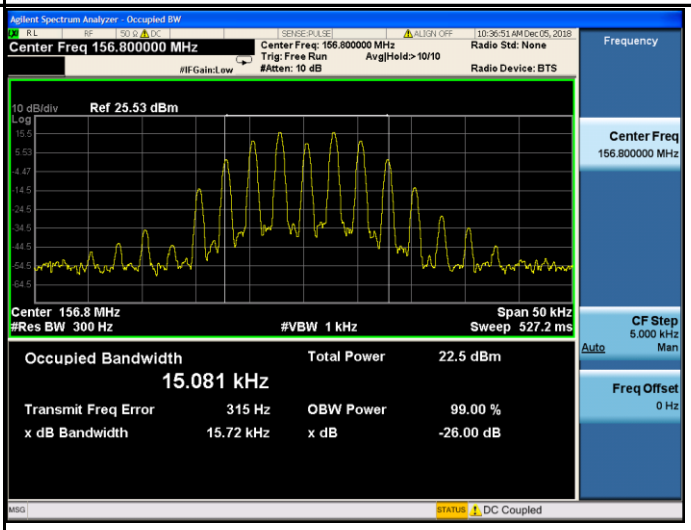
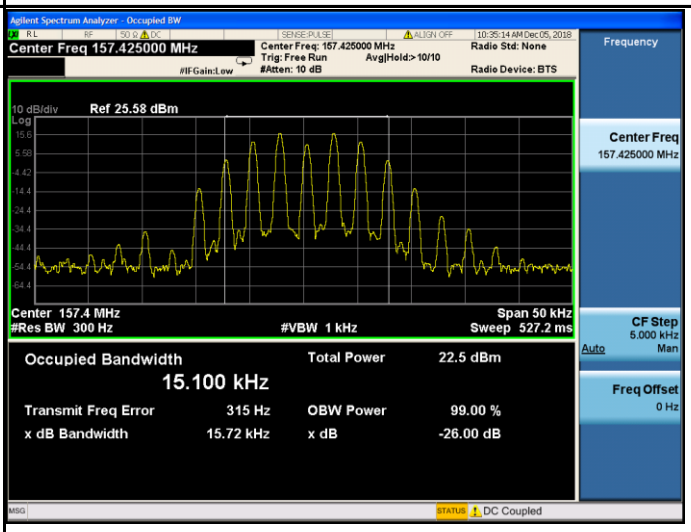
**Appendix A:Maximum Transmitter Power**

| Operation Mode | Modulation Type | Test Channel | Measured Power(dBm) | Rated Power(W) | Difference(dB) | Limit (dB) | Result |
|---|---|---|---|---|---|---|---|
| TX-AWH | FM | $CH_L$ | 34.7 | 3.00 | -0.1 | ±1 | PASS |
| TX-AWH | FM | $CH_M$ | 34.7 | 3.00 | -0.1 | ±1 | PASS |
| TX-AWH | FM | $CH_H$ | 34.7 | 3.00 | -0.1 | ±1 | PASS |
| TX-AWL | FM | $CH_L$ | 27.2 | 0.50 | 0.2 | ±1 | PASS |
| TX-AWL | FM | $CH_M$ | 27.0 | 0.50 | 0.0 | ±1 | PASS |
| TX-AWL | FM | $CH_H$ | 27.0 | 0.50 | 0.0 | ±1 | PASS |

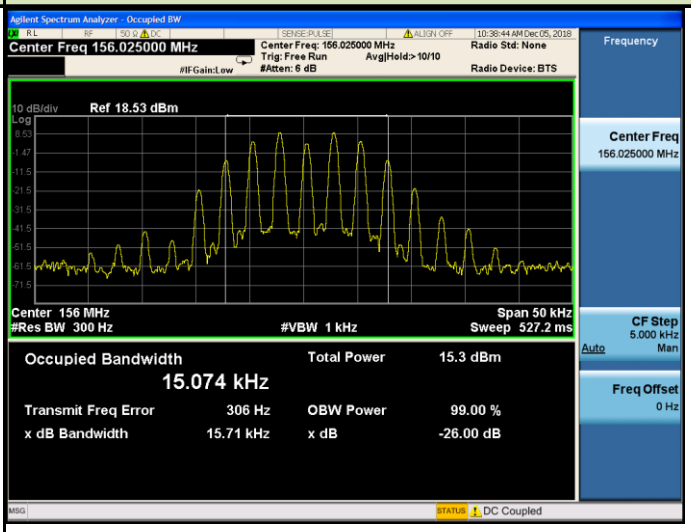
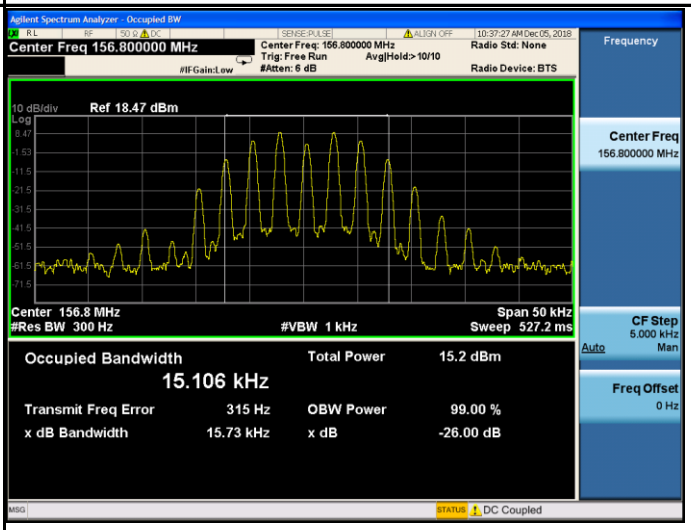
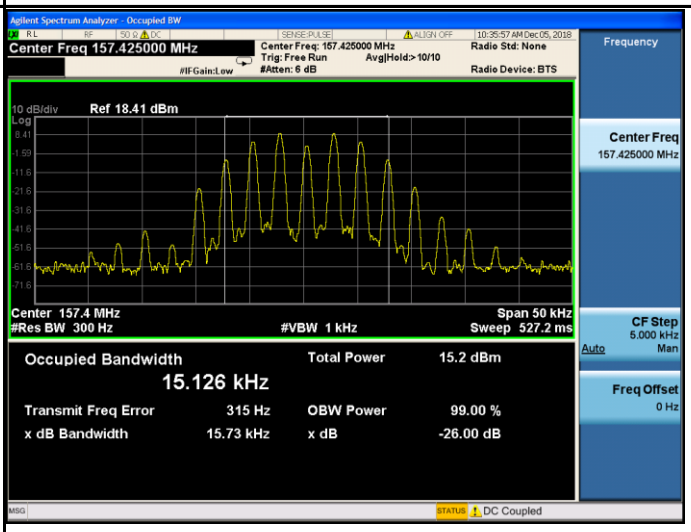
**Appendix B:Occupied Bandwidth**

| Operation Mode | Modulation Type | Test Channel | Occupied Bandwidth | | 99% Limit(kHz) | Result |
|---|---|---|---|---|---|---|
| | | | 99%(kHz) | 26dB(kHz) | | |
| TX-AWH | FM | $CH_L$ | 15.053 | 15.710 | ⩽20 | PASS |
| TX-AWH | FM | $CH_M$ | 15.081 | 15.710 | ⩽20 | PASS |
| TX-AWH | FM | $CH_H$ | **15.100** | 15.720 | ⩽20 | PASS |
| TX-AWL | FM | $CH_L$ | 15.074 | 15.710 | ⩽20 | PASS |
| TX-AWL | FM | $CH_M$ | 15.106 | 15.730 | ⩽20 | PASS |
| TX-AWL | FM | $CH_H$ | **15.126** | 15.730 | ⩽20 | PASS |

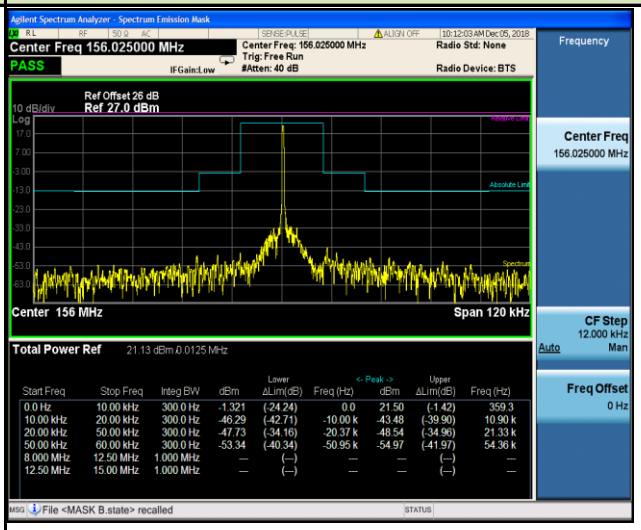
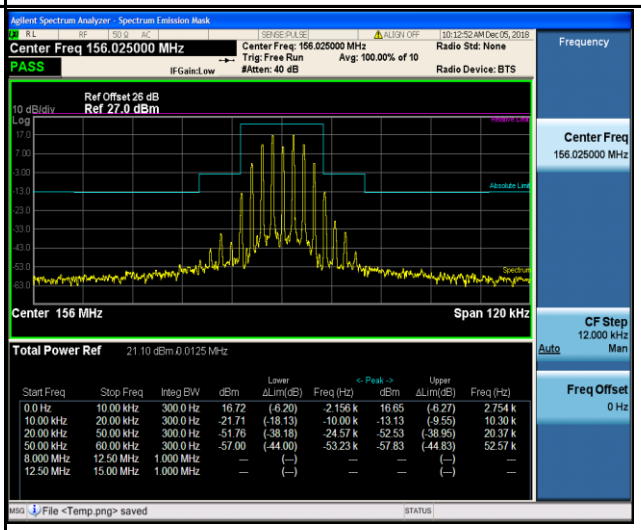
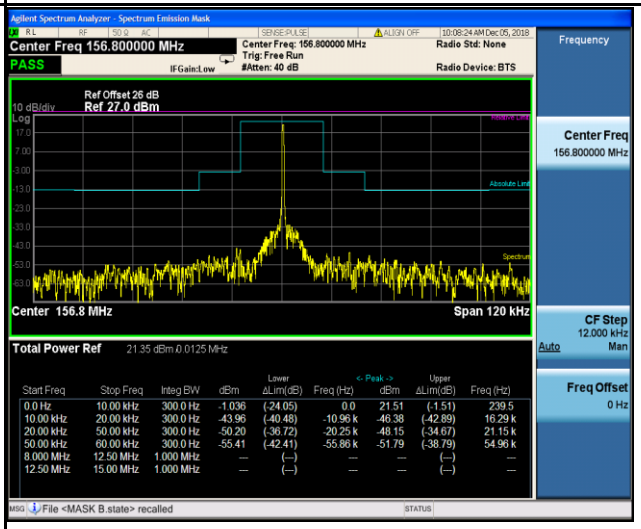
## Appendix B:Occupied Bandwidth

| Operation Mode | Modulation Type | Test Channel | TEST PLOT RESULT |
|---|---|---|---|
| TX-AWH | FM | $CH_L$ |  |
| TX-AWH | FM | $CH_M$ |  |
| TX-AWH | FM | $CH_H$ |  |

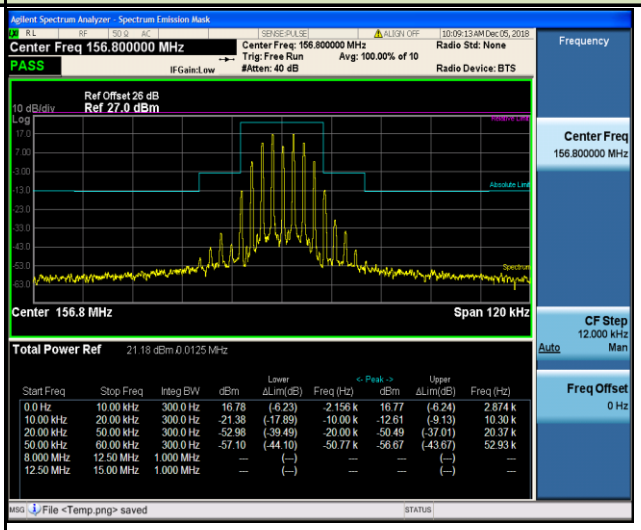
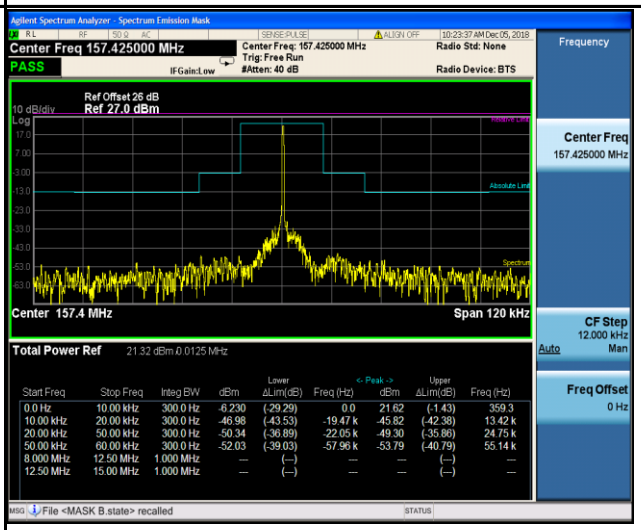
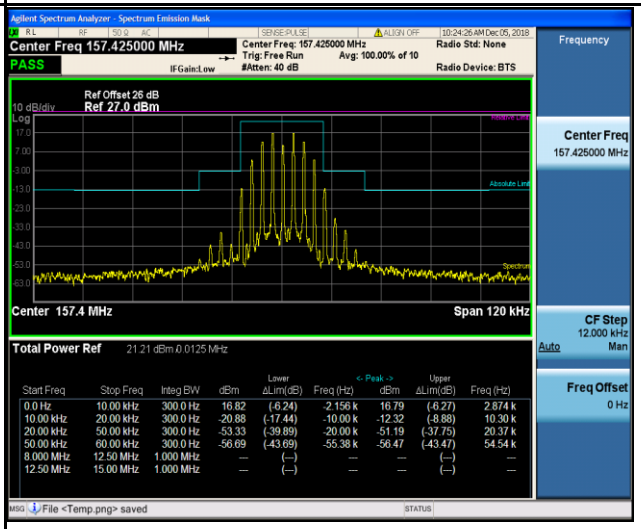
## Appendix B:Occupied Bandwidth

| Operation Mode | Modulation Type | Test Channel | TEST PLOT RESULT |
|---|---|---|---|
| TX-AWL | FM | $CH_L$ |  |
| TX-AWL | FM | $CH_M$ |  |
| TX-AWL | FM | $CH_H$ |  |

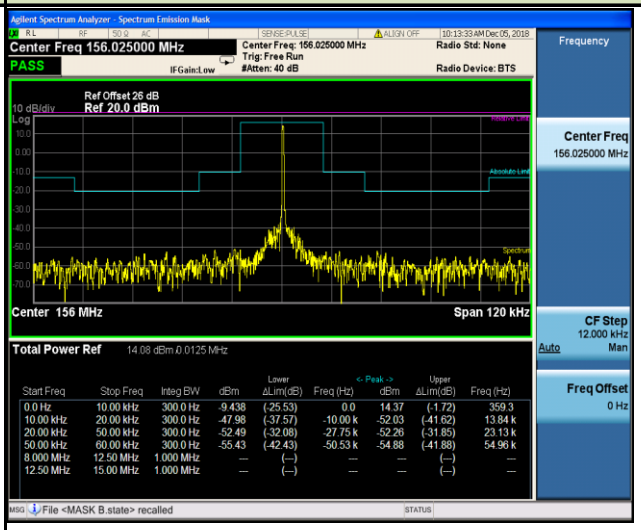
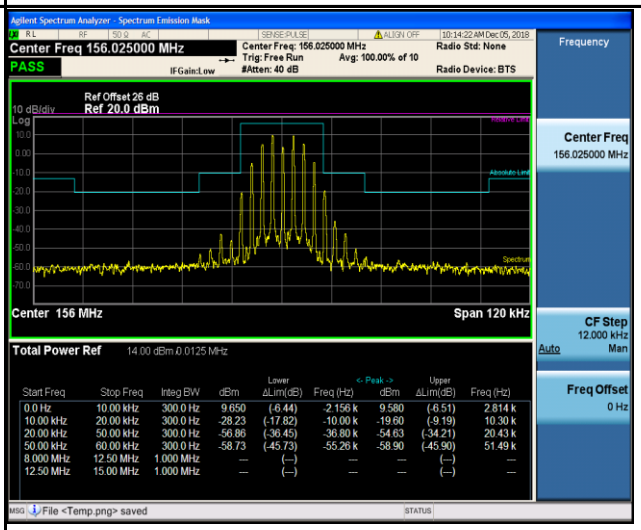
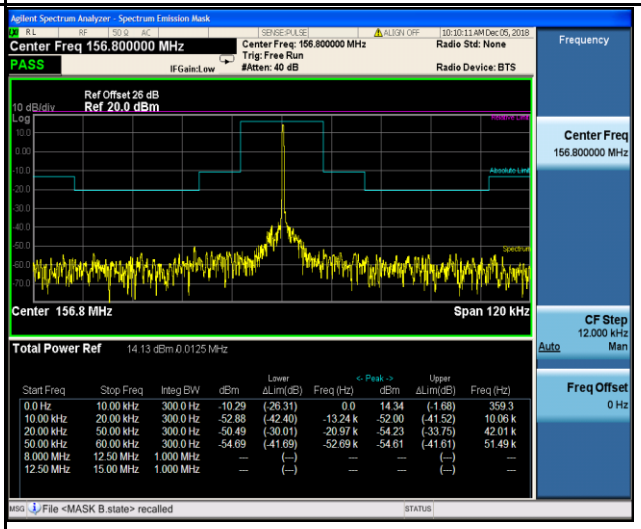
## Appendix C:Emission Mask

| Operation Mode | Modulation Type | Test Channel | TEST PLOT RESULT |
|---|---|---|---|
| TX-AWH | FM | $CH_L$ |  |
| TX-AWH | FM | $CH_L$ |  |
| TX-AWH | FM | $CH_M$ |  |

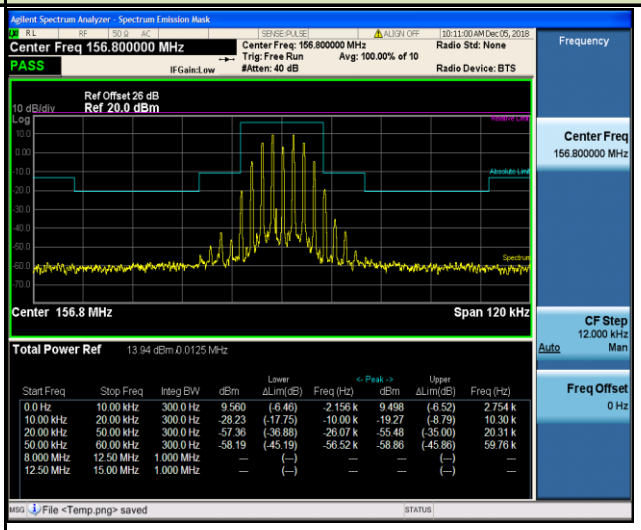
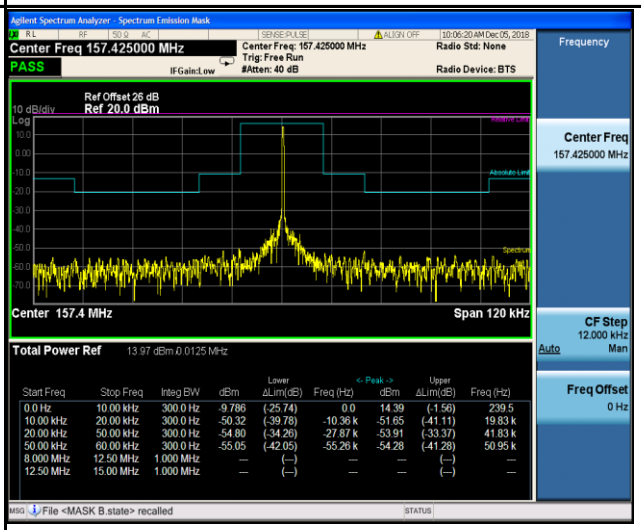
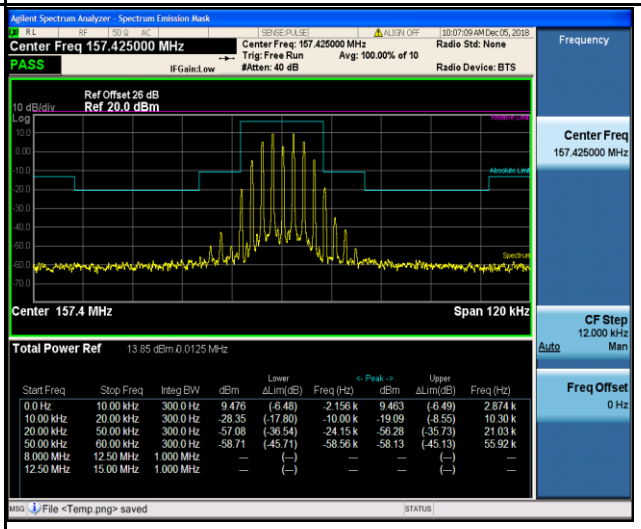
## Appendix C:Emission Mask

| Operation Mode | Modulation Type | Test Channel | TEST PLOT RESULT |
|---|---|---|---|
| TX-AWH | FM | $CH_M$ |  |
| TX-AWH | FM | $CH_H$ |  |
| TX-AWH | FM | $CH_H$ |  |

## Appendix C:Emission Mask

| Operation Mode | Modulation Type | Test Channel | TEST PLOT RESULT |
|---|---|---|---|
| TX-AWL | FM | $CH_L$ |  |
| TX-AWL | FM | $CH_L$ |  |
| TX-AWL | FM | $CH_M$ |  |

## Appendix C:Emission Mask

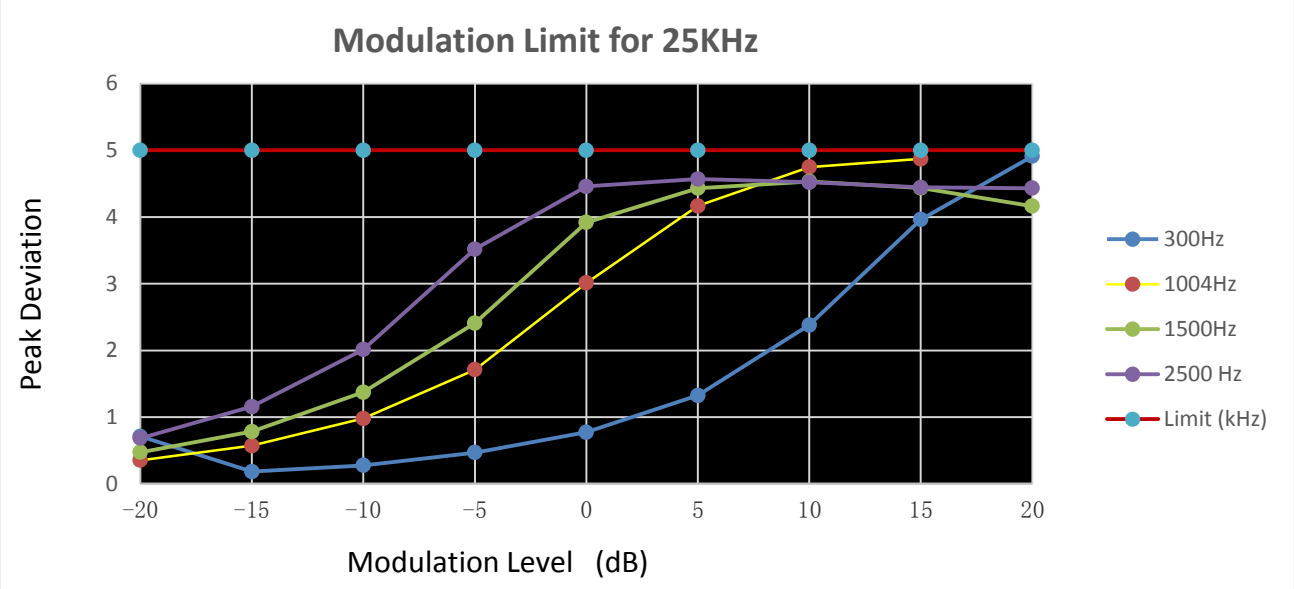
| Operation Mode | Modulation Type | Test Channel | TEST PLOT RESULT |
|---|---|---|---|
| TX-AWL | FM | $CH_M$ |  |
| TX-AWL | FM | $CH_H$ |  |
| TX-AWL | FM | $CH_H$ |  |

**Appendix D:Modulation Limit**

| Operation Mode | Modulation Type | Test Channel | Modulation Level (dB) | Peak frequency deviation (kHz) | | | | Limit (kHz) | Result |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 300Hz | 1004Hz | 1500Hz | 2500 Hz | | |
| TX-AWH | FM | $CH_M$ | -20 | 0.71 | 0.353 | 0.473 | 0.685 | 5 | PASS |
| TX-AWH | FM | $CH_M$ | -15 | 0.184 | 0.571 | 0.784 | 1.157 | 5 | PASS |
| TX-AWH | FM | $CH_M$ | -10 | 0.276 | 0.981 | 1.374 | 2.015 | 5 | PASS |
| TX-AWH | FM | $CH_M$ | -5 | 0.469 | 1.712 | 2.41 | 3.519 | 5 | PASS |
| TX-AWH | FM | $CH_M$ | 0 | 0.774 | 3.013 | 3.918 | 4.459 | 5 | PASS |
| TX-AWH | FM | $CH_M$ | 5 | 1.326 | 4.166 | 4.432 | 4.569 | 5 | PASS |
| TX-AWH | FM | $CH_M$ | 10 | 2.382 | 4.749 | 4.534 | 4.521 | 5 | PASS |
| TX-AWH | FM | $CH_M$ | 15 | 3.961 | 4.871 | 4.434 | 4.444 | 5 | PASS |
| TX-AWH | FM | $CH_M$ | 20 | 4.912 | 4.847 | 4.163 | 4.431 | 5 | PASS |

**Appendix D:Modulation Limit**

| TEST PLOT RESULT |
|---|

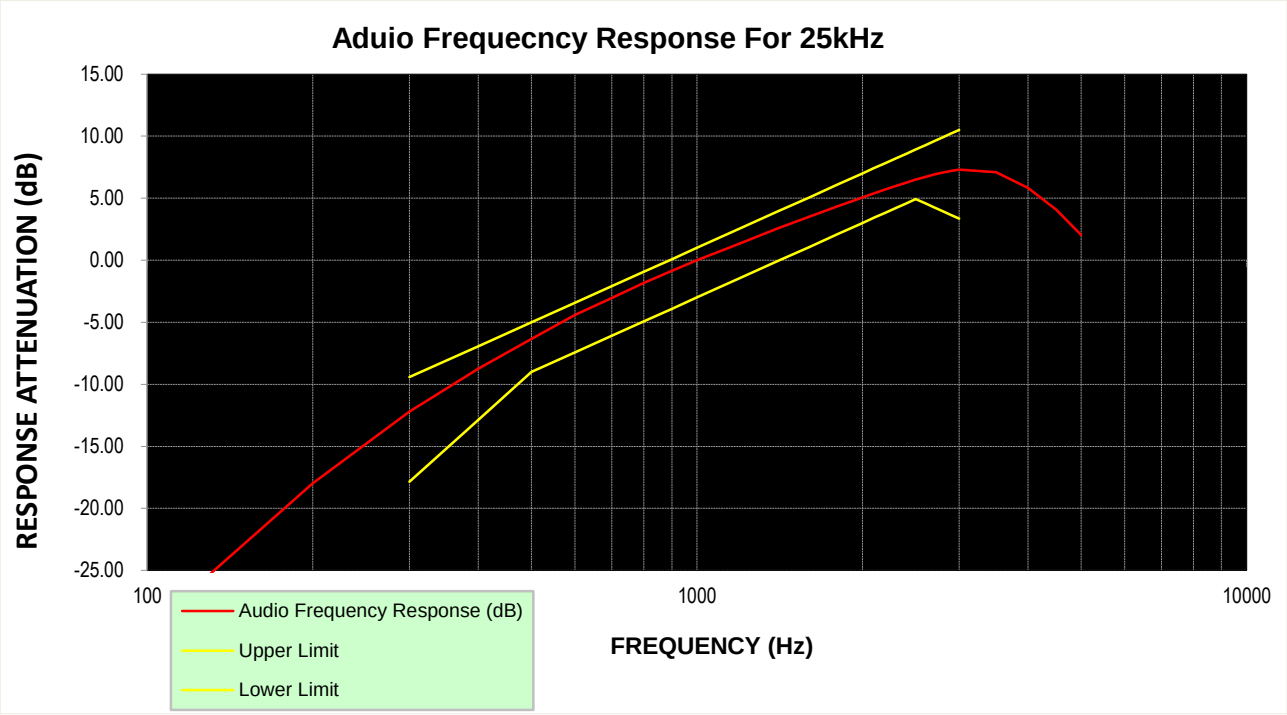


**Appendix E:Aduio Frequency Response**

| Operation Mode | Modulation Type | Test Channel | Frequency (Hz) | Audio Frequency Response (dB) | Lower Limit | Upper Limit | Result |
|---|---|---|---|---|---|---|---|
| TX-AWH | FM | $CH_M$ | 100 | -29.77 | | | PASS |
| TX-AWH | FM | $CH_M$ | 200 | -17.99 | | | PASS |
| TX-AWH | FM | $CH_M$ | 300 | -12.19 | -17.84 | -9.42 | PASS |
| TX-AWH | FM | $CH_M$ | 400 | -8.74 | -12.86 | -6.93 | PASS |
| TX-AWH | FM | $CH_M$ | 500 | -6.36 | -9.00 | -5.00 | PASS |
| TX-AWH | FM | $CH_M$ | 600 | -4.42 | -7.42 | -3.42 | PASS |
| TX-AWH | FM | $CH_M$ | 700 | -3.05 | -6.09 | -2.09 | PASS |
| TX-AWH | FM | $CH_M$ | 800 | -1.82 | -4.93 | -0.93 | PASS |
| TX-AWH | FM | $CH_M$ | 900 | -0.86 | -3.91 | 0.09 | PASS |
| TX-AWH | FM | $CH_M$ | 1000 | 0.01 | -3.00 | 1.00 | PASS |
| TX-AWH | FM | $CH_M$ | 1200 | 1.38 | -1.42 | 2.58 | PASS |
| TX-AWH | FM | $CH_M$ | 1400 | 2.55 | -0.09 | 3.91 | PASS |
| TX-AWH | FM | $CH_M$ | 1600 | 3.51 | 1.07 | 5.07 | PASS |
| TX-AWH | FM | $CH_M$ | 1800 | 4.33 | 2.09 | 6.09 | PASS |
| TX-AWH | FM | $CH_M$ | 2000 | 5.07 | 3.00 | 7.00 | PASS |
| TX-AWH | FM | $CH_M$ | 2100 | 5.40 | 3.42 | 7.42 | PASS |
| TX-AWH | FM | $CH_M$ | 2200 | 5.70 | 3.83 | 7.83 | PASS |
| TX-AWH | FM | $CH_M$ | 2300 | 5.99 | 4.21 | 8.21 | PASS |
| TX-AWH | FM | $CH_M$ | 2400 | 6.25 | 4.58 | 8.58 | PASS |
| TX-AWH | FM | $CH_M$ | 2500 | 6.50 | 4.93 | 8.93 | PASS |
| TX-AWH | FM | $CH_M$ | 2600 | 6.72 | 4.59 | 9.27 | PASS |
| TX-AWH | FM | $CH_M$ | 2700 | 6.91 | 4.27 | 9.60 | PASS |
| TX-AWH | FM | $CH_M$ | 2800 | 7.07 | 3.95 | 9.91 | PASS |
| TX-AWH | FM | $CH_M$ | 2900 | 7.19 | 3.65 | 10.22 | PASS |
| TX-AWH | FM | $CH_M$ | 3000 | 7.29 | 3.35 | 10.51 | PASS |
| TX-AWH | FM | $CH_M$ | 3500 | 7.09 | | | PASS |
| TX-AWH | FM | $CH_M$ | 4000 | 5.84 | | | PASS |
| TX-AWH | FM | $CH_M$ | 4500 | 4.07 | | | PASS |
| TX-AWH | FM | $CH_M$ | 5000 | 2.04 | | | PASS |

**Appendix E:Aduio Frequency Response**

| TEST PLOT RESULT |
|---|



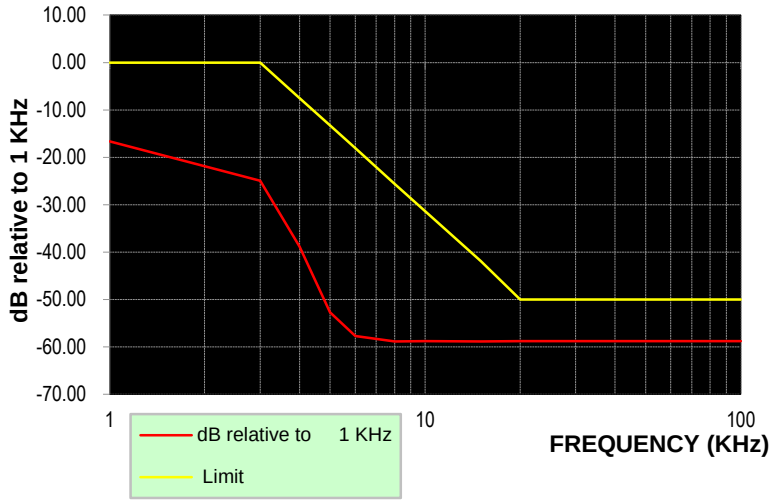

Note: The highest audio frequency response at 3kHz<3.125kHz, so meet the requirement.

**Appendix F:Audio Low Pass Filter Response**

| Operation Mode | Modulation Type | Test Channel | Frequency (KHz) | dB relative to 1 KHz | Limit | Result |
|---|---|---|---|---|---|---|
| TX-AWH | FM | $CH_M$ | 1 | -16.67 | 0.00 | PASS |
| TX-AWH | FM | $CH_M$ | 3 | -24.98 | 0.00 | PASS |
| TX-AWH | FM | $CH_M$ | 4 | -38.86 | -7.50 | PASS |
| TX-AWH | FM | $CH_M$ | 5 | -52.74 | -13.30 | PASS |
| TX-AWH | FM | $CH_M$ | 6 | -57.69 | -18.10 | PASS |
| TX-AWH | FM | $CH_M$ | 8 | -58.89 | -25.60 | PASS |
| TX-AWH | FM | $CH_M$ | 10 | -58.82 | -31.40 | PASS |
| TX-AWH | FM | $CH_M$ | 15 | -58.87 | -41.90 | PASS |
| TX-AWH | FM | $CH_M$ | 20 | -58.83 | -50.00 | PASS |
| TX-AWH | FM | $CH_M$ | 30 | -58.79 | -50.00 | PASS |
| TX-AWH | FM | $CH_M$ | 40 | -58.79 | -50.00 | PASS |
| TX-AWH | FM | $CH_M$ | 50 | -58.79 | -50.00 | PASS |
| TX-AWH | FM | $CH_M$ | 60 | -58.79 | -50.00 | PASS |
| TX-AWH | FM | $CH_M$ | 70 | -58.79 | -50.00 | PASS |
| TX-AWH | FM | $CH_M$ | 80 | -58.79 | -50.00 | PASS |
| TX-AWH | FM | $CH_M$ | 90 | -58.79 | -50.00 | PASS |
| TX-AWH | FM | $CH_M$ | 100 | -58.79 | -50.00 | PASS |

`

**Appendix F:Audio Low Pass Filter Response**

| Operation Mode | Modulation Type | Test Channel | TEST PLOT RESULT |
|---|---|---|---|
| TX-AWH | FM | $CH_M$ |  |

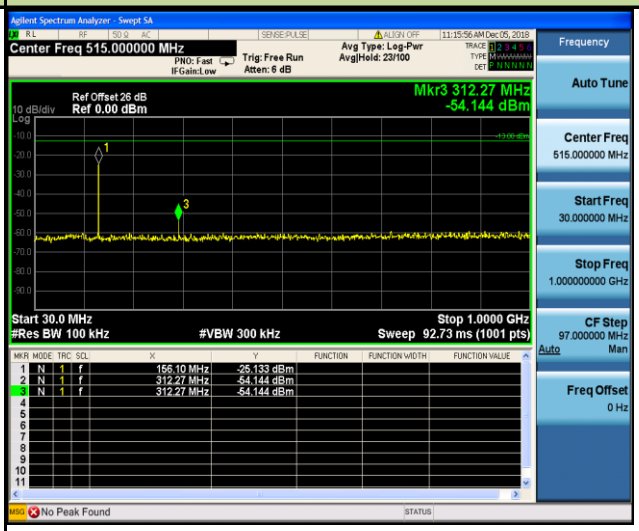
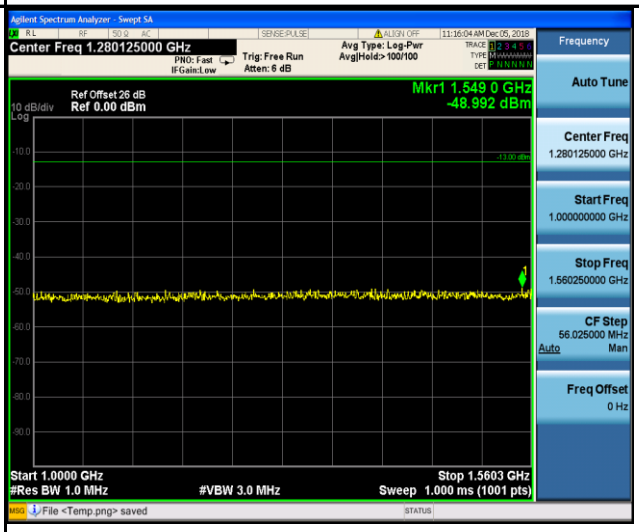
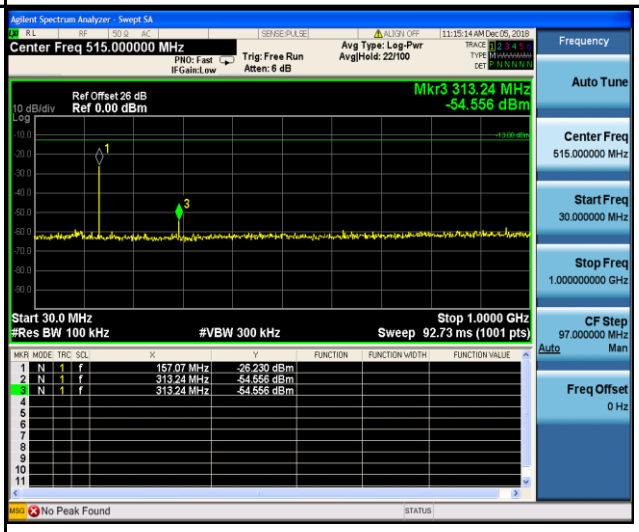
**Appendix G:Frequency Stability Test & Temperature**

| Operation Mode | Modulation Type | Test Conditions | | Frequency error (ppm) | | | Limit (ppm) | Result |
|---|---|---|---|---|---|---|---|---|
| | | Voltage | Temperature | $CH_L$ | $CH_M$ | $CH_H$ | | |
| TX-AWH | FM | $V_N$ | -30 | -1.658 | -1.644 | **-1.740** | ±10 | PASS |
| TX-AWH | FM | $V_N$ | -20 | -1.519 | -1.613 | -1.602 | ±10 | PASS |
| TX-AWH | FM | $V_N$ | -10 | -1.490 | -1.429 | -1.570 | ±10 | PASS |
| TX-AWH | FM | $V_N$ | 0 | -1.331 | -1.307 | -1.369 | ±10 | PASS |
| TX-AWH | FM | $V_N$ | 10 | -1.182 | -1.205 | -1.188 | ±10 | PASS |
| TX-AWH | FM | $V_N$ | 20 | -0.993 | -1.021 | -1.061 | ±10 | PASS |
| TX-AWH | FM | $V_N$ | 30 | -1.211 | -1.174 | -1.273 | ±10 | PASS |
| TX-AWH | FM | $V_N$ | 40 | -1.271 | -1.307 | -1.369 | ±10 | PASS |
| TX-AWH | FM | $V_N$ | 55 | -1.400 | -1.419 | -1.454 | ±10 | PASS |
| TX-AWL | FM | $V_N$ | -30 | -1.600 | -1.579 | -1.592 | ±10 | PASS |
| TX-AWL | FM | $V_N$ | -20 | -1.527 | -1.475 | -1.486 | ±10 | PASS |
| TX-AWL | FM | $V_N$ | -10 | -1.414 | -1.360 | -1.412 | ±10 | PASS |
| TX-AWL | FM | $V_N$ | 0 | -1.280 | -1.255 | -1.370 | ±10 | PASS |
| TX-AWL | FM | $V_N$ | 10 | -1.218 | -1.234 | -1.244 | ±10 | PASS |
| TX-AWL | FM | $V_N$ | 20 | -1.032 | -1.046 | -1.054 | ±10 | PASS |
| TX-AWL | FM | $V_N$ | 30 | -1.269 | -1.213 | -1.286 | ±10 | PASS |
| TX-AWL | FM | $V_N$ | 40 | -1.311 | -1.308 | -1.349 | ±10 | PASS |
| TX-AWL | FM | $V_N$ | 55 | -1.455 | -1.433 | -1.476 | ±10 | PASS |

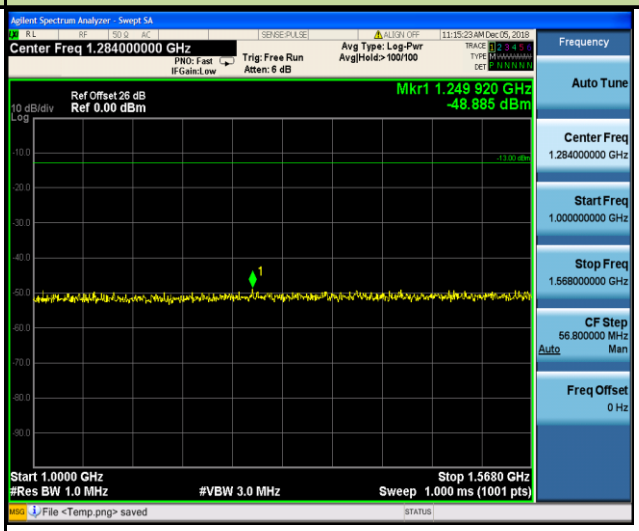
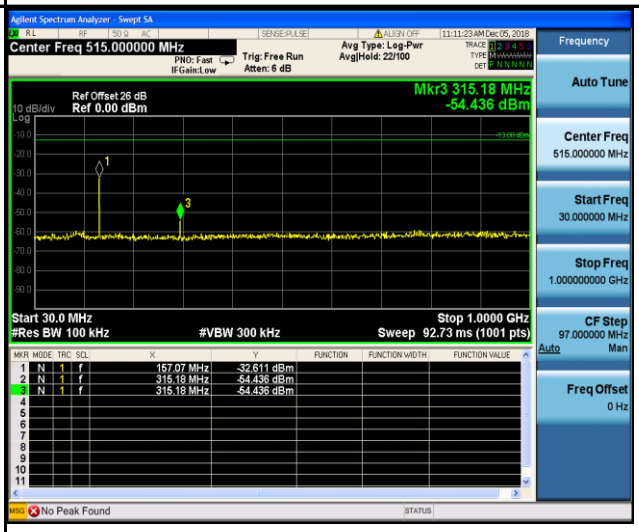
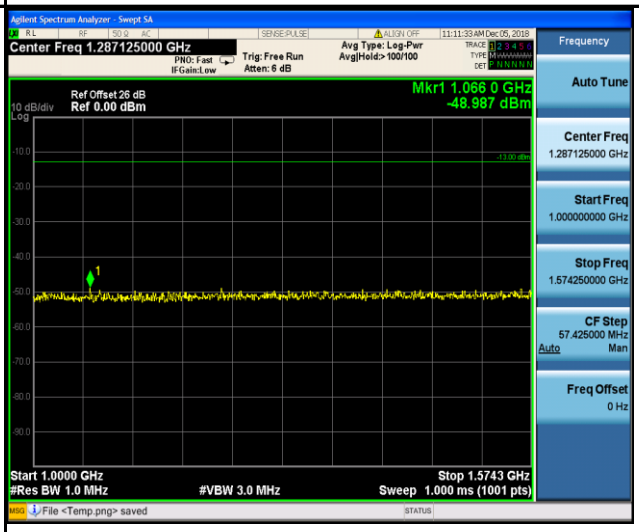
**Appendix H:Frequency Stability Test & Voltage**

| Operation Mode | Modulation Type | Test Conditions | | Frequency error (ppm) | | | Limit (ppm) | Result |
|---|---|---|---|---|---|---|---|---|
| | | Voltage | Temperature | $CH_L$ | $CH_M$ | $CH_H$ | | |
| TX-AWH | FM | $V_N$ | $T_N$ | -0.993 | -1.021 | -1.061 | ±10 | PASS |
| TX-AWH | FM | $V_L$ | $T_N$ | -1.483 | -1.511 | **-1.521** | ±10 | PASS |
| TX-AWH | FM | $V_H$ | $T_N$ | -1.223 | -1.231 | -1.261 | ±10 | PASS |
| TX-AWL | FM | $V_N$ | $T_N$ | -1.032 | -1.046 | -1.054 | ±10 | PASS |
| TX-AWL | FM | $V_L$ | $T_N$ | -1.282 | -1.386 | -1.404 | ±10 | PASS |
| TX-AWL | FM | $V_H$ | $T_N$ | -1.212 | -1.276 | -1.274 | ±10 | PASS |

## Appendix I:Spurious Emission On Antenna Port

| Operation Mode | Modulation Type | Test Channel | TEST PLOT RESULT |
|---|---|---|---|
| TX-AWH | FM | $CH_L$ |  <br>30MHz~1GHz |
| TX-AWH | FM | $CH_L$ |  <br>1GHz~10th Harmonic |
| TX-AWH | FM | $CH_M$ |  <br>30MHz~1GHz |

## Appendix I:Spurious Emission On Antenna Port

| Operation Mode | Modulation Type | Test Channel | TEST PLOT RESULT |
|---|---|---|---|
| TX-AWH | FM | $CH_M$ |  <br>1GHz~10th Harmonic |
| TX-AWH | FM | $CH_H$ |  <br>30MHz~1GHz |
| TX-AWH | FM | $CH_H$ |  <br>1GHz~10th Harmonic |

----End of Report----