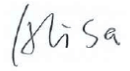
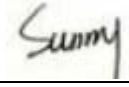
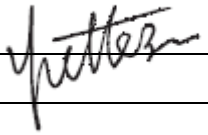
# TEST REPORT

**FCC Part 90**

| | | |
|---|---|---|
| **Report Reference No. .....:** | **MTWC21100743** | |
| **FCC ID. .....:** | **2A3NB-SR-3** | |
| Compiled by ( position+printed name+signature) .....: | File administrators Alisa Luo |  |
| Supervised by ( position+printed name+signature) .....: | Test Engineer Sunny Deng |  |
| Approved by ( position+printed name+signature) .....: | Manager Yvette Zhou |  |
| Date of issue .....: | 2021.11.02 | |
| **Testing Laboratory Name** .....: | **Shenzhen Most Technology Service Co., Ltd.** | |
| Address .....: | No.5, 2nd Langshan Road, North District, Hi-tech Industrial Park, Nanshan, Shenzhen, Guangdong, China. | |
| **Applicant's name** .....: | **Sure-Response, Inc.** | |
| Address .....: | 1075 N Reed Station Rd, Carbondale, IL 62902, USA | |
| **Test specification** .....: | | |
| Standard .....: | **FCC Part 90** | |



| | |
|---|---|
| **Test item description.....:** | **FM Transceiver** |
| Trade Mark .....: | Sure-Response |
| **Manufacturer** .....: | **Rexon Technology Co, Ltd.** |
| Model/Type reference .....: | SR-3 |
| Listed Models .....: | N/A |
| Ratings .....: | DC 3.7V by Battery<br>DC 5V (by Adapter) |
| Modulation .....: | FM |
| Hardware version.....: | V 1.0 |
| Software version .....: | V1.0_191220 |
| Frequency ..... | 450MHz~470MHz |
| Result .....: | **PASS** |

# TEST REPORT

| | | |
|---|---|---|
| Equipment under Test | : | FM Transceiver |
| Model /Type | : | SR-3 |
| Listed Models | : | N/A |
| **Applicant** | : | Sure-Response, Inc. |
| Address | : | 1075 N Reed Station Rd, Carbondale, IL 62902, USA |
| **Manufacturer** | : | Rexon Technology Co,, Ltd. |
| Address | : | No. 261 Jen hwa Road, Tali, Taichung 412, Taiwan, R.O.C |

| **Test result** | **Pass *** |
|---|---|

* In the configuration tested, the EUT complied with the standards specified page 4.

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

## TABLE OF CONTENTS

# 1. Revision History

| Revision | Issue Date | Revisions | Revised By |
|---|---|---|---|
| 00 | 2021.11.02 | Initial Issue | Alisa Luo |
| | | | |
| | | | |

# 2. TEST STANDARDS

The tests were performed according to following standards:

FCC Part 90: PRIVATE LAND MOBILE RADIO SERVICES

TIA/EIA 603-D-2010: Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

47 CFR FCC Part 15 Subpart B - Unintentional Radiators
FCC Part 2: FREQUENCY ALLOCA-TIONS AND RADIO TREATY MAT-TERS; GENERAL RULES AND REG-ULATIONS

# 2. SUMMARY

## 2.1 General Remarks

| | | |
|---|---|---|
| **Data of receipt of test sample** | : | 2021.10.26 |
| | | |
| **Testing commenced on** | : | 2021.10.27 |
| | | |
| **Testing concluded on** | : | 2021.11.01 |

## 2.2 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 3.7V by Battery/DC 5V (by Adapter)

## 2.3 Short description of the Equipment under Test (EUT)

This is a FM Transceiver

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

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

The FM Transceiver Model: SR-3 or the “EUT” as referred to in this report; more general information as follows, for more details, refer to the user’s manual of the EUT.

| | | |
|---|---|---|
| Name of EUT | FM Transceiver | |
| Model Number | SR-3 | |
| Maximum Transmitter Power | 32.996dBm | |
| Power Supply | DC 3.7V,1200mAh by battery, charging for DC 5 V | |
| Modulation Type | FM | 11K0F3E for 12.5KHz Channel Separation |
| | | 16K0F3E for 25KHz Channel Separation |
| Channel Separation | 12.5KHz/25KHz | |
| Antenna Type | External | |
| Antenna Gain | 0dBi | |
| Frequency Range | From 450MHz to 470MHz | |
| Output power Modification | 2W/1W<br>(It was fixed by the manufacturer, any individual can’t arbitrarily change it.) | |

**Test frequency list**

| Frequency Range (MHz) | Modulation Type | Channel Separation (KHz) | Test frequency (MHz) |
|---|---|---|---|
| 450-470 MHz | FM | 12.5KHz/25KHz | 450.0250MHz |
| | | | 460.0250 MHz |
| | | | 469.9750MHz |

## 2.5 EUT operation mode

RF test modes:
The EUT (FM Transceiver) has been tested under normal operating condition. (The top channel, the middle channel and the bottom channel) are chosen for testing at each channel separation.

The Conducted Emissions test mode:Charging

Note:
1.Only the result of the worst case was recorded in the report, if no other cases.
2.For Radiated Emission, 3axis were chosen for testing for each applicable mode.
3.For Conducted Test method, a temporary antenna connector is provided by the manufacture.
4.Manufacturers use computer PC programming software to switch and operate frequency points, refer to the instructions for details.

## 2.6 Test Item (Equipment Under Test) Description*

| Short designation | EUT Name | EUT Description | Serial number | Hardware status | Software status |
|---|---|---|---|---|---|
| EUT A | | | | | |
| EUT B | | | | | |
| | | | | | |

*: declared by the applicant. According to customers information EUTs A and B are the same devices.

## 2.7 Auxiliary Equipment (AE) Description

| AE short designation | EUT Name (if available) | EUT Description | Serial number (if available) | Software (if used) |
|---|---|---|---|---|
| AE 1 | --- | | --- | |
| AE 2 | | | | |
| | | | | |

## 2.8 Antenna Information*

| Short designation | Antenna Name | Antenna Type | Frequency Range | Serial number | Antenna Peak Gain |
|---|---|---|---|---|---|
| Antenna 1 | --- | External Antenna | 450 to 470MHz | --- | 0dBi |
| Antenna 2 | | | | | |
| | | | | | |

*: declared by the applicant.

## 2.9 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for the device filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

## 2.10 Modifications

No modifications were implemented to meet testing criteria.

## 2.11 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: 2A3NB-SR-3 filing to comply with the FCC Part 90 Rules.

# 3. TEST ENVIRONMENT

## 3. 1 TEST FACILITY

**Shenzhen Most Technology Service Co., Ltd.**
No.5, 2nd Langshan Road, North District, Hi-tech Industrial Park, Nanshan, Shenzhen, Guangdong, China.
The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.4:2014 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

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

**FCC-Designation No.: CN1315**
Shenzhen Most Technology Service 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.

**A2LA-Lab Cert. No.: 6343.01**
Shenzhen Most Technology Service 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.

## 3.2 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 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 EMCMeasurements“ and is documented in the Shenzhen Most Technology 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 Most Technology Service Co., Ltd. is reported:

| Test | Range | Measurement Uncertainty | Notes |
|---|---|---|---|
| Radiated Emission | 30~1000MHz | 3.15 dB | (1) |
| Radiated Emission | 1~18GHz | 4.32 dB | (1) |
| Radiated Emission | 18-40GHz | 5.54 dB | (1) |
| Conducted Disturbance | 0.15~30MHz | 1.25 dB | (1) |
| Spurious RF Conducted Emission | 9KHz~40GHz | 1.22 dB | (1) |
| Band Edge Compliance of RF Emission | 9KHz~40GHz | 1.22 dB | (1) |
| Occupied Bandwidth | 9KHz~40GHz | - | (1) |

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

## 3.5. Equipments Used during the Test

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | L.I.S.N. | R&S | ENV216 | 100093 | 2021/04/19 | 1 Year |
| 2 | Three-phase artificial power network | Schwarzback Mess | NNLK8129 | 8129178 | 2021/04/19 | 1 Year |
| 3. | Receiver | R&S | ESCI | 100492 | 2021/04/7 | 1 Year |
| 4 | Receiver | R&S | ESPI | 101202 | 2021/04/7 | 1 Year |
| 5 | Spectrum analyzer | Agilent | 9020A | MT-E306 | 2021/04/7 | 1 Year |
| 6 | Bilong Antenna | Sunol Sciences | JB3 | A121206 | 2021/03/14 | 1 Year |
| 7 | Horn antenna | HF Antenna | HF Antenna | MT-E158 | 2021/04/7 | 1 Year |
| 8 | Loop antenna | Beijing Daze | ZN30900B | / | 2021/04/16 | 1 Year |
| 9 | Horn antenna | R&S | OBH100400 | 26999002 | 2021/04/16 | 1 Year |
| 10 | Wireless Communication Test Set | R&S | CMW500 | / | 2021/04/15 | 1 Year |
| 11 | Spectrum analyzer | R&S | FSP | 100019 | 2021/04/15 | 1 Year |
| 12 | High gain antenna | Schwarzbeck | LB-180400KF | MT-E389 | 2021/03/14 | 1 Year |
| 13 | Preamplifier | Schwarzbeck | BBV 9743 | MT-E390 | 2021/03/14 | 1 Year |
| 14 | Pre-amplifier | EMCI | EMC051845SE | MT-E391 | 2021/03/14 | 1 Year |
| 15 | Pre-amplifier | Agilent | 83051A | MT-E392 | 2021/03/14 | 1 Year |
| 16 | High pass filter unit | Tonscend | JS0806-F | MT-E393 | 2021/03/14 | 1 Year |
| 17 | RF Cable(below1GHz) | Times | 9kHz-1GHz | MT-E394 | 2021/03/14 | 1 Year |
| 18 | RF Cable(above 1GHz) | Times | 1-40G | MT-E395 | 2021/03/14 | 1 Year |
| 19 | RF Cable (9KHz-40GHz) | Tonscend | 170660 | N/A | 2021/03/14 | 1 Year |
| 20 | RF COMMUNICATION TEST SET | HP | 8920A | 3813A10206 | 2021/04/16 | 1 Year |
| 21 | Storage Oscilloscope | Tektronix | TDS3054B | B033917 | 2021/04/07 | 1 Year |

## 3.6. General Technical Requirements and Summary of Test Results

| FCC Rules | Description of Test | Test Result |
|---|---|---|
| FCC PART 90 | Antenna Equipment | Complies |
| § 90.205 | Maximum Transmitter Power | Complies |
| § 90.207 | Modulation Characteristic | Complies |
| § 2.1047 | Audio Low Pass Filter Response | Complies |
| § 90.209 | Occupied Bandwidth | Complies |
| § 90.210 | Emission Mask | Complies |
| § 90.213 | Frequency Stability | Complies |
| § 90.214 | Transmitter Frequency Behavior | Complies |
| § 90.210 | Transmitter Radiated Spurious Emission | Complies |
| § 90.210 | Spurious Emission On Antenna Port | Complies |

## 3.10 Environmental conditions

Radiated Emission:

| | |
|---|---|
| Temperature: | 25 ° C |
| | |
| Humidity: | 48 % |
| | |
| Atmospheric pressure: | 950-1050mbar |

AC Main Conducted testing：

| | |
|---|---|
| Temperature: | 26 ° C |
| | |
| Humidity: | 45 % |
| | |
| Atmospheric pressure: | 950-1050mbar |

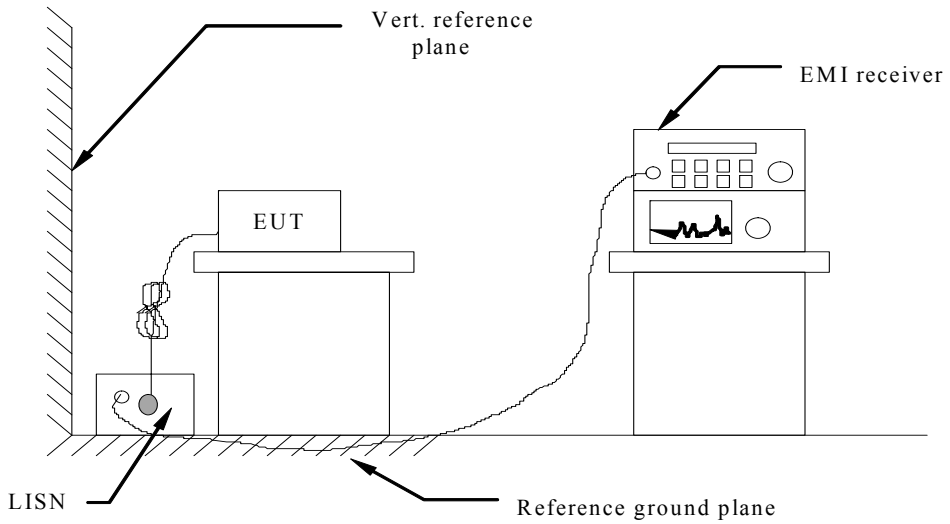
Conducted testing：

| | |
|---|---|
| Temperature: | 26 ° C |
| | |
| Humidity: | 45 % |
| | |
| Atmospheric pressure: | 950-1050mbar |

# 4. TEST CONDITIONS AND RESULTS

## 4.1 Conducted Emissions Test

**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.
2 Support equipment, if needed, was placed as per ANSI C63.4.
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.
4 The EUT received DC3.7V power from the 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.

**Conducted Power Line Emission Limit**

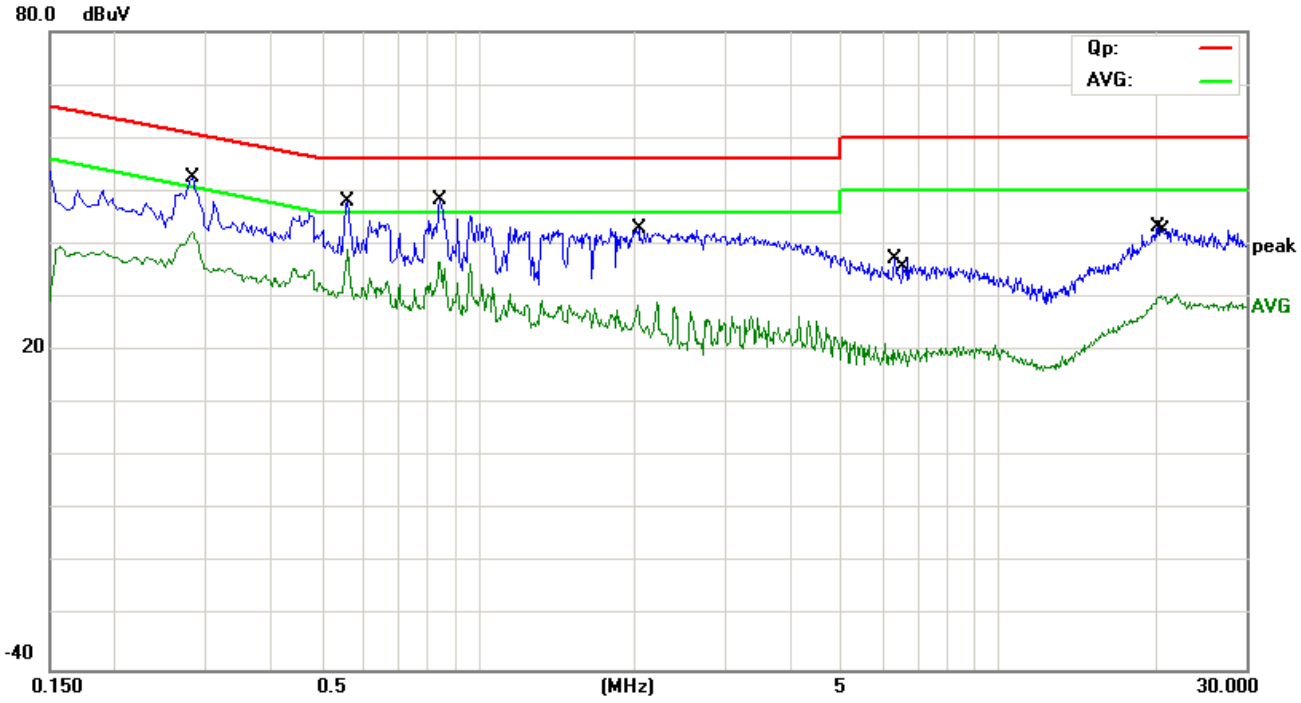
For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following：

| Frequency (MHz) | Maximum RF Line Voltage (dBμV) | | | |
|---|---|---|---|---|
| | CLASS A | | CLASS B | |
| | Q.P. | Ave. | Q.P. | Ave. |
| 0.15-0.50 | 79 | 66 | 66-65 | 56-46 |
| 0.50-5.00 | 73 | 60 | 56 | 46 |
| 5.00-30.0 | 73 | 60 | 60 | 50 |

* Decreasing linearly with the logarithm of the frequency
For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

**TEST RESULTS**

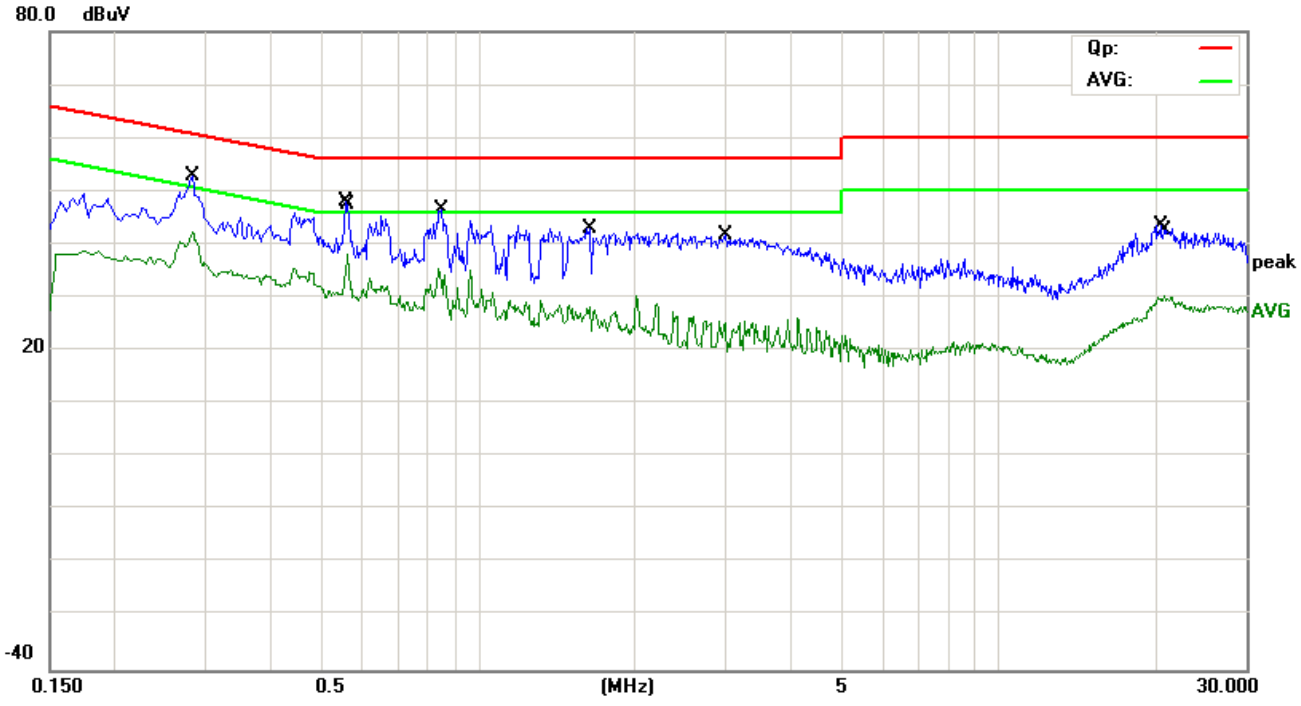
| Power supply: | DC5V(by USB) | Polarization | L |
|---|---|---|---|




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | | 0.2820 | 43.01 | 9.59 | 52.60 | 60.76 | -8.16 | QP | |
| 2 | | 0.2820 | 32.88 | 9.59 | 42.47 | 50.76 | -8.29 | AVG | |
| 3 | | 0.5620 | 38.48 | 9.59 | 48.07 | 56.00 | -7.93 | QP | |
| 4 | * | 0.5620 | 29.49 | 9.59 | 39.08 | 46.00 | -6.92 | AVG | |
| 5 | | 0.8420 | 27.08 | 9.60 | 36.68 | 46.00 | -9.32 | AVG | |
| 6 | | 0.8460 | 38.74 | 9.60 | 48.34 | 56.00 | -7.66 | QP | |
| 7 | | 2.0300 | 18.83 | 9.60 | 28.43 | 46.00 | -17.57 | AVG | |
| 8 | | 2.0340 | 33.21 | 9.60 | 42.81 | 56.00 | -13.19 | QP | |
| 9 | | 6.3500 | 27.59 | 9.64 | 37.23 | 60.00 | -22.77 | QP | |
| 10 | | 6.4540 | 9.81 | 9.64 | 19.45 | 50.00 | -30.55 | AVG | |
| 11 | | 20.3500 | 33.47 | 9.73 | 43.20 | 60.00 | -16.80 | QP | |
| 12 | | 20.5860 | 20.50 | 9.73 | 30.23 | 50.00 | -19.77 | AVG | |

*:Maximum data x:Over limit !:over margin

| Power supply: | DC5V(by USB) | Polarization | N |
|---|---|---|---|




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | | 0.2820 | 43.29 | 9.59 | 52.88 | 60.76 | -7.88 | QP | |
| 2 | | 0.2820 | 32.88 | 9.59 | 42.47 | 50.76 | -8.29 | AVG | |
| 3 | * | 0.5580 | 38.60 | 9.59 | 48.19 | 56.00 | -7.81 | QP | |
| 4 | | 0.5620 | 28.43 | 9.59 | 38.02 | 46.00 | -7.98 | AVG | |
| 5 | | 0.8460 | 25.01 | 9.60 | 34.61 | 46.00 | -11.39 | AVG | |
| 6 | | 0.8500 | 37.07 | 9.60 | 46.67 | 56.00 | -9.33 | QP | |
| 7 | | 1.6380 | 33.29 | 9.60 | 42.89 | 56.00 | -13.11 | QP | |
| 8 | | 1.6380 | 18.64 | 9.60 | 28.24 | 46.00 | -17.76 | AVG | |
| 9 | | 2.9900 | 15.73 | 9.61 | 25.34 | 46.00 | -20.66 | AVG | |
| 10 | | 2.9940 | 32.05 | 9.61 | 41.66 | 56.00 | -14.34 | QP | |
| 11 | | 20.5420 | 33.86 | 9.73 | 43.59 | 60.00 | -16.41 | QP | |
| 12 | | 20.8940 | 20.52 | 9.73 | 30.25 | 50.00 | -19.75 | AVG | |

*:Maximum data x:Over limit !:over margin

## 4.2 Occupied Bandwidth and Emission Mask

**PROVISIONS APPLICABLE**

a). Occupied Bandwidth: The EUT was connected to the audio signal generator and the spectrum analyzer via the main RF connector, and through an appropriate attenuator. The EUT was controlled to transmit its maximum power. Then the bandwidth of 99% power can be measured by the spectrum analyzer.

(b). Emission Mask B: For transmitters that are equipped with an audio low-pass filter pursuant to §90.211(a), the power of any emission must be below the unmodulated carrier power (P) as follows:

(1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.

(2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

(c). Emission Mask D, 12.5 kHz channel bandwidth equipment: For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

(1) On any frequency from the center of the authorized bandwidth f0 to 5.625 kHz removed from f0: Zero dB.

(2) On any frequency removed from the center of the authorized bandwidth 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.

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

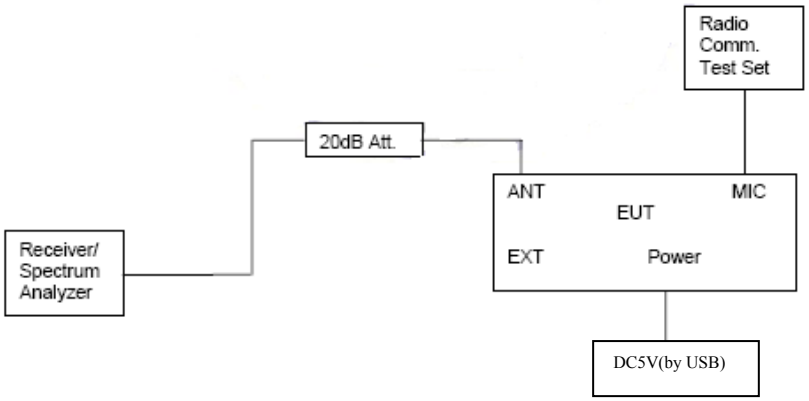
(d). Emission Mask E—6.25 kHz or less channel bandwidth equipment. For transmitters designed to operate with a 6.25 kHz or less bandwidth, any emis-sion must be attenuated below the power (P) of the highest emission con-tained within the authorized band-width as follows

(1) On any frequency from the center of the authorized bandwidth f0to 3.0 kHz removed from f0: Zero dB.

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fdin kHz) of more than 3.0 kHz but no more than 4.6 kHz: At least 30 + 16.67(fd-3 kHz) or 55 + 10 log (P) or 65 dB, whichever is the lesser attenuation.

(3) On any frequency removed from the center of the authorized bandwidth by more than 4.6 kHz: At least 55 + 10log (P) or 65 dB, whichever is the lesser attenuation.

**TEST CONFIGURATION**



**TEST PROCEDURE**

1 The EUT was modulated by 2.5 KHz 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 (12.5 kHz channel spacing)
2 Set EUT as normal operation.
3 Set SPA Center Frequency = fundamental frequency, RBW=300Hz, VBW= 3 KHz, span =50 KHz.
4 Set SPA Max hold. Mark peak, Set 99% Occupied Bandwidth and 26dB Occupied Bandwidth.
6 Set SPA Center Frequency=fundamental frequency, set RBW =100Hz, VBW=1 KHz, span=50 KHz for 12.5 channel spacing and set =100Hz, VBW=1 KHz, span=50 KHz for 6.25 channel spacing

**TEST RESULTS:**

## Occupied Bandwidth

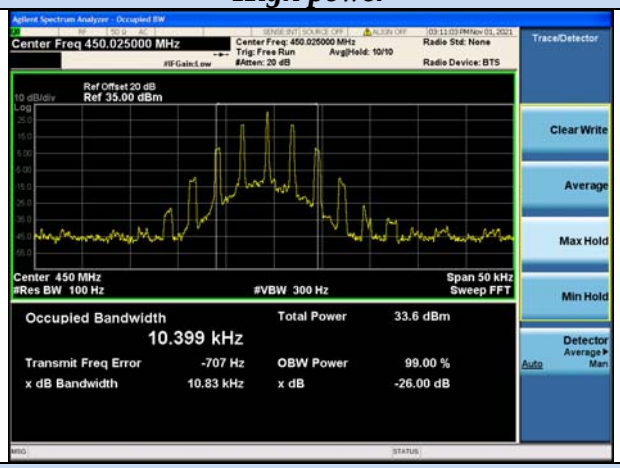
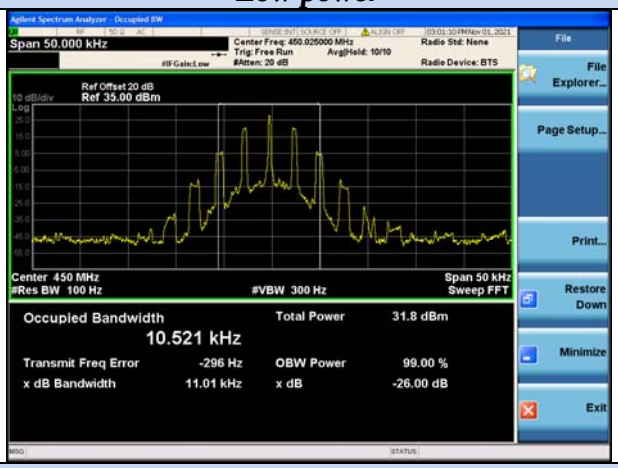
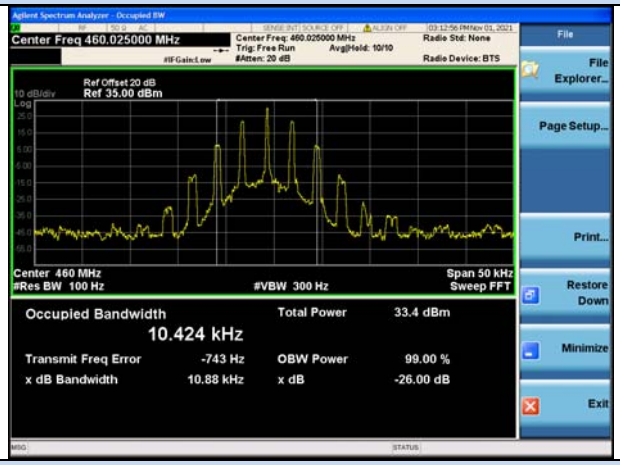
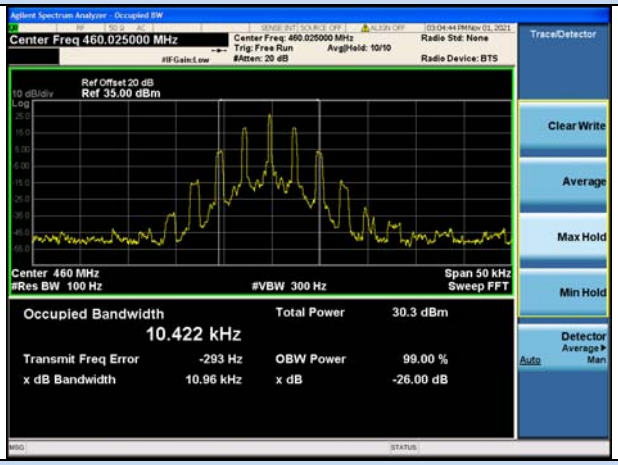
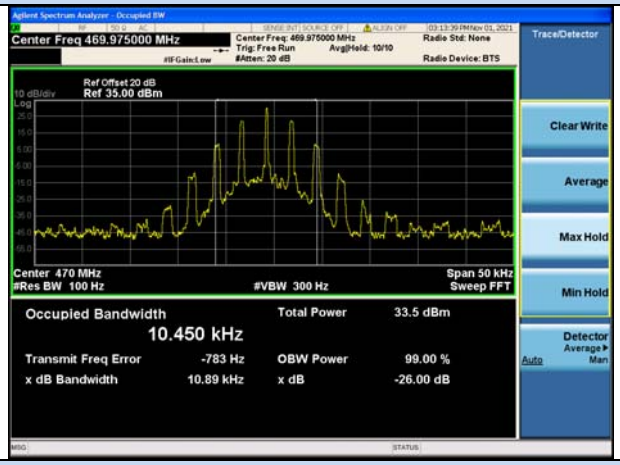
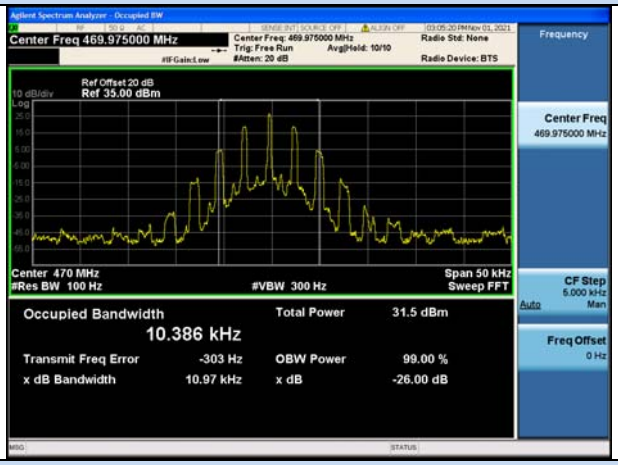
High power:

| Modulation Type | Channel Separation | Test Channel | Test Frequency | 99% Occupied Bandwidth (KHz) | 26dB Occupied Band width (KHz) |
|---|---|---|---|---|---|
| FM | 12.5KHz | Low | 450.0250MHz | 10.399 | 10.83 |
| | | Middle | 460.0250 MHz | 10.424 | 10.88 |
| | | High | 469.9750MHz | 10.450 | 10.89 |
| | 25 KHz | Low | 450.0250MHz | 15.389 | 16.29 |
| | | Middle | 460.0250 MHz | 15.382 | 16.27 |
| | | High | 469.9750MHz | 15.403 | 16.36 |
| Limit | | 11.25KHz for 12.5KHz Channel Separation | | | |
| | | 20KHz for 25KHz Channel Separation | | | |
| Test Results | | Compliance | | | |

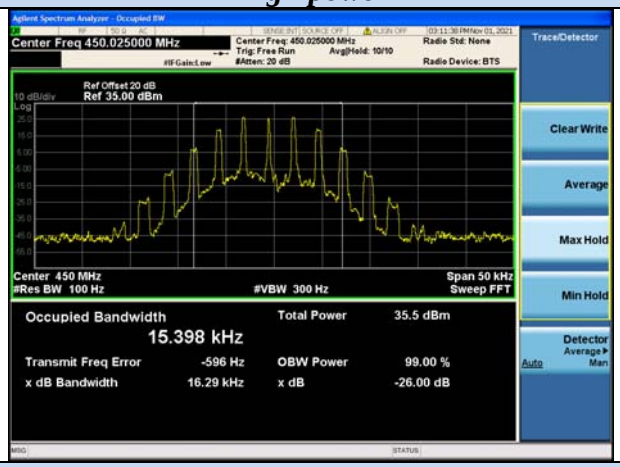
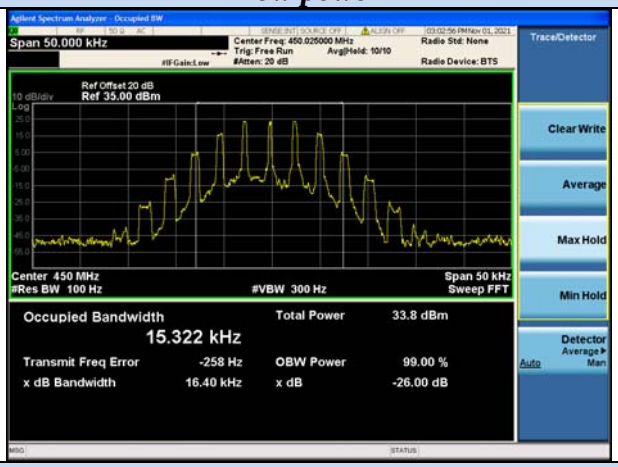
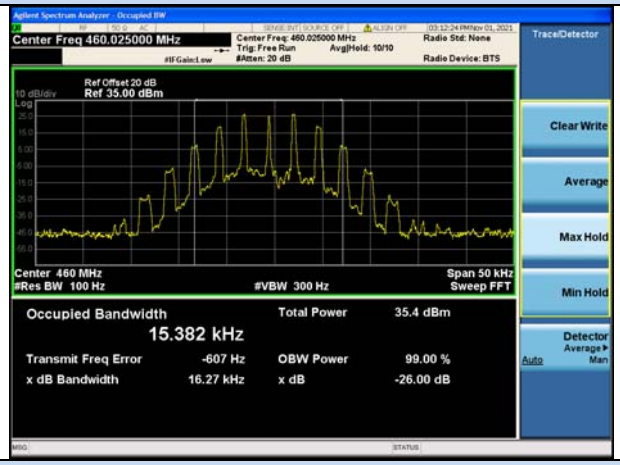
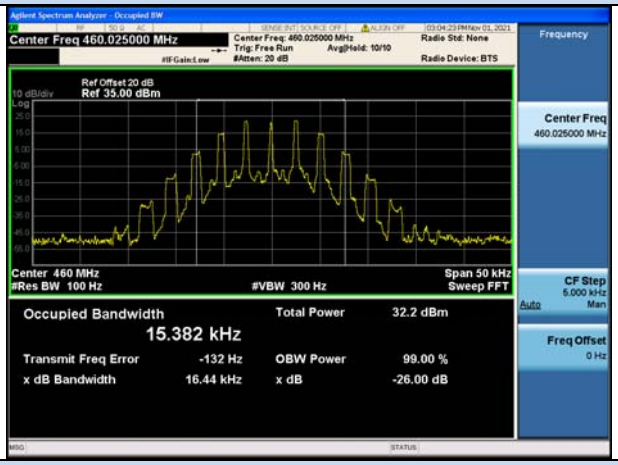
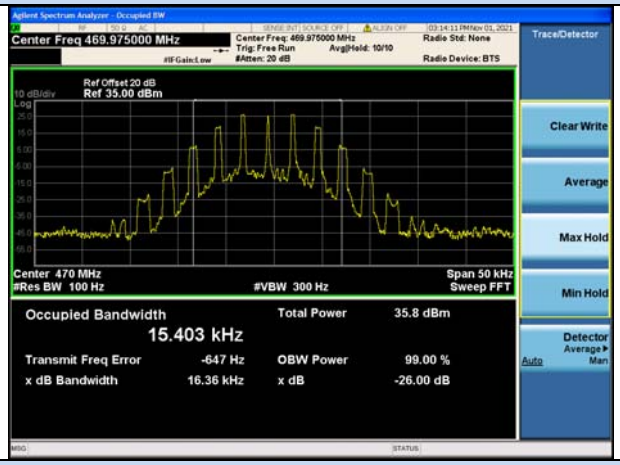
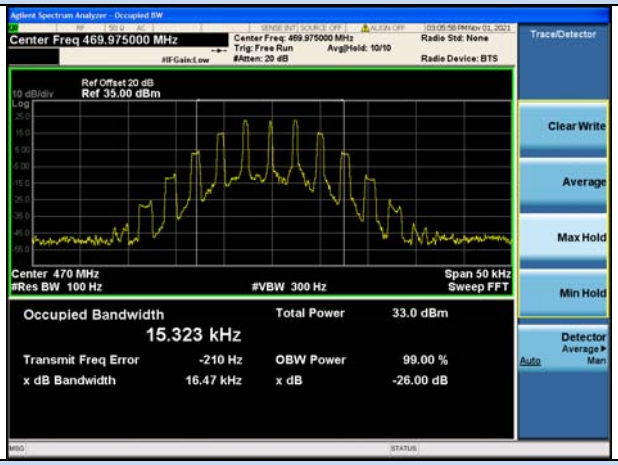
Low power:

| Modulation Type | Channel Separation | Test Channel | Test Frequency | 99% Occupied Bandwidth (KHz) | 26dB Occupied Band width (KHz) |
|---|---|---|---|---|---|
| FM | 12.5KHz | Low | 450.0250MHz | 10.521 | 11.01 |
| | | Middle | 460.0250 MHz | 10.422 | 10.96 |
| | | High | 469.9750MHz | 10.386 | 10.97 |
| | 25 KHz | Low | 450.0250MHz | 15.322 | 16.40 |
| | | Middle | 460.0250 MHz | 15.382 | 16.44 |
| | | High | 469.9750MHz | 15.323 | 16.47 |
| Limit | | 11.25KHz for 12.5KHz Channel Separation | | | |
| | | 20KHz for 25KHz Channel Separation | | | |
| Test Results | | Compliance | | | |

Analog/FM(12.5KHz)

| *Occupied Bandwidth and 26dB Bandwidth* | |
|---|---|
| ***High power*** | ***Low power*** |
|  |  |
| 450.0250MHz | 450.0250MHz |
|  |  |
| 460.0250 MHz | 460.0250 MHz |
|  |  |
| 469.9750MHz | 469.9750MHz |

Analog/FM(25KHz)

| *Occupied Bandwidth and 26dB Bandwidth* | |
|---|---|
| ***High power*** | ***Low power*** |
|  |  |
| 450.0250MHz | 450.0250MHz |
|  |  |
| 460.0250 MHz | 460.0250 MHz |
|  |  |
| 469.9750MHz | 469.9750MHz |

# Emission Mask

## Applicable Standard

FCC § 90.210

(b) Emission Mask B. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

(1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.

(2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

(d) Emission Mask D—12.5 kHz channel bandwidth equipment. For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

(1) On any frequency from the center of the authorized bandwidth f0 to 5.625 kHz removed from f0: Zero dB.

(2) On any frequency removed from the center of the authorized bandwidth 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.

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

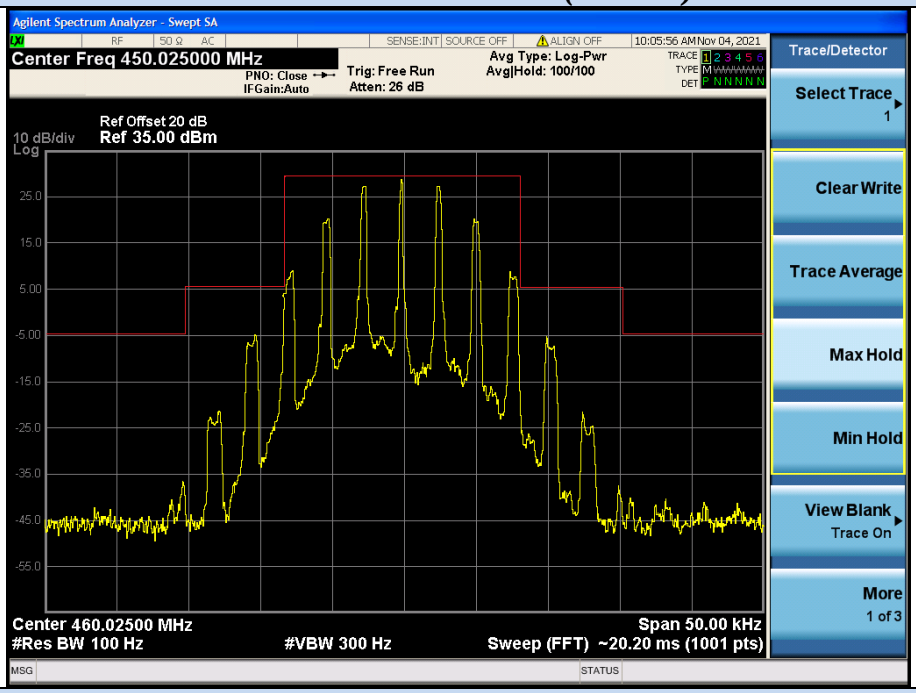
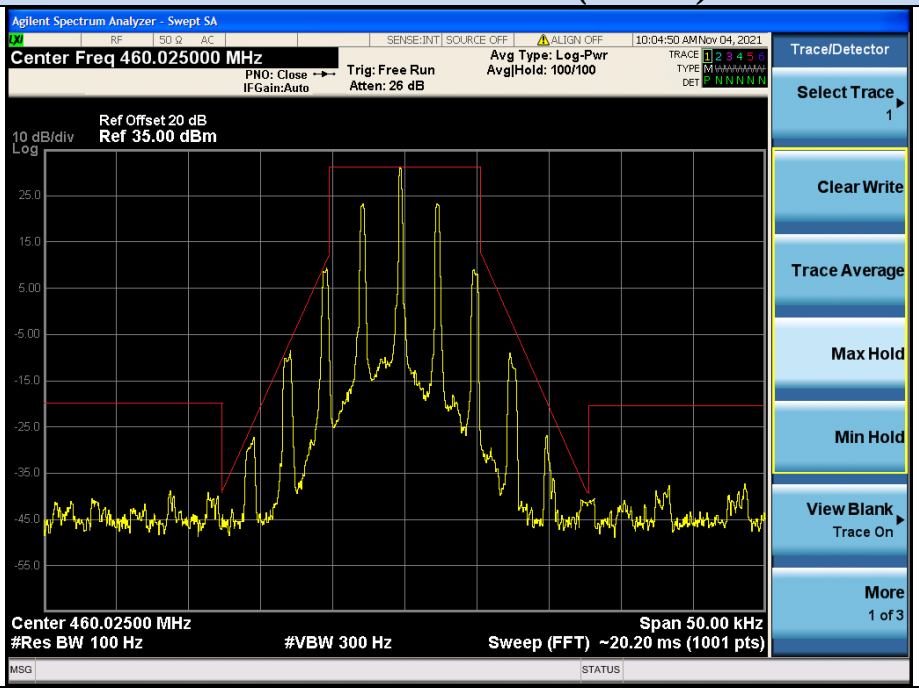
(4) The reference level for showing compliance with the emission mask shall be established using a resolution bandwidth sufficiently wide (usually two or three times the channel bandwidth) to capture the true peak emission of the equipment under test. In order to show compliance with the emission mask up to and including 50 kHz removed from the edge of the authorized bandwidth, adjust the resolution bandwidth to 100 Hz with the measuring instrument in a peak hold mode. A sufficient number of sweeps must be measured to insure that the emission profile is developed. If video filtering is used, its bandwidth must not be less than the instrument resolution bandwidth. For emissions beyond 50 kHz from the edge of the authorized bandwidth, see paragraph (o) of this section. If it can be shown that use of the above instrumentation settings do not accurately represent the true interference potential of the equipment under test, an alternate procedure may be used provided prior Commission approval is obtained.

**TEST RESULTS:**

# Emission Mask

Note: The report only reflects the high-power mid-channel 12.5HKz/25HKz data.

FM/Analog

| *Emission Mask* |
|---|
| *460.0250MHz/25KHz/2W (*Mask B *)* |
|  |
| *460.0250MHz/12.5KHz/2W (*Mask D *)* |
|  |

## 4.3. Radiated Spurious Emission Test

**TEST APPLICABLE**

According to the TIA/EIA 603 test method, and according to Section 90.210, the power of each unwanted emission shall be less than Transmitted Power as specified below for transmitters designed to operate with 12.5 KHz channel bandwidth:

1 On any frequency removed from the center of the authorized bandwidth fo to 5.625 KHz removed from fo: Zero dB

2 On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in KHz) fo of more than 5.625 KHz but no more than 12.5 KHz: At least 7.27dB

3 On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in KHz) fo of more than 12.5 KHz: At least 50+10 log (P) dB or 70 dB, which ever is lesser attenuation.

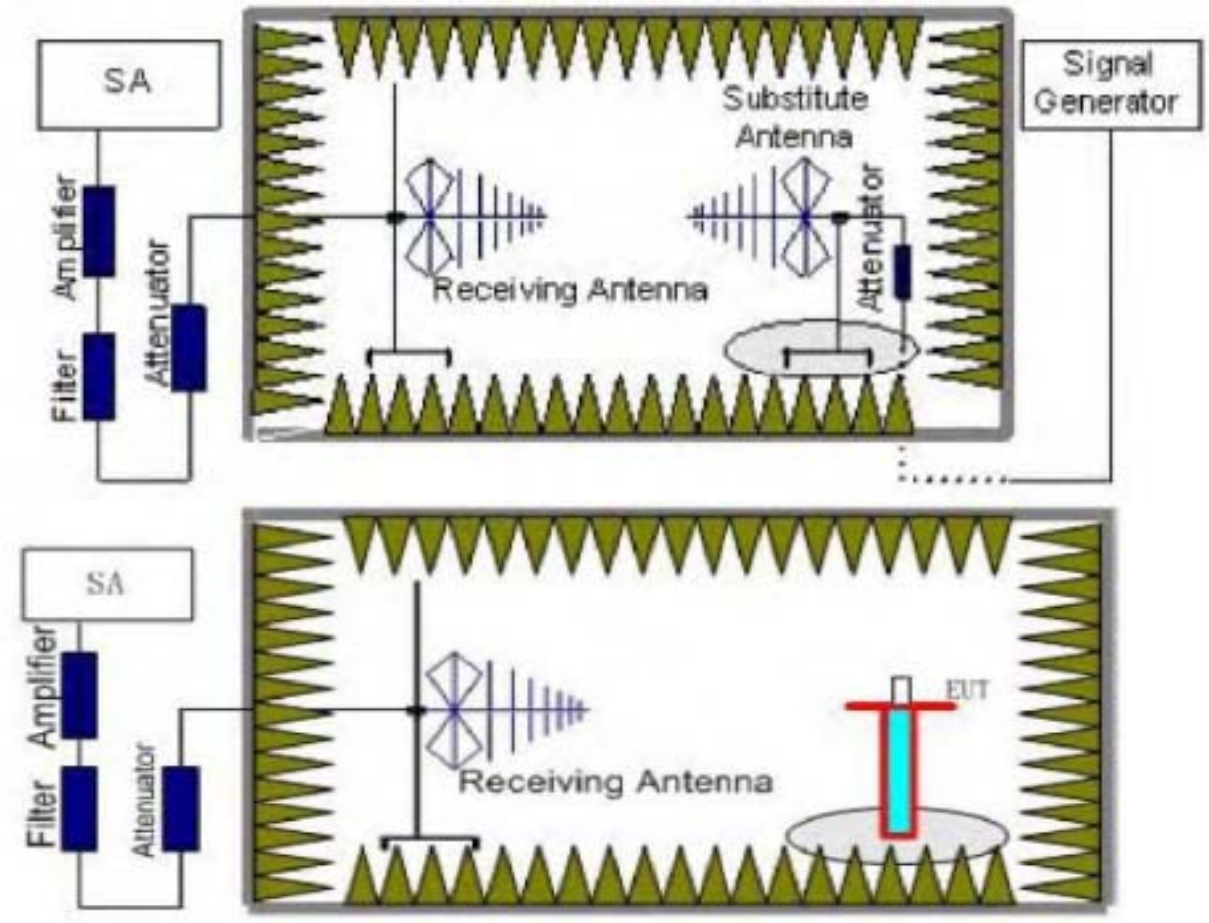
For transmitters designed to transmit with 6.25 KHz channel separation and equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as following:

1 On any frequency from the center of the authorized bandwidth f0 to 3.0 kHz removed from f0: Zero dB.

2 On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 3.0 kHz but no more than 4.6 kHz: At least 30 + 16.67(fd−3 kHz) or 55 + 10 log (P) or 65 dB, whichever is the lesser attenuation.

3 On any frequency removed from the center of the authorized bandwidth by more than 4.6 kHz: At least 55 + 10 log (P) or 65 dB, whichever is the lesser attenuation.

**TEST CONFIGURATION**



## TEST PROCEDURE

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load, which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT .The test was performed by placing the EUT on 3-orthogonal axis. The frequency range up to teeth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB =10 1g (TXpwr in Watts/0.001)-the absolute level Spurious attenuation limit in dB =50+10 $Log_{10}$ (power out in Watts) for EUT with a 12.5 kHz channel bandwidth.

## TEST RESULTS

**Modulation Type: FM**

Note: 1. In general, the worse case attenuation requirement shown above was applied.

2. The measurement frequency range from 30 MHz to 5 GHz.

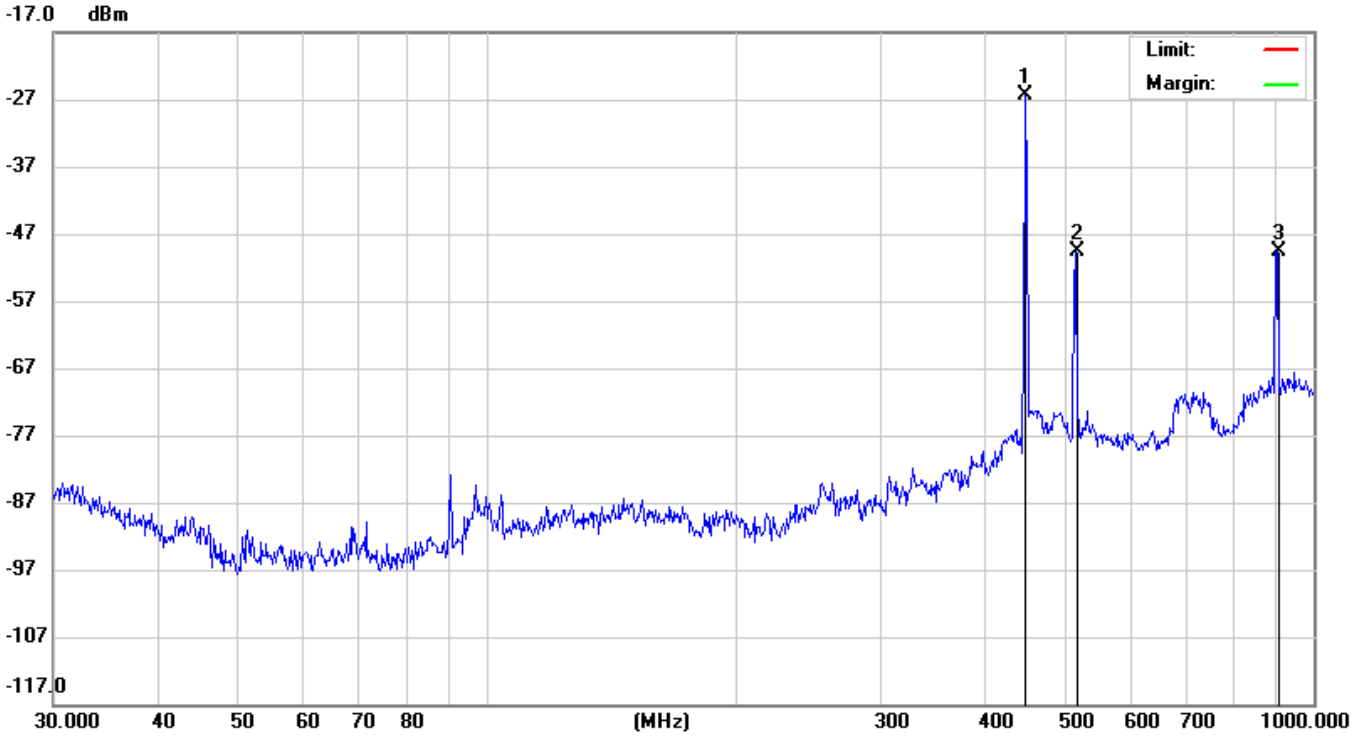
3. *** means that the emission level is too low to be measured or at least 20 dB down than the limit.

| Modulation | FM | | Channel Separation | | 25KHz | | |
|---|---|---|---|---|---|---|---|
| Test Channel | Low Channel | | Test Frequency | | 450.025MHz | | |
| Frequency (MHz) | EMI Detector (Peak/QP) | Antenna Polarization | Antenna Height (cm) | Table Angle (Degree) | ERP measured by Substitution Method(dBm) | Limit (dBm) | Margin (dB) |
| 514.74 | Peak | H | 140 | 247 | -52.47 | -20 | -32.47 |
| 1350.22 | Peak | H | 100 | 240 | -52.82 | -20 | -32.82 |
| 1800.21 | Peak | H | 100 | 240 | -50.23 | -20 | -30.23 |
| 2463.13 | Peak | H | 120 | 152 | -46.42 | -20 | -26.42 |
| 3144.14 | Peak | H | 120 | 47 | -53.66 | -20 | -33.66 |
| … | | | | | | | |
| 512.41 | Peak | V | 100 | 345 | -46.12 | -20 | -26.12 |
| 1350.55 | Peak | V | 100 | 360 | -51.36 | -20 | -31.36 |
| 1811.23 | Peak | V | 100 | 360 | -50.89 | -20 | -30.89 |
| 2250.47 | Peak | V | 130 | 94 | -48.43 | -20 | -28.43 |
| 3175.42 | Peak | V | 120 | 123 | -54.72 | -20 | -34.72 |

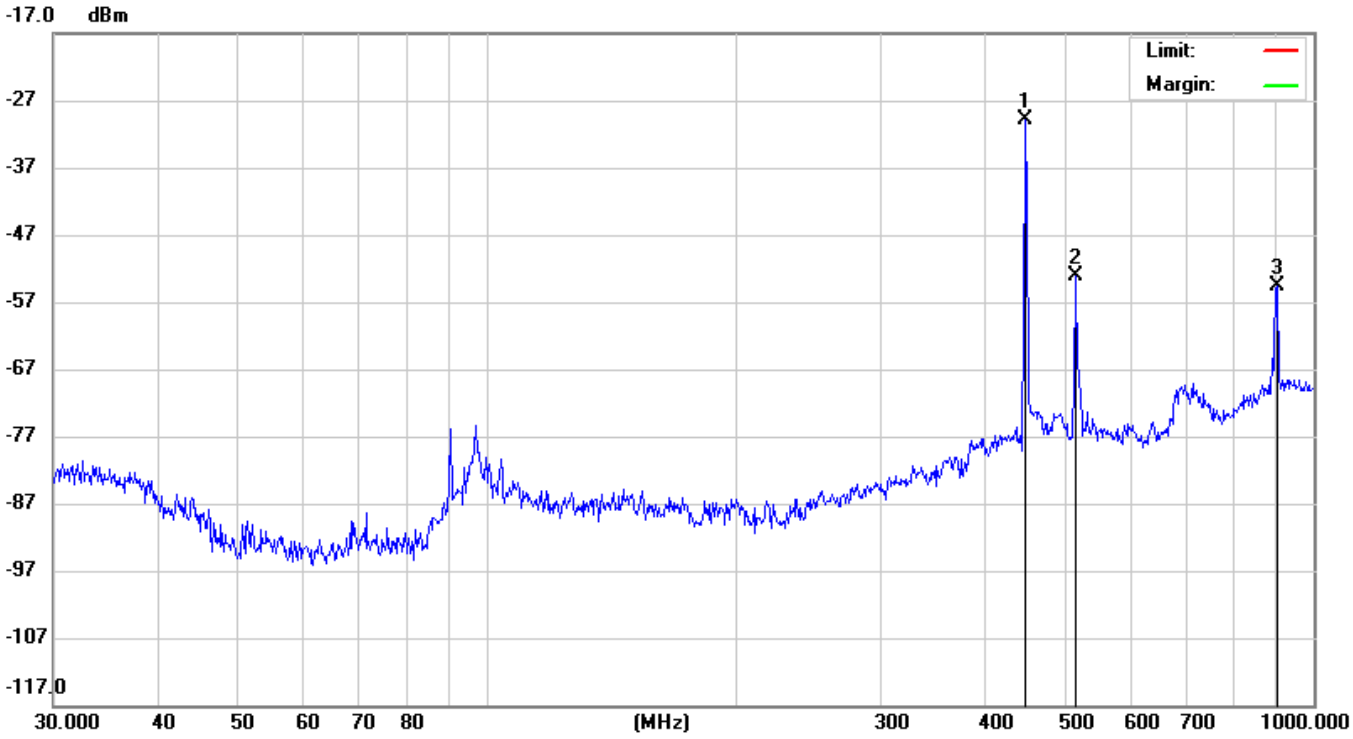
| Modulation | FM | | Channel Separation | | 25KHz | | |
|---|---|---|---|---|---|---|---|
| Test Channel | Middle Channel | | Test Frequency | | 460.025MHz | | |
| Frequency (MHz) | EMI Detector (Peak/QP) | Antenna Polarization | Antenna Height (cm) | Table Angle (Degree) | ERP measured by Substitution Method(dBm) | Limit (dBm) | Margin (dB) |
| 483.54 | Peak | H | 140 | 261 | -50.14 | -20 | -30.14 |
| 1380.25 | Peak | H | 150 | 360 | -49.32 | -20 | -29.32 |
| 1850.23 | Peak | H | 150 | 150 | -54.54 | -20 | -34.54 |
| 2352.37 | Peak | H | 120 | 156 | -44.66 | -20 | -24.66 |
| 3241.87 | Peak | H | 120 | 44 | -53.41 | -20 | -33.41 |
| … | | | | | | | |
| 471.46 | Peak | V | 100 | 350 | -45.11 | -20 | -25.11 |
| 1380.42 | Peak | V | 100 | 360 | -53.78 | -20 | -33.78 |
| 1840.51 | Peak | V | 100 | 360 | -51.79 | -20 | -31.79 |
| 2331.27 | Peak | V | 130 | 101 | -47.50 | -20 | -27.50 |
| 3220.24 | Peak | V | 120 | 147 | -52.87 | -20 | -32.87 |

| Modulation | FM | | Channel Separation | | 25KHz | | |
|---|---|---|---|---|---|---|---|
| Test Channel | High Channel | | Test Frequency | | 469.9750 MHz | | |
| Frequency (MHz) | EMI Detector (Peak/QP) | Antenna Polarization | Antenna Height (cm) | Table Angle (Degree) | ERP measured by Substitution Method(dBm) | Limit (dBm) | Margin (dB) |
| 536.54 | Peak | H | 100 | 302 | -52.62 | -20 | -32.62 |
| 1410.55 | Peak | H | 100 | 180 | -53.1 | -20 | -33.1 |
| 1882.43 | Peak | H | 100 | 180 | -52.22 | -20 | -32.22 |
| 2417.23 | Peak | H | 200 | 78 | -46.61 | -20 | -26.61 |
| 3242.23 | Peak | H | 200 | 149 | -53.46 | -20 | -33.46 |
| … | | H | | | | | |
| 450.35 | Peak | V | 100 | 274 | -46.33 | -20 | -26.33 |
| 1410.52 | Peak | V | 100 | 360 | -53.94 | -20 | -33.94 |
| 1885.42 | Peak | V | 100 | 150 | -50.73 | -20 | -30.73 |
| 2824.25 | Peak | V | 200 | 105 | -46.42 | -20 | -26.42 |
| 3317.67 | Peak | V | 100 | 43 | -54.21 | -20 | -34.21 |

The test pattern only reflects below 1G:
450.025MHz

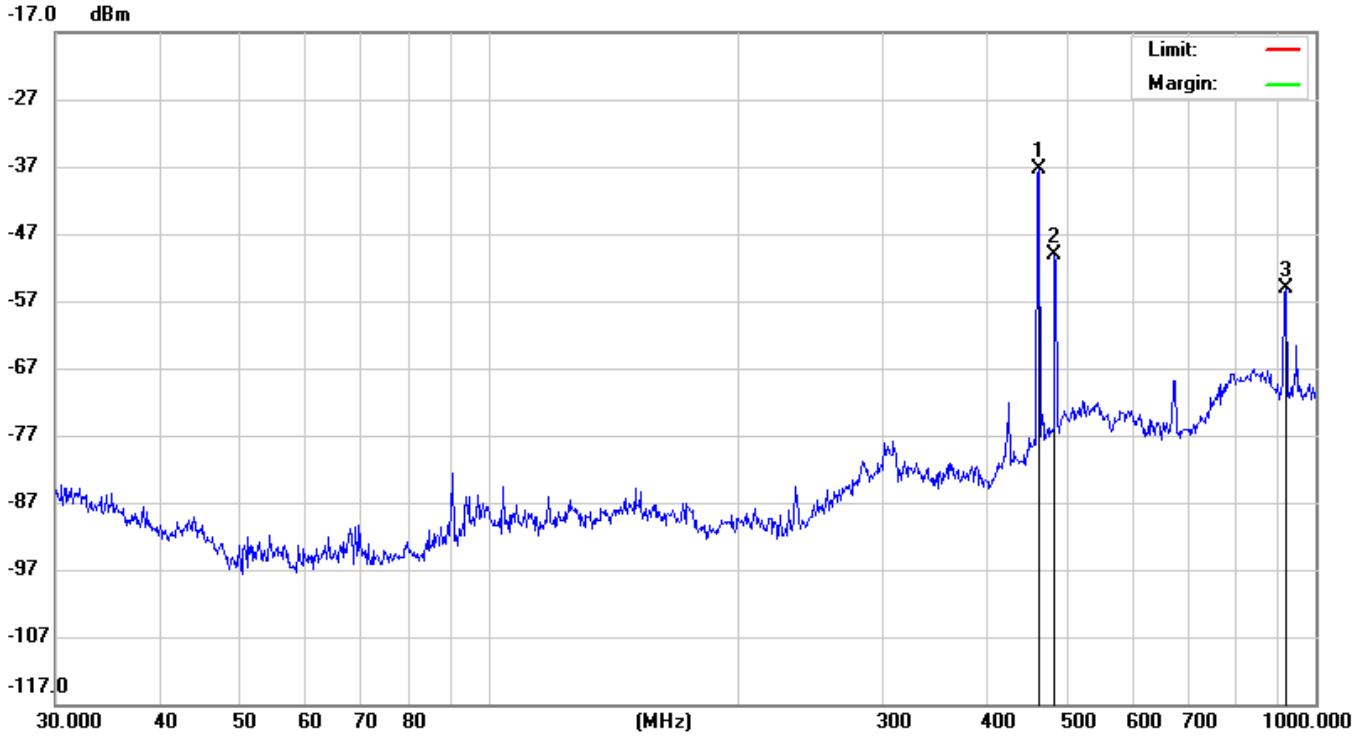



H

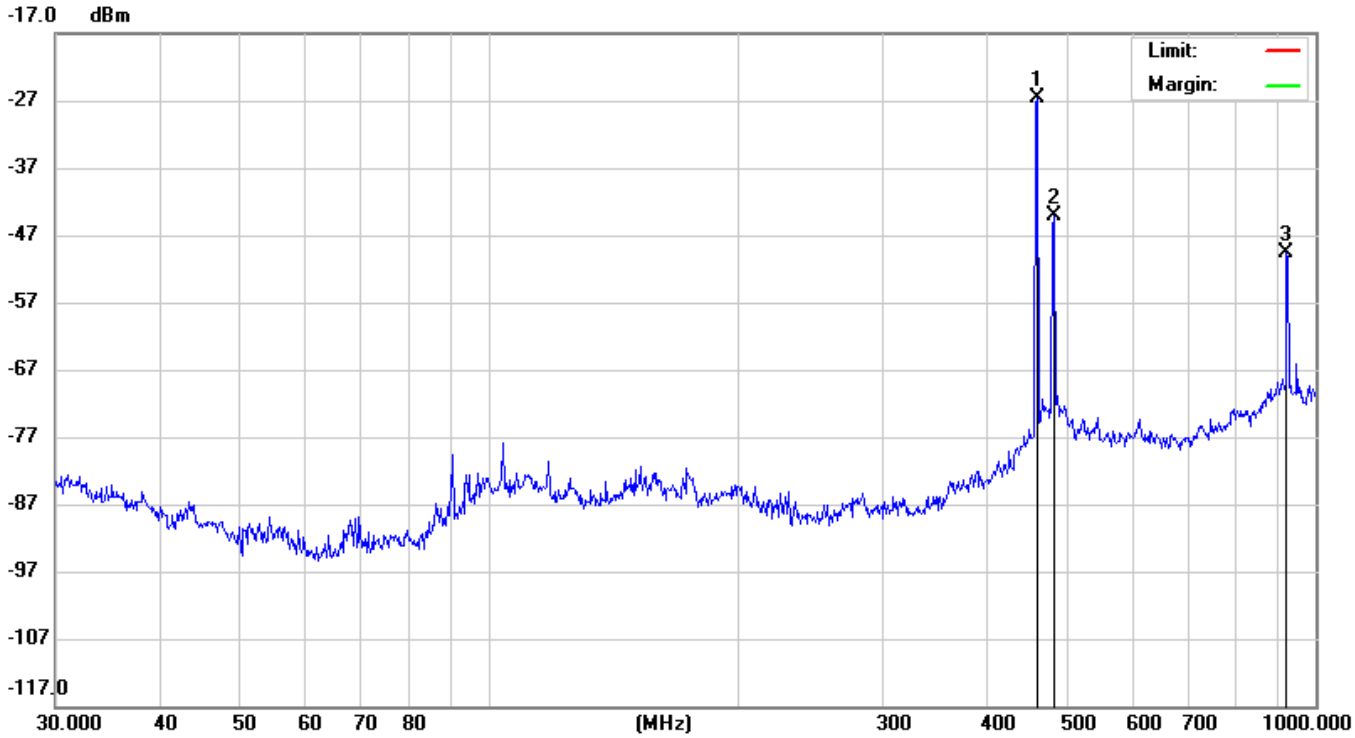



V

460.025MHz

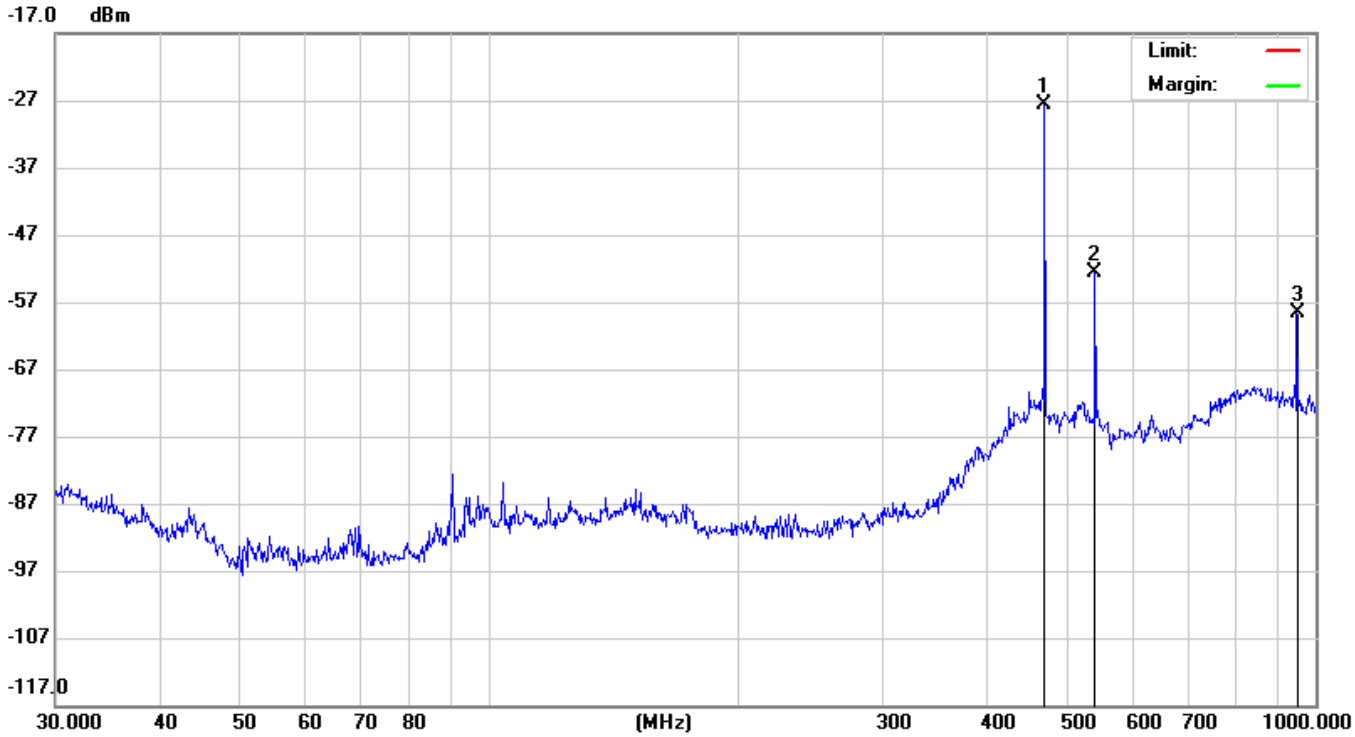



H

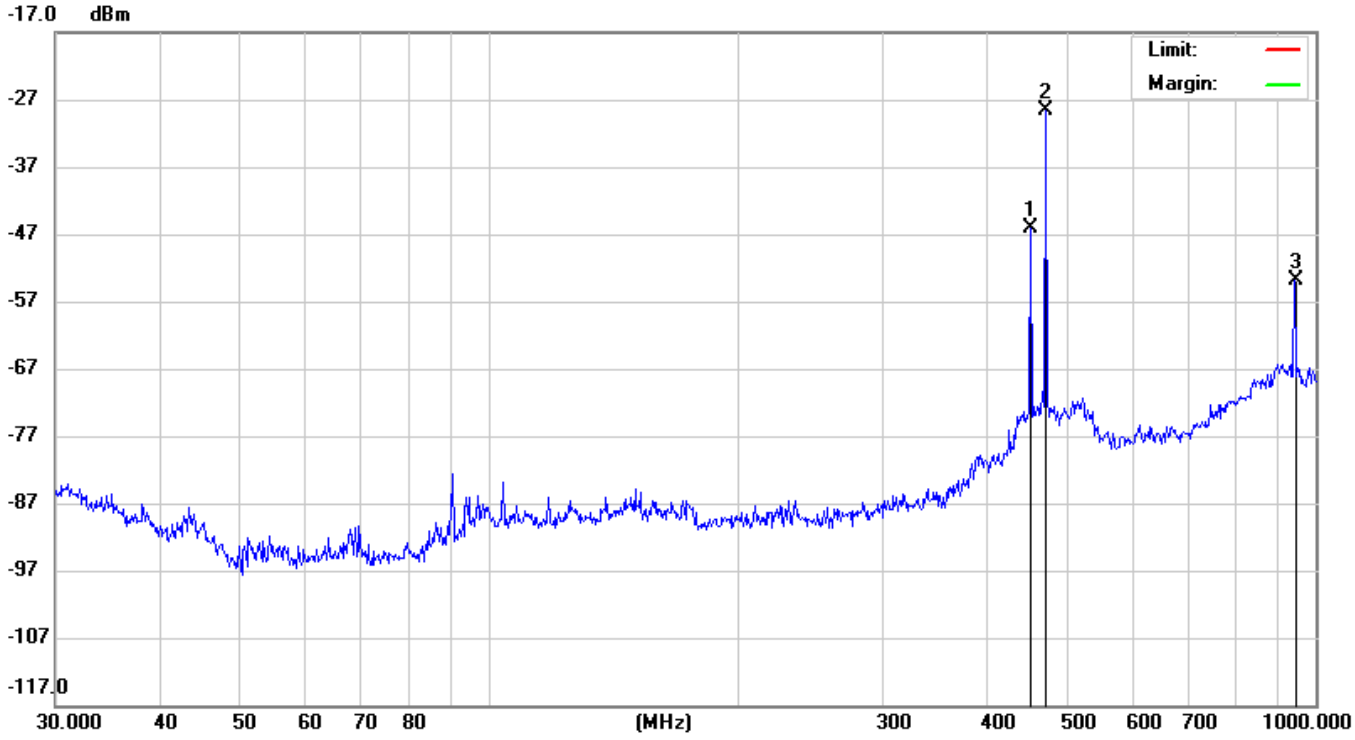



V

469.9750 MHz




H



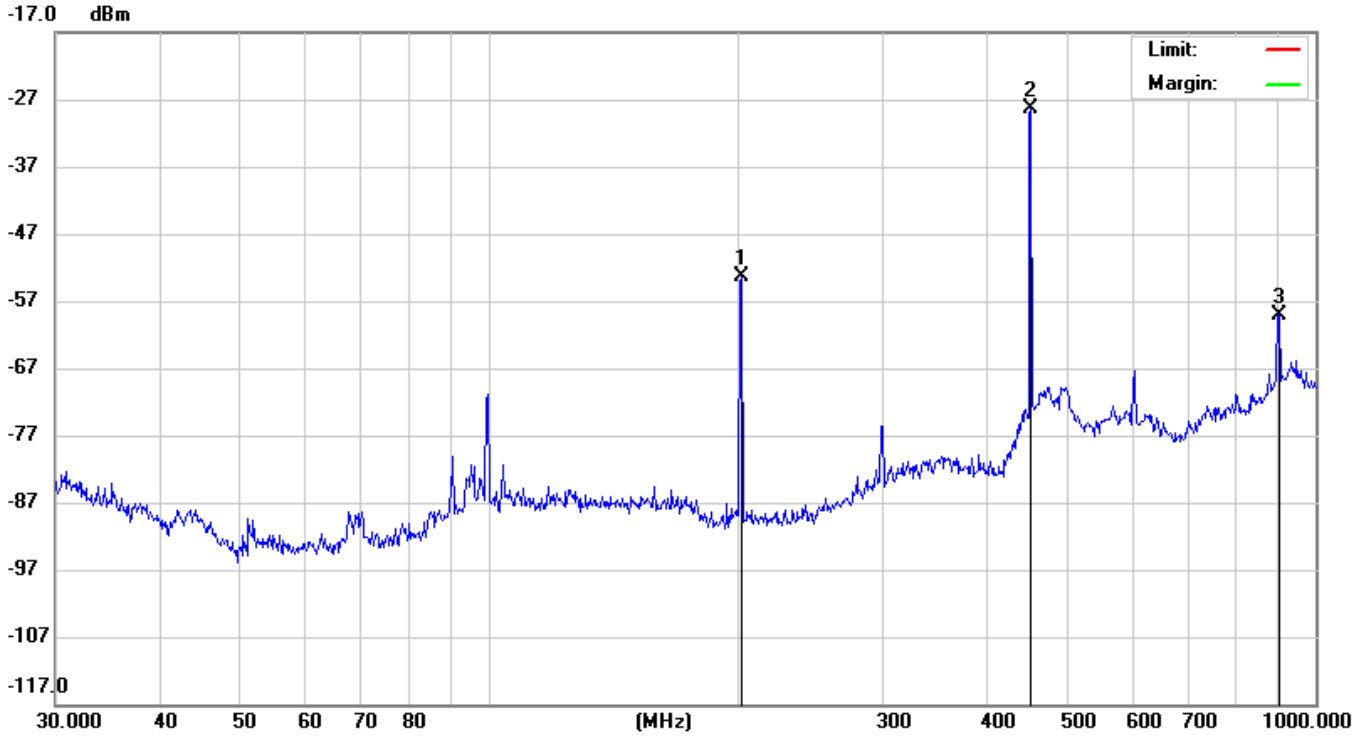

V

| Modulation | FM | | Channel Separation | | 12.5KHz | | |
|---|---|---|---|---|---|---|---|
| Test Channel | Low Channel | | Test Frequency | | 450.0250 MHz | | |
| Frequency (MHz) | EMI Detector (Peak/QP) | Antenna Polarization | Antenna Height (cm) | Table Angle (Degree) | ERP measured by Substitution Method(dBm) | Limit (dBm) | Margin (dB) |
| 201.024 | Peak | H | 140 | 247 | -53.34 | -20 | -33.34 |
| 1350.52 | Peak | H | 100 | 120 | -54.17 | -20 | -34.17 |
| 1800.25 | Peak | H | 100 | 120 | -53.54 | -20 | -33.54 |
| 2231.32 | Peak | H | 120 | 152 | -47.42 | -20 | -27.42 |
| 3214.05 | Peak | H | 120 | 47 | -54.55 | -20 | -34.55 |
| … | | | | | | | |
| 513.37 | Peak | V | 100 | 243 | -47.65 | -20 | -27.65 |
| 1350.12 | Peak | V | 100 | 250 | -53.22 | -20 | -33.22 |
| 1805.26 | Peak | V | 100 | 250 | -53.51 | -20 | -33.51 |
| 2276.59 | Peak | V | 130 | 52 | -46.74 | -20 | -26.74 |
| 3135.52 | Peak | V | 120 | 124 | -54.83 | -20 | -34.83 |

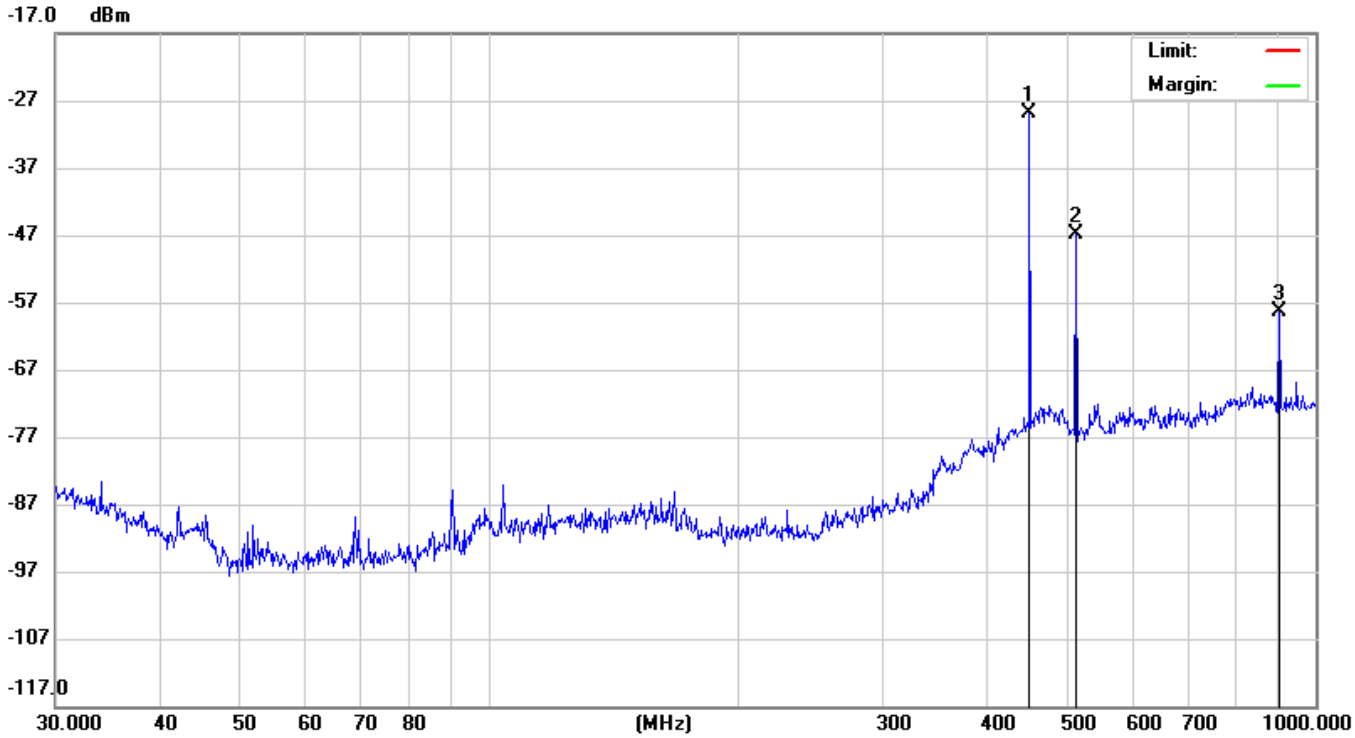
| Modulation | FM | | Channel Separation | | 12.5KHz | | |
|---|---|---|---|---|---|---|---|
| Test Channel | Middle Channel | | Test Frequency | | 460.0250MHz | | |
| Frequency (MHz) | EMI Detector (Peak/QP) | Antenna Polarization | Antenna Height (cm) | Table Angle (Degree) | ERP measured by Substitution Method(dBm) | Limit (dBm) | Margin (dB) |
| 455.14 | Peak | H | 140 | 261 | -47.52 | -20 | -27.52 |
| 1380.23 | Peak | H | 100 | 150 | -50.54 | -20 | -30.54 |
| 1840.55 | Peak | H | 100 | 150 | -52.24 | -20 | -32.24 |
| 2362.36 | Peak | H | 120 | 156 | -42.74 | -20 | -22.74 |
| 3236.88 | Peak | H | 120 | 35 | -53.52 | -20 | -33.52 |
| … | | | | | | | |
| 481.41 | Peak | V | 100 | 350 | -45.25 | -20 | -25.25 |
| 1380.55 | Peak | V | 100 | 360 | -50.91 | -20 | -30.91 |
| 1840.62 | Peak | V | 100 | 360 | -53.95 | -20 | -33.95 |
| 2344.23 | Peak | V | 130 | 120 | -43.54 | -20 | -23.54 |
| 3248.25 | Peak | V | 120 | 147 | -47.43 | -20 | -27.43 |

| Modulation | FM | | Channel Separation | | 12.5KHz | | |
|---|---|---|---|---|---|---|---|
| Test Channel | High Channel | | Test Frequency | | 469.9750MHz | | |
| Frequency (MHz) | EMI Detector (Peak/QP) | Antenna Polarization | Antenna Height (cm) | Table Angle (Degree) | ERP measured by Substitution Method(dBm) | Limit (dBm) | Margin (dB) |
| 554.67 | Peak | H | 100 | 302 | -52.67 | -20 | -32.67 |
| 1410.13 | Peak | H | 100 | 360 | -53.52 | -20 | -33.52 |
| 1880.12 | Peak | H | 100 | 360 | -52.81 | -20 | -32.81 |
| 2316.29 | Peak | H | 200 | 78 | -44.78 | -20 | -24.78 |
| 3274.22 | Peak | H | 200 | 149 | -56.59 | -20 | -36.59 |
| … | | | | | | | |
| 482.34 | Peak | V | 100 | 35 | -48.31 | -20 | -28.31 |
| 1410.44 | Peak | V | 100 | 15 | -53.73 | -20 | -33.73 |
| 1880.41 | Peak | V | 100 | 12 | -53.91 | -20 | -33.91 |
| 2343.26 | Peak | V | 200 | 105 | -47.52 | -20 | -27.52 |
| 3146.68 | Peak | V | 100 | 43 | -53.33 | -20 | -33.33 |

450.0250 MHz

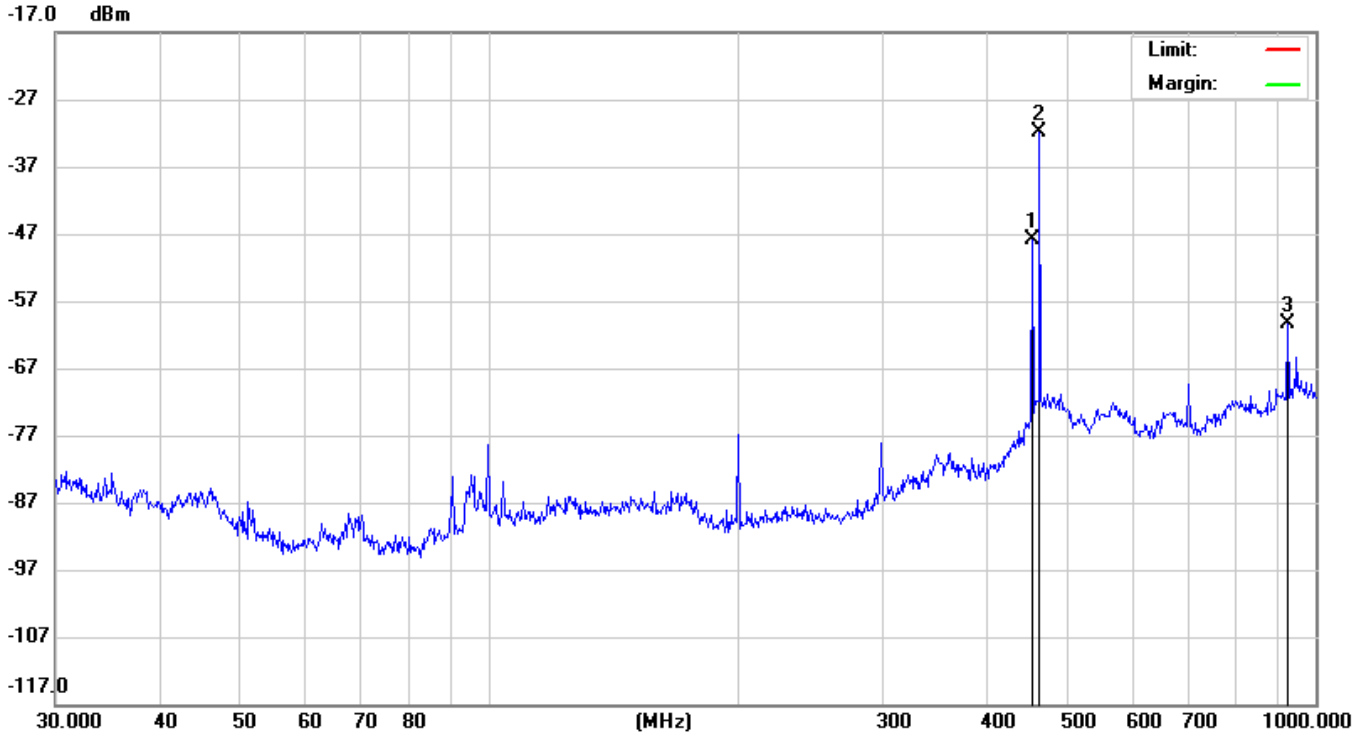



H

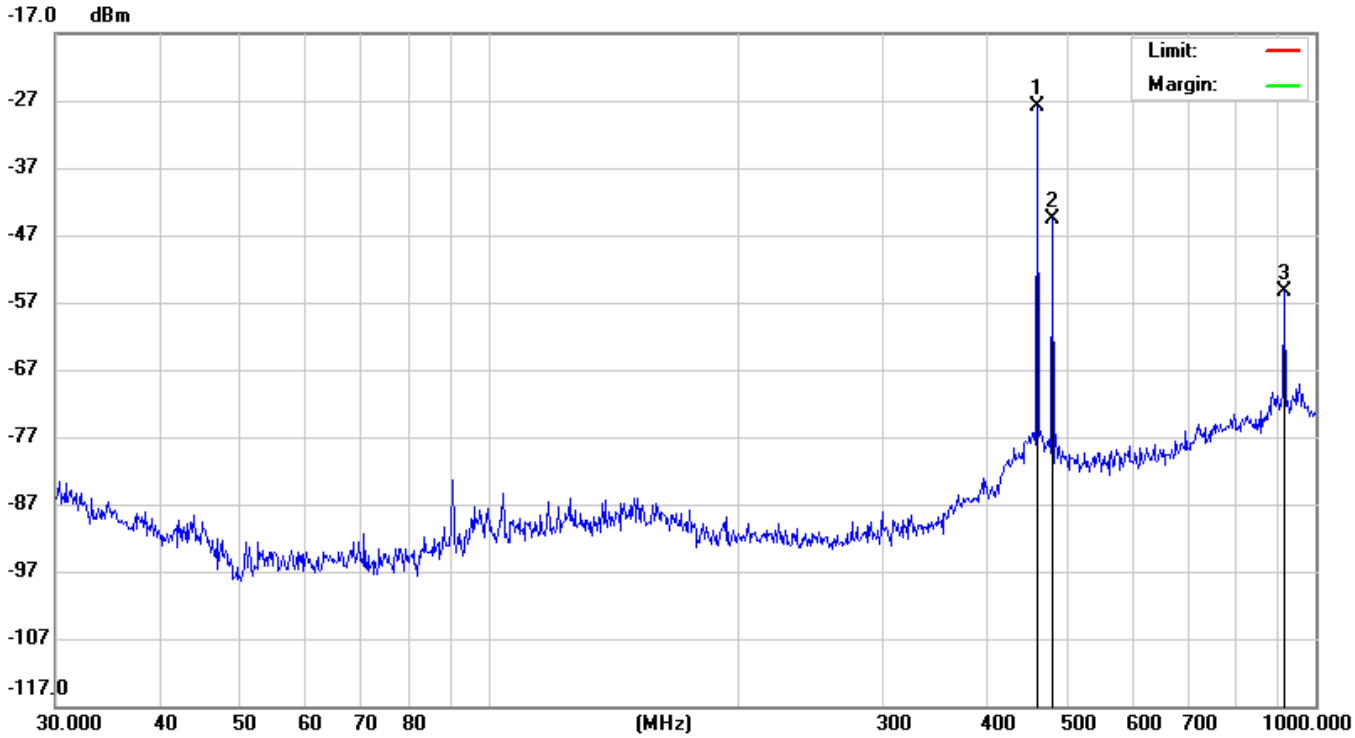



V

460.0250MHz

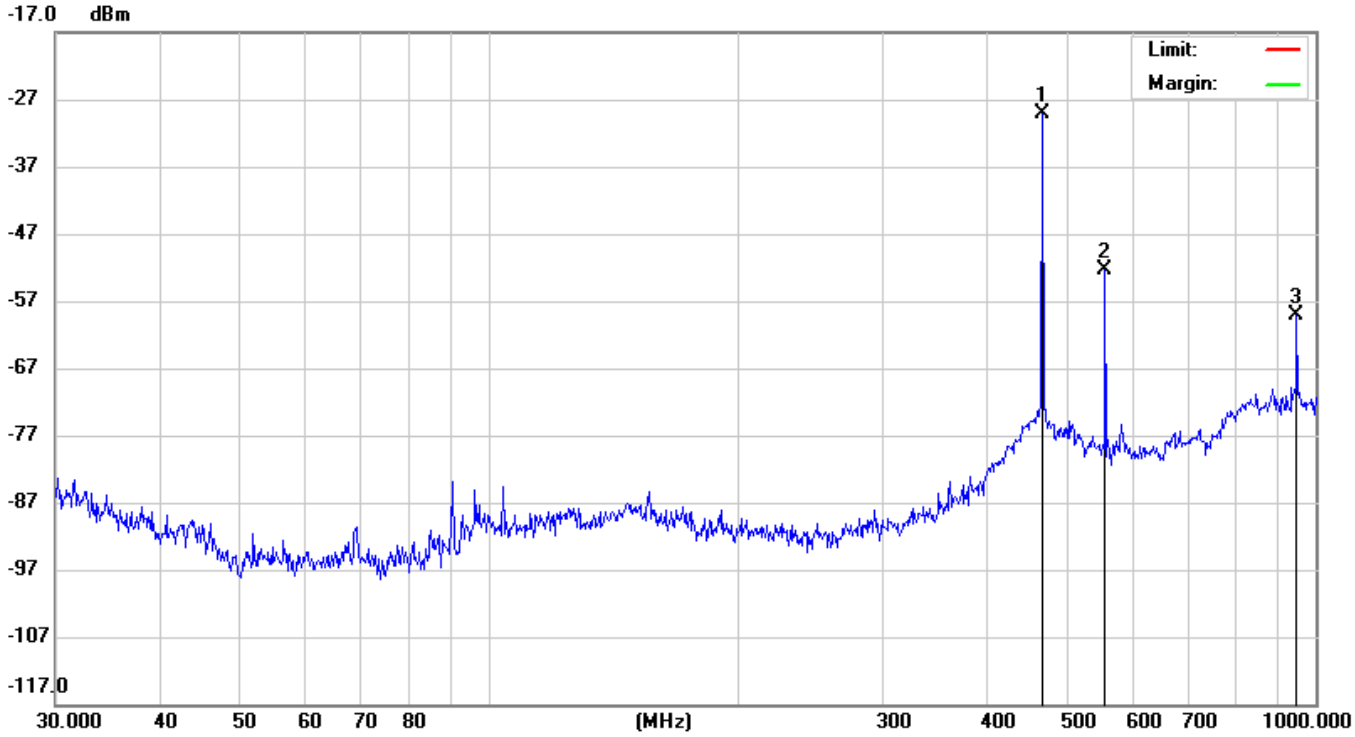



H

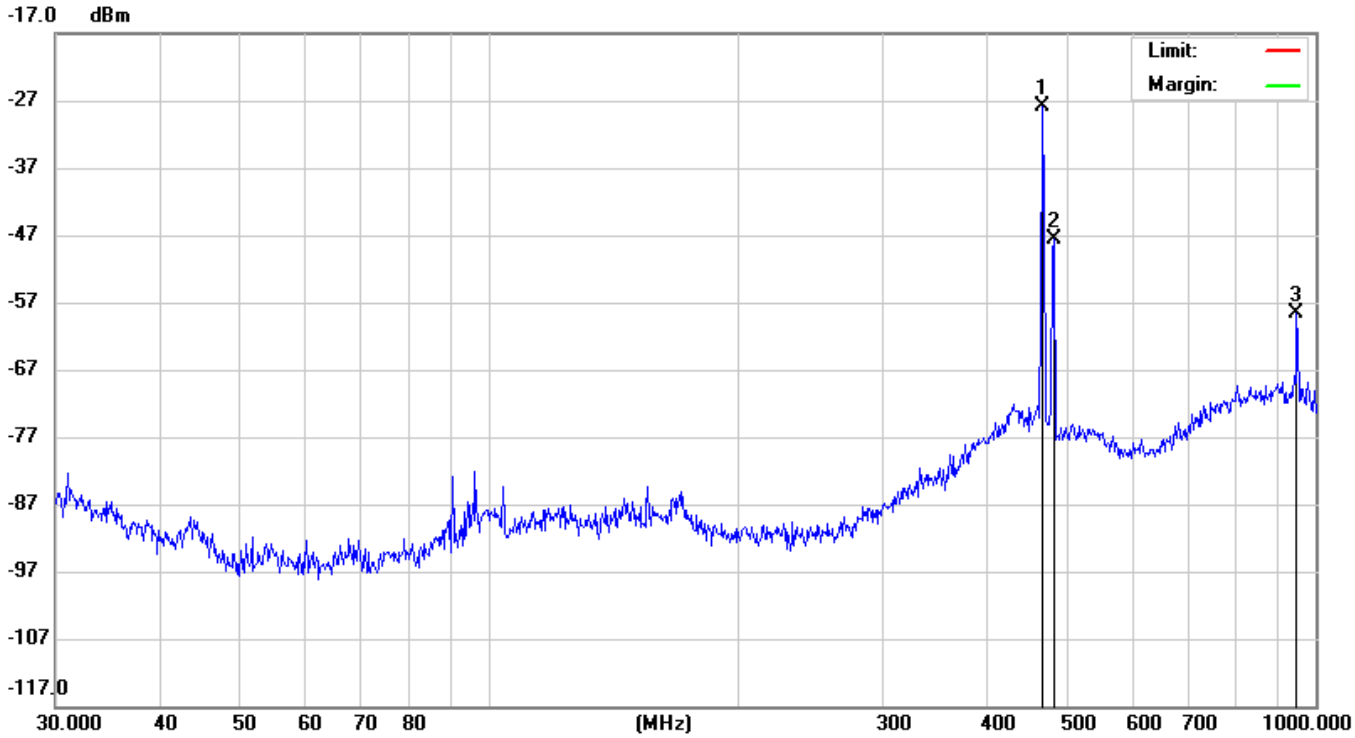



V

469.9750MHz




H




V

## 4.4. Spurious Emission On Antenna Port

**TEST APPLICABLE**

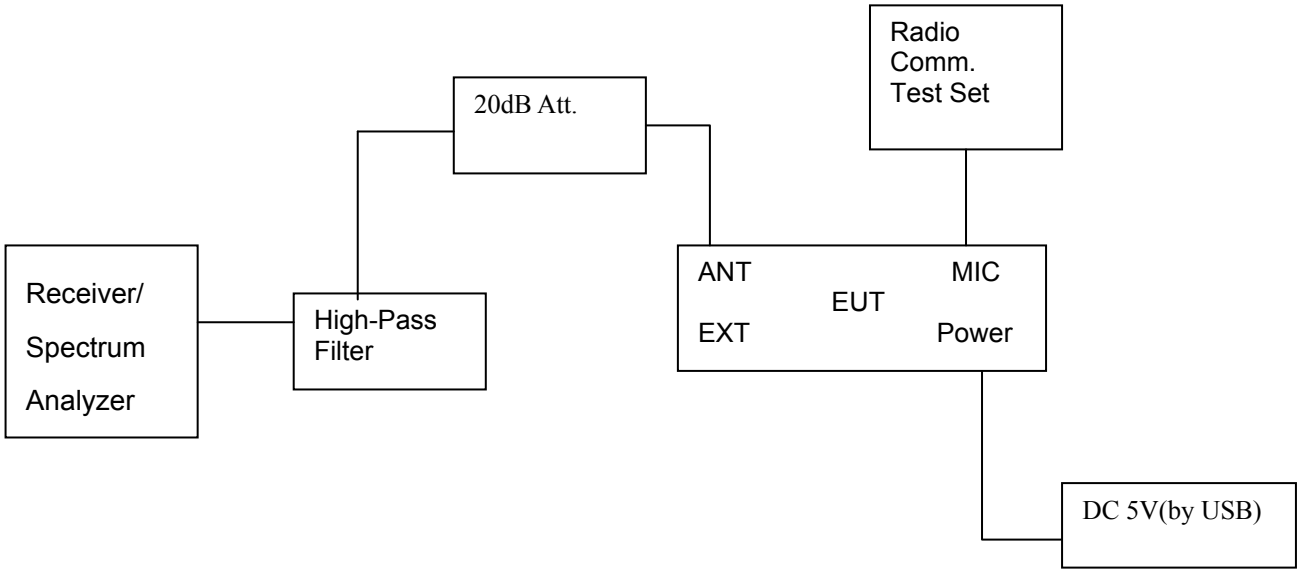
The same as Section 4.3

**TEST PROCEDURE**

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. 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.

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 RESULTS:**

**Modulation Type: FM**

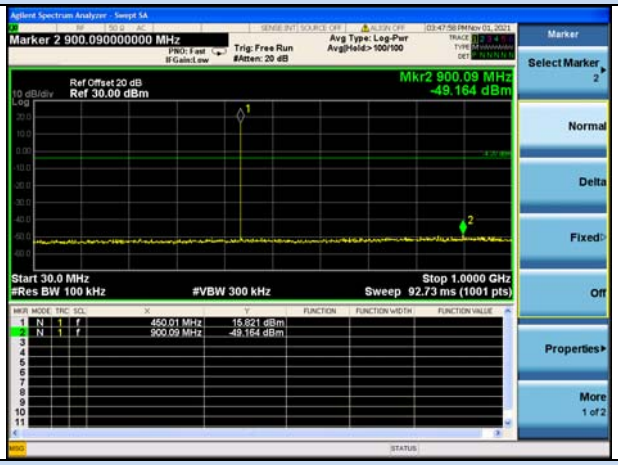
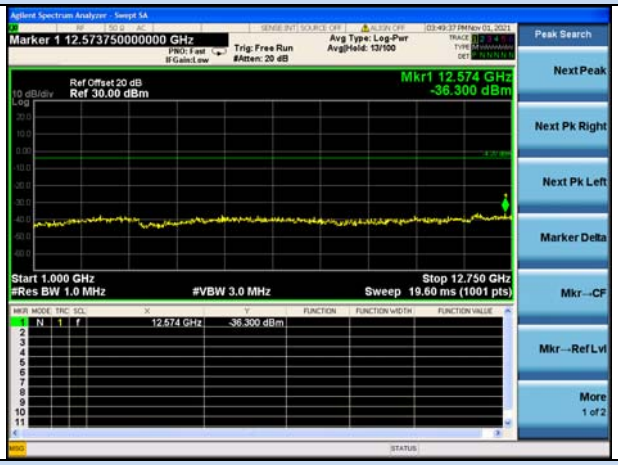
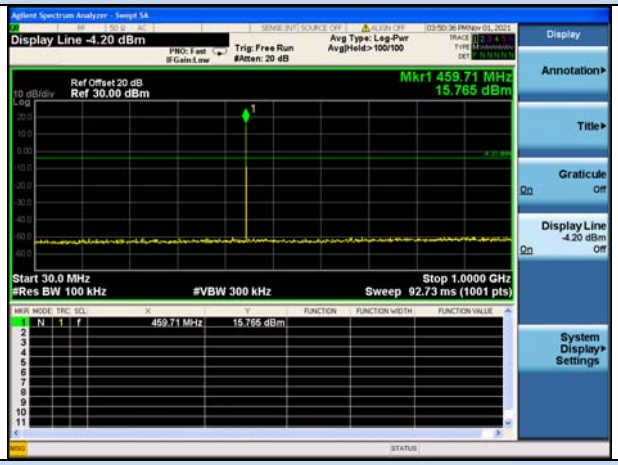
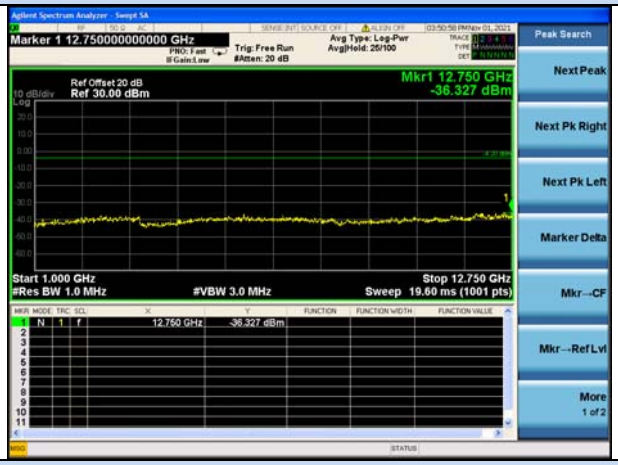
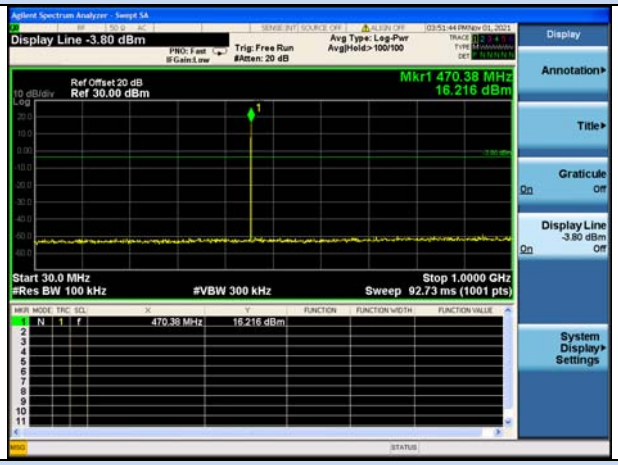
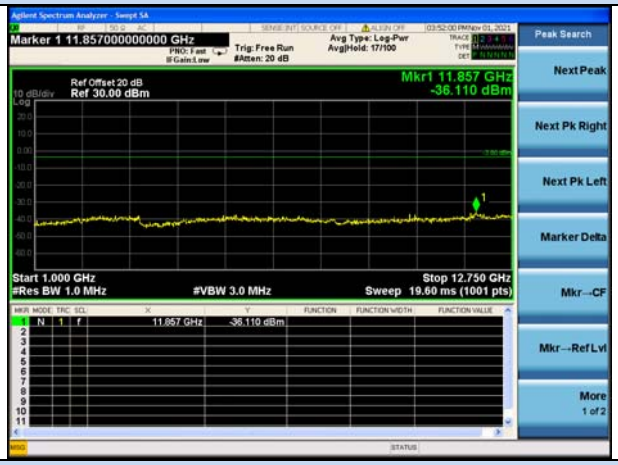
Note: 1. In general, the worse case attenuation requirement shown above was applied.

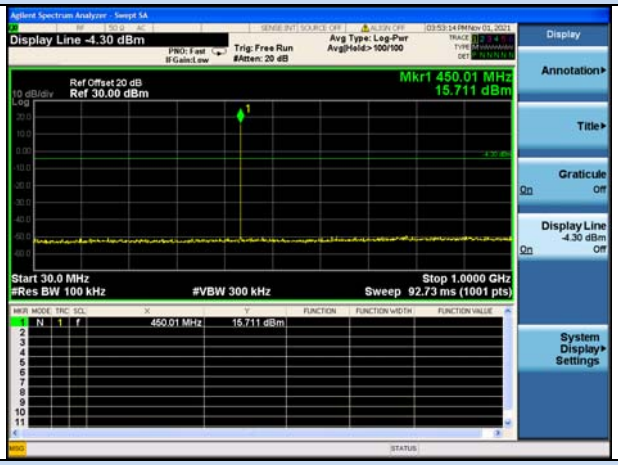
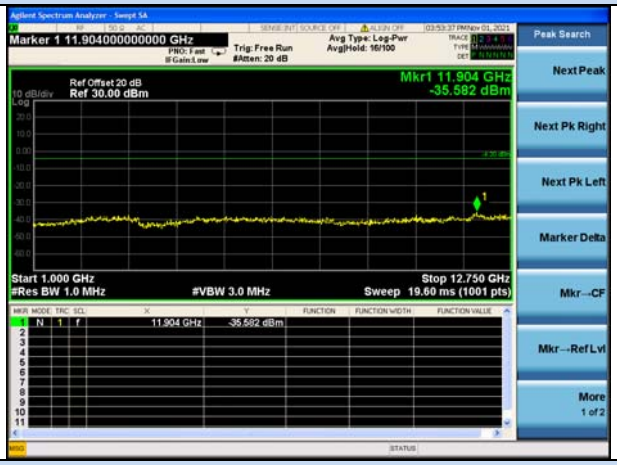
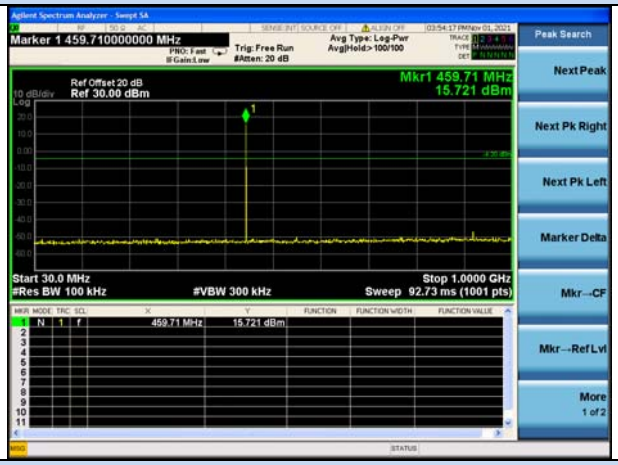
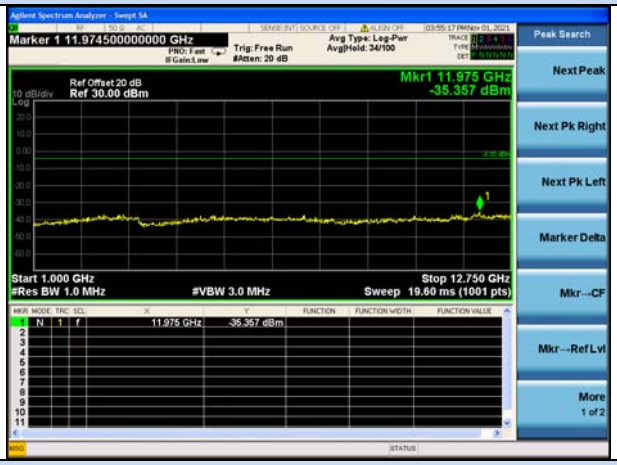
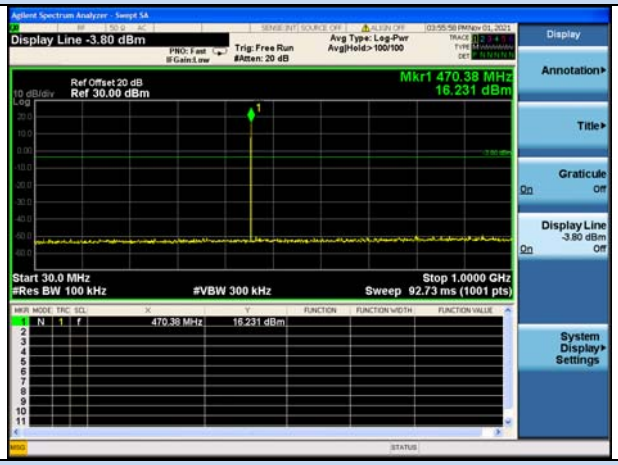
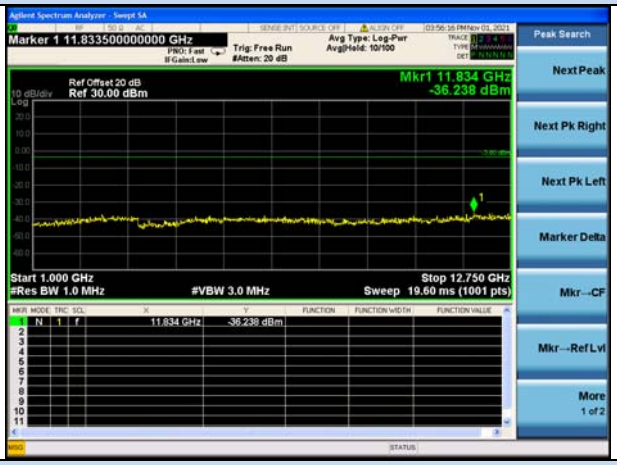
2. The measurement frequency range from 30 MHz to 5 GHz.

**Plots of Spurious Emission on Antenna Port Measurement**

See next pages.

| *Modulation* | *Frequency (MHz)* | *Test Frequency Range* | *Spurious Emissions at Antenna Port (dBm)* | *ISED Limits (dBmc)* | *Verdict* |
|---|---|---|---|---|---|
| Analog/FM(12.5KHz) | 450.0250 | 9 KHz – 5 GHz | <-20.00 | -20.00 | PASS |
| | 460.0250 | 9 KHz – 5 GHz | <-20.00 | -20.00 | PASS |
| | 469.9750 | 9 KHz – 5 GHz | <-20.00 | -20.00 | PASS |
| Analog/FM(25KHz) | 450.0250 | 9 KHz – 5 GHz | <-20.00 | -20.00 | PASS |
| | 460.0250 | 9 KHz – 5 GHz | <-20.00 | -20.00 | PASS |
| | 469.9750 | 9 KHz – 5 GHz | <-20.00 | -20.00 | PASS |

| *Spurious Emissions at Antenna Port* | |
|---|---|
| Analog/FM(12.5KHz) | |
| *450.0250MHz* | |
|  |  |
| *30 MHz –1GHz* | *1GHz – 12.75GHz* |
| *460.0250 MHz* | |
|  |  |
| *30 MHz –1GHz* | *1GHz – 12.75GHz* |
| *469.9750 MHz* | |
|  |  |
| *30 MHz –1GHz* | *1GHz – 12.75GHz* |

| *Spurious Emissions at Antenna Port* | |
|---|---|
| Analog/FM(25KHz) | |
| *450.0250MHz* | |
|  |  |
| *30 MHz –1GHz* | *1GHz – 12.75GHz* |
| *460.0250 MHz* | |
|  |  |
| *30 MHz –1GHz* | *1GHz – 12.75GHz* |
| *469.9750 MHz* | |
|  |  |
| *30 MHz –1GHz* | *1GHz – 12.75GHz* |

## 4.5. Modulation Characteristics

**TEST APPLICABLE**

According toCFR47 section 2.1047(a), for Voice Modulation Communication Equipment, the frequency response of the audio modulation circuit over a range of 100 to 5000Hz shall be measured.

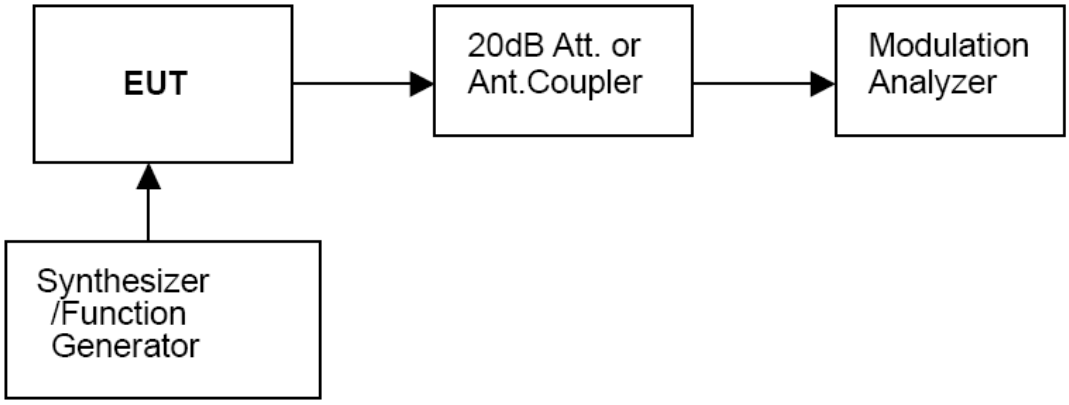
**TEST PROCEDURE**

**Modulation Limit**

1 Configure the EUT as shown in figure 1, adjust the audio input for 60% of rated system deviation at 1 KHz using this level as a reference (0dB) and vary the input level from –20 to +20dB. Record the frequency deviation obtained as a function of the input level.

2 Repeat step 1 with input frequency changing to 300, 1004, 1500 and 2500Hz in sequence.

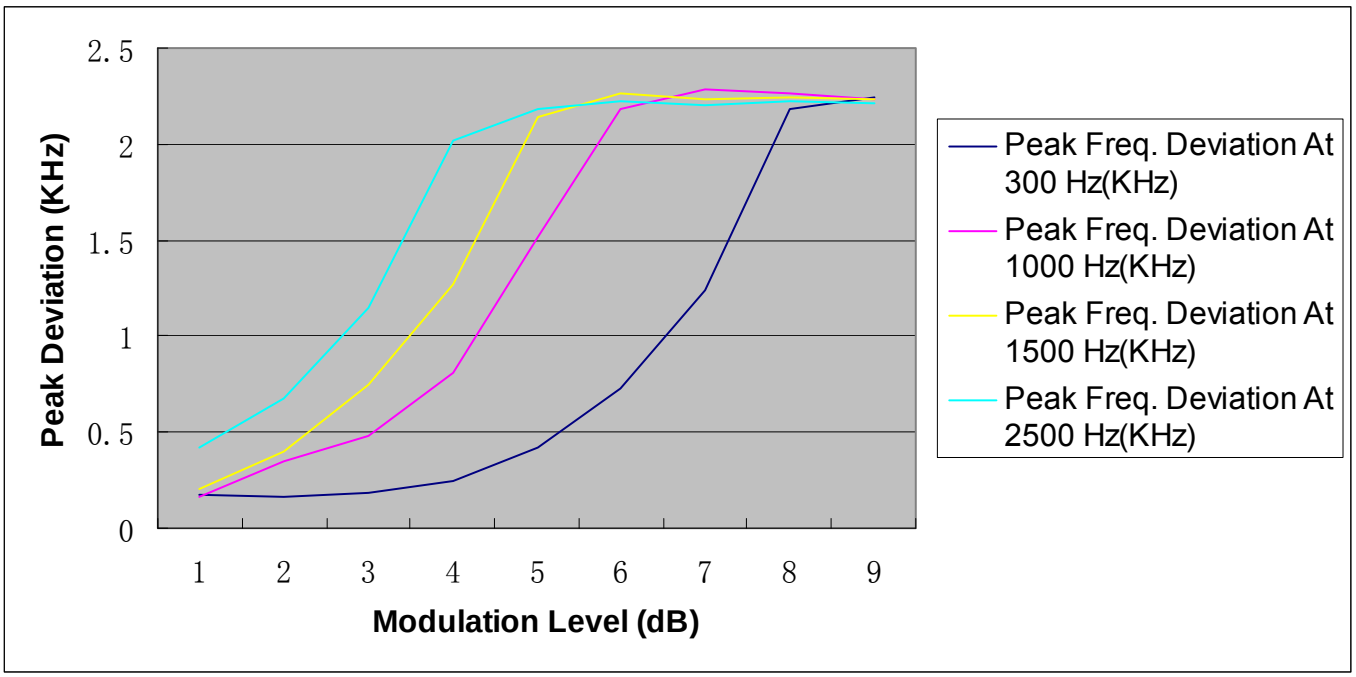
**TEST CONFIGURATION**



**TEST RESULTS**
**Modulation Type: FM**

**12.5 KHz Channel Separation**

| Modulation Level(dB) | Peak Freq. Deviation At 300 Hz(KHz) | Peak Freq. Deviation At 1000 Hz(KHz) | Peak Freq. Deviation At 1500 Hz(KHz) | Peak Freq. Deviation At 2500 Hz(KHz) | Limit (KHz) |
|---|---|---|---|---|---|
| -20 | 0.17 | 0.15 | 0.21 | 0.41 | 2.5 |
| -15 | 0.17 | 0.34 | 0.40 | 0.67 | 2.5 |
| -10 | 0.18 | 0.48 | 0.74 | 1.14 | 2.5 |
| -5 | 0.25 | 0.81 | 1.26 | 2.01 | 2.5 |
| 0 | 0.42 | 1.51 | 2.14 | 2.17 | 2.5 |
| +5 | 0.73 | 2.18 | 2.26 | 2.22 | 2.5 |
| +10 | 1.24 | 2.29 | 2.23 | 2.20 | 2.5 |
| 15 | 2.18 | 2.26 | 2.24 | 2.22 | 2.5 |
| +20 | 2.24 | 2.24 | 2.23 | 2.22 | 2.5 |



## 4.6. Frequency Stability Measurement

**TEST APPLICABLE**

1 According to FCC Part 2 Section 2.1055 (a)(1), the frequency stability shall be measured with variation of ambient temperature from -30℃ to +50℃ centigrade.

2 According to FCC Part 2 Section 2.1055 (a) (2), for battery powered equipment, the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point, which is specified by the manufacture.

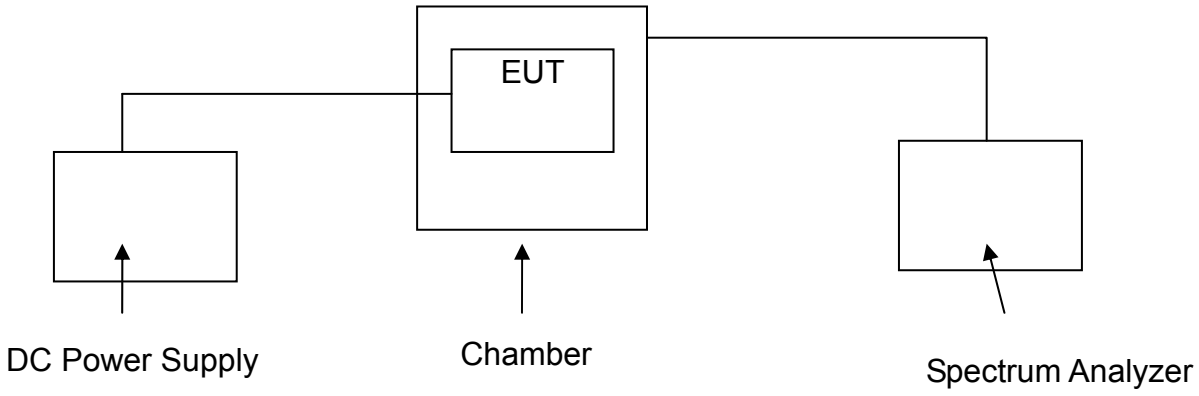
3 Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment and tested end point voltage.

4 According to §90.213, the frequency stability limit is 2.5 ppm for 12.5 KHz channel separation and 1.0 ppm for 6.25KHz channel separation.

**TEST PROCEDURE**

The EUT was set in the climate chamber and connected to an external DC power supply. The RF output was directly connected to Spectrum Analyzer ESI 26. The coupling loss of the additional cables was recorded and taken in account for all the measurements. After temperature stabilization (approx. 20 min for each stage), the frequency for the lower, the middle and the highest frequency range was recorded. For Frequency stability Vs. Voltage the EUT was connected to a DC power supply and the voltage was adjusted in the required ranges. The result was recorded.

**TEST SETUP BLOCK DIAGRAM**



**TEST LIMITS**

According to 90.213, Transmitters used must have minimum frequency stability as specified in the following table.

| Frequency range (MHz) | Fixed and base stations | Mobile stations | |
|---|---|---|---|
| | | Over 2 watts output power | 2 watts or less output power |
| Below 25 | [1,2,3] 100 | 100 | 200 |
| 25–50 | 20 | 20 | 50 |
| 72–76 | 5 | ..... | 50 |
| 150–174 | [5,11] 5 | [6] 5 | [4,6] 50 |
| 216–220 | 1.0 | ..... | 1.0 |
| 220–222 [12] | 0.1 | 1.5 | 1.5 |
| 421–512 | [7,11,14] 2.5 | [8] 5 | [8] 5 |
| 806–809 | [14] 1.0 | 1.5 | 1.5 |
| 809–824 | [14] 1.5 | 2.5 | 2.5 |
| 851–854 | 1.0 | 1.5 | 1.5 |
| 854–869 | 1.5 | 2.5 | 2.5 |
| 896–901 | [14] 0.1 | 1.5 | 1.5 |
| 902–928 | 2.5 | 2.5 | 2.5 |
| 902–928 [13] | 2.5 | 2.5 | 2.5 |
| 929–930 | 1.5 | ..... | ..... |
| 935–940 | 0.1 | 1.5 | 1.5 |
| 1427–1435 | [9] 300 | 300 | 300 |
| Above 2450 [10] | ..... | ..... | ..... |

**(1) Frequency stability versus input voltage (Supply nominal voltage is 3.7V)-2W-12.5KHz**

| Environment Temperature(℃) | Power Supply (v) | Reference Frequency | | | Limit: ppm |
|---|---|---|---|---|---|
| | | 450.0250MHz | 460.0250 MHz | 469.9750 MHz | |
| 50 | DC 3.7V | 0.870 | 0.766 | 0.821 | 2.5 |
| 40 | DC 3.7V | 0.762 | 0.688 | 0.764 | |
| 30 | DC 3.7V | 0.675 | 0.752 | 0.843 | |
| 20 | DC 3.7V | 0.865 | 0.842 | 0.625 | |
| 10 | DC 3.7V | 0.763 | 0.756 | 0.625 | |
| 0 | DC 3.7V | 0.668 | 0.841 | 0.678 | |
| -10 | DC 3.7V | 0.754 | 0.745 | 0.642 | |
| -20 | DC 3.7V | 0.842 | 0.648 | 0.705 | |
| -30 | DC 3.7V | 0.802 | 0.842 | 0.741 | |
| Result | PASS | | | | |

**(2) Frequency stability versus input voltage (Battery endpoint is 3.15V) -2W-25KHz**

| Environment Temperature(℃) | Power Supply (v) | Reference Frequency | | | Limit: ppm |
|---|---|---|---|---|---|
| | | 450.0250MHz | 460.0250 MHz | 469.9750 MHz | |
| 50 | DC 3.15V | 0.861 | 0.766 | 0.788 | 2.5 |
| 40 | DC 3.15V | 0.821 | 0.702 | 0.751 | |
| 30 | DC 3.15V | 0.651 | 0.801 | 0.802 | |
| 20 | DC 3.15V | 0.832 | 0.812 | 0.714 | |
| 10 | DC 3.15V | 0.755 | 0.724 | 0.622 | |
| 0 | DC 3.15V | 0.605 | 0.785 | 0.631 | |
| -10 | DC 3.15V | 0.654 | 0.745 | 0.598 | |
| -20 | DC 3.15V | 0.801 | 0.645 | 0.625 | |
| -30 | DC 3.15V | 0.798 | 0.852 | 0.672 | |
| Result | PASS | | | | |

**Note: 1.Battery terminal voltage is declared and specified by the manufacturer.**
**2. All test values are in "ppm"**

## 4.7. Conducted Output Power

**TEST APPLICABLE**

450-470 MHz.

(1) The maximum allowable station effective radiated power (ERP) is dependent upon the station's antenna HAAT and required service area and will be authorized in accordance with table 2. Applicants requesting an ERP in excess of that listed in table 2 must submit an engineering analysis based upon generally accepted engineering practices and standards that includes coverage contours to demonstrate that the requested station parameters will not produce coverage in excess of that which the applicant requires.

(2) Applications for stations where special circumstances exist that make it necessary to deviate from the ERP and antenna heights in Table 2 will be submitted to the frequency coordinator accompanied by a technical analysis, based upon generally accepted engineering practices and standards, that demonstrates that the requested station parameters will not produce a signal strength in excess of 39 dBu at any point along the edge of the requested service area. The coordinator may then recommend any ERP appropriate to meet this condition.

(3) An applicant for a station with a service area radius greater than 32 km (20 mi) must justify the requested service area radius, which may be authorized only in accordance with table 2, note 4. For base stations with service areas greater than 80 km, all operations 80 km or less from the base station will be on a primary basis and all operations outside of 80 km from the base station will be on a secondary basis and will be entitled to no protection from primary operations.

| | Service area radius (km) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 3 | 8 | 13 | 16 | 24 | 32 | 40[4] | 48[4] | 64[4] | 80[4] |
| Maximum ERP (w)[1] | 2 | 100 | 500[2] | 500[2] | 500[2] | 500[2] | 500[2] | 500[2] | 500[2] | 500[2] |
| Up to reference HAAT (m)[3] | 15 | 15 | 15 | 27 | 63 | 125 | 250 | 410 | 950 | 2700 |

[1] Maximum ERP indicated provides for a 39 dBu signal strength at the edge of the service area per FCC Report R-6602, Fig. 29 (See § 73.699, Fig. 10 b).

[2] Maximum ERP of 500 watts allowed. Signal strength at the service area contour may be less than 39 dBu.

[3] When the actual antenna HAAT is greater than the reference HAAT, the allowable ERP will be reduced in accordance with the following equation: ERPallow = ERPmax × (HAATref / HAATactual)2.

[4] Applications for this service area radius may be granted upon specific request with justification and must include a technical demonstration that the signal strength at the edge of the service area does not exceed 39 dBu.

**TEST PROCEDURE**

The RF output of Two-way radiowas conducted to a spectrum analyzer through an appropriate attenuator.

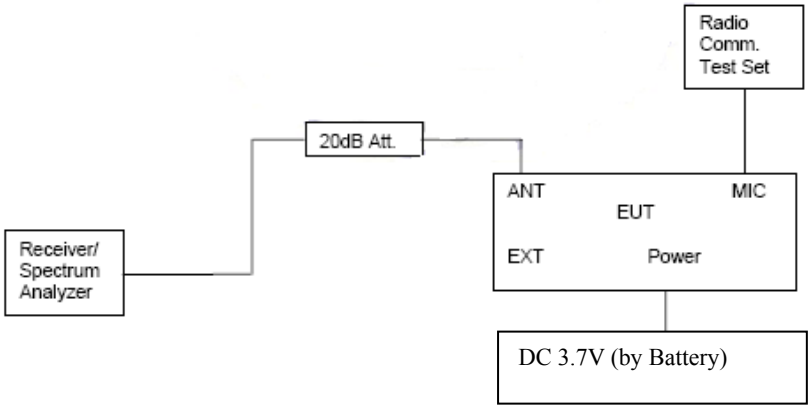
In the semi-anechoic chamber, setup as illustrated above the DUT placed on the 0.8m height of Turn Table, rotated the table 45 degree each interval to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power for each degree interval. The “Read Value” is the spectrum reading of maximum power value.

The substitution antenna is substituted for DUT at the same position and signals generator (S.G) export the CW signal to the substitution antenna via a TX cable. The receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum radiation power. Record the power level of maximum radiation power from spectrum. So, the Measured substitution value = Ref level of S.G + TX cables loss – Substituted Antenna Gain.

EIRP = “Read Value” + Measured substitution value + 2.15.

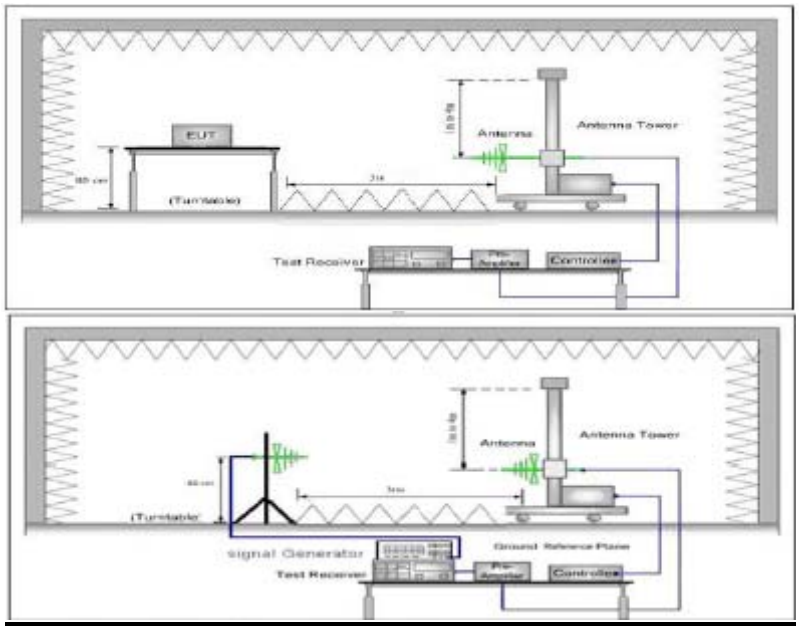
**TEST CONFIGURATION**

**Conducted Output Power:**

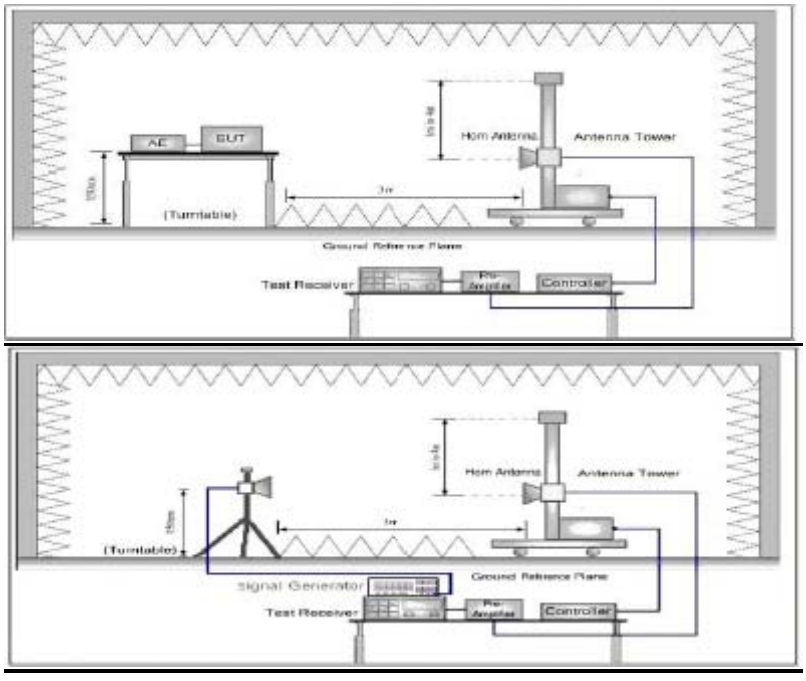



**Effective Radiated Power**

**Radiated Below1GHz**




**Radiated Above 1 GHz**



## TEST RESULTS

### Conducted Power Measurement Results

| Modulation Type | Channel Separation | Operation Mode | Test Channel | Test Frequency (MHz) | Test Results (dBm) | |
|---|---|---|---|---|---|---|
| | | | | | Rated High | Rated Low |
| Analog/FM | 12.5 KHz | TX | Ch1 | 450.0250 | 32.985 | 30.841 |
| | | | Ch2 | 460.0250 | 32.996 | 29.783 |
| | | | Ch3 | 469.9750 | 32.982 | 29.574 |
| | 25KHz | | Ch7 | 450.0250 | 32.872 | 30.750 |
| | | | Ch8 | 460.0250 | 32.855 | 29.748 |
| | | | Ch9 | 469.9750 | 32.928 | 29.524 |

### Radiated Power Measurement Results

| Modulation Type | Channel Separation | Operation Mode | Test Channel | Test Frequency (MHz) | Test Results (dBm) | |
|---|---|---|---|---|---|---|
| | | | | | Rated High | Rated Low |
| Analog/FM | 12.5 KHz | TX | Ch1 | 450.0250 | 32.056 | 30.100 |
| | | | Ch2 | 460.0250 | 32.543 | 30.250 |
| | | | Ch3 | 469.9750 | 32.820 | 30.050 |
| | 25KHz | | Ch7 | 450.0250 | 32.855 | 30.150 |
| | | | Ch8 | 460.0250 | 32.813 | 29.885 |
| | | | Ch9 | 469.9750 | 32.500 | 29.880 |

## 4.8. Transmitter Frequency Behavior

**TEST APPLICABLE**

Section 90.214

Transient frequencies must be within the maximum frequency difference limits during the time intervals indicated:

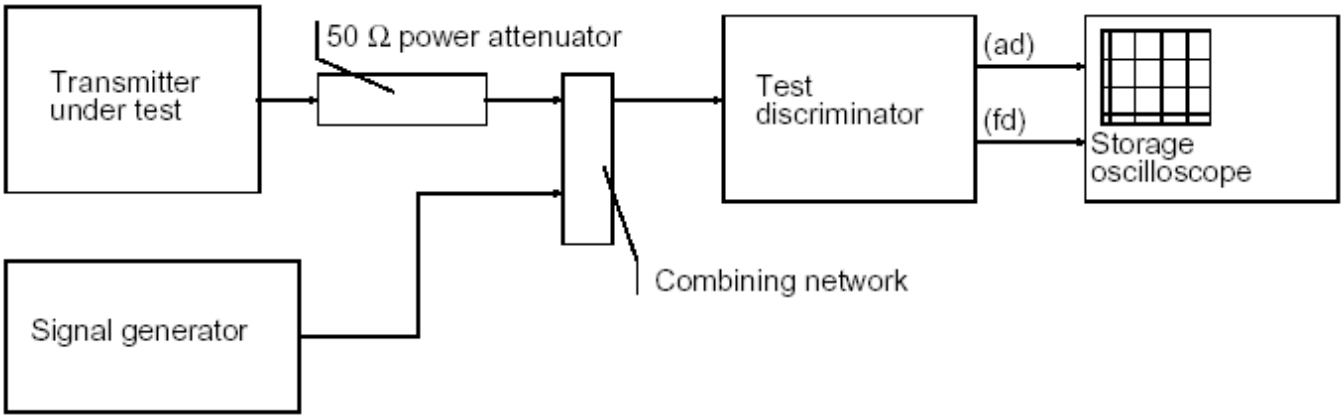
| Time intervals [1, 2] | Maximum frequency difference [3] | All equipment | |
|---|---|---|---|
| | | 150 to 174 MHz | 421 to 512MHz |
| Transient Frequency Behavior for Equipment Designed to Operate on 25 KHz Channels | | | |
| $t_1$ [4] ..... | ± 25.0 KHz | 5.0 ms | 10.0 ms |
| $t_2$ ..... | ± 12.5 KHz | 20.0 ms | 25.0 ms |
| $t_3$ [4] ..... | ± 25.0 KHz | 5.0 ms | 10.0 ms |
| Transient Frequency Behavior for Equipment Designed to Operate on 12.5 KHz Channels | | | |
| $t_1$ [4] ..... | ± 12.5 KHz | 5.0 ms | 10.0 ms |
| $t_2$ ..... | ± 6.25 KHz | 20.0 ms | 25.0 ms |
| $t_3$ [4] ..... | ± 12.5 KHz | 5.0 ms | 10.0 ms |
| Transient Frequency Behavior for Equipment Designed to Operate on 6.25 KHz Channels | | | |
| $t_1$ [4] ..... | ±6.25 KHz | 5.0 ms | 10.0 ms |
| $t_2$ ..... | ±3.125 KHz | 20.0 ms | 25.0 ms |
| $t_3$ [4] ..... | ±6.25 KHz | 5.0 ms | 10.0 ms |

1. $t_{on}$ is the instant when a 1 KHz test signal is completely suppressed, including any capture time due to phasing.
   $t_1$ is the time period immediately following $t_{on}$.
   $t_2$ is the time period immediately following $t_1$.
   $t_3$ is the time period from the instant when the transmitter is turned off until $t_{off}$.
   $t_{off}$ is the instant when the 1 KHz test signal starts to rise.
2. During the time from the end of $t_2$ to the beginning of $t_3$, the frequency difference must not exceed the limits specified in § 90.213.
3. Difference between the actual transmitter frequency and the assigned transmitter frequency.
4. If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

**TEST PROCEDURE**

TIA/EIA-603 2.2.19

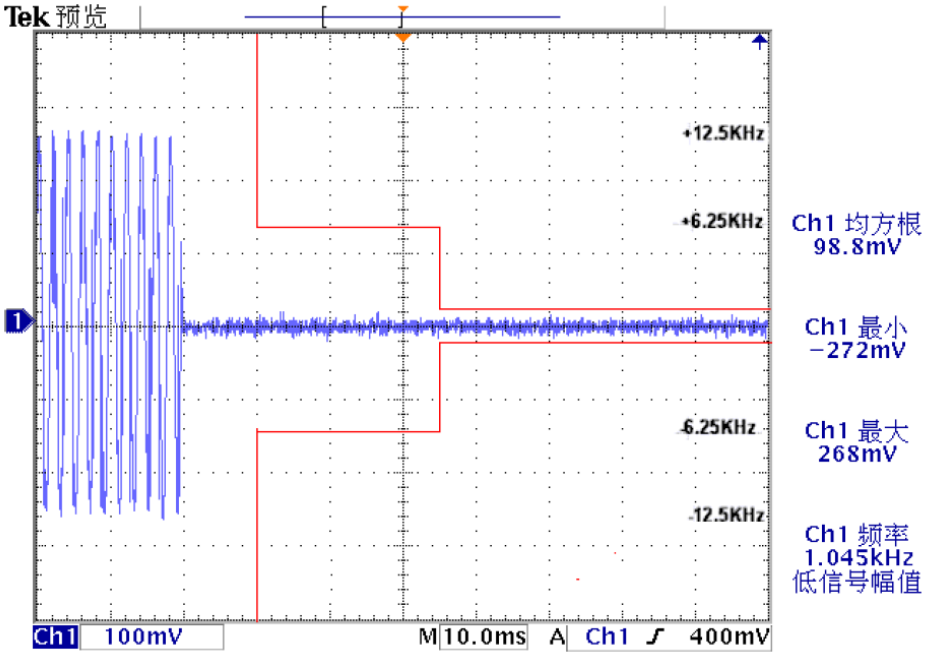
**TEST CONFIGURATION**



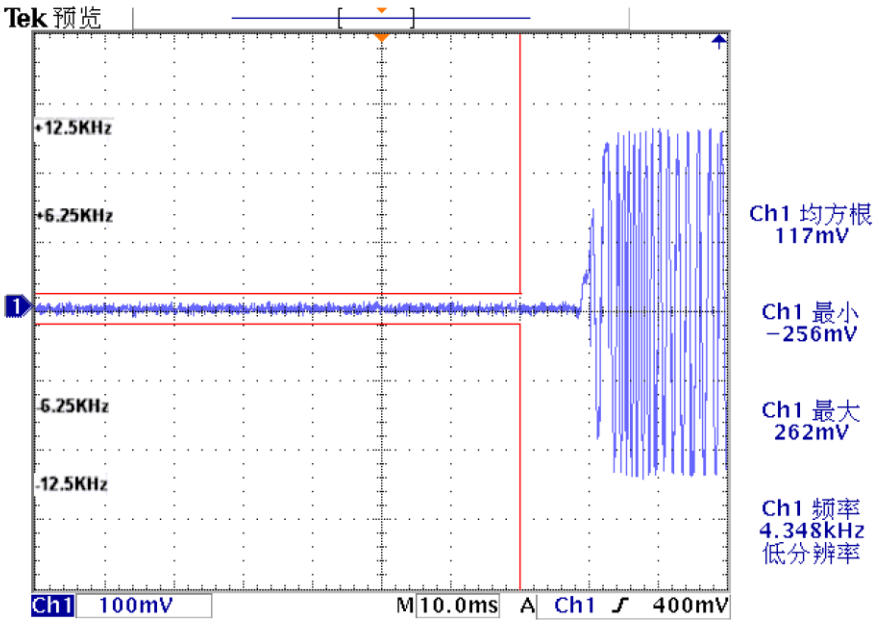
**TEST RESULTS**

Note: All the test frequencies was tested, but only the worst data (12.5KHz/High power/469.9750MHz)be recorded in this part.

Transmitter Frequency Behavior @ 12.5 KHz Channel Separation------Off – On




Transmitter Frequency Behavior @ 12.5KHz Channel Separation------Off – On



# 4.9. AUDIO LOW PASS FILTER RESPONSE

## TEST APPLICABLE

2.1047(a): Voice modulated communication equipment. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.

90.242(b)(8): Recommended audio filter attenuation characteristics are given below:

| Audio band | Minimum Attenuation Rel. to 1 KHz Attenuation |
|---|---|
| 3 –20 KHz<br>20 – 30 KHz | 60 $\log_{10}$(f/3) dB where f is in KHz<br>50dB |

## TEST PROCEDURE

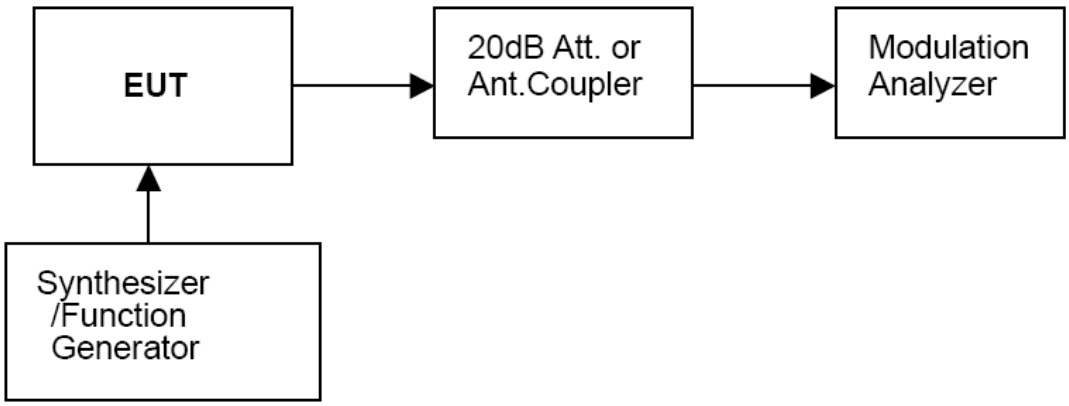
1 Configure the EUT as shown in figure 1.

2 Adjust the audio input for 20% of rated system deviation at 1 KHz using this level as a reference (0dB).

3 Vary the Audio frequency from 100 Hz to 3 KHz and record the frequency deviation.

4 Audio Frequency Response =20log10 (Deviation of test frequency/Deviation of 1 KHz reference).

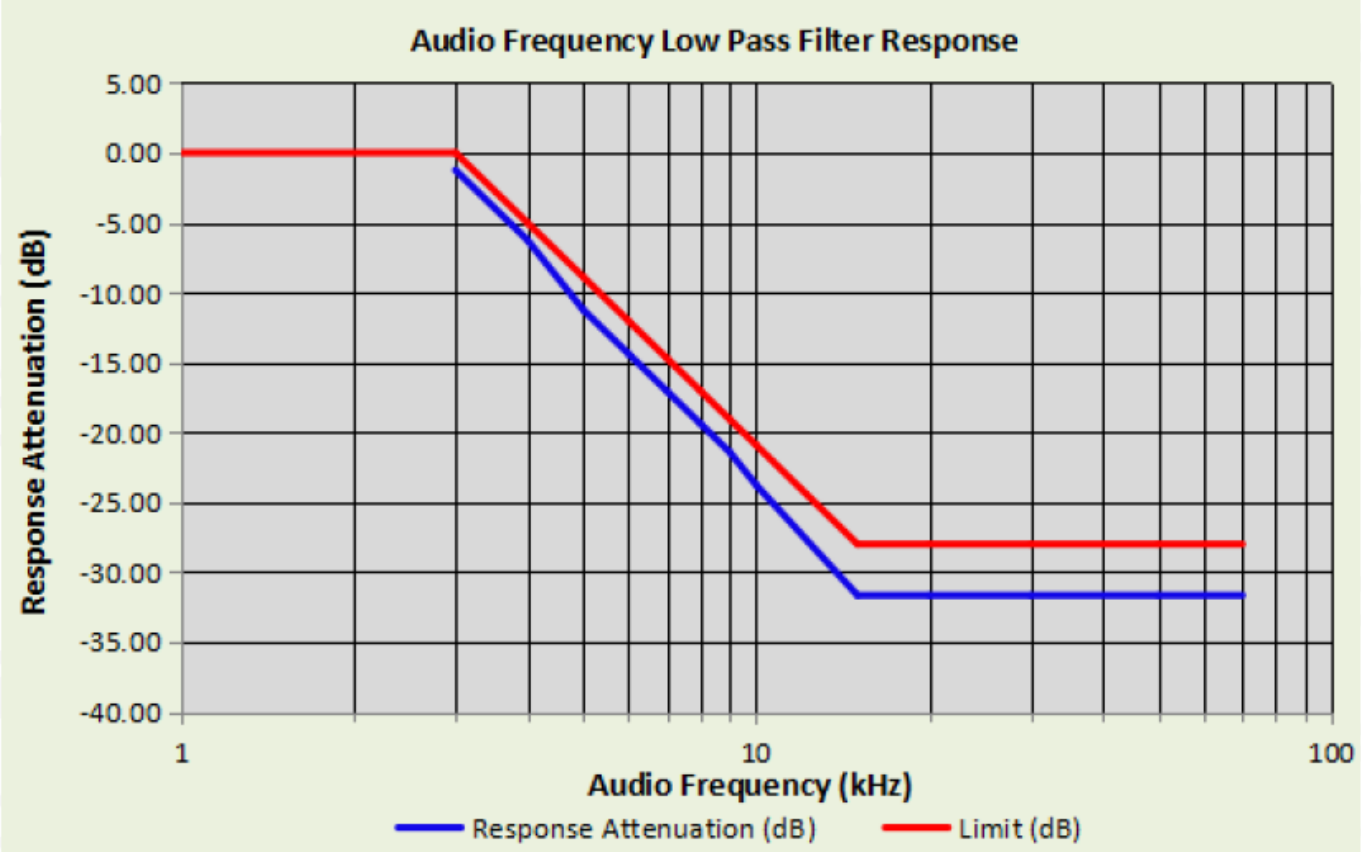
## TEST CONFIGURATION



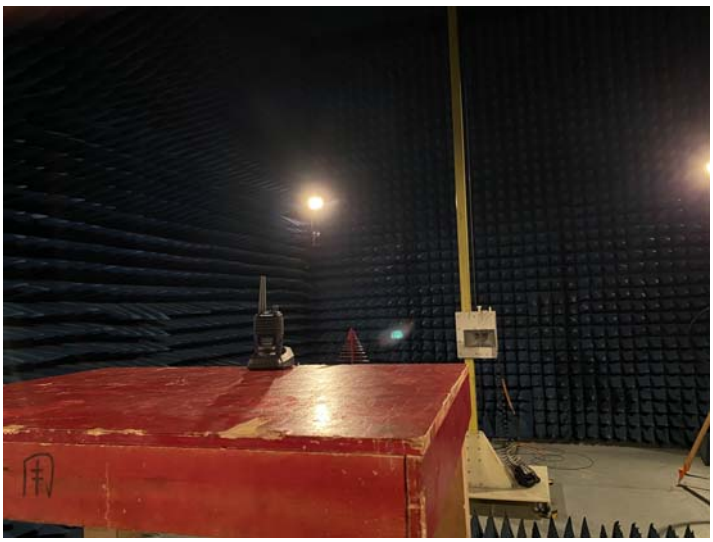
**TEST RESULTS**

Note: All the test frequencies was tested, but only the worst data (12.5KHz/High power/469.9750MHz)be recorded in this part.

| Audio Frequency (kHz) | Response Attenuation (dB) | Limit (dB) |
|---|---|---|
| 1 | 0 | / |
| 3 | -1.25 | 0.00 |
| 4 | -6.24 | -5.00 |
| 5 | -11.21 | -8.85 |
| 6 | -14.38 | -12.04 |
| 7 | -17.22 | -14.2 |
| 8 | -19.35 | -17.04 |
| 9 | -21.41 | -19.08 |
| 10 | -23.77 | -20.95 |
| 15 | -31.65 | -28.00 |
| 20 | -31.65 | -28.00 |
| 30 | -31.65 | -28.00 |
| 50 | -31.65 | -28.00 |
| 70 | -31.65 | -28.00 |



# 5 Test Setup Photos of the EUT



# 6. Photos of the EUT

See " SR-3_External Photos " and " SR-3_Internal Photo ".