

# FCC TEST REPORT

Product Name: FRS Radio  
Trade Mark: Uniden  
Model No.: GMR2050-2C  
Add. Model No.: GMR2035-V2  
Report Number: 190118016RFC-1  
Test Standards: FCC 47 CFR Part 95 Subpart B  
FCC 47 CFR Part 2  
FCC ID: AMWON2055V2  
Test Result: PASS  
Date of Issue: May 5, 2019

Prepared for:

**Uniden America Corporation**  
**3001 Gateway Drive, Suite 130, Irving TX 75063**

Prepared by:

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## Version

| Version No. | Date        | Description |
|-------------|-------------|-------------|
| V1.0        | May 5, 2019 | Original    |



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## 1. GENERAL INFORMATION

### 1.1 CLIENT INFORMATION

|                                 |                                                                                               |
|---------------------------------|-----------------------------------------------------------------------------------------------|
| <b>Applicant:</b>               | Uniden America Corporation                                                                    |
| <b>Address of Applicant:</b>    | 3001 Gateway Drive, Suite 130, Irving TX 75063                                                |
| <b>Manufacturer:</b>            | Xin Xing Great Success Plastic Product Limited                                                |
| <b>Address of Manufacturer:</b> | Building A, District 1, B2-02, Xincheng Industrial Park , Xin Xing, Yin Fu, Guang Dong, China |

### 1.2 EUT INFORMATION

#### 1.2.1 General Description of EUT

|                                   |                                                                                                                 |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>Product Name:</b>              | FRS Radio                                                                                                       |
| <b>Model No.:</b>                 | GMR2050-2C                                                                                                      |
| <b>Add. Model No.:</b>            | GMR2035-V2                                                                                                      |
| <b>Trade Mark:</b>                | Uniden                                                                                                          |
| <b>DUT Stage:</b>                 | Identical Prototype                                                                                             |
| <b>Software Version:</b>          | N/A                                                                                                             |
| <b>Hardware Version:</b>          | N/A                                                                                                             |
| <b>Sample Received Date:</b>      | February 1, 2019                                                                                                |
| <b>Sample Tested Date:</b>        | February 2, 2019 to February 14, 2019                                                                           |
| <b>Declaration of Differences</b> | The differences between these two models are package, including gift box and label, so we only test GMR2050-V2. |

#### 1.2.2 Description of Accessories

| Battery                        |                                                            |
|--------------------------------|------------------------------------------------------------|
| <b>Model No.:</b>              | Environmental Friendly Ni-MH AAA Rechargeable Battery 1.2V |
| <b>Battery Type:</b>           | Ni MH battery                                              |
| <b>Rated Voltage:</b>          | 1.2 Vdc *3                                                 |
| <b>Limited Charge Voltage:</b> | 1.4 Vdc                                                    |
| <b>Rated Capacity:</b>         | 300 mAh                                                    |

| Cable               |                          |
|---------------------|--------------------------|
| <b>Trade Mark:</b>  | N/A                      |
| <b>Model No.:</b>   | N/A                      |
| <b>Description:</b> | USB Micro-B Plug Cable   |
| <b>Cable Type:</b>  | Shielded without ferrite |
| <b>Length:</b>      | 0.8 Meter                |

### 1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

|                                                    |                      |                              |
|----------------------------------------------------|----------------------|------------------------------|
| Frequency Range:                                   | FRS:                 | 462.5625 MHz to 462.7125 MHz |
|                                                    |                      | 467.5625 MHz to 467.7125 MHz |
|                                                    |                      | 462.5500 MHz to 462.7250 MHz |
| Rated Output Power:                                | FRS<br>(See Note 1): | 0.5W(27dBm)                  |
| Modulation Type:                                   | FRS:                 | FM                           |
| Channel Separation:                                | FRS:                 | 12.5 KHz                     |
| Emission Designator:                               | FRS:                 | 10K0F3E                      |
| Maximum Transmitter Power (ERP):                   | FRS:                 | 26.25dBm                     |
| Number of Channels:                                | 22                   |                              |
| Antenna Type:                                      | Integral Antenna     |                              |
| Antenna Gain:                                      | 2 dBi                |                              |
| Normal Test Voltage:                               | 3.6 Vdc              |                              |
| Extreme Test Voltage:                              | 3.0 to 4.0 Vdc       |                              |
| Extreme Test Temperature:                          | -20 °C to +55 °C     |                              |
| Note 1: The EUT only supports voice communication. |                      |                              |

### 1.4 OTHER INFORMATION

| Operation Frequency Each of Channel |              |         |              |         |              |
|-------------------------------------|--------------|---------|--------------|---------|--------------|
| Channel                             | Frequency    | Channel | Frequency    | Channel | Frequency    |
| 1                                   | 462.5625 MHz | 8       | 467.5625 MHz | 15      | 462.5500 MHz |
| 2                                   | 462.5875 MHz | 9       | 467.5875 MHz | 16      | 462.5750 MHz |
| 3                                   | 462.6125 MHz | 10      | 467.6125 MHz | 17      | 462.6000 MHz |
| 4                                   | 462.6375 MHz | 11      | 467.6375 MHz | 18      | 462.6250 MHz |
| 5                                   | 462.6625 MHz | 12      | 467.6625 MHz | 19      | 462.6500 MHz |
| 6                                   | 462.6875 MHz | 13      | 467.6875 MHz | 20      | 462.6750 MHz |
| 7                                   | 462.7125 MHz | 14      | 467.7125 MHz | 21      | 462.7000 MHz |
|                                     |              |         |              | 22      | 462.7250 MHz |

### 1.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

#### 1) Support Equipment

| Description | Manufacturer | Model No. | Serial Number | Supplied by |
|-------------|--------------|-----------|---------------|-------------|
| --          | --           | --        | --            | --          |

#### 2) Support Cable

| Cable No. | Description   | Connector | Length     | Supplied by |
|-----------|---------------|-----------|------------|-------------|
| 1         | Antenna Cable | SMA       | 0.30 Meter | UnionTrust  |

## 1.6 TEST LOCATION

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### **Shenzhen UnionTrust Quality and Technology Co., Ltd.**

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China 518109  
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## 1.7 TEST FACILITY

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

### **CNAS-Lab Code: L9069**

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC/EN 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

### **IC-Registration No.: 21600-1**

The 3m Semi-anechoic chamber of Shenzhen UnionTrust Quality and Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 21600-1.

### **A2LA-Lab Certificate No.: 4312.01**

Shenzhen UnionTrust Quality and Technology Co., Ltd. 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 Accredited Lab.**

Designation Number: CN1194  
Test Firm Registration Number: 259480

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## 1.8 DEVIATION FROM STANDARDS

None.

## 1.9 ABNORMALITIES FROM STANDARD CONDITIONS

None.

## 1.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

### 1.11 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .

| No. | Item                                   | Measurement Uncertainty |
|-----|----------------------------------------|-------------------------|
| 1   | Radiated Spurious emissions 30MHz-1GHz | $\pm 4.5$ dB            |
| 2   | Radiated Spurious emissions 1GHz-18GHz | $\pm 4.4$ dB            |



## 2. TEST SUMMARY

| FCC 47 CFR Part 95 Subpart B Test Cases                                                          |                                                         |                     |               |
|--------------------------------------------------------------------------------------------------|---------------------------------------------------------|---------------------|---------------|
| Test Item                                                                                        | Test Requirement                                        | Test Method         | Result        |
| Maximum Transmitter Power                                                                        | FCC 47 CFR Part 95.567<br>FCC 47 CFR Part 2.1046(a)     | ANSI/TIA-603-E-2016 | PASS          |
| Modulation Limit                                                                                 | FCC 47 CFR Part 95.575<br>FCC 47 CFR Part 2.1047(a)(b)  | ANSI/TIA-603-E-2016 | PASS          |
| Audio Frequency Response                                                                         | FCC 47 CFR Part 2.1047(a)                               | ANSI/TIA-603-E-2016 | PASS          |
| Audio Low Pass Filter Response                                                                   | FCC 47 CFR Part 2.1047(a)                               | ANSI/TIA-603-E-2016 | PASS          |
| Emission Bandwidth                                                                               | FCC 47 CFR Part 95.573<br>FCC 47 CFR Part 2.1049        | ANSI/TIA-603-E-2016 | PASS          |
| Emission Mask                                                                                    | FCC 47 CFR Part 95.579                                  | ANSI/TIA-603-E-2016 | PASS          |
| Transmitter Radiated Spurious Emission                                                           | FCC 47 CFR Part 95.579<br>FCC 47 CFR Part 2.1053        | ANSI/TIA-603-E-2016 | PASS          |
| Spurious Emission On Antenna Port                                                                | FCC 47 CFR Part 95.579<br>FCC 47 CFR Part 2.1051        | ANSI/TIA-603-E-2016 | N/A Note 1, 2 |
| Frequency Stability                                                                              | FCC 47 CFR Part 95.565<br>FCC 47 CFR Part 2.1055 (a)(1) | ANSI/TIA-603-E-2016 | PASS          |
| <b>Note:</b><br>1) N/A: In this whole report not application.<br>2) The EUT is Integral Antenna. |                                                         |                     |               |

### 3. EQUIPMENT LIST

| Radiated Emission Test Equipment List |                                  |              |            |                            |                         |                             |
|---------------------------------------|----------------------------------|--------------|------------|----------------------------|-------------------------|-----------------------------|
| Used                                  | Equipment                        | Manufacturer | Model No.  | Serial Number              | Cal. date (mm dd, yyyy) | Cal. Due date (mm dd, yyyy) |
| <input checked="" type="checkbox"/>   | 3M Chamber & Accessory Equipment | ETS-LINDGREN | 3M         | N/A                        | Dec. 03, 2018           | Dec. 03, 2021               |
| <input checked="" type="checkbox"/>   | Receiver                         | R&S          | ESIB26     | 100114                     | Nov. 24, 2018           | Nov. 24, 2019               |
| <input checked="" type="checkbox"/>   | Loop Antenna                     | ETS-LINDGREN | 6502       | 00202525                   | Dec. 03, 2018           | Dec. 03, 2019               |
| <input checked="" type="checkbox"/>   | Broadband Antenna                | ETS-LINDGREN | 3142E      | 00201566                   | Dec. 08, 2018           | Dec. 08, 2019               |
| <input checked="" type="checkbox"/>   | 6dB Attenuator                   | Talent       | RA6A5-N-18 | 18103001                   | Dec. 08, 2018           | Dec. 08, 2019               |
| <input checked="" type="checkbox"/>   | Preamplifier                     | HP           | 8447F      | 2805A02960                 | Nov. 24, 2018           | Nov. 24, 2019               |
| <input checked="" type="checkbox"/>   | Horn Antenna (Pre-amplifier)     | ETS-LINDGREN | 3117-PA    | 00201874                   | May 22, 2018            | May 22, 2019                |
| <input checked="" type="checkbox"/>   | Multi device Controller          | ETS-LINDGREN | 7006-001   | 00160105                   | N/A                     | N/A                         |
| <input checked="" type="checkbox"/>   | Test Software                    | Audix        | e3         | Software Version: 9.160323 |                         |                             |

| Conducted RF test Equipment List    |                                         |              |              |                        |                         |                             |
|-------------------------------------|-----------------------------------------|--------------|--------------|------------------------|-------------------------|-----------------------------|
| Used                                | Equipment                               | Manufacturer | Model No.    | Serial Number          | Cal. date (mm dd, yyyy) | Cal. Due date (mm dd, yyyy) |
| <input checked="" type="checkbox"/> | Receiver                                | R&S          | ESR7         | 1316.3003K07-101181-K3 | Nov. 24, 2018           | Nov. 24, 2019               |
| <input checked="" type="checkbox"/> | RF COMMUNICATION TEST SET               | HP           | 8920A        | 3813A10206             | Nov. 10, 2018           | Nov. 09, 2019               |
| <input type="checkbox"/>            | Oscilloscope                            | Tektronix    | TDS3032B     | B013680                | Sep. 18, 2018           | Sep. 18, 2019               |
| <input type="checkbox"/>            | MXG X-Series RF Vector Signal Generator | KEYSIGHT     | N5182B       | MY51350267             | Nov. 24, 2018           | Nov. 24, 2019               |
| <input checked="" type="checkbox"/> | DC Source                               | KIKUSUI      | PWR400L      | LK003024               | Sep. 18, 2018           | Sep. 18, 2019               |
| <input type="checkbox"/>            | Temp & Humidity chamber                 | Espec        | GL(U)04KA(W) | 16921H201P3            | Sep. 20, 2018           | Sep. 20, 2019               |
| <input checked="" type="checkbox"/> | Temp & Humidity chamber                 | Votisch      | VT4002       | 58566133290020         | Jun. 15, 2018           | Jun. 14, 2019               |

## 4. TEST CONFIGURATION

### 4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

#### 4.1.1 Normal or Extreme Test Conditions

| Test Environment                                                                                                                                                                                                                                                                                                                                                                                                                | Selected Values During Tests |             |                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-------------|-----------------------|
| Test Condition                                                                                                                                                                                                                                                                                                                                                                                                                  | Ambient                      |             |                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                 | Temperature (°C)             | Voltage (V) | Relative Humidity (%) |
| TN/VN                                                                                                                                                                                                                                                                                                                                                                                                                           | +15 to +35                   | 3.6         | 20 to 75              |
| TL/VN                                                                                                                                                                                                                                                                                                                                                                                                                           | -20                          | 3.6         | 20 to 75              |
| TH/VN                                                                                                                                                                                                                                                                                                                                                                                                                           | +55                          | 3.6         | 20 to 75              |
| TN/VH                                                                                                                                                                                                                                                                                                                                                                                                                           | 25                           | 4.0         | 20 to 75              |
| TN/VL                                                                                                                                                                                                                                                                                                                                                                                                                           | 25                           | 3.3         | 20 to 75              |
| <b>Remark:</b><br>1) The EUT just work in such extreme temperature of -20 °C to +55 °C and the extreme voltage of 3.0 V to 4.0 V, so here the EUT is tested in the temperature of -20 °C to +55 °C and the voltage of 3.0 V to 4.0 V.<br>2) VN: Normal Voltage; TN: Normal Temperature;<br>TL: Low Extreme Test Temperature; TH: High Extreme Test Temperature;<br>VL: Low Extreme Test Voltage; VH: High Extreme Test Voltage. |                              |             |                       |

### 4.2 TEST CHANNELS

| Operation Mode | Frequency Range              | Test RF Channel Lists |              |              |
|----------------|------------------------------|-----------------------|--------------|--------------|
| FRS            | 462.5625 MHz to 462.7125 MHz | Lowest                | Middle       | Highest      |
|                |                              | Channel 1             | Channel 4    | Channel 7    |
|                |                              | 462.5625 MHz          | 462.6375 MHz | 462.7125 MHz |
|                | 467.5625 MHz to 467.7125 MHz | Lowest                | Middle       | Highest      |
|                |                              | Channel 8             | Channel 11   | Channel 14   |
|                |                              | 467.5625 MHz          | 467.6375 MHz | 467.7125 MHz |
|                | 462.5500 MHz to 462.7250 MHz | Lowest                | Middle       | Highest      |
|                |                              | Channel 15            | Channel 19   | Channel 22   |
|                |                              | 462.5500 MHz          | 462.6500 MHz | 462.7250 MHz |

### 4.3 EUT TEST STATUS

| Mode | Description                                                                              |
|------|------------------------------------------------------------------------------------------|
| FRS  | Keep the EUT in continuously transmitting with modulation or single carrier test single. |

#### 4.4 SYSTEM TEST CONFIGURATION

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. It was powered by a 3.6Vdc Ni MH battery. Only the worst case data were recorded in this test report.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. Video bandwidth was 3 times greater than resolution bandwidth.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 30 MHz to the tenth harmonic of the highest fundamental frequency. The spurious emissions more than 20 dB below the permissible value are not reported.

## 5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION

### 5.1 REFERENCE DOCUMENTS FOR TESTING

| No. | Identity                            | Document Title                                                                      |
|-----|-------------------------------------|-------------------------------------------------------------------------------------|
| 1   | FCC 47 CFR Part 2 Subpart J         | Frequency allocations and radio treaty matters; general rules and regulations       |
| 2   | FCC 47 CFR Part 95 Subpart B        | Personal Radio Service                                                              |
| 3   | ANSI/TIA-603-E-2016                 | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards |
| 4   | KDB 888861 D01 Part 95 GMRS FRS v01 | Guidance for Certification of Part 95 GMRS and FRS transmitting equipment.          |

### 5.2 MAXIMUM TRANSMITTER POWER (EFFECTIVE RADIATED POWER)

**Test Requirement:** FCC 47 CFR Part 95.567  
FCC 47 CFR Part 2.1046(a)

**Test Method:** ANSI/TIA-603-E-2016, Section 2.2.17

**Limit:**

**For FRS**

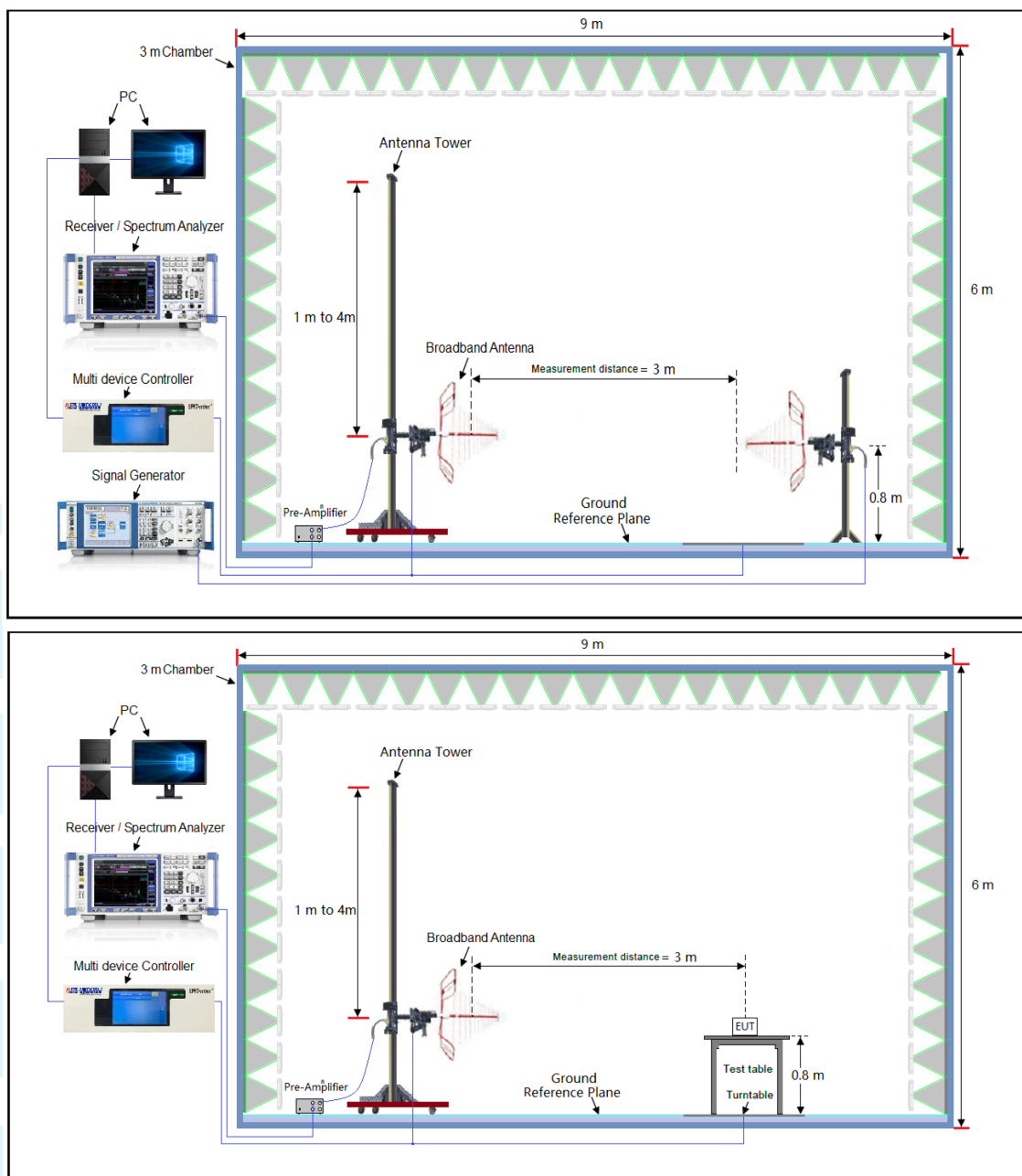
Each FRS transmitter type must be designed such that the effective radiated power (ERP) on channels 8 through 14 does not exceed 0.5 Watts and the ERP on channels 1 through 7 and 15 through 22 does not exceed 2.0 Watts.

**Test Procedure:**

Test procedure as below:

- 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 disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made. The radiated emission measurements of all transmit frequencies in all 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=100kHz, VBW=300kHz for 30MHz to 1GHz, And the maximum value of the receiver should be recorded as (Pr).
- 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 (PMea) 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 (Pr). The power of signal source (PMea) 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 (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.  
The measurement results are obtained as described below:  $\text{Power(EIRP)} = \text{PMea} - \text{PAg} - \text{Pcl} - \text{Ga}$   
The measurement results are amend as described below:  
 $\text{Power(EIRP)} = \text{PMea} - \text{Pcl} - \text{Ga}$
- 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,  $\text{ERP} = \text{EIRP} - 2.15\text{dBi}$ .
- 8) Test the EUT in the lowest channel, the middle channel the Highest channel

**Test Setup:**



**Instruments Used:**

Refer to section 3 for details

**Test Mode:**

Unmodulated Transmitter mode

**Test Results:**

Refer to APPENDIX A.

### 5.3 MODULATION LIMIT

**Test Requirement:** FCC 47 CFR Part 95.575  
FCC 47 CFR Part 2.1047(a)(b)

**Test Method:** ANSI/TIA-603-E-2016, Section 2.2.3

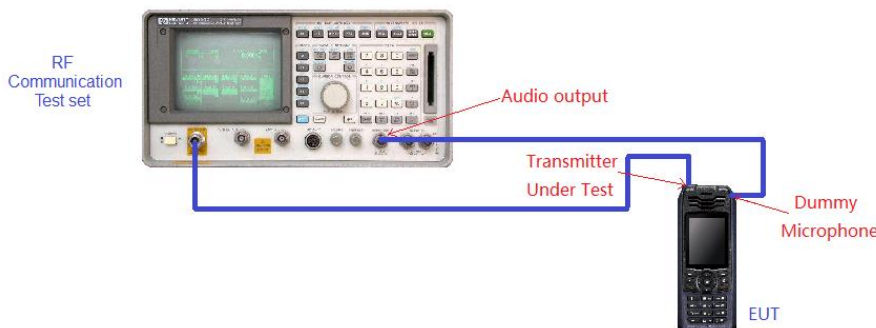
**Limit:**

Each FRS transmitter type must be designed such that the peak frequency deviation does not exceed 2.5 kHz, and the highest audio frequency contributing substantially to modulation must not exceed 3.125 kHz.

**Test Procedure:**

- Connect the equipment as illustrated.
- Adjust the transmitter per the manufacturer's procedure for full rated system deviation.
- Set the test receiver to measure peak positive deviation. Set the audio bandwidth for  $\leq 0.25$  Hz to  $\geq 15,000$  Hz. Turn the de-emphasis function off.
- 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.
- Increase the level from the audio frequency generator by 20 dB in one step (rise time between the 10% and 90% points shall be 0.1 second maximum).
- Measure both the instantaneous and steady-state deviation at and after the time of increasing the audio input level.
- With the level from the audio frequency generator held constant at the level obtained in step e), slowly vary the audio frequency from 300 Hz to 3000 Hz and observe the steady-state deviation. Record the maximum deviation.
- Set the test receiver to measure peak negative deviation and repeat steps d) through g).
- The values recorded in steps g) and h) are the modulation limiting.

**Test Setup:**



**Instruments Used:** Refer to section 3 for details

**Test Mode:** Modulated Transmitter mode

**Test Results:** Refer to APPENDIX B.

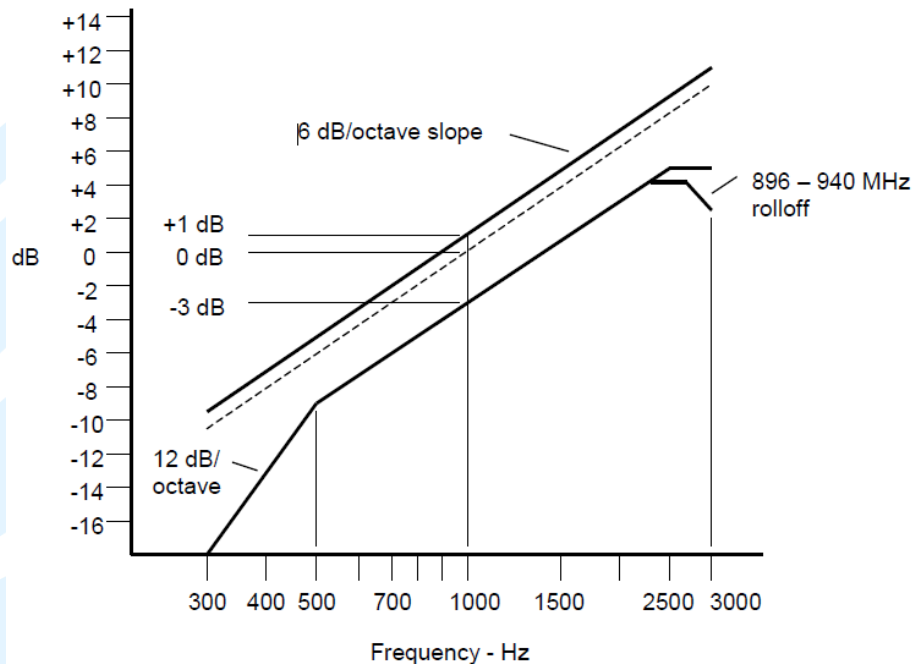
## 5.4 AUDIO FREQUENCY RESPONSE

**Test Requirement:** FCC 47 CFR Part 2.1047(a)

**Test Method:** ANSI/TIA-603-E-2016, Section 2.2.6

**Limit:**

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.

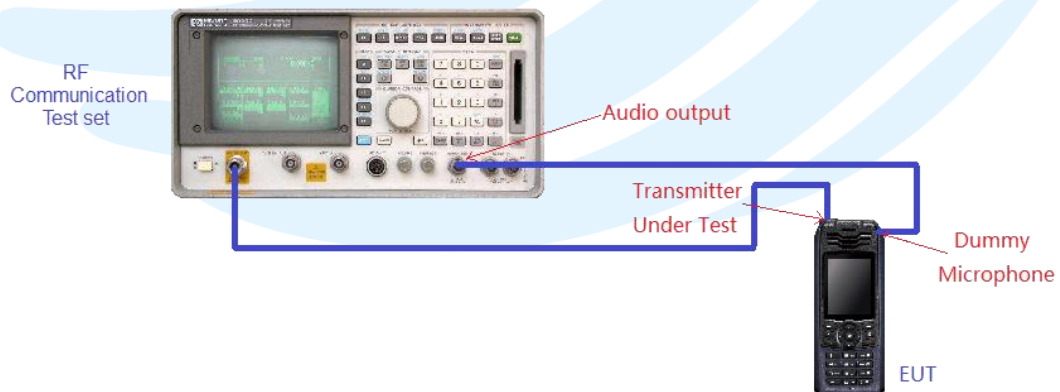


An additional 6 dB per octave attenuation is allowed from 2500 Hz to 3000 Hz in equipment operating in the 25 MHz to 869 MHz range.

### 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 =  $20\log_{10} (V_{FREQ}/V_{REF})$ .

### Test Setup:



**Instruments Used:** Refer to section 3 for details

**Test Mode:** Modulated Transmitter mode

**Test Results:** Refer to APPENDIX C

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## 5.5 AUDIO LOW PASS FILTER RESPONSE

**Test Requirement:** FCC 47 CFR Part 2.1047(a)

**Test Method:** ANSI/TIA-603-E-2016, Section 2.2.15

**Limit:**

For audio frequencies above 3000 Hz, the audio response of the post limiter low-pass filter shall meet or exceed the following requirements:

a) For equipment operating on 20, 25 or 30 kHz channel bandwidth in the 25 MHz to 174 MHz range:

At frequencies from 3000 Hz through 15,000 Hz the attenuation shall be greater than the attenuation at 1000 Hz by at least:  $40 \log_{10}(f / 3000)$  dB

where: f is the audio frequency in Hz.

At frequencies above 15,000 Hz, the attenuation shall be greater than the attenuation at 1000 Hz, by at least: 28 dB.

b) For equipment operating with 25 kHz bandwidth channels between 406 and 512 MHz through 896 MHz, and between 929 MHz through 930 MHz:

At frequencies from 3000 Hz through 20,000 Hz, the attenuation shall be greater than the attenuation at 1000 Hz by at least:  $60 \log_{10}(f / 3000)$  dB

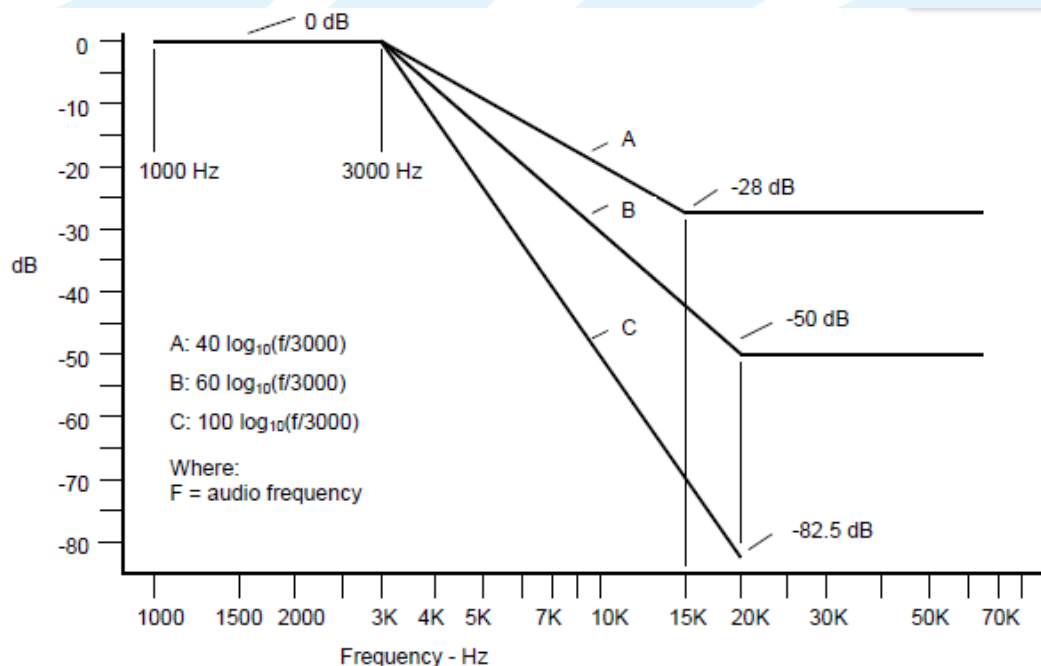
where: f is the audio frequency in Hz.

At frequencies above 20,000 Hz the attenuation shall be greater than the attenuation at 1000 Hz by at least: 50 dB.

c) For equipment operating on channels between 896 MHz through 901 MHz, between 935 MHz through 940 MHz, and 12.5 or 15 kHz spaced channels in the frequency range 138-174 MHz and 406-512 MHz.

At frequencies from 3000 Hz through 20,000 Hz the attenuation shall be greater than the attenuation at 1000 Hz by at least:  $100 \log_{10}(f / 3000)$  dB

where: f is the audio frequency in Hz.



### Test Procedure:

- Connect the equipment as illustrated.
- Connect the audio frequency generator as close as possible the input of the post limiter low pass filter within the transmitter under test.
- Connect the audio spectrum analyzer to the output of the post limiter low pass filter within the transmitter under test.
- Apply a 1000 Hz tone from the audio frequency generator and adjust the level per manufacturer's specifications.
- Record the dB level of the 1000 Hz spectral line on the audio spectrum analyzer as  $LEV_{REF}$ .

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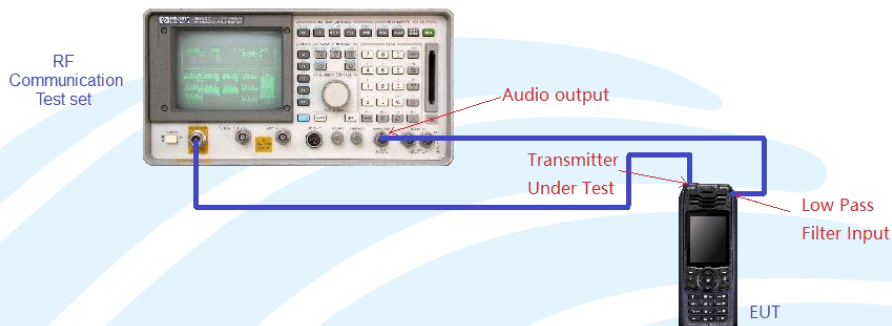
Fax: +86-755-28230886

E-mail: info@uttlab.com

[Http://www.uttlab.com](http://www.uttlab.com)

- f) Set the audio frequency generator to the desired test frequency between 3000 Hz and the upper low pass filter limit.
- g) Record audio spectrum analyzer levels, at the test frequency in step f).
- h) Record the dB level on the audio spectrum analyzer as  $LEV_{FREQ}$ .
- i) Calculate the audio frequency response at the test frequency as:  
low pass frequency response =  $LEV_{FREQ} - LEV_{REF}$
- j) Repeat steps f) through i) for all the desired test frequencies.

**Test Setup:**



**Instruments Used:** Refer to section 3 for details

**Test Results:** Refer to APPENDIX D

## 5.6 FREQUENCY STABILITY

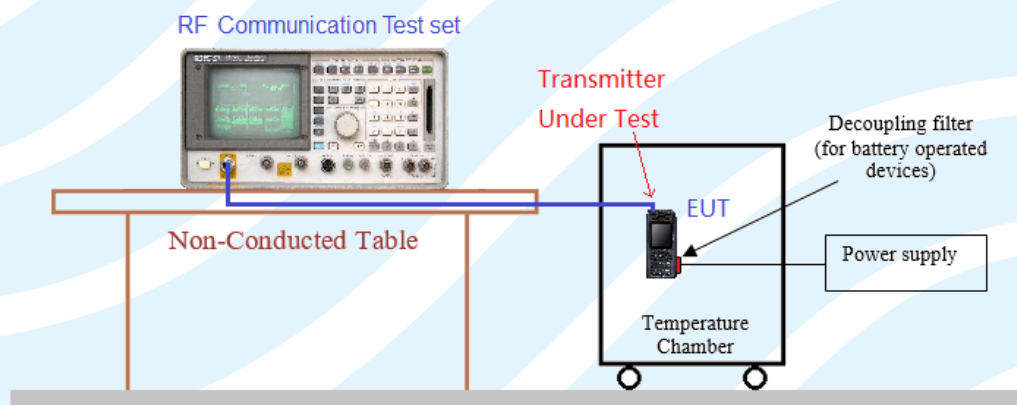
**Test Requirement:** FCC 47 CFR Part 95.565  
FCC 47 CFR Part 2.1055 (a)(1)  
**Test Method:** ANSI/TIA-603-E-2016, Section 2.2.2  
**Limit:**

Each FRS transmitter type must be designed such that the carrier frequencies remain within  $\pm 2.5$  parts-per-million of the channel center frequencies specified in §95.563 during normal operating conditions.

**Test Procedure:**

1. According to FCC Part 2 Section 2.1055 (a)(1), the frequency stability shall be measured with variation of ambient temperature from  $-20^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  centigrade.
2. According to FCC Part 2 Section 2.1055 (d) (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 3.0 V to 4.0 V.
4. 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 or RF Communication Test set. 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:**



**Instruments Used:** Refer to section 3 for details  
**Test Mode:** Unmodulated Transmitter mode  
**Test Results:** Refer to APPENDIX E

## 5.7 EMISSION BANDWIDTH

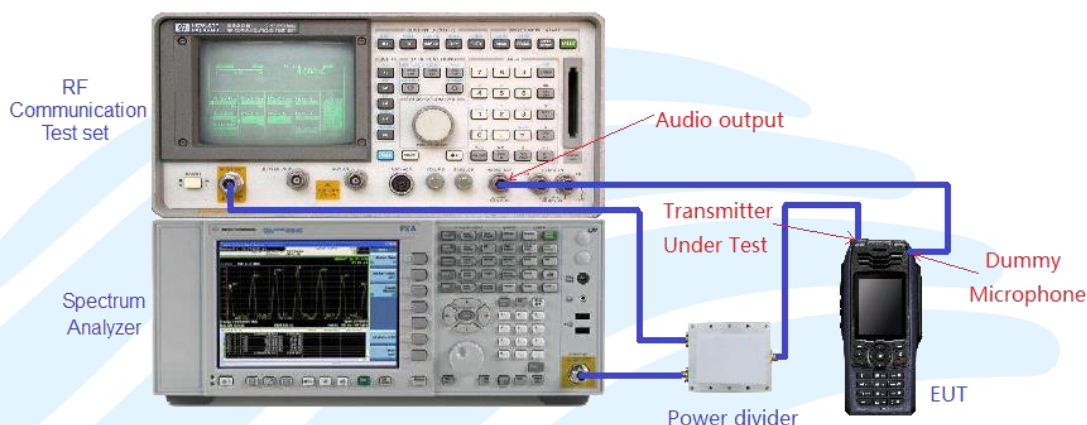
**Test Requirement:** FCC 47 CFR Part 95.573  
FCC 47 CFR Part 2.1049

**Test Method:** ANSI/TIA-603-E-2016, Section 2.2.11

**Limits:**

Each FRS transmitter type must be designed such that the occupied bandwidth does not exceed 12.5 kHz.

### Test Setup:



### Test Procedures:

- 1) The EUT was modulated by 2.5 kHz sine wave audio signal; the level of the audio signal employed is 16dB greater than that necessary to produce 50% of rated system deviation. Rated system deviation is 2.5kHz and 5kHz).
- 2) Spectrum set as follow:  
Centre frequency = fundamental frequency, span=50kHz,  
RBW=100Hz, VBW=300Hz, Sweep = auto, Detector function = peak, Trace = max hold
- 3) Set 99% Occupied Bandwidth and 26dB Occupied Bandwidth
- 4) Measure and record the results in the test report.

**Equipment Used:** Refer to section 3 for details.

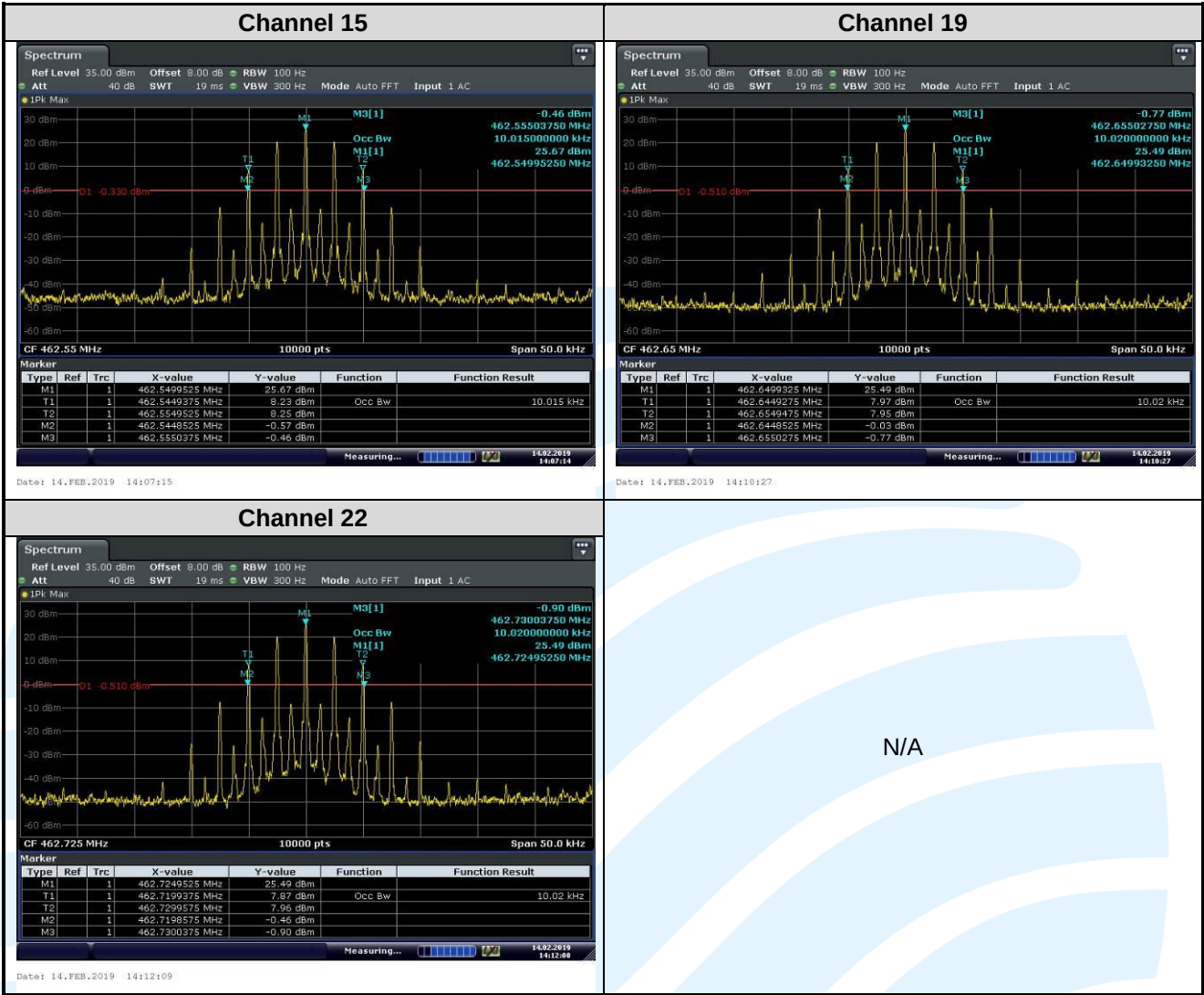
**Test Result:** Pass

The measurement data as follows:

| Operation Mode | Channel | Frequency (KHz) | 26 dB Bandwidth (KHz) | 99% Bandwidth (KHz) | 26 dB Bandwidth Limit | Pass / Fail |
|----------------|---------|-----------------|-----------------------|---------------------|-----------------------|-------------|
| FRS            | 1       | 462.6525        | 10.180                | 10.020              | ≤ 12.5 kHz            | Pass        |
|                | 4       | 462.6375        | 10.175                | 10.020              | ≤ 12.5 kHz            | Pass        |
|                | 7       | 462.7125        | 10.165                | 10.015              | ≤ 12.5 kHz            | Pass        |
|                | 8       | 467.5625        | 10.170                | 10.020              | ≤ 12.5 kHz            | Pass        |
|                | 11      | 467.6375        | 10.175                | 10.015              | ≤ 12.5 kHz            | Pass        |
|                | 14      | 467.7125        | 10.175                | 10.015              | ≤ 12.5 kHz            | Pass        |
|                | 15      | 462.5500        | 10.185                | 10.015              | ≤ 20 kHz              | Pass        |
|                | 19      | 462.6500        | 10.175                | 10.020              | ≤ 20 kHz              | Pass        |
|                | 22      | 462.7250        | 10.180                | 10.020              | ≤ 20 kHz              | Pass        |

The test plot as follows:





## 5.8 EMISSION MASK

**Test Requirement:** FCC 47 CFR Part 95.579

**Test Method:** ANSI/TIA-603-E-2016, Section 2.2.11

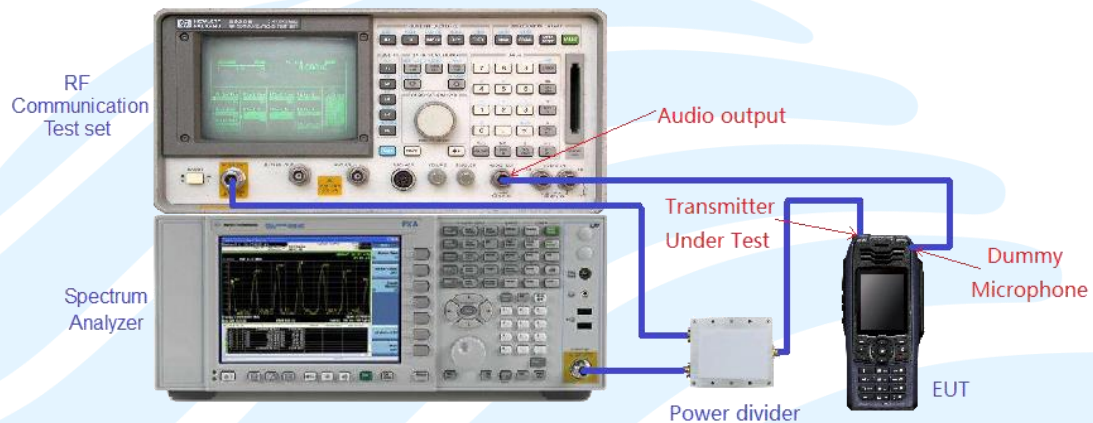
**Limits:**

The power of unwanted emissions must be attenuated below the carrier power output in Watts (P) by at least:

- (1) 25 dB (decibels) in the frequency band 6.25 kHz to 12.5 kHz removed from the channel center frequency.
- (2) 35 dB in the frequency band 12.5 kHz to 31.25 kHz removed from the channel center frequency.

43 + 10 log (P) dB in any frequency band removed from the channel center frequency by more than 31.25 kHz.

**Test Setup:**



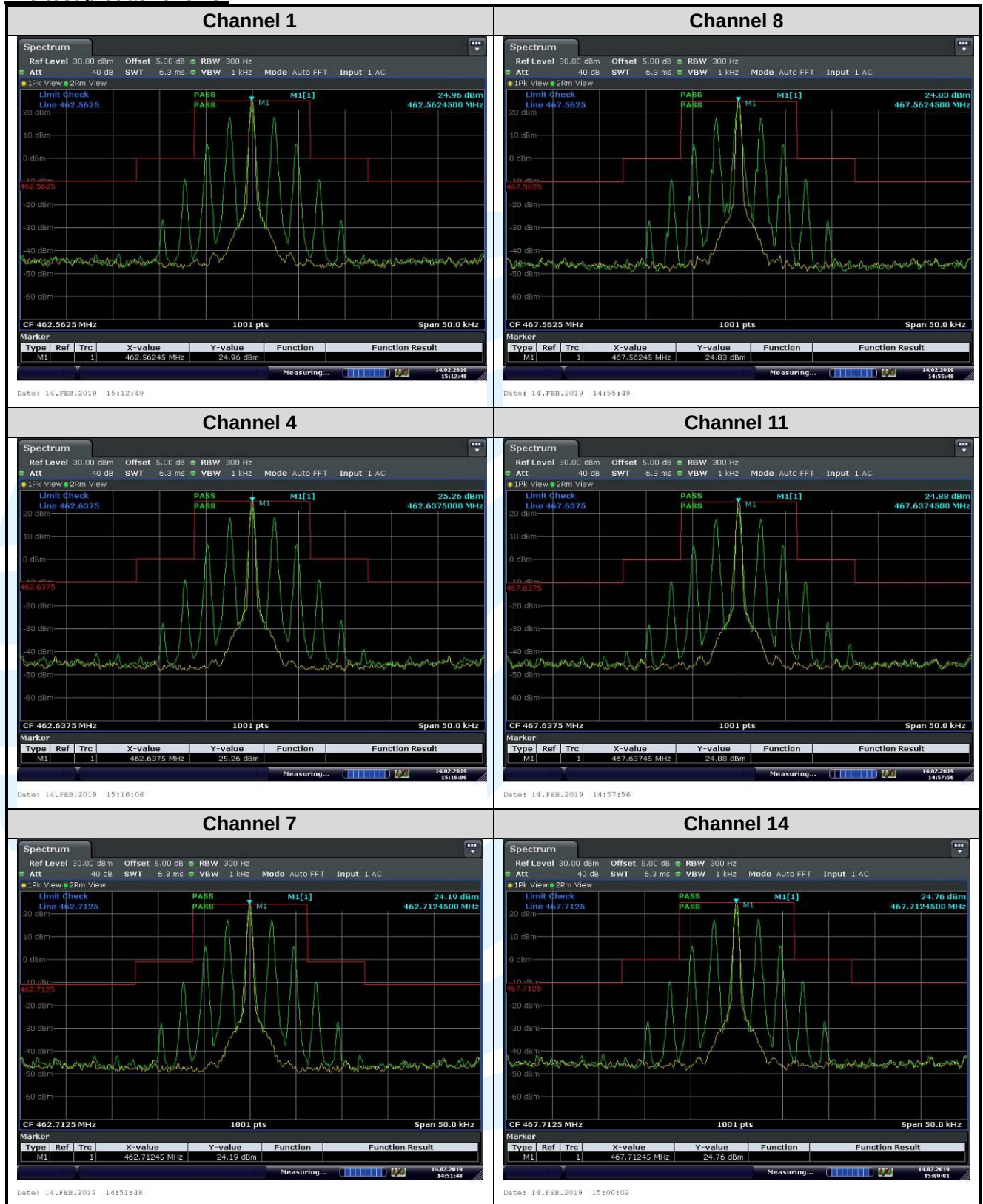
**Test Procedures:**

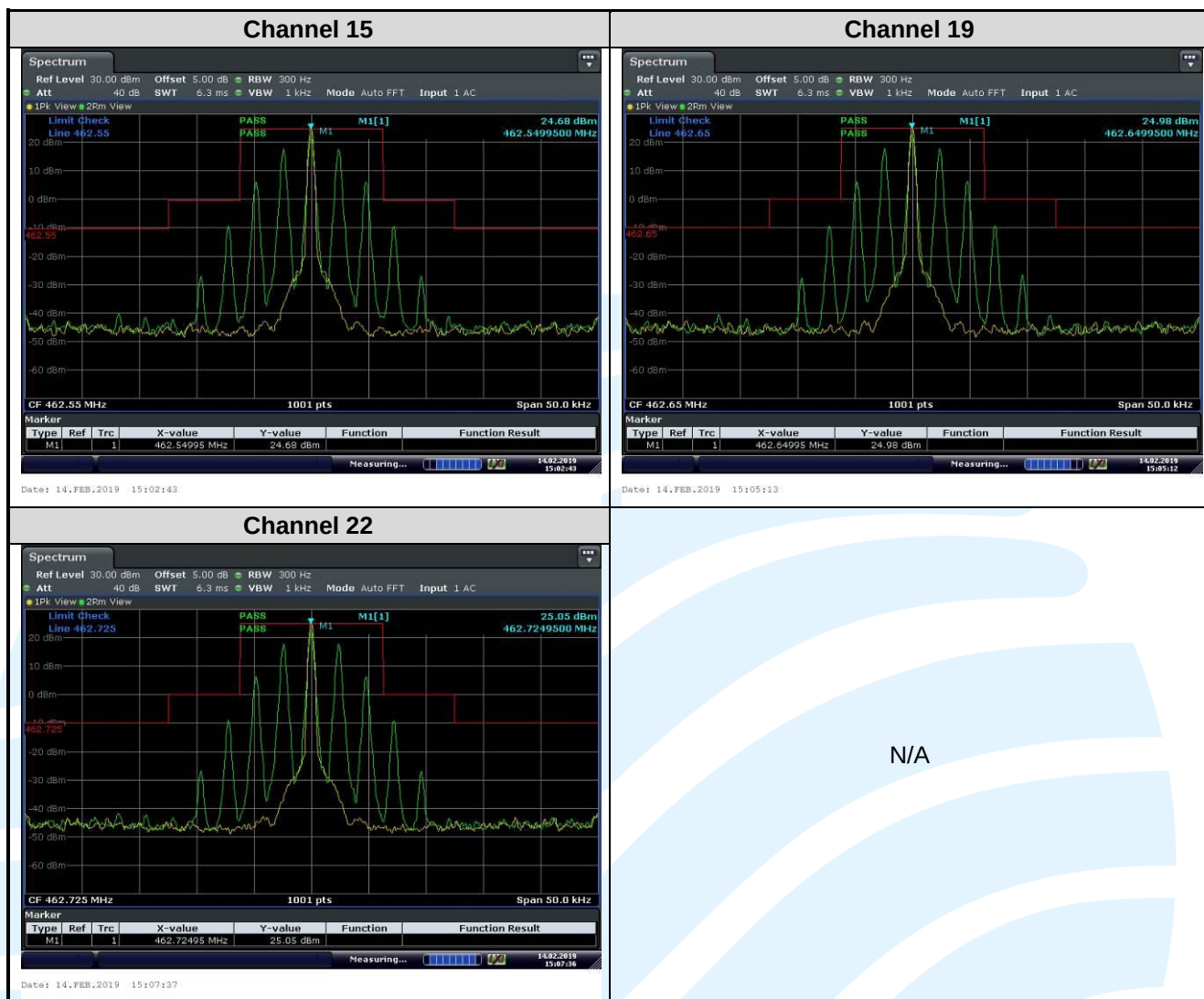
- 5) Connect the equipment as illustrated.
- 6) Spectrum set as follow:  
Centre frequency = fundamental frequency, span=125kHz for 12.5kHz channel spacing, RBW=300Hz, VBW=1000Hz, Sweep = auto, Detector function = peak, Trace = max hold
- 7) Key the transmitter, and set the level of the unmodulated carrier to a full scale reference line. This is the 0dB reference for the measurement.  
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 (Rated system deviation is 2.5 kHz for 12.5kHz channel spacing).
- 8) The input level shall be established at the frequency of maximum response of the audio modulating circuit. Transmitters employing digital modulation techniques that bypass the limiter and the audio low-pass filter shall be modulated as specified by the manufacturer
- 9) Measure and record the results in the test report.

**Equipment Used:** Refer to section 3 for details.

**Test Result:** Pass

The test plot as follows:





## 5.9 TRANSMITTER RADIATED SPURIOUS EMISSION

**Test Requirement:** FCC 47 CFR Part 95.579  
FCC 47 CFR Part 2.1053

**Test Method:** ANSI/TIA-603-E-2016, Section 2.2.12

**Limit:**

The power of unwanted emissions must be attenuated below the carrier power output in Watts (P) by at least:

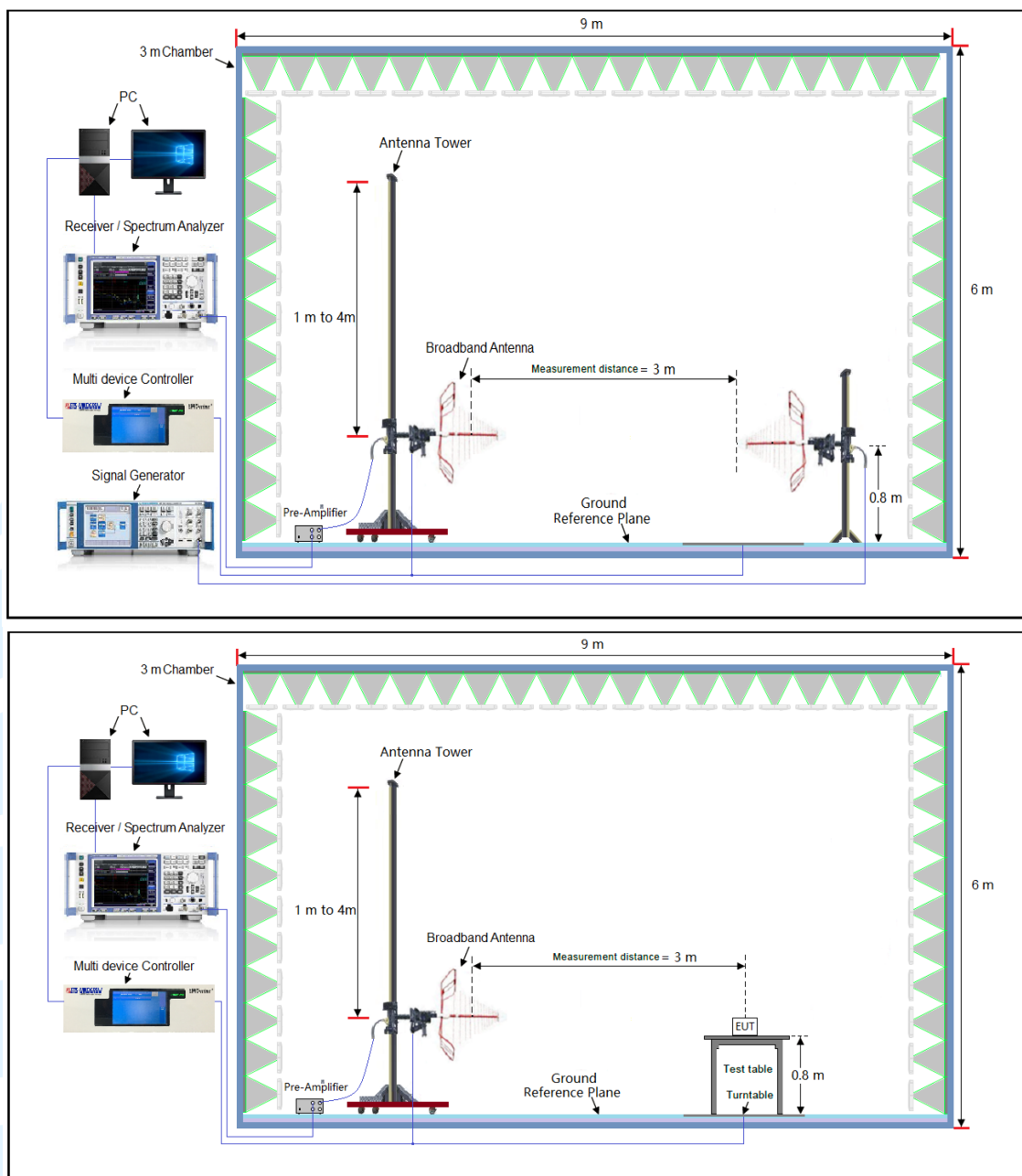
- (1) 25 dB (decibels) in the frequency band 6.25 kHz to 12.5 kHz removed from the channel center frequency.
- (2) 35 dB in the frequency band 12.5 kHz to 31.25 kHz removed from the channel center frequency.
- (3)  $43 + 10 \log (P)$  dB in any frequency band removed from the channel center frequency by more than 31.25 kHz.

**Test Procedure:**

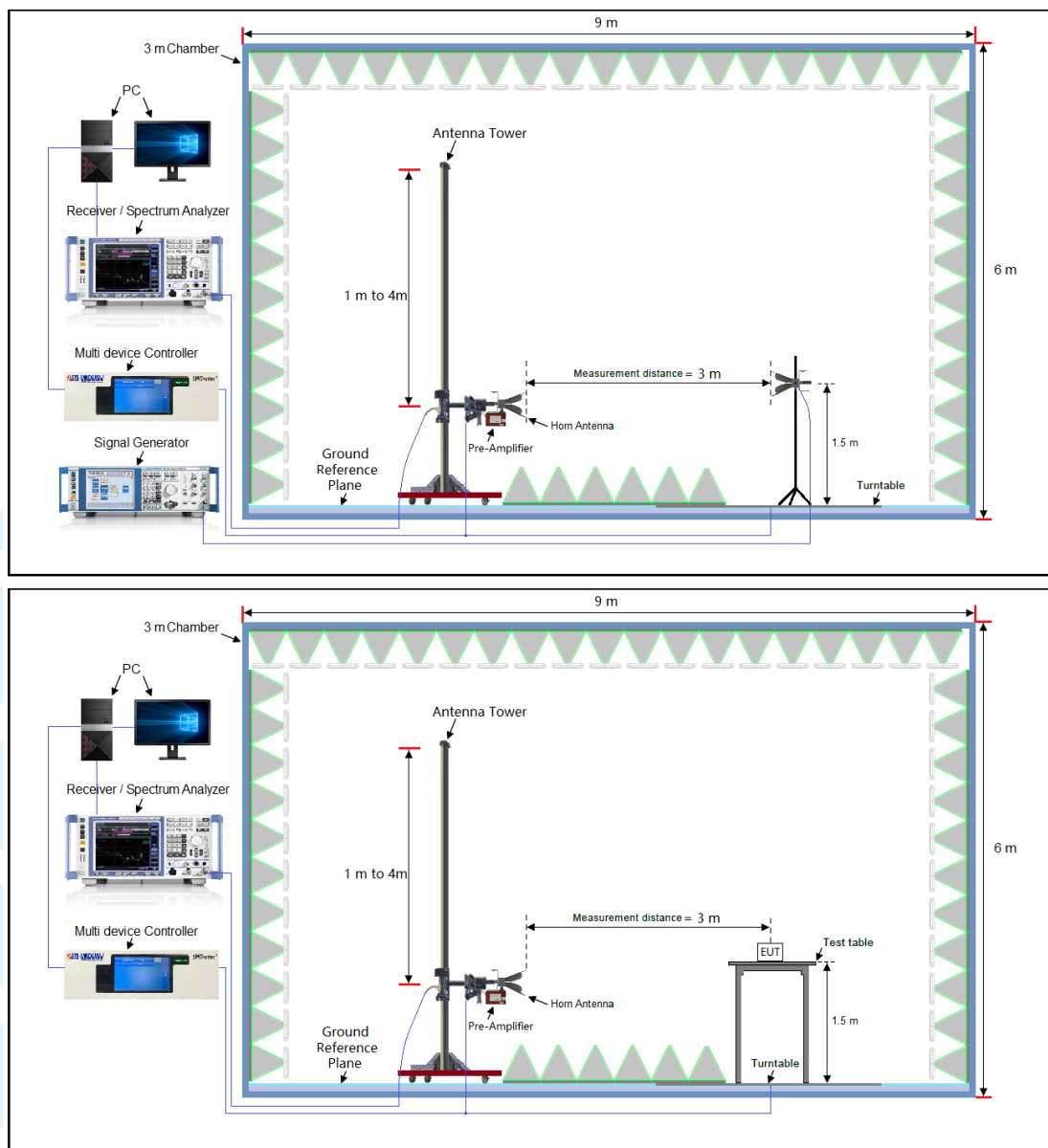
Test procedure as below:

- 1) EUT was placed on a 0.8 or 1.5 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 disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made. The radiated emission measurements of all transmit frequencies in all 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 and RBW=100kHz, VBW=300kHz for 30MHz to 1GHz, And the maximum value of the receiver should be recorded as (Pr).
- 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 (PMea) 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 (Pr). The power of signal source (PMea) 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 (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.  
The measurement results are obtained as described below:  $\text{Power(EIRP)} = \text{PMea} - \text{PAg} - \text{Pcl} - \text{Ga}$   
The measurement results are amend as described below:  
 $\text{Power(EIRP)} = \text{PMea} - \text{Pcl} - \text{Ga}$
- 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,  $\text{ERP} = \text{EIRP} - 2.15\text{dBi}$ .
- 8) Test the EUT in the lowest channel, the middle channel the Highest channel

**Test Setup:**

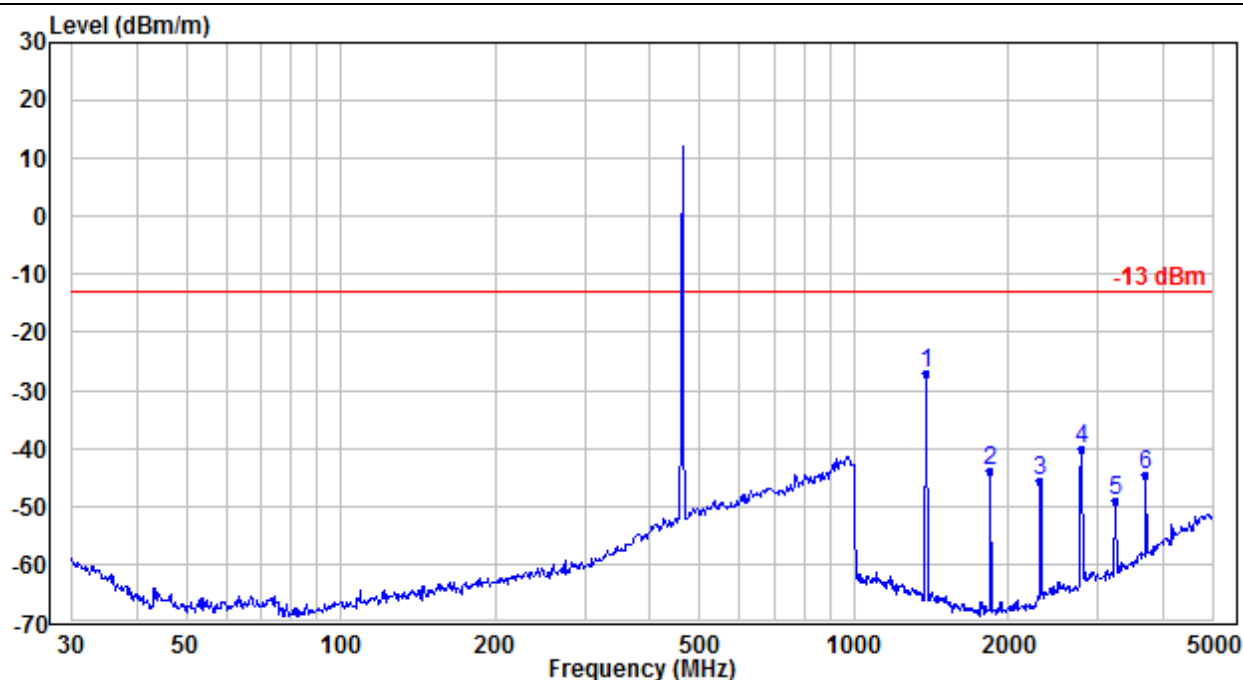


ERP Test Setup

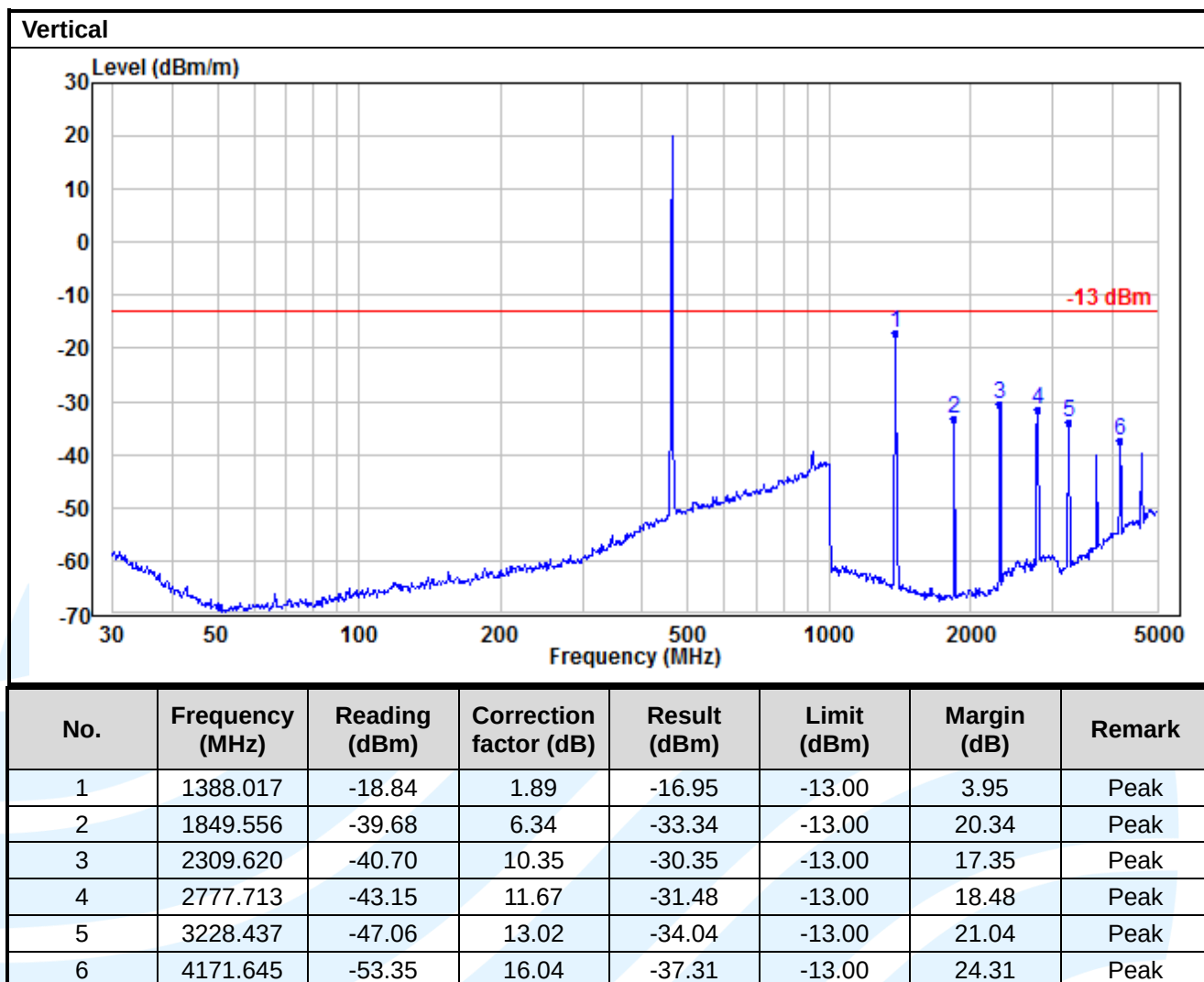


EIRP Test Setup

**Instruments Used:** Refer to section 3 for details  
**Test Mode:** Unmodulated Transmitter mode  
**Test Results:** Pass  
**The measurement data as follows:**

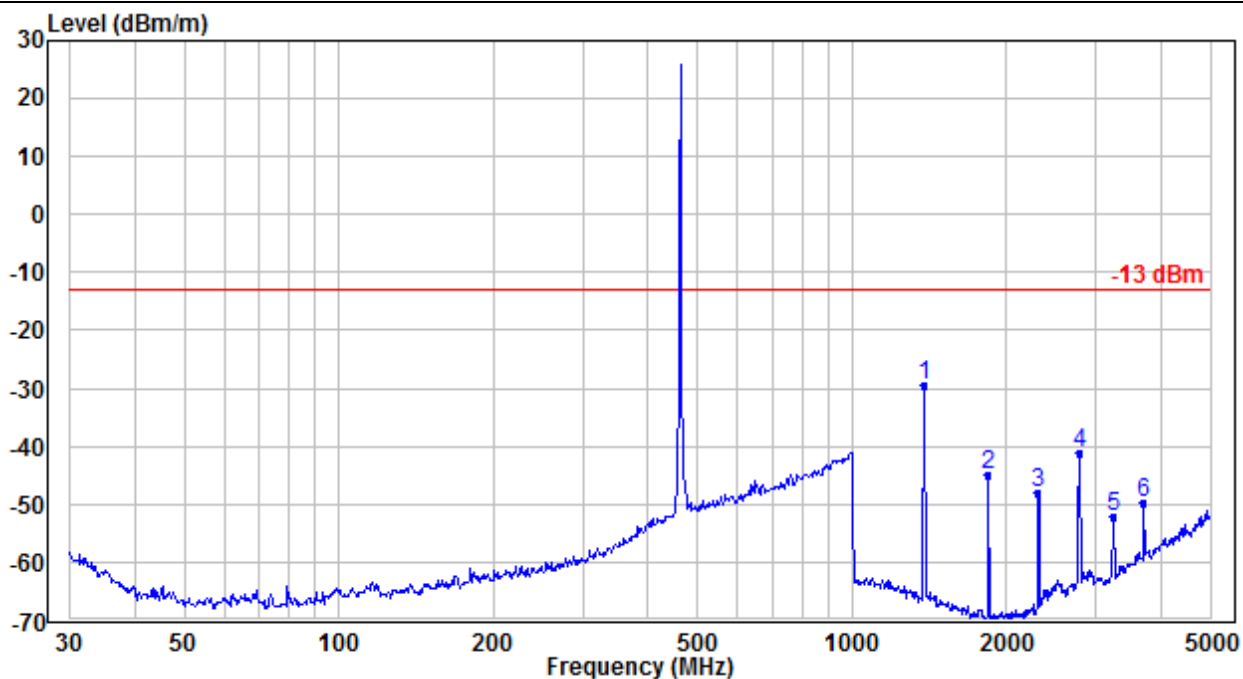
**Spurious emissions test data (30MHz to 6 GHz):**
**Channel 1**
**Horizontal**


| No. | Frequency (MHz) | Reading (dBm) | Correction factor (dB) | Result (dBm) | Limit (dBm) | Margin (dB) | Remark |
|-----|-----------------|---------------|------------------------|--------------|-------------|-------------|--------|
| 1   | 1383.281        | -28.03        | 0.87                   | -27.16       | -13.00      | 14.16       | Peak   |
| 2   | 1843.246        | -47.75        | 3.93                   | -43.82       | -13.00      | 30.82       | Peak   |
| 3   | 2309.620        | -53.49        | 7.82                   | -45.67       | -13.00      | 32.67       | Peak   |
| 4   | 2777.713        | -49.83        | 9.82                   | -40.01       | -13.00      | 27.01       | Peak   |
| 5   | 3228.437        | -60.53        | 11.66                  | -48.87       | -13.00      | 35.87       | Peak   |
| 6   | 3701.352        | -58.45        | 13.77                  | -44.68       | -13.00      | 31.68       | Peak   |

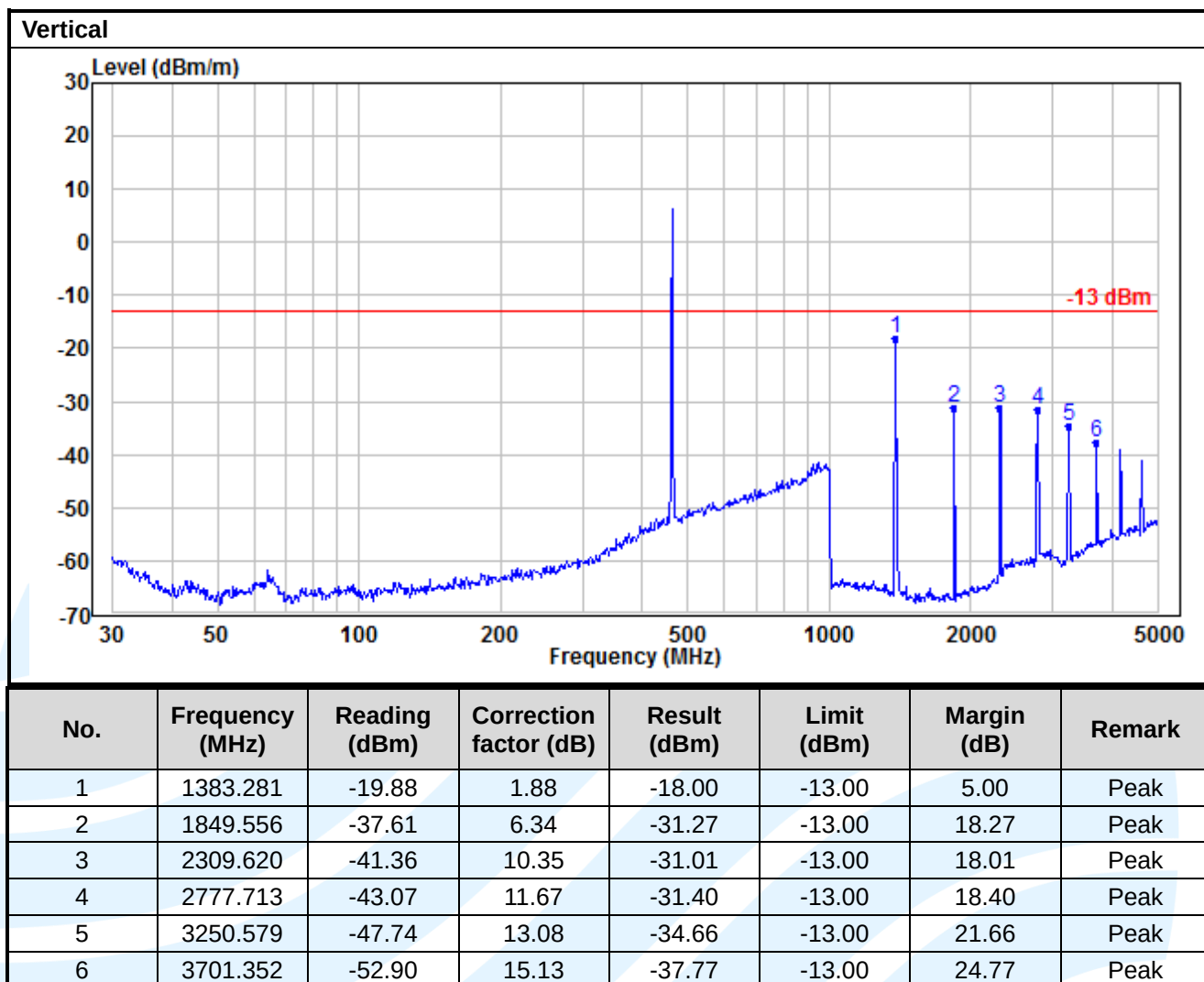


## Channel 4

## Horizontal

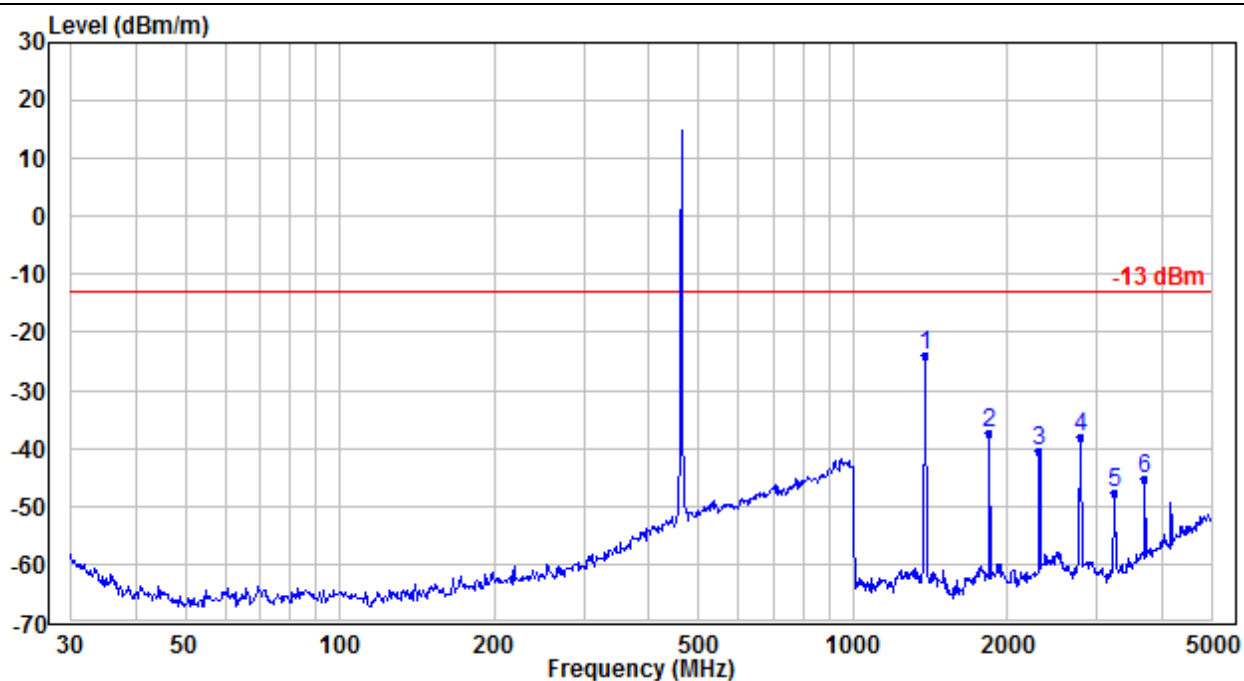


| No. | Frequency (MHz) | Reading (dBm) | Correction factor (dB) | Result (dBm) | Limit (dBm) | Margin (dB) | Remark |
|-----|-----------------|---------------|------------------------|--------------|-------------|-------------|--------|
| 1   | 1383.281        | -30.48        | 0.87                   | -29.61       | -13.00      | 16.61       | Peak   |
| 2   | 1849.556        | -48.84        | 3.98                   | -44.86       | -13.00      | 31.86       | Peak   |
| 3   | 2309.620        | -55.73        | 7.82                   | -47.91       | -13.00      | 34.91       | Peak   |
| 4   | 2777.713        | -51.13        | 9.82                   | -41.31       | -13.00      | 28.31       | Peak   |
| 5   | 3250.579        | -64.01        | 11.73                  | -52.28       | -13.00      | 39.28       | Peak   |
| 6   | 3701.352        | -63.34        | 13.77                  | -49.57       | -13.00      | 36.57       | Peak   |

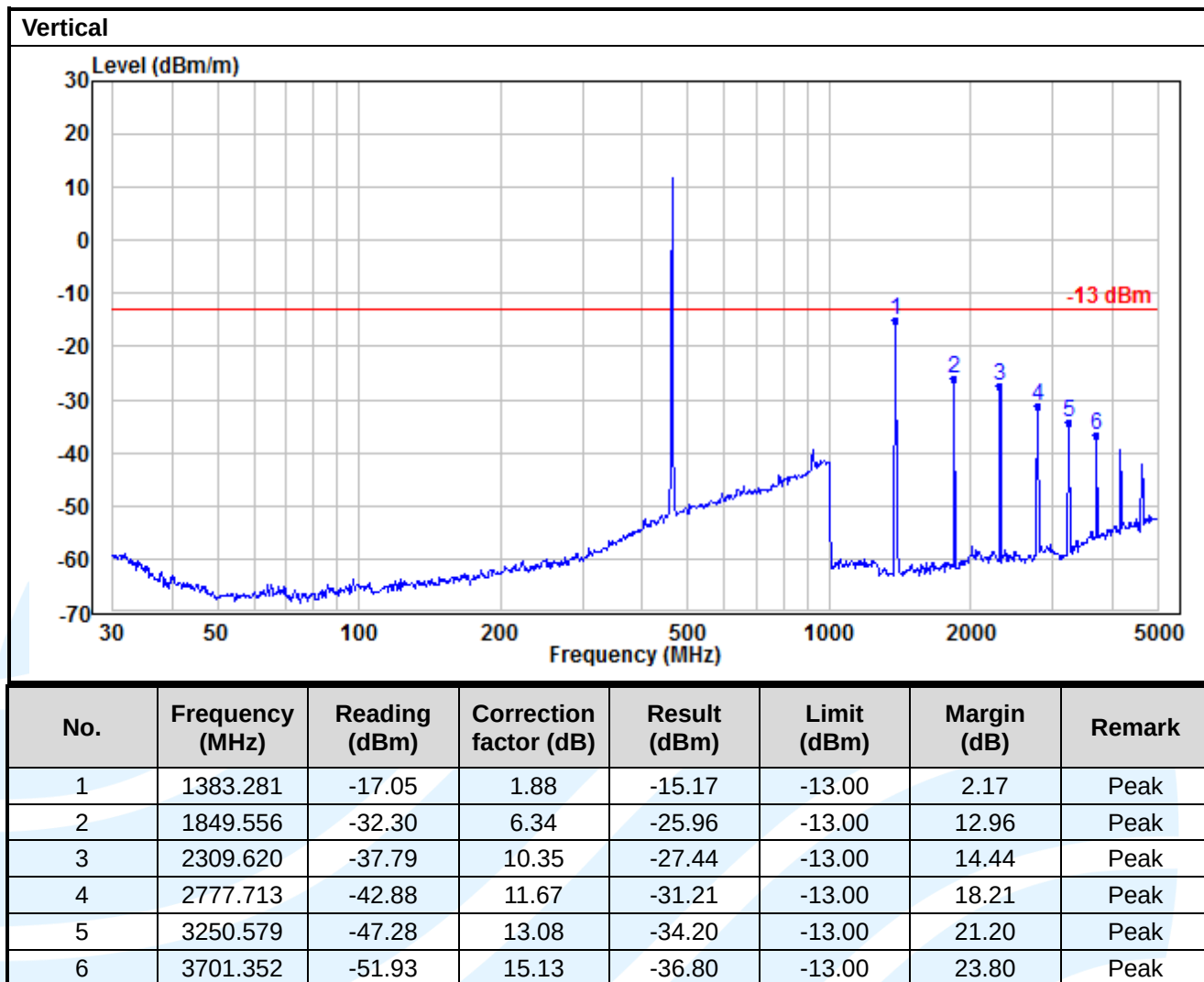


## Channel 7

## Horizontal

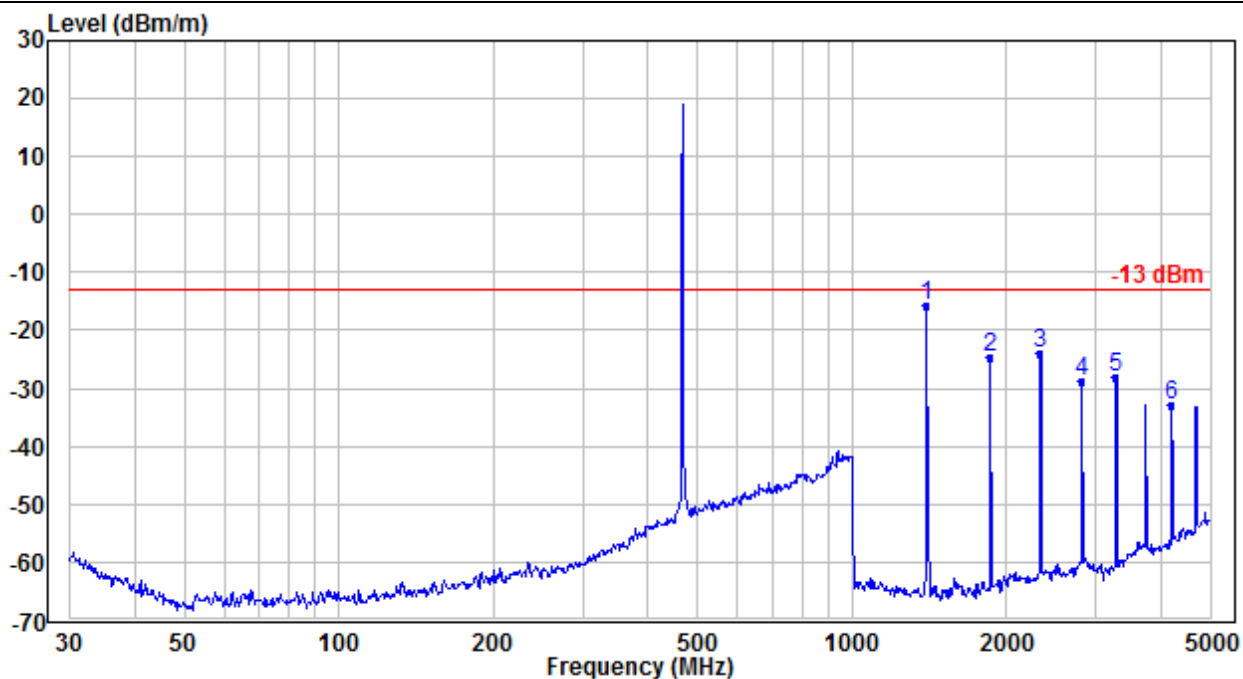


| No. | Frequency (MHz) | Reading (dBm) | Correction factor (dB) | Result (dBm) | Limit (dBm) | Margin (dB) | Remark |
|-----|-----------------|---------------|------------------------|--------------|-------------|-------------|--------|
| 1   | 1388.017        | -24.90        | 0.88                   | -24.02       | -13.00      | 11.02       | Peak   |
| 2   | 1849.556        | -41.17        | 3.98                   | -37.19       | -13.00      | 24.19       | Peak   |
| 3   | 2309.620        | -48.32        | 7.82                   | -40.50       | -13.00      | 27.50       | Peak   |
| 4   | 2777.713        | -47.85        | 9.82                   | -38.03       | -13.00      | 25.03       | Peak   |
| 5   | 3250.579        | -59.42        | 11.73                  | -47.69       | -13.00      | 34.69       | Peak   |
| 6   | 3701.352        | -59.05        | 13.77                  | -45.28       | -13.00      | 32.28       | Peak   |

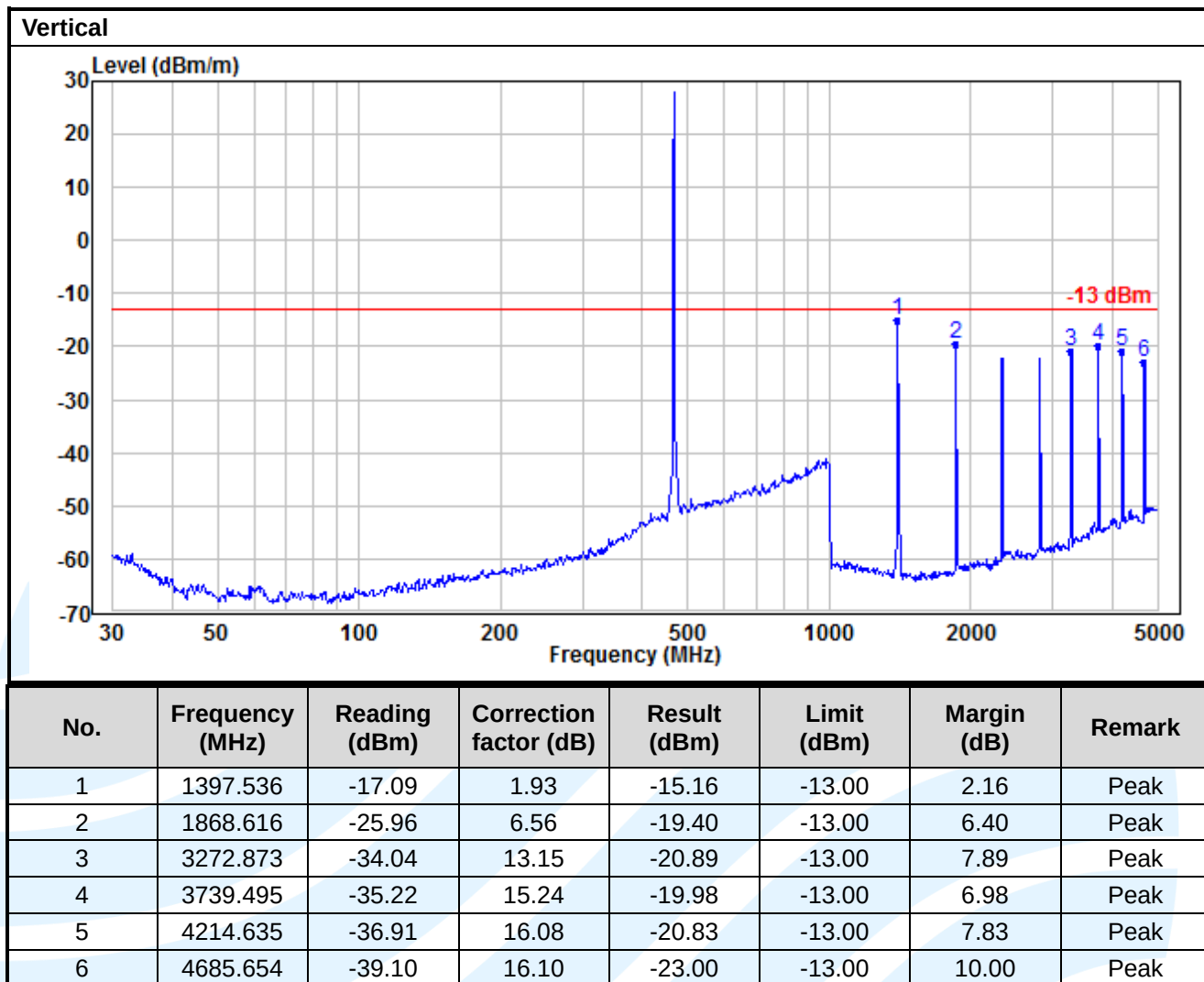


## Channel 8

## Horizontal

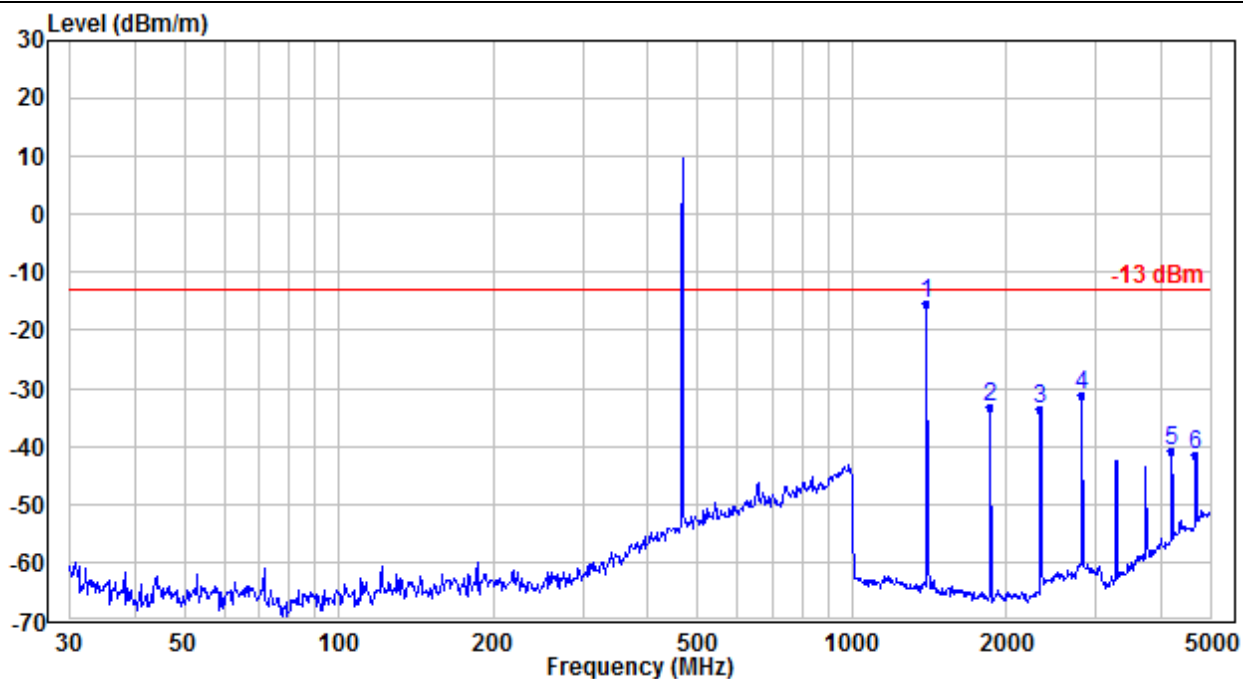


| No. | Frequency (MHz) | Reading (dBm) | Correction factor (dB) | Result (dBm) | Limit (dBm) | Margin (dB) | Remark |
|-----|-----------------|---------------|------------------------|--------------|-------------|-------------|--------|
| 1   | 1397.536        | -16.58        | 0.91                   | -15.67       | -13.00      | 2.67        | Peak   |
| 2   | 1868.616        | -28.68        | 4.13                   | -24.55       | -13.00      | 11.55       | Peak   |
| 3   | 2333.422        | -31.96        | 8.17                   | -23.79       | -13.00      | 10.79       | Peak   |
| 4   | 2806.338        | -38.78        | 9.91                   | -28.87       | -13.00      | 15.87       | Peak   |
| 5   | 3272.873        | -39.94        | 11.81                  | -28.13       | -13.00      | 15.13       | Peak   |
| 6   | 4214.635        | -47.73        | 14.74                  | -32.99       | -13.00      | 19.99       | Peak   |

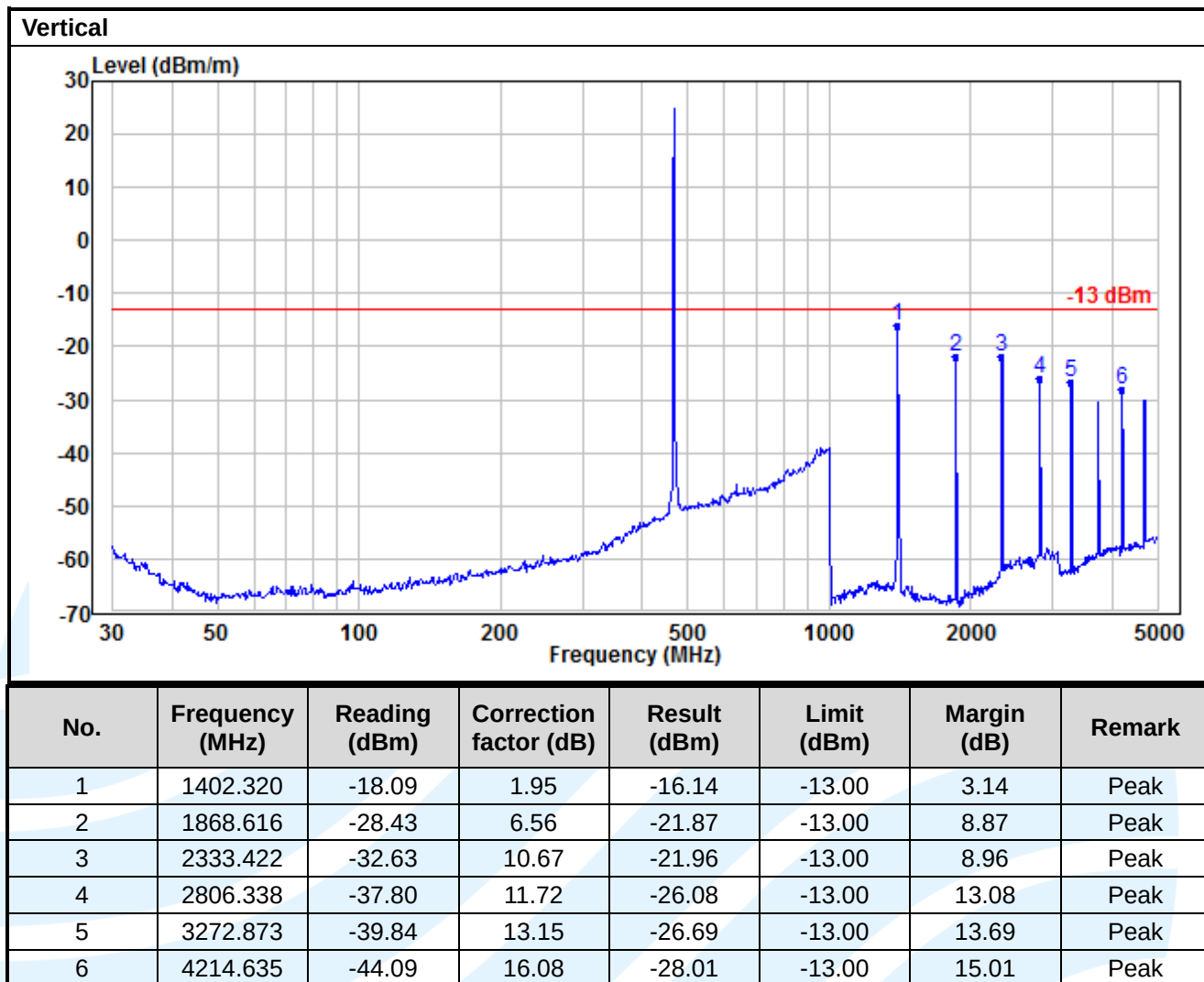


## Channel 11

## Horizontal

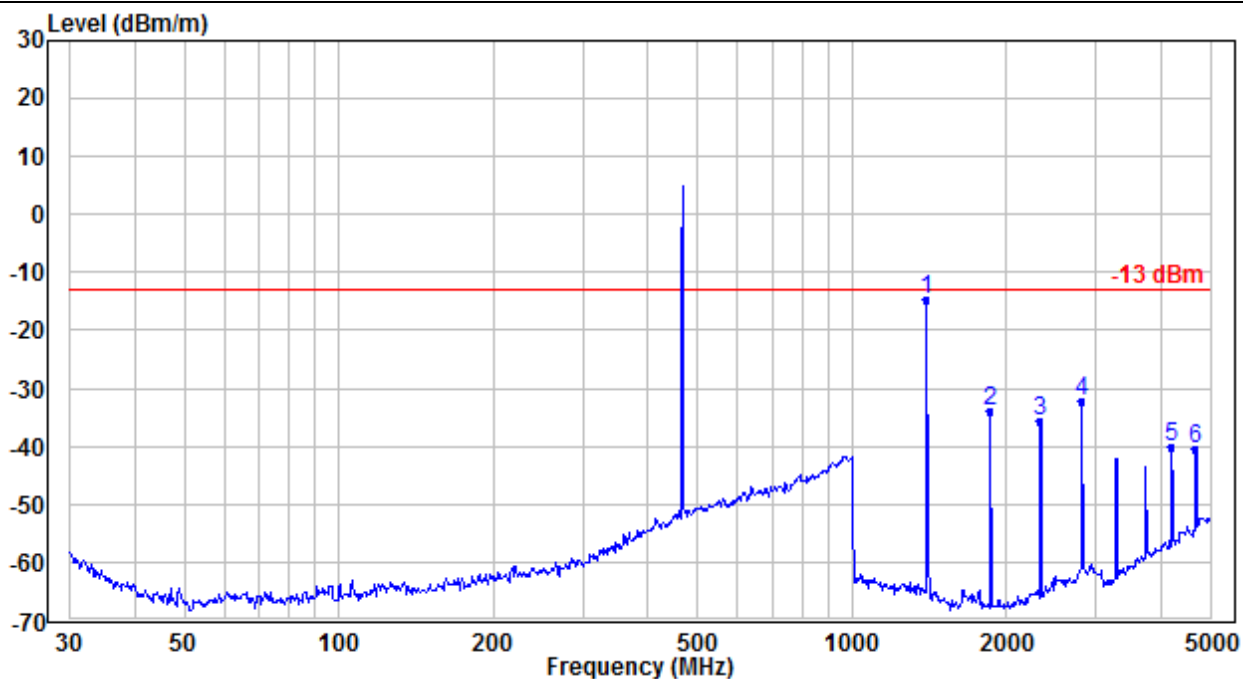


| No. | Frequency (MHz) | Reading (dBm) | Correction factor (dB) | Result (dBm) | Limit (dBm) | Margin (dB) | Remark |
|-----|-----------------|---------------|------------------------|--------------|-------------|-------------|--------|
| 1   | 1402.320        | -16.36        | 0.93                   | -15.43       | -13.00      | 2.43        | Peak   |
| 2   | 1868.616        | -37.46        | 4.13                   | -33.33       | -13.00      | 20.33       | Peak   |
| 3   | 2333.422        | -41.87        | 8.17                   | -33.70       | -13.00      | 20.70       | Peak   |
| 4   | 2806.338        | -41.22        | 9.91                   | -31.31       | -13.00      | 18.31       | Peak   |
| 5   | 4214.635        | -55.37        | 14.74                  | -40.63       | -13.00      | 27.63       | Peak   |
| 6   | 4685.654        | -56.41        | 15.10                  | -41.31       | -13.00      | 28.31       | Peak   |

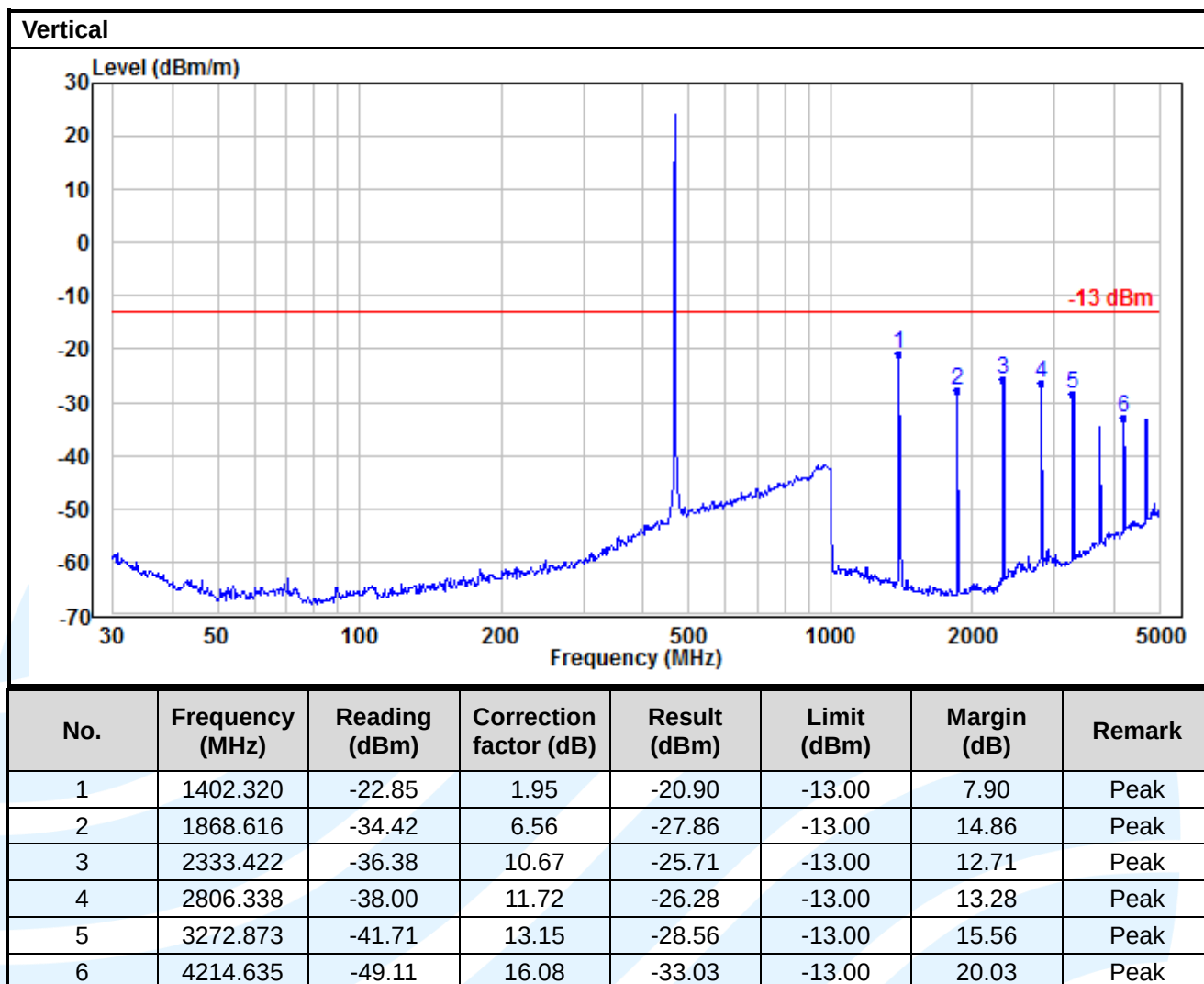


## Channel 14

## Horizontal

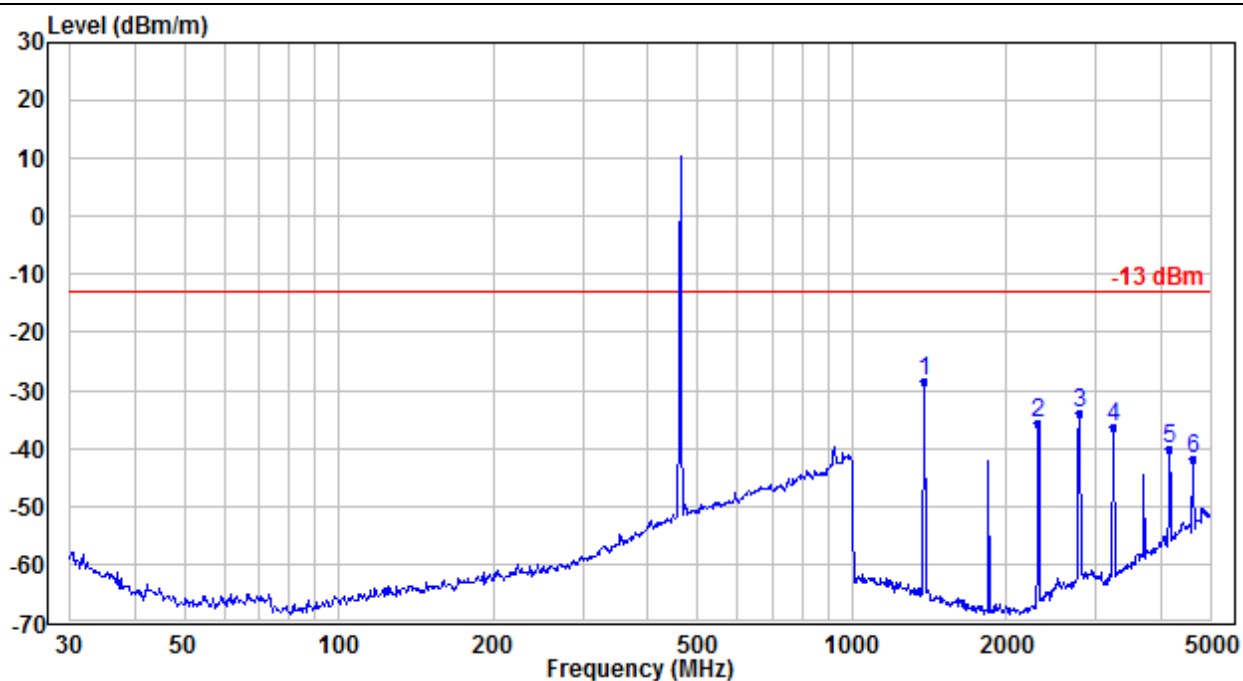


| No. | Frequency (MHz) | Reading (dBm) | Correction factor (dB) | Result (dBm) | Limit (dBm) | Margin (dB) | Remark |
|-----|-----------------|---------------|------------------------|--------------|-------------|-------------|--------|
| 1   | 1402.320        | -15.49        | 0.93                   | -14.56       | -13.00      | 1.56        | Peak   |
| 2   | 1868.616        | -38.10        | 4.13                   | -33.97       | -13.00      | 20.97       | Peak   |
| 3   | 2333.422        | -43.86        | 8.17                   | -35.69       | -13.00      | 22.69       | Peak   |
| 4   | 2806.338        | -42.17        | 9.91                   | -32.26       | -13.00      | 19.26       | Peak   |
| 5   | 4214.635        | -54.71        | 14.74                  | -39.97       | -13.00      | 26.97       | Peak   |
| 6   | 4685.654        | -55.63        | 15.10                  | -40.53       | -13.00      | 27.53       | Peak   |

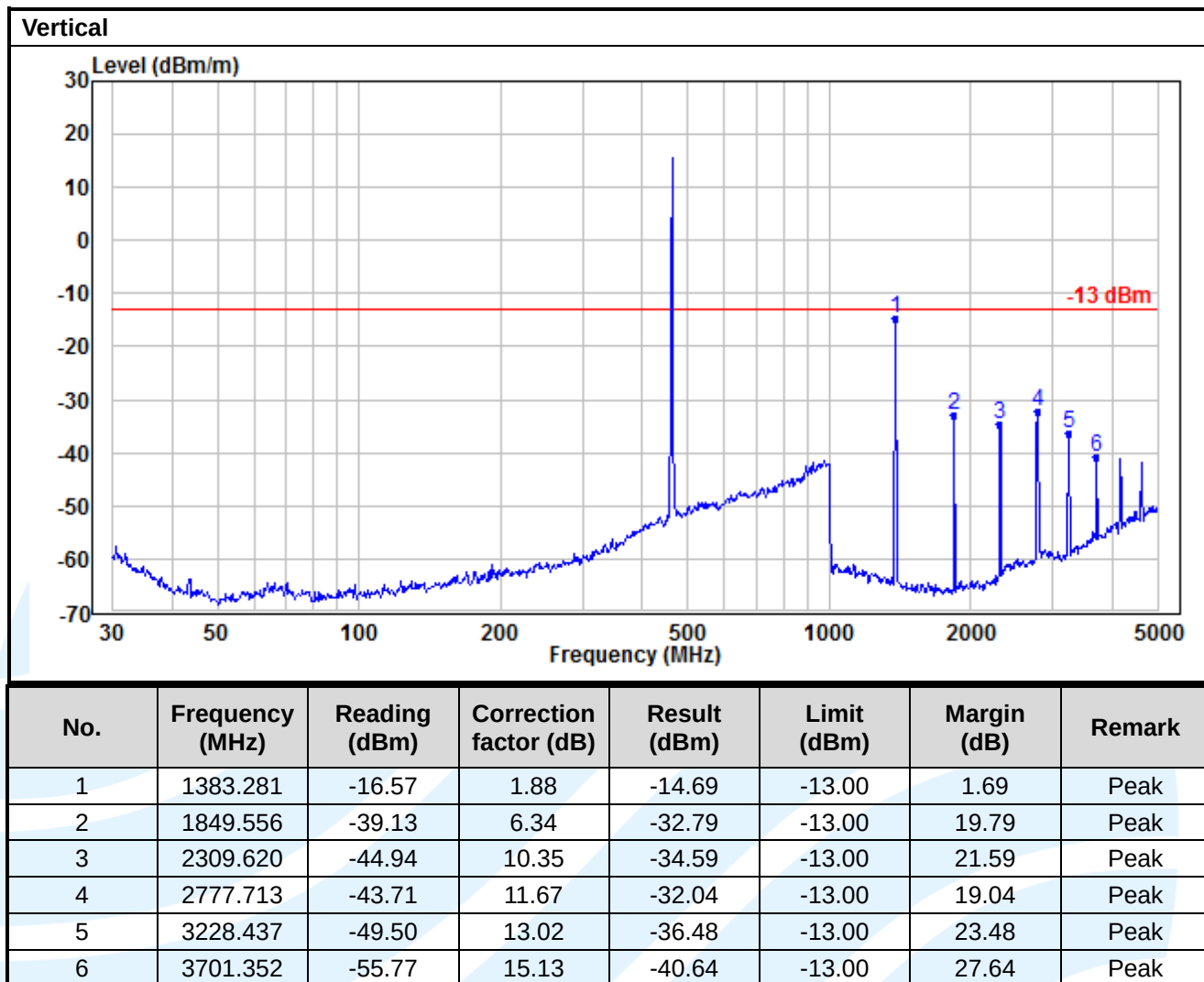


## Channel 15

## Horizontal

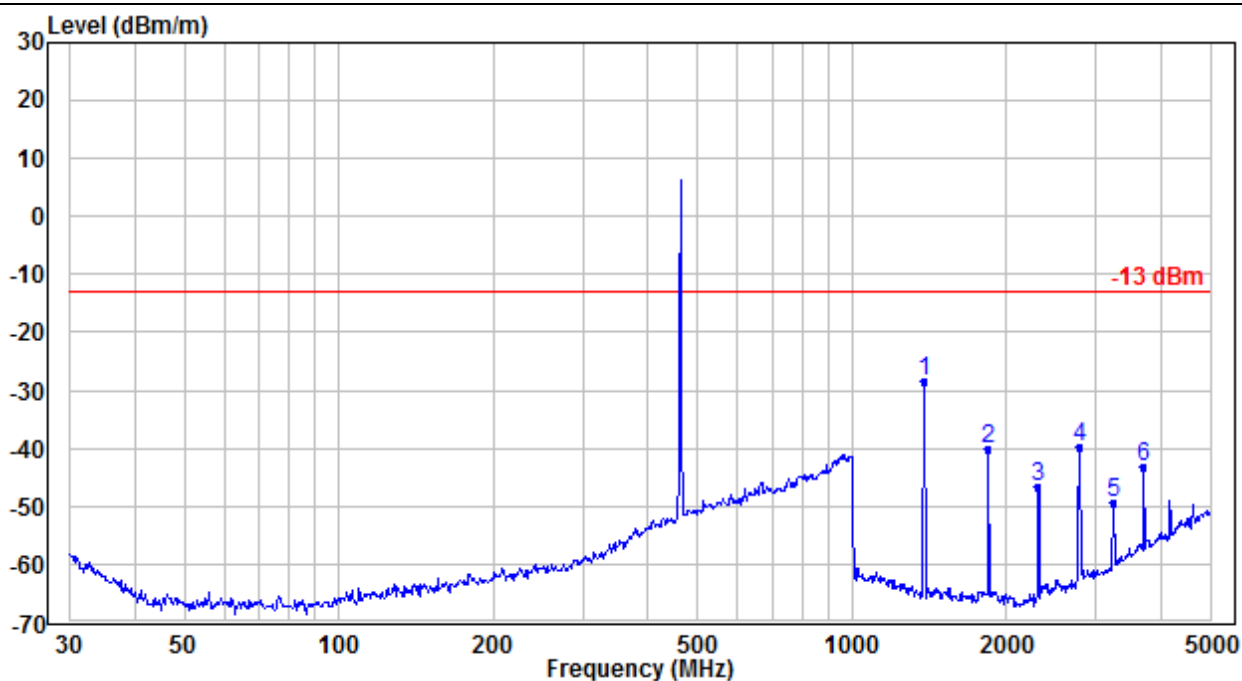


| No. | Frequency (MHz) | Reading (dBm) | Correction factor (dB) | Result (dBm) | Limit (dBm) | Margin (dB) | Remark |
|-----|-----------------|---------------|------------------------|--------------|-------------|-------------|--------|
| 1   | 1388.017        | -29.34        | 0.88                   | -28.46       | -13.00      | 15.46       | Peak   |
| 2   | 2309.620        | -43.48        | 7.82                   | -35.66       | -13.00      | 22.66       | Peak   |
| 3   | 2777.713        | -43.83        | 9.82                   | -34.01       | -13.00      | 21.01       | Peak   |
| 4   | 3228.437        | -47.84        | 11.66                  | -36.18       | -13.00      | 23.18       | Peak   |
| 5   | 4171.645        | -54.82        | 14.64                  | -40.18       | -13.00      | 27.18       | Peak   |
| 6   | 4622.037        | -56.64        | 14.77                  | -41.87       | -13.00      | 28.87       | Peak   |

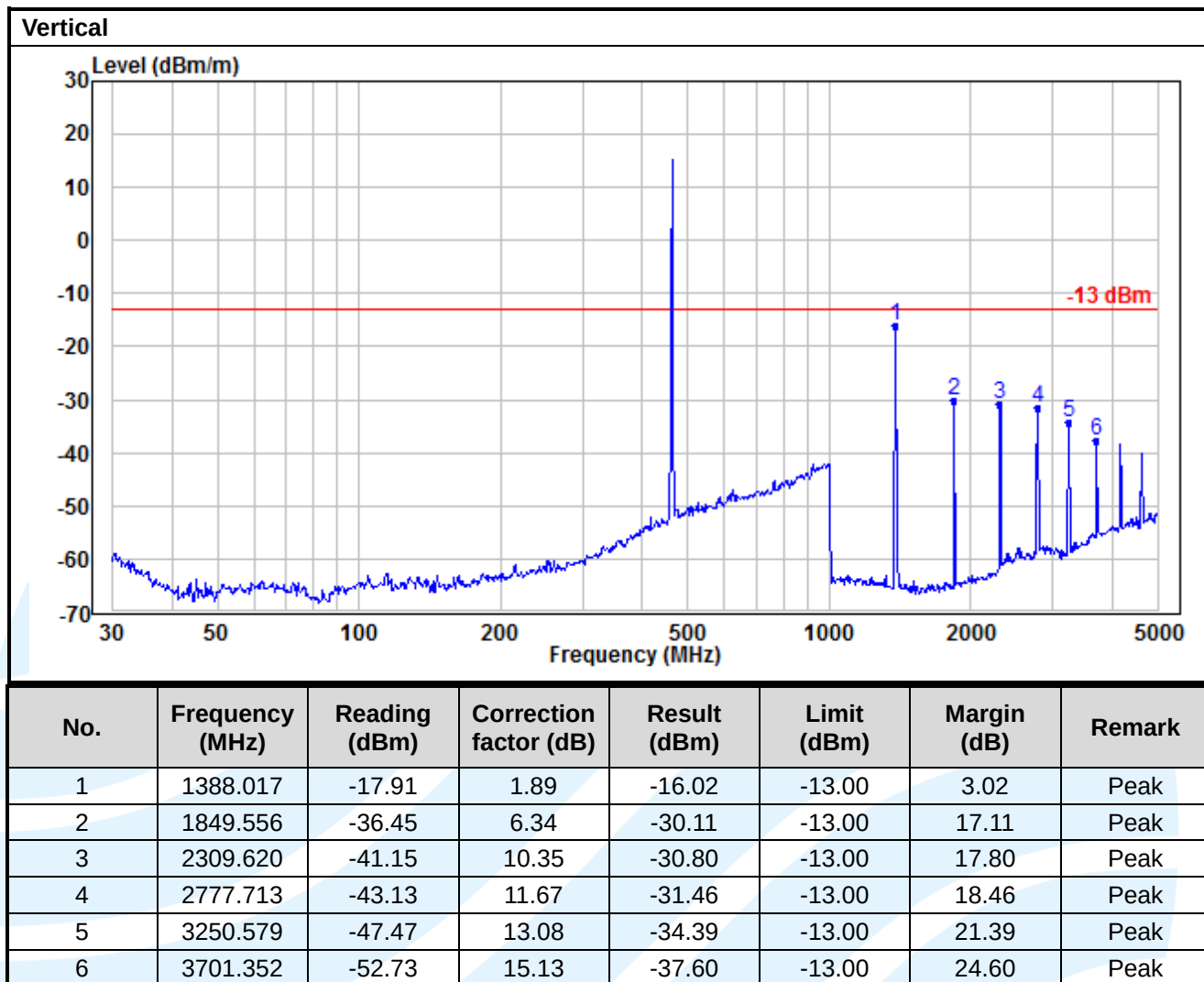


## Channel 19

## Horizontal

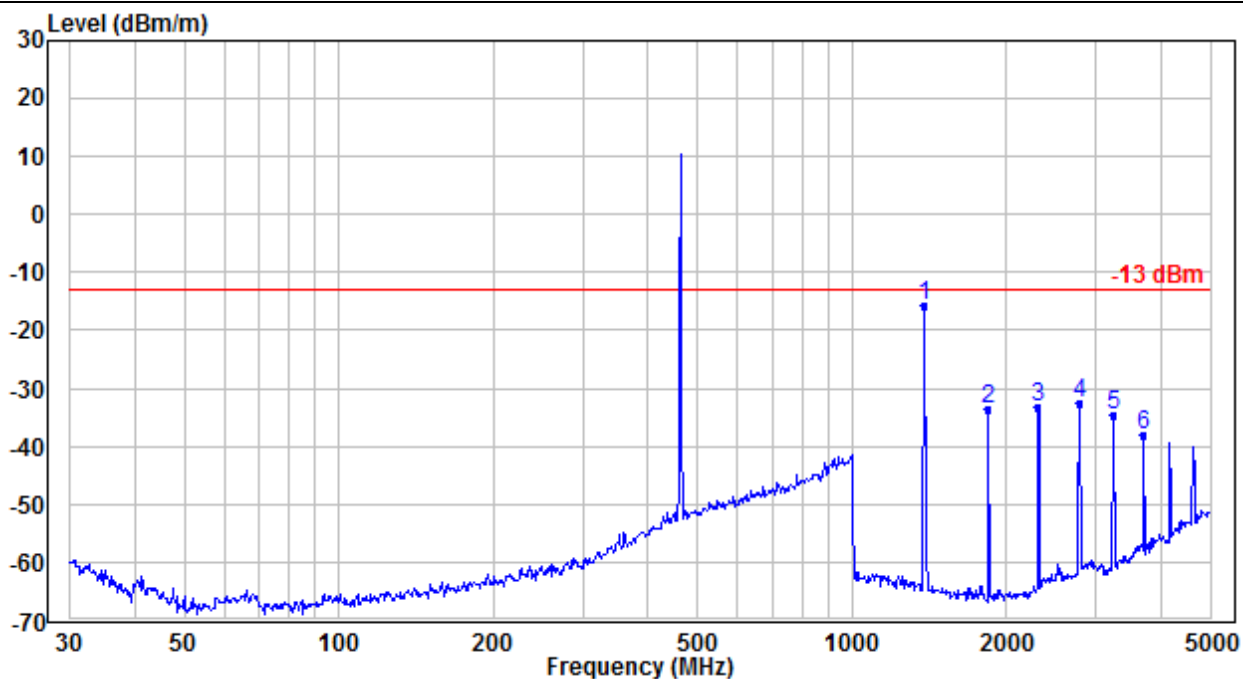


| No. | Frequency (MHz) | Reading (dBm) | Correction factor (dB) | Result (dBm) | Limit (dBm) | Margin (dB) | Remark |
|-----|-----------------|---------------|------------------------|--------------|-------------|-------------|--------|
| 1   | 1388.017        | -29.24        | 0.88                   | -28.36       | -13.00      | 15.36       | Peak   |
| 2   | 1849.556        | -44.09        | 3.98                   | -40.11       | -13.00      | 27.11       | Peak   |
| 3   | 2309.620        | -54.45        | 7.82                   | -46.63       | -13.00      | 33.63       | Peak   |
| 4   | 2787.223        | -49.65        | 9.84                   | -39.81       | -13.00      | 26.81       | Peak   |
| 5   | 3250.579        | -61.11        | 11.73                  | -49.38       | -13.00      | 36.38       | Peak   |
| 6   | 3701.352        | -57.06        | 13.77                  | -43.29       | -13.00      | 30.29       | Peak   |

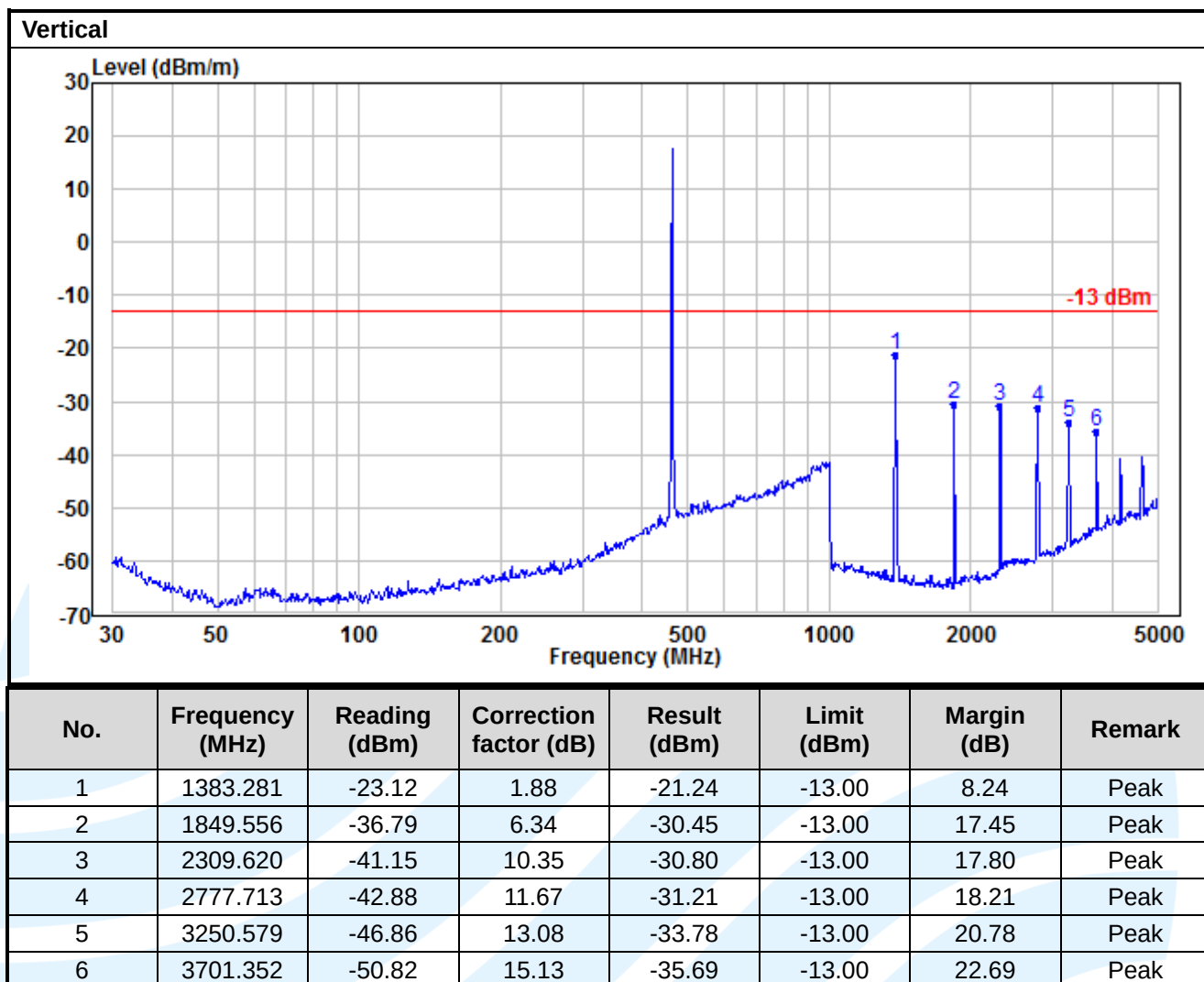


## Channel 22

## Horizontal



| No. | Frequency (MHz) | Reading (dBm) | Correction factor (dB) | Result (dBm) | Limit (dBm) | Margin (dB) | Remark |
|-----|-----------------|---------------|------------------------|--------------|-------------|-------------|--------|
| 1   | 1383.281        | -16.71        | 0.87                   | -15.84       | -13.00      | 2.84        | Peak   |
| 2   | 1849.556        | -37.54        | 3.98                   | -33.56       | -13.00      | 20.56       | Peak   |
| 3   | 2309.620        | -40.89        | 7.82                   | -33.07       | -13.00      | 20.07       | Peak   |
| 4   | 2777.713        | -42.50        | 9.82                   | -32.68       | -13.00      | 19.68       | Peak   |
| 5   | 3250.579        | -46.37        | 11.73                  | -34.64       | -13.00      | 21.64       | Peak   |
| 6   | 3701.352        | -51.87        | 13.77                  | -38.10       | -13.00      | 25.10       | Peak   |



## APPENDIX 1 PHOTOS OF TEST SETUP

See test photos attached in Appendix 1 for the actual connections between Product and support equipment.

## APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal photos.

\*\*\* End of Report \*\*\*

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The test report is effective only with both signature and specialized stamp. The result(s) shown in this report refer only to the sample(s) tested. Without written approval of UnionTrust, this report can't be reproduced except in full.

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## APPENDIX A

### MAXIMUM TRANSMITTER POWER TEST DATA

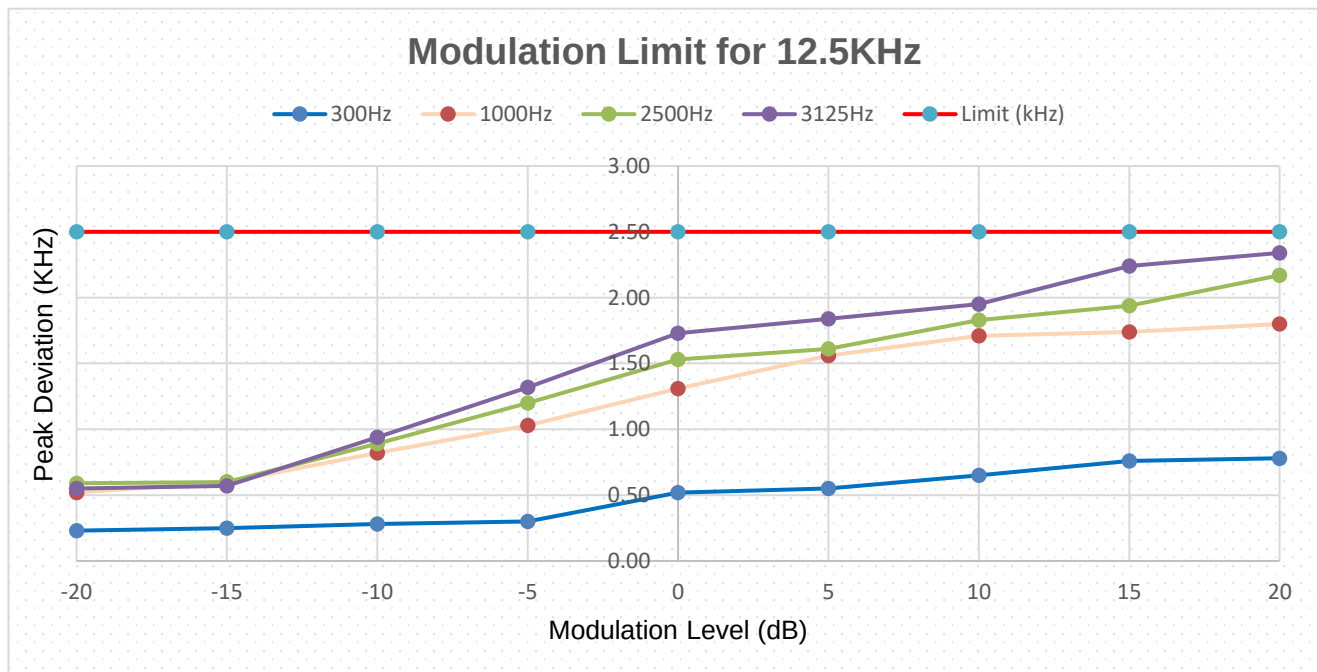
| Operation Mode | Channel | Frequency (MHz) | ERP (dBm) | ERP (W) | Limits (W) | Margin (W) | Pass/Fail |
|----------------|---------|-----------------|-----------|---------|------------|------------|-----------|
| FRS            | 1       | 462.6525        | 24.24     | 0.2655  | 2.00       | -1.7345    | Pass      |
|                | 4       | 462.6375        | 24.45     | 0.2786  | 2.00       | -1.7214    | Pass      |
|                | 7       | 462.7125        | 24.79     | 0.3013  | 2.00       | -1.6987    | Pass      |
|                | 8       | 467.5625        | 23.58     | 0.2280  | 0.50       | -0.2720    | Pass      |
|                | 11      | 467.6375        | 25.72     | 0.3733  | 0.50       | -0.1267    | Pass      |
|                | 14      | 467.7125        | 25.68     | 0.3698  | 0.50       | -0.1302    | Pass      |
|                | 15      | 462.5500        | 24.77     | 0.2999  | 2.00       | -1.7001    | Pass      |
|                | 19      | 462.6500        | 25.34     | 0.3420  | 2.00       | -1.6580    | Pass      |
|                | 22      | 462.7250        | 26.25     | 0.4217  | 2.00       | -1.5783    | Pass      |

## APPENDIX B

### MODULATION LIMIT TEST DATA

| FRS: Channel 4        |                                |        |        |        |             |             |
|-----------------------|--------------------------------|--------|--------|--------|-------------|-------------|
| Modulation Level (dB) | Peak frequency deviation (kHz) |        |        |        | Limit (kHz) | Pass / Fail |
|                       | 300Hz                          | 1000Hz | 2500Hz | 3125Hz |             |             |
| -20                   | 0.23                           | 0.52   | 0.59   | 0.55   | 2.50        | Pass        |
| -15                   | 0.25                           | 0.60   | 0.60   | 0.57   | 2.50        | Pass        |
| -10                   | 0.28                           | 0.82   | 0.89   | 0.94   | 2.50        | Pass        |
| -5                    | 0.30                           | 1.03   | 1.20   | 1.32   | 2.50        | Pass        |
| 0                     | 0.52                           | 1.31   | 1.53   | 1.73   | 2.50        | Pass        |
| 5                     | 0.55                           | 1.56   | 1.61   | 1.84   | 2.50        | Pass        |
| 10                    | 0.65                           | 1.71   | 1.83   | 1.95   | 2.50        | Pass        |
| 15                    | 0.76                           | 1.74   | 1.94   | 2.24   | 2.50        | Pass        |
| 20                    | 0.78                           | 1.80   | 2.17   | 2.34   | 2.50        | Pass        |

The test plot as follows:

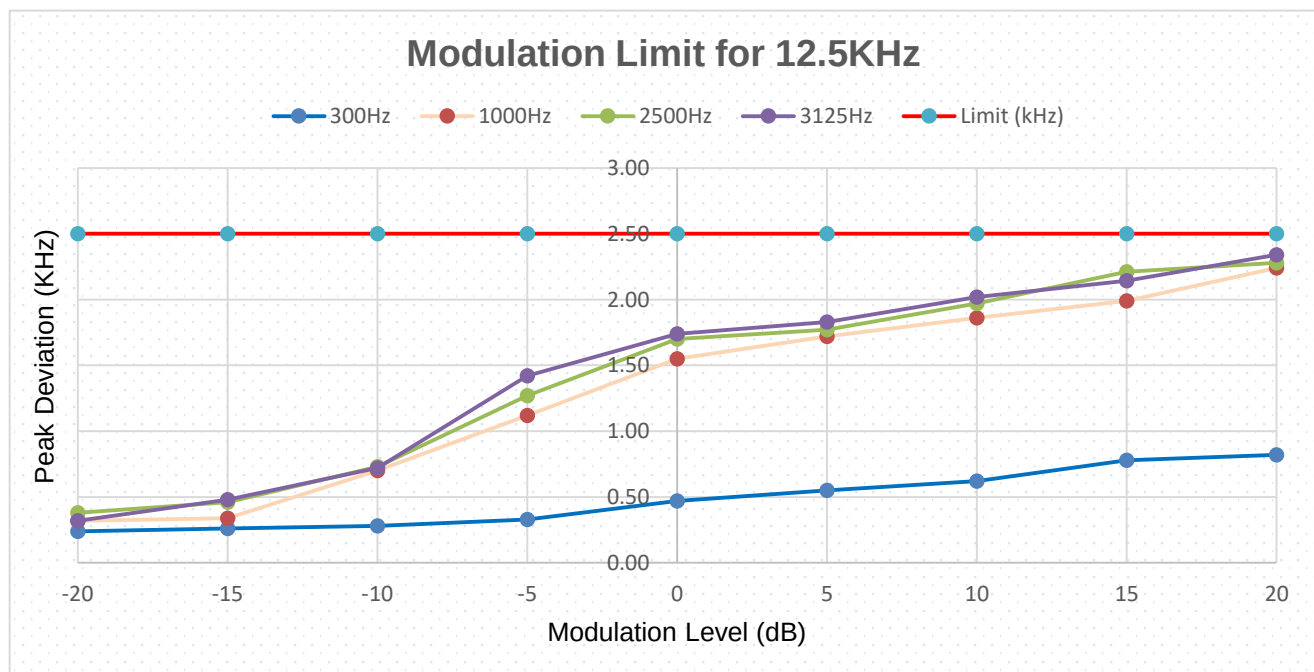


## APPENDIX B

### MODULATION LIMIT TEST DATA

| FRS: Channel 11       |                                |        |        |        |             |             |
|-----------------------|--------------------------------|--------|--------|--------|-------------|-------------|
| Modulation Level (dB) | Peak frequency deviation (kHz) |        |        |        | Limit (kHz) | Pass / Fail |
|                       | 300Hz                          | 1000Hz | 2500Hz | 3125Hz |             |             |
| -20                   | 0.24                           | 0.32   | 0.38   | 0.32   | 2.50        | Pass        |
| -15                   | 0.26                           | 0.34   | 0.46   | 0.48   | 2.50        | Pass        |
| -10                   | 0.28                           | 0.70   | 0.73   | 0.72   | 2.50        | Pass        |
| -5                    | 0.33                           | 1.12   | 1.27   | 1.42   | 2.50        | Pass        |
| 0                     | 0.47                           | 1.55   | 1.70   | 1.74   | 2.50        | Pass        |
| 5                     | 0.55                           | 1.72   | 1.77   | 1.83   | 2.50        | Pass        |
| 10                    | 0.62                           | 1.86   | 1.97   | 2.02   | 2.50        | Pass        |
| 15                    | 0.78                           | 1.99   | 2.21   | 2.14   | 2.50        | Pass        |
| 20                    | 0.82                           | 2.24   | 2.28   | 2.34   | 2.50        | Pass        |

The test plot as follows:

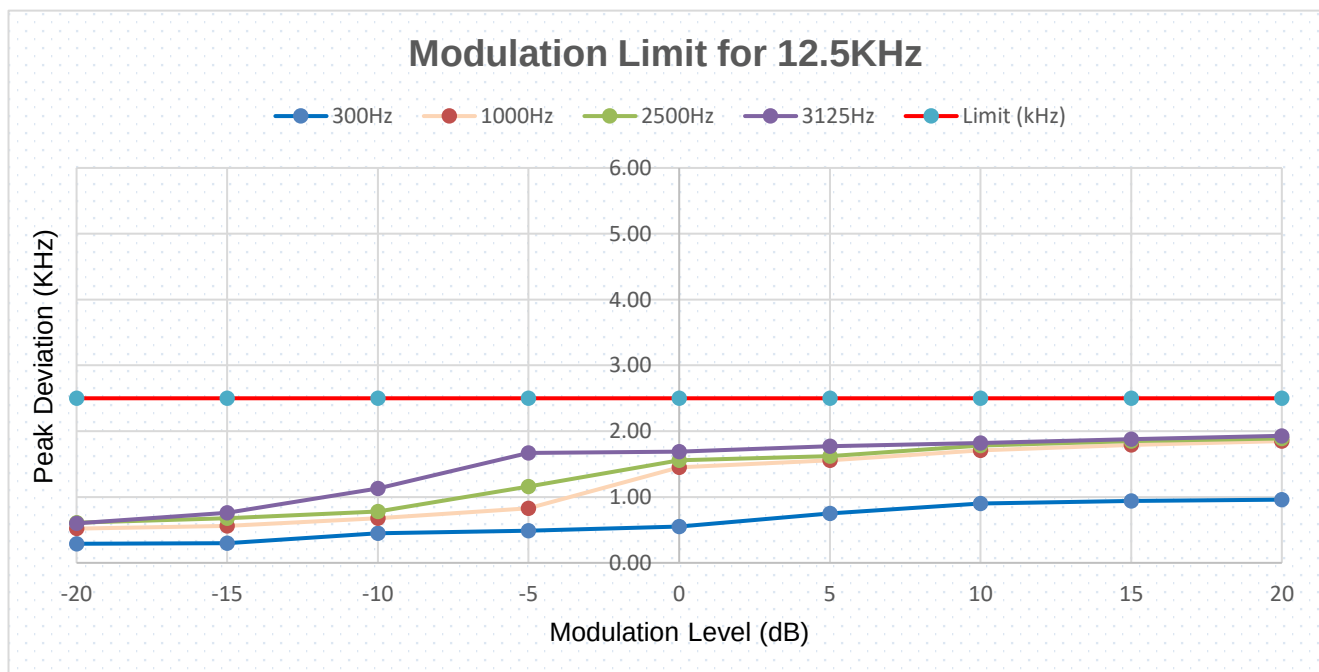


## APPENDIX B

### MODULATION LIMIT TEST DATA

| FRS: Channel 19       |                                |        |        |        |             |             |
|-----------------------|--------------------------------|--------|--------|--------|-------------|-------------|
| Modulation Level (dB) | Peak frequency deviation (kHz) |        |        |        | Limit (kHz) | Pass / Fail |
|                       | 300Hz                          | 1000Hz | 2500Hz | 3125Hz |             |             |
| -20                   | 0.29                           | 0.52   | 0.61   | 0.60   | 2.50        | Pass        |
| -15                   | 0.30                           | 0.56   | 0.68   | 0.76   | 2.50        | Pass        |
| -10                   | 0.45                           | 0.68   | 0.78   | 1.13   | 2.50        | Pass        |
| -5                    | 0.49                           | 0.83   | 1.16   | 1.67   | 2.50        | Pass        |
| 0                     | 0.55                           | 1.45   | 1.56   | 1.69   | 2.50        | Pass        |
| 5                     | 0.75                           | 1.56   | 1.62   | 1.77   | 2.50        | Pass        |
| 10                    | 0.90                           | 1.71   | 1.78   | 1.82   | 2.50        | Pass        |
| 15                    | 0.94                           | 1.79   | 1.85   | 1.88   | 2.50        | Pass        |
| 20                    | 0.96                           | 1.85   | 1.89   | 1.93   | 2.50        | Pass        |

The test plot as follows:



## APPENDIX C

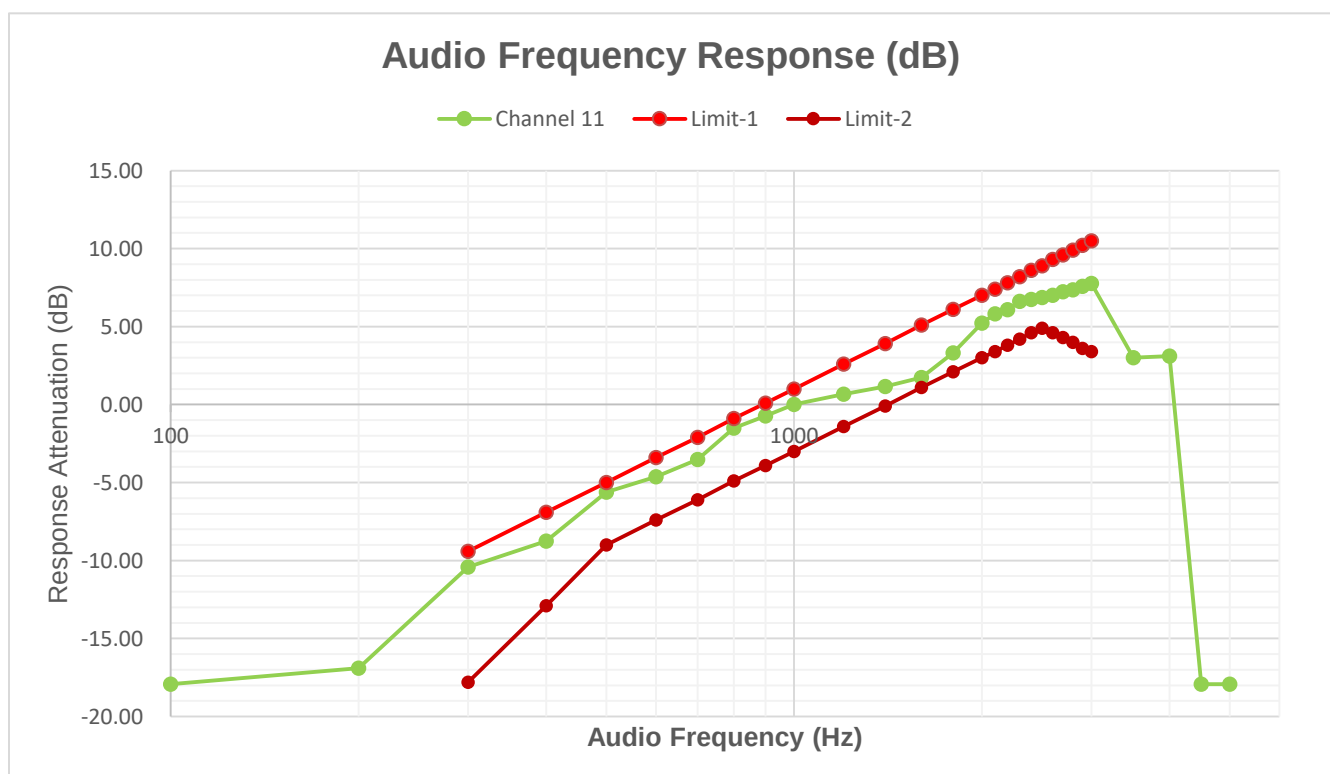
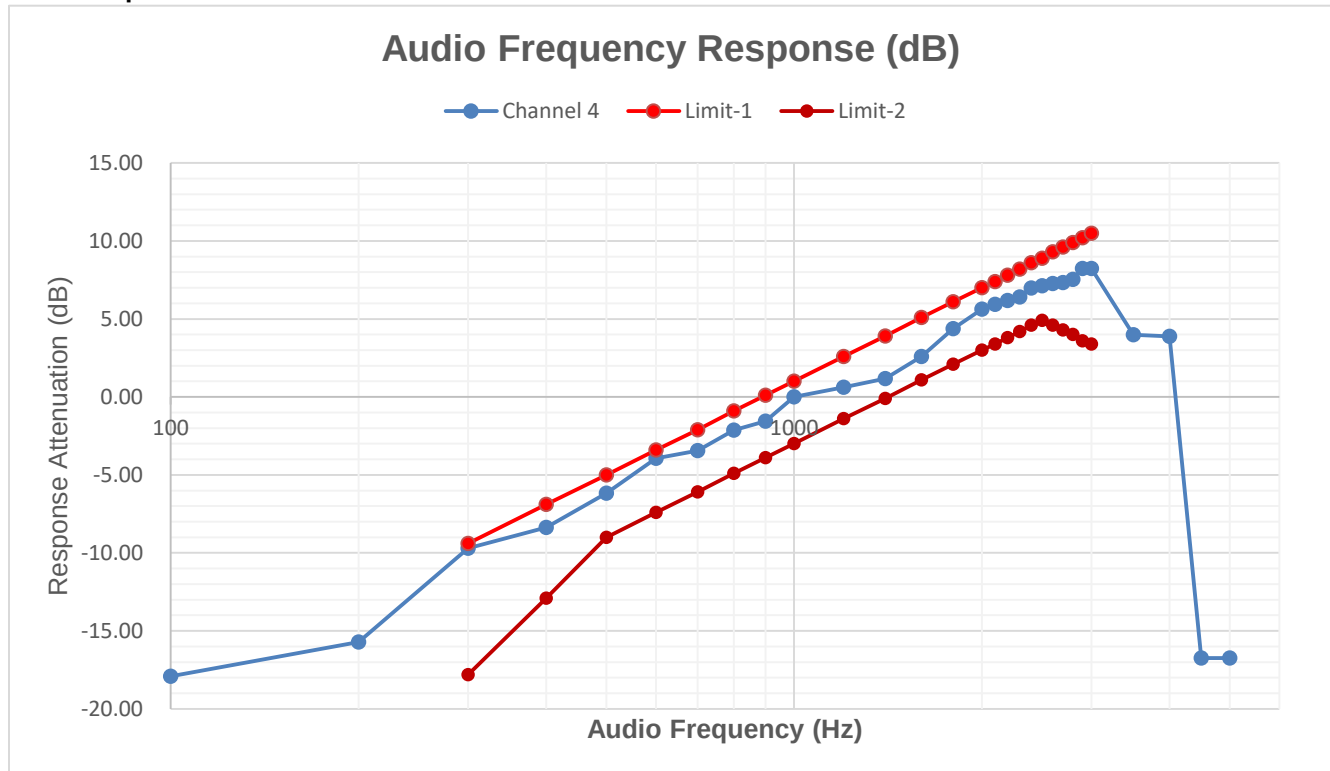
### AUDIO FREQUENCY RESPONSE TEST DATA

| Audio Frequency (Hz) | Frequency Deviation |            |            | Audio Frequency Response (dB) |            |            | Limit-1 | Limit-2 |
|----------------------|---------------------|------------|------------|-------------------------------|------------|------------|---------|---------|
|                      | Channel 4           | Channel 11 | Channel 19 | Channel 4                     | Channel 11 | Channel 19 |         |         |
| 100                  | 0.07                | 0.08       | 0.07       | -17.91                        | -17.93     | -19.88     |         |         |
| 200                  | 0.09                | 0.09       | 0.08       | -15.72                        | -16.90     | -18.72     |         |         |
| 300                  | 0.18                | 0.19       | 0.20       | -9.70                         | -10.41     | -10.76     | -9.40   | -17.80  |
| 400                  | 0.21                | 0.23       | 0.27       | -8.36                         | -8.75      | -8.15      | -6.90   | -12.90  |
| 500                  | 0.27                | 0.33       | 0.34       | -6.18                         | -5.62      | -6.15      | -5.00   | -9.00   |
| 600                  | 0.35                | 0.37       | 0.37       | -3.93                         | -4.62      | -5.41      | -3.40   | -7.40   |
| 700                  | 0.37                | 0.42       | 0.45       | -3.44                         | -3.52      | -3.71      | -2.10   | -6.10   |
| 800                  | 0.43                | 0.53       | 0.58       | -2.14                         | -1.50      | -1.52      | -0.90   | -4.90   |
| 900                  | 0.46                | 0.58       | 0.61       | -1.55                         | -0.72      | -1.07      | 0.10    | -3.90   |
| 1000                 | 0.55                | 0.63       | 0.69       | 0.00                          | 0.00       | 0.00       | 1.00    | -3.00   |
| 1200                 | 0.59                | 0.68       | 0.72       | 0.61                          | 0.66       | 0.37       | 2.60    | -1.40   |
| 1400                 | 0.63                | 0.72       | 0.82       | 1.18                          | 1.16       | 1.50       | 3.90    | -0.10   |
| 1600                 | 0.74                | 0.77       | 0.89       | 2.58                          | 1.74       | 2.21       | 5.10    | 1.10    |
| 1800                 | 0.91                | 0.92       | 0.97       | 4.37                          | 3.32       | 2.96       | 6.10    | 2.10    |
| 2000                 | 1.05                | 1.15       | 1.23       | 5.62                          | 5.23       | 5.02       | 7.00    | 3.00    |
| 2100                 | 1.09                | 1.23       | 1.31       | 5.94                          | 5.81       | 5.57       | 7.40    | 3.40    |
| 2200                 | 1.12                | 1.27       | 1.35       | 6.18                          | 6.09       | 5.83       | 7.80    | 3.80    |
| 2300                 | 1.15                | 1.35       | 1.38       | 6.41                          | 6.62       | 6.02       | 8.20    | 4.20    |
| 2400                 | 1.23                | 1.37       | 1.41       | 6.99                          | 6.75       | 6.21       | 8.60    | 4.60    |
| 2500                 | 1.25                | 1.39       | 1.43       | 7.13                          | 6.87       | 6.33       | 8.90    | 4.90    |
| 2600                 | 1.27                | 1.41       | 1.45       | 7.27                          | 7.00       | 6.45       | 9.30    | 4.60    |
| 2700                 | 1.28                | 1.45       | 1.48       | 7.34                          | 7.24       | 6.63       | 9.60    | 4.30    |
| 2800                 | 1.31                | 1.47       | 1.53       | 7.54                          | 7.36       | 6.92       | 9.90    | 4.00    |
| 2900                 | 1.42                | 1.51       | 1.56       | 8.24                          | 7.59       | 7.09       | 10.20   | 3.60    |
| 3000                 | 1.42                | 1.54       | 1.59       | 8.24                          | 7.76       | 7.25       | 10.50   | 3.40    |
| 3500                 | 0.87                | 0.89       | 0.89       | 3.98                          | 3.00       | 2.21       |         |         |
| 4000                 | 0.86                | 0.90       | 0.86       | 3.88                          | 3.10       | 1.91       |         |         |
| 4500                 | 0.08                | 0.08       | 0.08       | -16.75                        | -17.93     | -18.72     |         |         |
| 5000                 | 0.08                | 0.08       | 0.08       | -16.75                        | -17.93     | -18.72     |         |         |
| Pass/Fail            | Pass                |            |            |                               |            |            |         |         |

## APPENDIX C

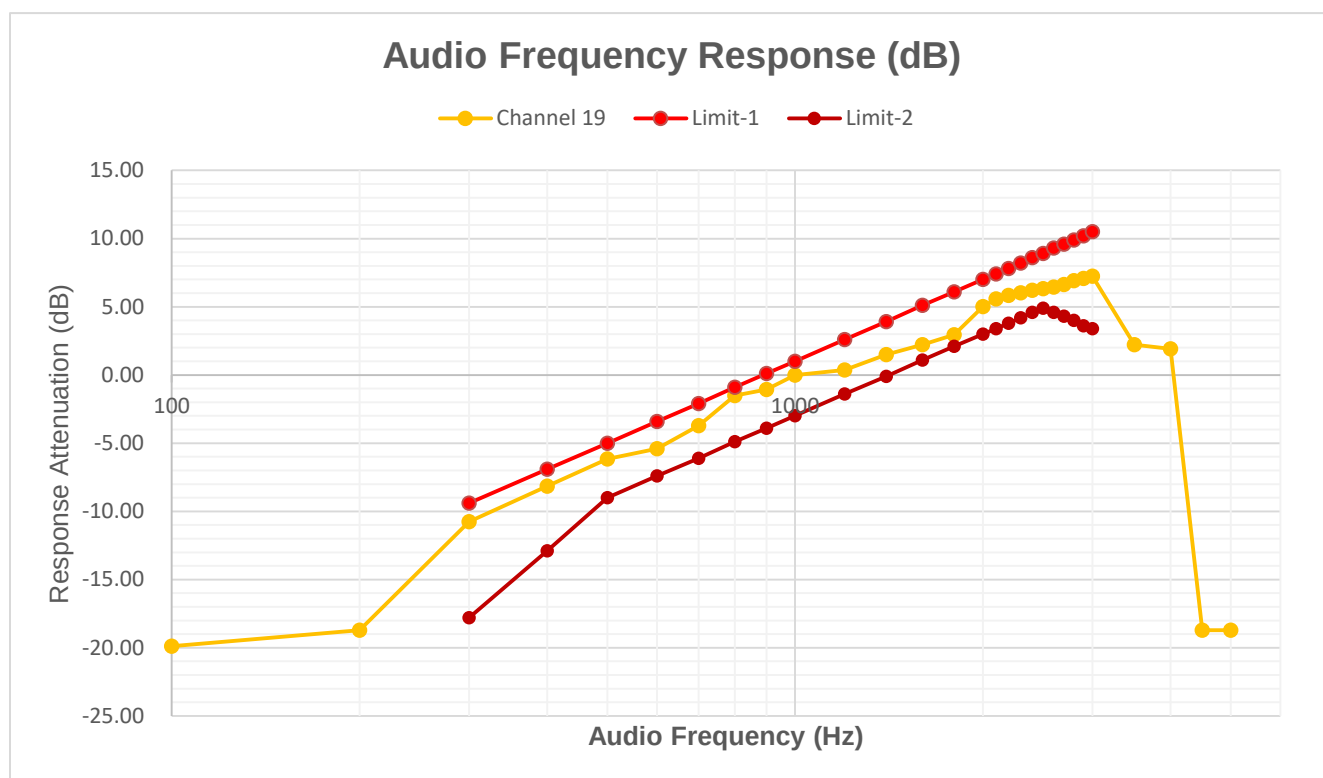
### AUDIO FREQUENCY RESPONSE TEST DATA

The test plot as follows:



## APPENDIX C

### AUDIO FREQUENCY RESPONSE TEST DATA

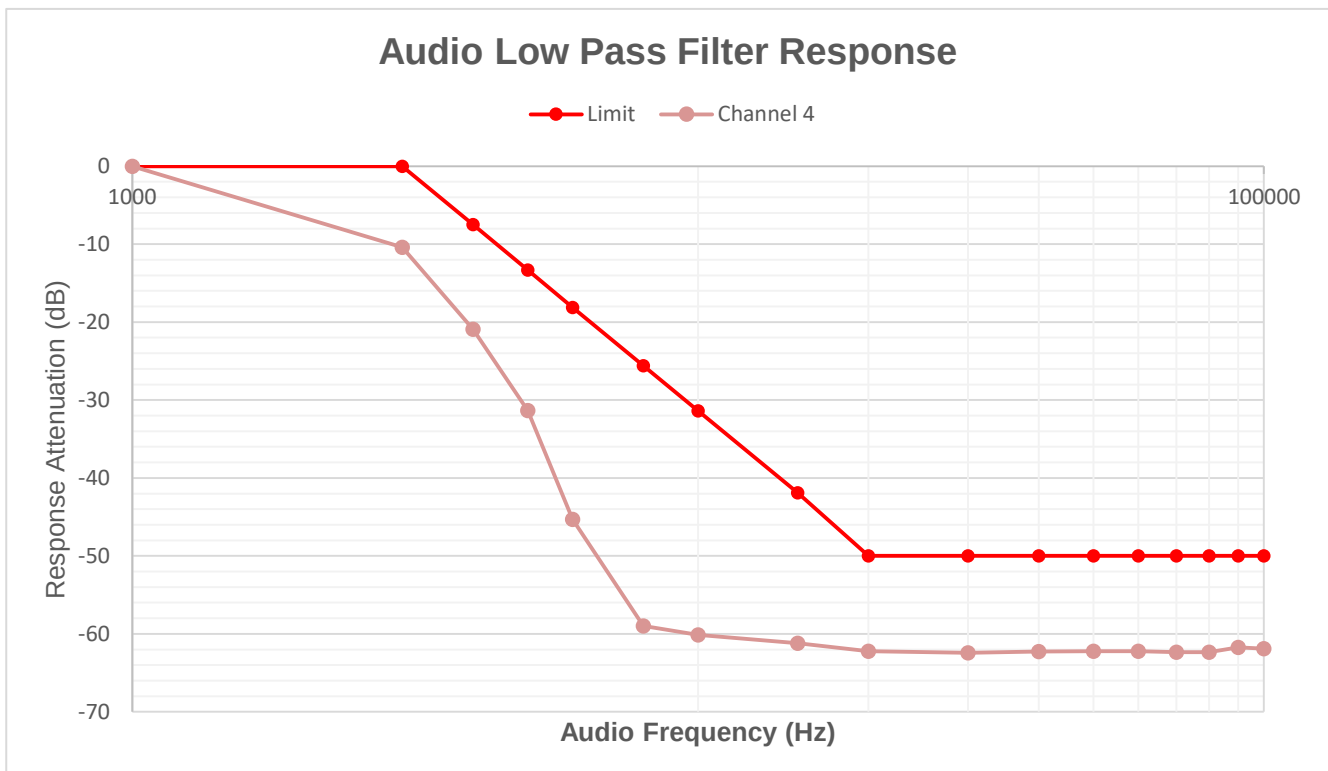


## APPENDIX D

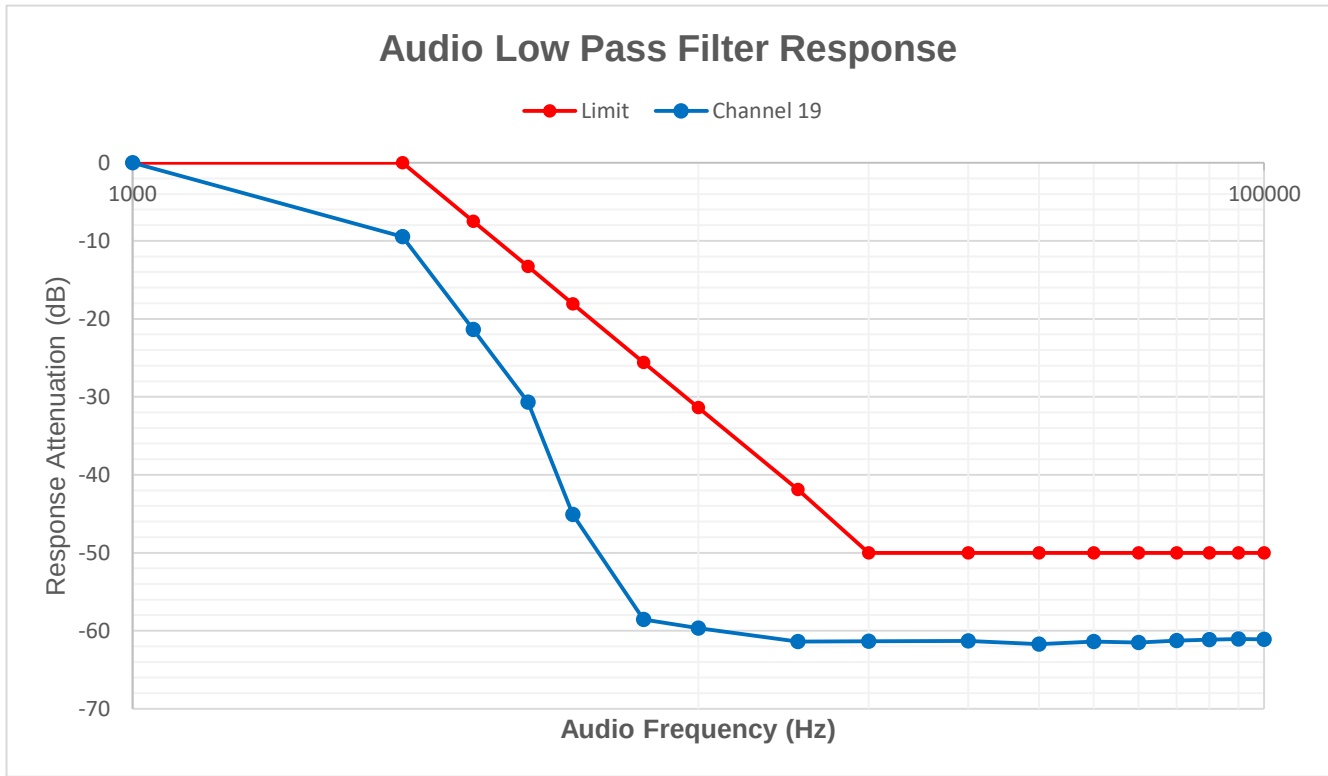
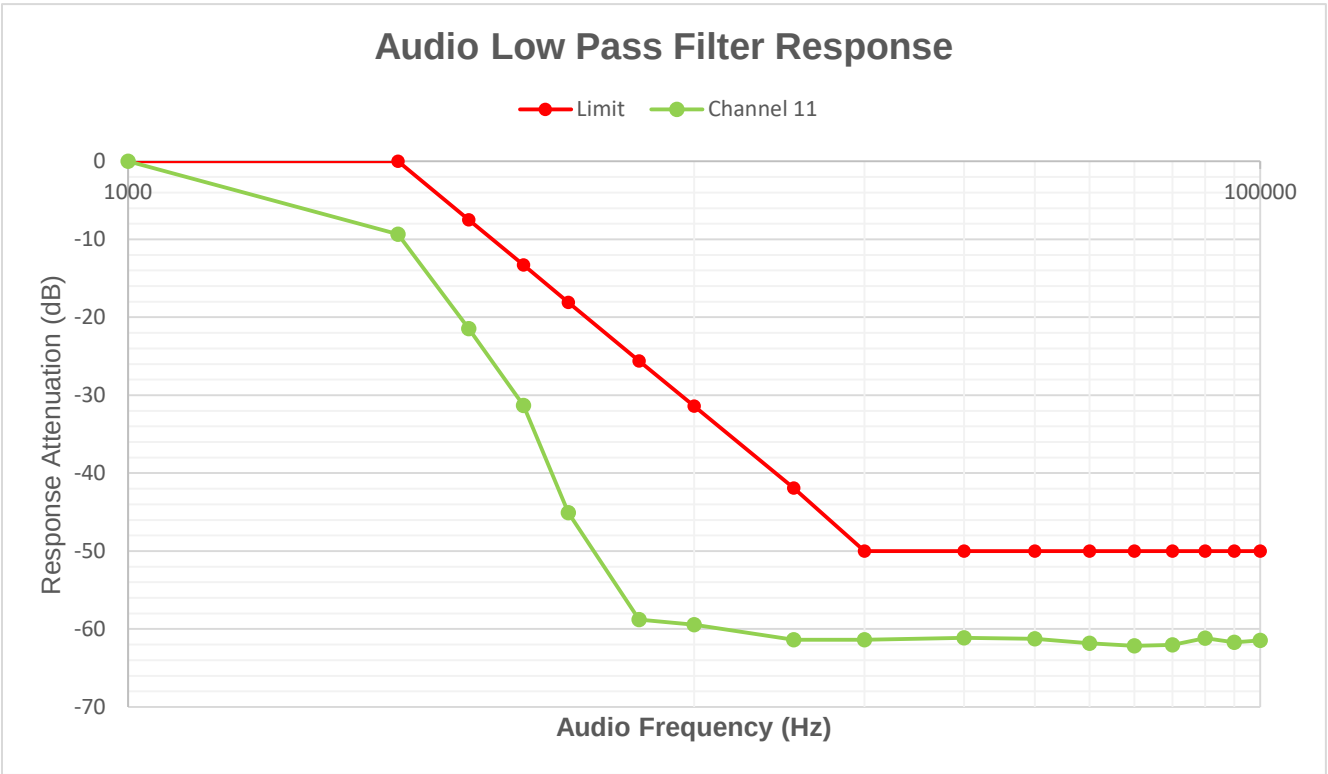
### AUDIO LOW PASS FILTER RESPONSE TEST DATA

| Audio Frequency (Hz) | Measured value (dB) |            |            | Response Attenuation (dB) |            |            | Limit  | Pass/Fail |
|----------------------|---------------------|------------|------------|---------------------------|------------|------------|--------|-----------|
|                      | Channel 4           | Channel 11 | Channel 19 | Channel 4                 | Channel 11 | Channel 19 |        |           |
| 1000                 | -0.15               | -0.36      | -0.49      | 0.00                      | 0.00       | 0.00       | 0.00   | Pass      |
| 3000                 | -10.56              | -9.69      | -9.97      | -10.42                    | -9.33      | -9.48      | 0.00   | Pass      |
| 4000                 | -21.06              | -21.83     | -21.88     | -20.91                    | -21.47     | -21.39     | -7.50  | Pass      |
| 5000                 | -31.48              | -31.68     | -31.19     | -31.33                    | -31.32     | -30.70     | -13.30 | Pass      |
| 6000                 | -45.47              | -45.42     | -45.60     | -45.32                    | -45.06     | -45.11     | -18.10 | Pass      |
| 8000                 | -59.12              | -59.17     | -59.05     | -58.98                    | -58.81     | -58.56     | -25.60 | Pass      |
| 10000                | -60.26              | -59.81     | -60.17     | -60.11                    | -59.45     | -59.68     | -31.40 | Pass      |
| 15000                | -61.35              | -61.74     | -61.89     | -61.20                    | -61.39     | -61.40     | -41.90 | Pass      |
| 20000                | -62.38              | -61.75     | -61.85     | -62.23                    | -61.39     | -61.36     | -50.00 | Pass      |
| 30000                | -62.59              | -61.51     | -61.81     | -62.44                    | -61.15     | -61.32     | -50.00 | Pass      |
| 40000                | -62.40              | -61.60     | -62.20     | -62.25                    | -61.24     | -61.71     | -50.00 | Pass      |
| 50000                | -62.36              | -62.20     | -61.87     | -62.21                    | -61.84     | -61.38     | -50.00 | Pass      |
| 60000                | -62.39              | -62.50     | -61.98     | -62.24                    | -62.14     | -61.49     | -50.00 | Pass      |
| 70000                | -62.48              | -62.39     | -61.76     | -62.33                    | -62.04     | -61.27     | -50.00 | Pass      |
| 80000                | -62.49              | -61.51     | -61.61     | -62.34                    | -61.15     | -61.12     | -50.00 | Pass      |
| 90000                | -61.88              | -62.07     | -61.56     | -61.73                    | -61.71     | -61.07     | -50.00 | Pass      |
| 100000               | -62.03              | -61.84     | -61.59     | -61.88                    | -61.48     | -61.10     | -50.00 | Pass      |

The test plot as follows:



APPENDIX D  
AUDIO LOW PASS FILTER RESPONSE TEST DATA



## APPENDIX E

### FREQUENCY STABILITY TEST DATA

| FRS_ Channel 4 (462.637500 MHz) |         |                    |                 |       |           |
|---------------------------------|---------|--------------------|-----------------|-------|-----------|
| Temp.                           | Voltage | Measured Frequency | Frequency Drift | Limit | Pass/Fail |
| (°C)                            |         | (MHz)              | (ppm)           | (ppm) |           |
| 50                              | VN      | 462.637331         | -0.3653         | 2.5   | Pass      |
| 40                              |         | 462.637338         | -0.3502         | 2.5   | Pass      |
| 30                              |         | 462.637335         | -0.3567         | 2.5   | Pass      |
| 20                              |         | 462.637331         | -0.3653         | 2.5   | Pass      |
| 10                              |         | 462.637330         | -0.3675         | 2.5   | Pass      |
| 0                               |         | 462.637320         | -0.3891         | 2.5   | Pass      |
| -10                             |         | 462.637424         | -0.1643         | 2.5   | Pass      |
| -20                             |         | 462.637334         | -0.3588         | 2.5   | Pass      |
| TN                              | VL      | 462.637342         | -0.3415         | 2.5   | Pass      |
|                                 | VH      | 462.637323         | -0.3826         | 2.5   | Pass      |

| FRS_ Channel 11 (467.637500 MHz) |         |                    |                 |       |           |
|----------------------------------|---------|--------------------|-----------------|-------|-----------|
| Temp.                            | Voltage | Measured Frequency | Frequency Drift | Limit | Pass/Fail |
| (°C)                             |         | (MHz)              | (ppm)           | (ppm) |           |
| 50                               | VN      | 467.637298         | -0.4320         | 2.5   | Pass      |
| 40                               |         | 467.637313         | -0.3999         | 2.5   | Pass      |
| 30                               |         | 467.637315         | -0.3956         | 2.5   | Pass      |
| 20                               |         | 467.637311         | -0.4042         | 2.5   | Pass      |
| 10                               |         | 467.637317         | -0.3913         | 2.5   | Pass      |
| 0                                |         | 467.637320         | -0.3849         | 2.5   | Pass      |
| -10                              |         | 467.637319         | -0.3871         | 2.5   | Pass      |
| -20                              |         | 467.637320         | -0.3849         | 2.5   | Pass      |
| TN                               | VL      | 467.637313         | -0.3999         | 2.5   | Pass      |
|                                  | VH      | 467.637317         | -0.3913         | 2.5   | Pass      |

## APPENDIX E

### FREQUENCY STABILITY TEST DATA

| FRS_ Channel 19 (462.650000 MHz) |         |                    |                 |       |           |
|----------------------------------|---------|--------------------|-----------------|-------|-----------|
| Temp.                            | Voltage | Measured Frequency | Frequency Drift | Limit | Pass/Fail |
| (°C)                             |         | (MHz)              | (ppm)           | (ppm) |           |
| 50                               | VN      | 462.649816         | -0.3977         | 5.00  | Pass      |
| 40                               |         | 462.649821         | -0.3869         | 5.00  | Pass      |
| 30                               |         | 462.649830         | -0.3674         | 5.00  | Pass      |
| 20                               |         | 462.649833         | -0.3610         | 5.00  | Pass      |
| 10                               |         | 462.649828         | -0.3718         | 5.00  | Pass      |
| 0                                |         | 462.649835         | -0.3566         | 5.00  | Pass      |
| -10                              |         | 462.649837         | -0.3523         | 5.00  | Pass      |
| -20                              |         | 462.649838         | -0.3502         | 5.00  | Pass      |
| TN                               | VL      | 462.649845         | -0.3350         | 5.00  | Pass      |
|                                  | VH      | 462.649847         | -0.3307         | 5.00  | Pass      |