

S

T

S

L

A

B



## FCC TEST REPORT

Report No: STS1905186W01

Issued for

Enping Shengyi Electronic Co.,Ltd

FL.2-5, Shi Zi Shi Bldg., Xinping RD., North Enping,  
Guangdong, China

|                       |                                                                                                                                                               |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product Name:</b>  | Microphone                                                                                                                                                    |
| <b>Brand Name:</b>    | Derrica                                                                                                                                                       |
| <b>Model Name:</b>    | U-7298                                                                                                                                                        |
| <b>Series Model:</b>  | U-7198, U-7118, U-7228, U-9198,<br>U-9298, U-8288, UH-07 UH-08, UH-15,<br>UH-16, UH-88, UH-17, UH-18, UH-05,<br>UH-06, UH-11, UH-12, UH-28, HT-018,<br>HT-028 |
| <b>FCC ID:</b>        | 2ABXZU-7298                                                                                                                                                   |
| <b>Test Standard:</b> | FCC Part 74 Rules                                                                                                                                             |

Any reproduction of this document must be done in full. No single part of this document may be reproduced without permission from STS, All Test Data Presented in this report is only applicable to presented Test sample.

Shenzhen STS Test Services Co., Ltd.  
1/F, Building B, Zhuoke Science Park, No.190, Chongqing Road,  
Fuyong Street, Bao'an District, Shenzhen, Guangdong, China  
TEL: +86-755 3688 6288 FAX: +86-755 3688 6277 E-mail: sts@stsapp.com



**TEST RESULT CERTIFICATION**

**Applicant's Name** .....: Enping Shengyi Electronic Co.,Ltd  
Address.....: FL.2-5,Shi Zi Shi Bldg.,Xinping RD.,North Enping,  
Guangdong,China

**Manufacture's Name** .....: Enping Shengyi Electronic Co.,Ltd  
Address.....: FL.2-5,Shi Zi Shi Bldg.,Xinping RD.,North Enping,  
Guangdong,China

**Product Description**

Product Name .....: Microphone

Brand Name .....: Derrica

Model Name.....: U-7298

Series Model .....: U-7198, U-7118, U-7228, U-9198, U-9298, U-8288, UH-07  
UH-08, UH-15, UH-16, UH-88, UH-17, UH-18, UH-05, UH-06,  
UH-11, UH-12, UH-28, HT-018, HT-028

**Test Standards** .....: FCC Part 74 Rules

Test Procedure.....: ANSI C63.4:2014;TIA/EIA 603

This device described above has been tested by STS, the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

This report shall not be reproduced except in full, without the written approval of STS, this document only be altered or revised by STS, personal only, and shall be noted in the revision of the document.

Date of Test.....:

Date of performance of tests .....: 15 May 2019 ~22 May 2019

Date of Issue.....: 23 May 2019

Test Result.....: Pass

Testing Engineer :

(Chris Chen)

Technical Manager :

(Sunday Hu)

Authorized Signatory :

(Vita Li)





| Table of Contents                                           | Page      |
|-------------------------------------------------------------|-----------|
| <b>1. SUMMARY OF TEST RESULTS</b>                           | <b>5</b>  |
| 1.1 TEST FACTORY                                            | 6         |
| 1.2 MEASUREMENT UNCERTAINTY                                 | 6         |
| <b>2. GENERAL INFORMATION</b>                               | <b>7</b>  |
| 2.1 GENERAL DESCRIPTION OF THE EUT                          | 7         |
| 2.2 DESCRIPTION OF THE TEST MODES                           | 9         |
| 2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED | 10        |
| 2.4 DESCRIPTION OF NECESSARY ACCESSORIES AND SUPPORT UNITS  | 10        |
| 2.5 TEST EQUIPMENT                                          | 11        |
| <b>3. TEST METHODOLOGY</b>                                  | <b>12</b> |
| 3.1 GENERAL TEST PROCEDURES                                 | 12        |
| 3.2 DESCRIPTION OF TEST MODES                               | 12        |
| 3.3 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS          | 12        |
| <b>4. FCC PART 74 REQUIREMENTS</b>                          | <b>13</b> |
| 4.1 RADIATED SPURIOUS EMISSION                              | 13        |
| 4.2 EMISSION MASK I                                         | 13        |
| 4.3 EMISSION MASK II                                        | 13        |
| 4.4 FREQUENCY STABILITY VS. TEMPERATURE & VOLTAGE           | 22        |
| 4.5 OCCUPIED BANDWIDTH                                      | 26        |
| 4.6 AUDIO FREQUENCY RESPONSE                                | 29        |
| 4.7 MODULATION DEVIATION                                    | 31        |
| 4.8 RF OUTPUT POWER                                         | 33        |
| <b>PHOTOS OF TEST SETUP</b>                                 | <b>37</b> |

**Revision History**

| Rev. | Issue Date  | Report NO.    | Effect Page | Contents      |
|------|-------------|---------------|-------------|---------------|
| 00   | 23 May 2019 | STS1905186W01 | ALL         | Initial Issue |
|      |             |               |             |               |





## 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

The EUT has been tested according to FCC CFR 47:

Part 2: Frequency Allocations and Radio Treaty Matters: General Rules and Regulations  
(10-1-05 Edition)

Part 74: Experimental Radio, Auxiliary, Special Broadcast and other program distributional services

| Emission                                 |                                        |                     |        |
|------------------------------------------|----------------------------------------|---------------------|--------|
| Standard                                 | Item                                   | Limit               | Result |
| FCC 2.1053; 74.861(e)(6)                 | Radiated Spurious Emission             | Refer to 74.861e(6) | PASS   |
| FCC 2.1046 (a), 74.861(e)(1)             | RF Output Power                        | 250 mW              | PASS   |
| FCC 2.1047 (b), 74.861(e)(3)             | Modulation Deviation                   | Refer to 74.861e(2) | PASS   |
| FCC 2.1047 (a)                           | Audio Frequency Response               | Refer to 2.1047(a)  | PASS   |
| FCC 74.861 (e)(5)                        | Occupied Bandwidth                     | < 200 KHz           | PASS   |
| FCC 74.861 (e)(6)(i) (ii);<br>FCC 2.1049 | Emission Mask                          | Refer to 74.861e(6) | PASS   |
| 2.1055(b); 74.861 e(4)                   | Frequency Stability vs.<br>Temperature | Refer to 74.861e(4) | PASS   |
| 2.1055(a)(1); 74.861 e(4)                | Frequency Stability vs.<br>Voltage     | Refer to 74.861e(4) | PASS   |
| FCC 15.207                               | Line Conducted Emissions               | --                  | N/A    |

NOTE:

(1) "N/A" denotes test is not applicable in this Test Report



### 1.1 TEST FACTORY

Shenzhen STS Test Services Co., Ltd.

Add.: 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road,  
Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

FCC test Firm Registration Number: 625569

A2LA Certificate No.: 4338.01

### 1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement  $y \pm U$ , where expended uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95 %.

| No. | Item                                | Uncertainty         |
|-----|-------------------------------------|---------------------|
| 1   | RF output power, conducted          | $\pm 0.71\text{dB}$ |
| 2   | Unwanted Emissions, conducted       | $\pm 0.63\text{dB}$ |
| 3   | All emissions, radiated 30-200MHz   | $\pm 3.43\text{dB}$ |
| 4   | All emissions, radiated 200MHz-1GHz | $\pm 3.57\text{dB}$ |
| 5   | All emissions, radiated >1G         | $\pm 4.13\text{dB}$ |
| 6   | Conducted Emission (9KHz-150KHz)    | $\pm 3.18\text{dB}$ |
| 7   | Conducted Emission (150KHz-30MHz)   | $\pm 2.70\text{dB}$ |



## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF THE EUT

|                               |                                                                                                                                                    |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Name:                 | Microphone                                                                                                                                         |
| Brand Name:                   | Derrica                                                                                                                                            |
| Model Name:                   | U-7298                                                                                                                                             |
| Series Model :                | U-7198, U-7118, U-7228, U-9198, U-9298, U-8288, UH-07, UH-08, UH-15, UH-16, UH-88, UH-17, UH-18, UH-05, UH-06, UH-11, UH-12, UH-28, HT-018, HT-028 |
| Model Difference description: | Just different in model name                                                                                                                       |
| Emission Bandwidth:           | 116.40KHz                                                                                                                                          |
| Battery:                      | Rated Voltage: 3.7V<br>Capacity: 640mAh<br>Charge Limit: 4.2V                                                                                      |
| Power Rating                  | 5V/1000mA                                                                                                                                          |
| Operation Frequency Range     | 481 MHz-599 MHz                                                                                                                                    |
| Maximum Transmitter Power:    | 2.251mW(3.524dBm)                                                                                                                                  |
| Modulation mode / type:       | FSK                                                                                                                                                |
| Frequency Tolerance           | 0.002703%                                                                                                                                          |
| Temperature Range:            | -30℃-50℃                                                                                                                                           |
| Test frequency list:          | See Note 6                                                                                                                                         |
| Software version number:      | N/A                                                                                                                                                |
| Hardware version number:      | N/A                                                                                                                                                |

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
2. Note: The product has the same digital working characters when operating in both two digitized voice/data mode. So only one set of test results for digital modulation modes are provided in this test report.
3. Please refer to Appendix B for the photographs of the EUT. For more details, please refer to the User's manual of the EUT.

| Channel List |                 |         |                 |         |                 |
|--------------|-----------------|---------|-----------------|---------|-----------------|
| Channel      | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 01           | 481             | 02      | 541             | 03      | 599             |

Note, the frequency of a total of 3 CH



## 5. Table for Filed Antenna

| Ant | Brand          | Model Name | Antenna Type   | Connector | Gain (dBi) | NOTE    |
|-----|----------------|------------|----------------|-----------|------------|---------|
| 1   | <b>Derrica</b> | U-7298     | Spring Antenna | NA        | 0          | Antenna |

The EUT antenna is Dipole Antenna. no antenna other than that furnished by the responsible party shall be used with the device.

## 6. Test frequency list

| Test Channel | EUT Channel | Test Frequency (MHz) |
|--------------|-------------|----------------------|
| lowest       | CH01        | 481                  |
| middle       | CH02        | 541                  |
| highest      | CH03        | 599                  |

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, please see the above listed frequency for testing.



## 2.2 DESCRIPTION OF THE TEST MODES

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possibly have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

| Pretest Mode | Description    |
|--------------|----------------|
| Mode 1       | Low Channel    |
| Mode 2       | Middle Channel |
| Mode 3       | High Channel   |
| Mode 4       | Link Mode      |

| For Radiated Emission |                |
|-----------------------|----------------|
| Final Test Mode       | Description    |
| Mode 1                | Low Channel    |
| Mode 2                | Middle Channel |
| Mode 3                | High Channel   |
| Mode 4                | Link Mode      |

Note:

(1) Due to the different configuration and test, in this list only some worse mode. The worst test data of the worse mode is reported by this report.



### 2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

E-1  
EUT

### 2.4 DESCRIPTION OF NECESSARY ACCESSORIES AND SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

#### Necessary accessories

| Item | Equipment | Mfr/Brand | Model/Type No. | Serial No. | Note |
|------|-----------|-----------|----------------|------------|------|
| N/A  | N/A       | N/A       | N/A            | N/A        | N/A  |
|      |           |           |                |            |      |
|      |           |           |                |            |      |
|      |           |           |                |            |      |

#### Support units

| Item | Equipment | Mfr/Brand | Model/Type No. | Serial No. | Note |
|------|-----------|-----------|----------------|------------|------|
| N/A  | N/A       | N/A       | N/A            | N/A        | N/A  |
|      |           |           |                |            |      |
|      |           |           |                |            |      |
|      |           |           |                |            |      |

#### Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.
- (3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.



## 2.5 TEST EQUIPMENT

## Radiation Test equipment

| Kind of Equipment            | Manufacturer | Type No.                   | Serial No.   | Last calibration | Calibrated until |
|------------------------------|--------------|----------------------------|--------------|------------------|------------------|
| Bilog Antenna                | TESEQ        | CBL6111D                   | 34678        | 2017.11.02       | 2020.11.1        |
| Horn Antenna                 | SCHWARZBECK  | BBHA<br>9120D(1201)        | 9120D-1343   | 2018.10.19       | 2021.10.18       |
| Pre-Amplifier<br>(0.1M-3GHz) | EM           | EM330                      | 060665       | 2018.10.13       | 2019.10.12       |
| Pre-Amplifier<br>(1G-18GHz)  | SKET         | LNPA-01018G-45             | SK2018080901 | 2018.10.13       | 2019.10.12       |
| Signal Analyzer              | Agilent      | N9020A                     | MY51110105   | 2019.03.02       | 2020.03.01       |
| Temperature &<br>Humidity    | HH660        | Mieo                       | N/A          | 2018.10.11       | 2019.10.10       |
| trun table                   | EM           | SC100_1                    | 60531        | N/A              | N/A              |
| Antnna mast                  | EM           | SC100                      | N/A          | N/A              | N/A              |
| AC Power Source              | APC          | KDF-11010G                 | F214050035   | N.C.R            | N.C.R            |
| Test SW                      | FARAD        | EZ-EMC(Ver.STSLAB-03A1 RE) |              |                  |                  |

## RF Connected Test equipment

| Kind of Equipment                          | Manufacturer | Type No.        | Serial No.    | Last calibration | Calibrated until |
|--------------------------------------------|--------------|-----------------|---------------|------------------|------------------|
| USB RF power<br>sensor                     | DARE         | RPR3006W        | 15I00041SNO03 | 2018.10.13       | 2019.10.12       |
| Signal Generator                           | Agilent      | N5182A          | MY46240556    | 2018.10.16       | 2019.10.15       |
| Signal Analyzer                            | Agilent      | N9020A          | MY49100060    | 2018.10.13       | 2019.10.12       |
| Universal Radio<br>communication<br>tester | R&S          | CMU200          | 11764         | 2018.10.13       | 2019.10.12       |
| Audio analyzer                             | R&S          | UPL             | N/A           | 2019.03.11       | 2020.03.10       |
| Temperature &<br>Humidity                  | HH660        | Mieo            | N/A           | 2018.10.11       | 2019.10.10       |
| programmable<br>power supply               | Agilent      | E3642A          | MY40002025    | 2018.10.13       | 2019.10.12       |
| Attenuator                                 | HP           | 8494B           | DC-18G        | 2019.05.06       | 2020.05.05       |
| AC Power Source                            | APC          | KDF-11010G      | F214050035    | N.C.R            | N.C.R            |
| Test SW                                    | FARAD        | LZ-RF /LzRf-3A3 |               |                  |                  |



### 3. TEST METHODOLOGY

#### 3.1 GENERAL TEST PROCEDURES

##### Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirement in Section 13.1.4.1 of ANSI C63.4:2003. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Not Applicable (Since the EUT is powered by battery)

##### Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4:2003.

#### 3.2 DESCRIPTION OF TEST MODES

The EUT has been tested under engineering test mode condition and the EUT staying in continuous transmitting mode.

#### 3.3 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz                        | MHz                   | MHz             | GHz              |
|----------------------------|-----------------------|-----------------|------------------|
| 0.090 - 0.110              | 16.42 - 16.423        | 399.9 - 410     | 4.5 - 5.15       |
| <sup>1</sup> 0.495 - 0.505 | 16.69475 - 16.69525   | 608 - 614       | 5.35 - 5.46      |
| 2.1735 - 2.1905            | 16.80425 - 16.80475   | 960 - 1240      | 7.25 - 7.75      |
| 4.125 - 4.128              | 25.5 - 25.67          | 1300 - 1427     | 8.025 - 8.5      |
| 4.17725 - 4.17775          | 37.5 - 38.25          | 1435 - 1626.5   | 9.0 - 9.2        |
| 4.20725 - 4.20775          | 73 - 74.6             | 1645.5 - 1646.5 | 9.3 - 9.5        |
| 6.215 - 6.218              | 74.8 - 75.2           | 1660 - 1710     | 10.6 - 12.7      |
| 6.26775 - 6.26825          | 108 - 121.94          | 1718.8 - 1722.2 | 13.25 - 13.4     |
| 6.31175 - 6.31225          | 123 - 138             | 2200 - 2300     | 14.47 - 14.5     |
| 8.291 - 8.294              | 149.9 - 150.05        | 2310 - 2390     | 15.35 - 16.2     |
| 8.362 - 8.366              | 156.52475 - 156.52525 | 2483.5 - 2500   | 17.7 - 21.4      |
| 8.37625 - 8.38675          | 156.7 - 156.9         | 2655 - 2900     | 22.01 - 23.12    |
| 8.41425 - 8.41475          | 162.0125 - 167.17     | 3260 - 3267     | 23.6 - 24.0      |
| 12.29 - 12.293             | 167.72 - 173.2        | 3332 - 3339     | 31.2 - 31.8      |
| 12.51975 - 12.52025        | 240 - 285             | 3345.8 - 3358   | 36.43 - 36.5     |
| 12.57675 - 12.57725        | 322 - 335.4           | 3600 - 4400     | ( <sup>2</sup> ) |
| 13.36 - 13.41              |                       |                 |                  |

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.



#### 4. FCC PART 74 REQUIREMENTS

##### 4.1 RADIATED SPURIOUS EMISSION

###### TEST LIMITS

According to CFR 47 section 74.861 e (6)(iii), the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

It is measured by means of a calibrated spectrum analyzer and scanned from 30 MHz up to a frequency including its 10th harmonic.

The limit line is derived from  $43 + 10\log(P)$  dB below the transmitter power P(Watts)

$$= P(W) - [43 + 10\log(P)] \text{ (dB)}$$

$$= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)}$$

$$= -13\text{dBm}.$$

##### 4.2 EMISSION MASK I

###### TEST LIMITS

- According to CFR 47 section 74.861 e (6), the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

- (1) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB;
- a. (2) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB;
- (3) On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least  $43 + 10\log 10 \cdot (\text{mean output power in watts})$  dB;

##### 4.3 EMISSION MASK II

###### TEST LIMITS

- According to ETSI EN 300 422-1 V1.5.1 Clause 8.3.1.2,

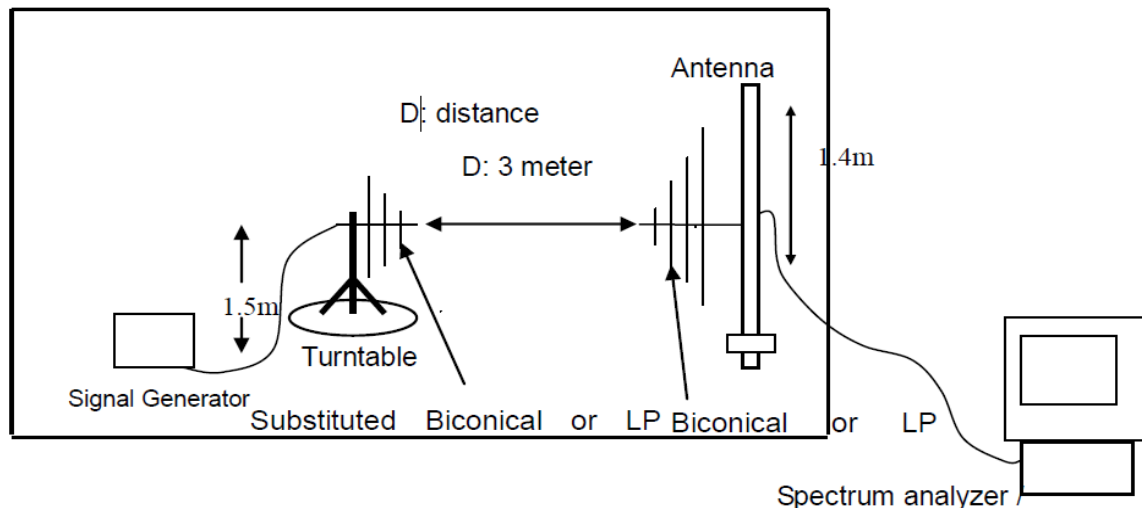
- a. The transmitter output spectrum shall be within the mask defined in figure 3 where B is the declared channel bandwidth

## TEST PROCEDURE

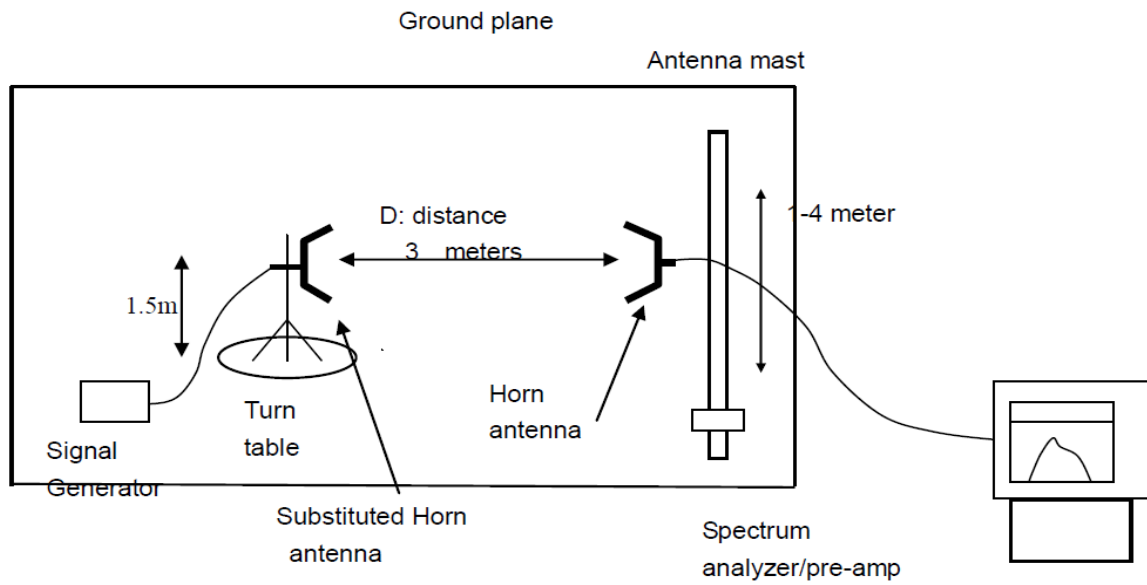
- a. On a test site, the EUT shall be placed on a turntable and in the position closest to the normal use as declared by the user.
- b. The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the transmitter.
- c. The output of the antenna shall be connected to the measuring receiver and either a peak or quasi-peak detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.
- d. The transmitter shall be switched on; if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.
- e. The test antenna shall be raised and lowered through the specified range of height until the measuring receiver detects a maximum signal level.
- f. The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
- g. The test antenna shall be raised and lowered again through the specified range of height until the measuring receiver detects a maximum signal level.
- h. The maximum signal level detected by the measuring receiver shall be noted.
- i. The measurement shall be repeated with the test antenna set to horizontal polarization.
- j. Replace the antenna with a proper Antenna (substitution antenna).
- k. The substitution antenna shall be oriented for vertical polarization and, if necessary, the length of the substitution antenna shall be adjusted to correspond to the frequency of transmitting.
- l. The substitution antenna shall be connected to a calibrated signal generator.
- m. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
- n. The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.
- o. The input signal to substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.
- p. The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
- q. The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.

## TEST CONFIGURATION

- (A) Radiated Emission Test-Up Frequency Above 30MHz  
Ground Plane



# (B) Radiated Emission Test-Up Frequency Above 1GHz





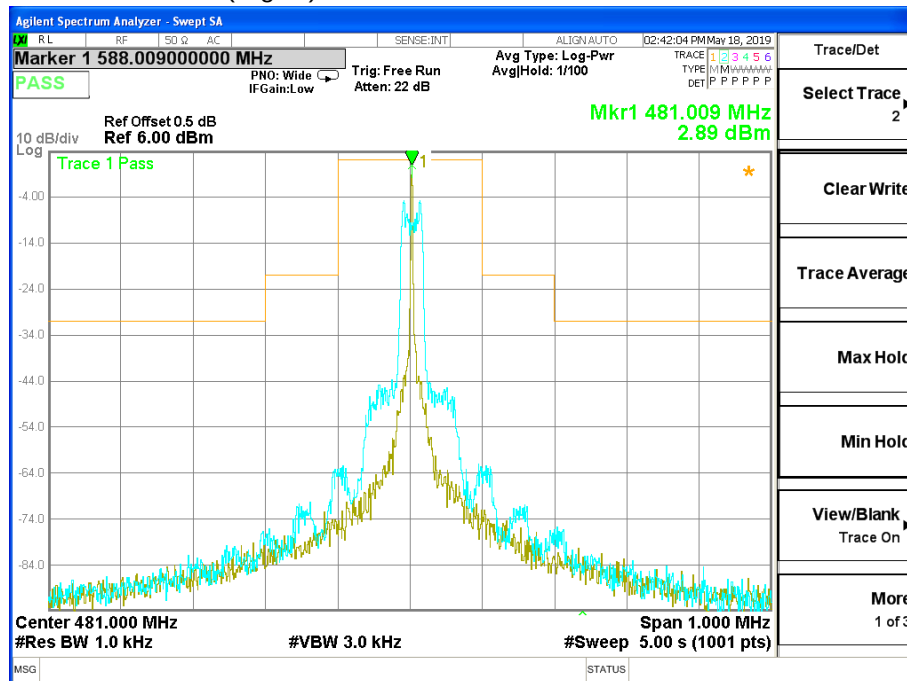
## TEST RESULTS

| (30-6000)MHz                                |                  |          |       |               |                |                 |          |
|---------------------------------------------|------------------|----------|-------|---------------|----------------|-----------------|----------|
| The Worst Test Results Low Channel 481 MHz  |                  |          |       |               |                |                 |          |
| Frequency(MHz)                              | S G.Lev<br>(dBm) | Ant(dBi) | Loss  | PMea<br>(dBm) | Limit<br>(dBm) | Margin<br>(dBm) | Polarity |
| 961.71                                      | -40.13           | 6.88     | 4.72  | -37.97        | -13.00         | -24.97          | H        |
| 1442.69                                     | -39.16           | 10.13    | 8.32  | -37.35        | -13.00         | -24.35          | H        |
| 1924.01                                     | -30.85           | 9.65     | 11.72 | -32.92        | -13.00         | -19.92          | H        |
| 961.69                                      | -43.14           | 6.88     | 4.72  | -40.98        | -13.00         | -27.98          | V        |
| 1442.89                                     | -43.95           | 10.13    | 8.32  | -42.14        | -13.00         | -29.14          | V        |
| 1923.66                                     | -42.49           | 9.65     | 11.72 | -44.56        | -13.00         | -31.56          | V        |
| The Worst Test Results Mid Channel 541 MHz  |                  |          |       |               |                |                 |          |
| Frequency(MHz)                              | S G.Lev<br>(dBm) | Ant(dBi) | Loss  | PMea<br>(dBm) | Limit<br>(dBm) | Margin<br>(dBm) | Polarity |
| 988.79                                      | -36.46           | 6.88     | 4.72  | -34.30        | -13.00         | -21.30          | H        |
| 1483.43                                     | -43.02           | 10.13    | 8.32  | -41.21        | -13.00         | -28.21          | H        |
| 1978.04                                     | -38.11           | 9.65     | 11.72 | -40.18        | -13.00         | -27.18          | H        |
| 989.00                                      | -37.50           | 6.88     | 4.72  | -35.34        | -13.00         | -22.34          | V        |
| 1483.22                                     | -31.80           | 10.13    | 8.32  | -29.99        | -13.00         | -16.99          | V        |
| 1977.86                                     | -36.66           | 9.65     | 11.72 | -38.73        | -13.00         | -25.73          | V        |
| The Worst Test Results High Channel 599 MHz |                  |          |       |               |                |                 |          |
| Frequency(MHz)                              | S G.Lev<br>(dBm) | Ant(dBi) | Loss  | PMea<br>(dBm) | Limit<br>(dBm) | Margin<br>(dBm) | Polarity |
| 1014.67                                     | -36.23           | 6.88     | 4.72  | -34.07        | -13.00         | -21.07          | H        |
| 1522.06                                     | -43.13           | 10.13    | 8.32  | -41.32        | -13.00         | -28.32          | H        |
| 2029.72                                     | -38.14           | 9.65     | 11.72 | -40.21        | -13.00         | -27.21          | H        |
| 1014.78                                     | -37.56           | 6.88     | 4.72  | -35.40        | -13.00         | -22.40          | V        |
| 1522.42                                     | -31.77           | 10.13    | 8.32  | -29.96        | -13.00         | -16.96          | V        |
| 2029.74                                     | -36.54           | 9.65     | 11.72 | -38.61        | -13.00         | -25.61          | V        |

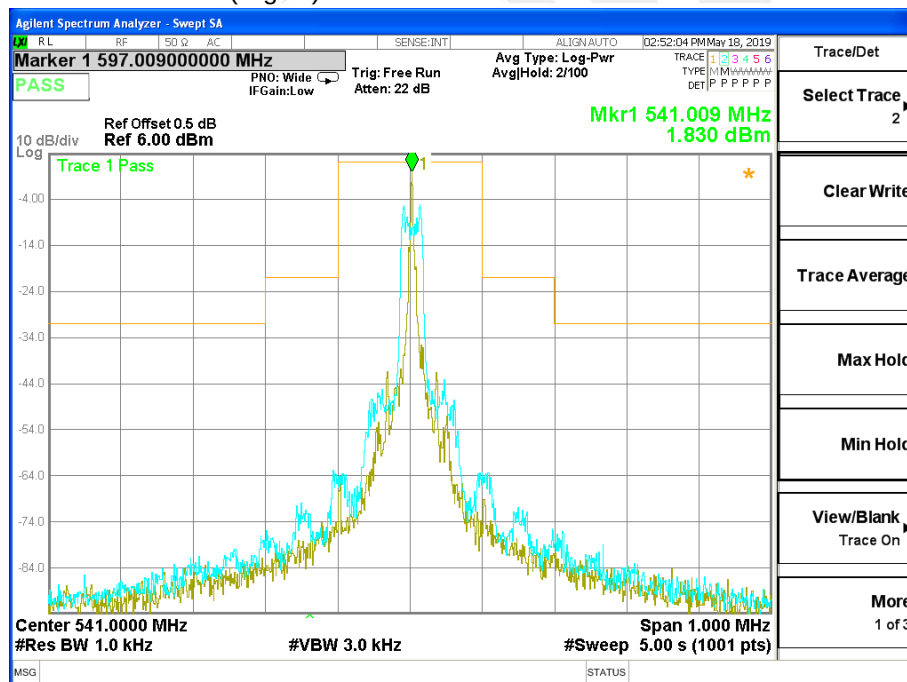


## Emission Mask I

## (Digital) Emission Mask Low Channel

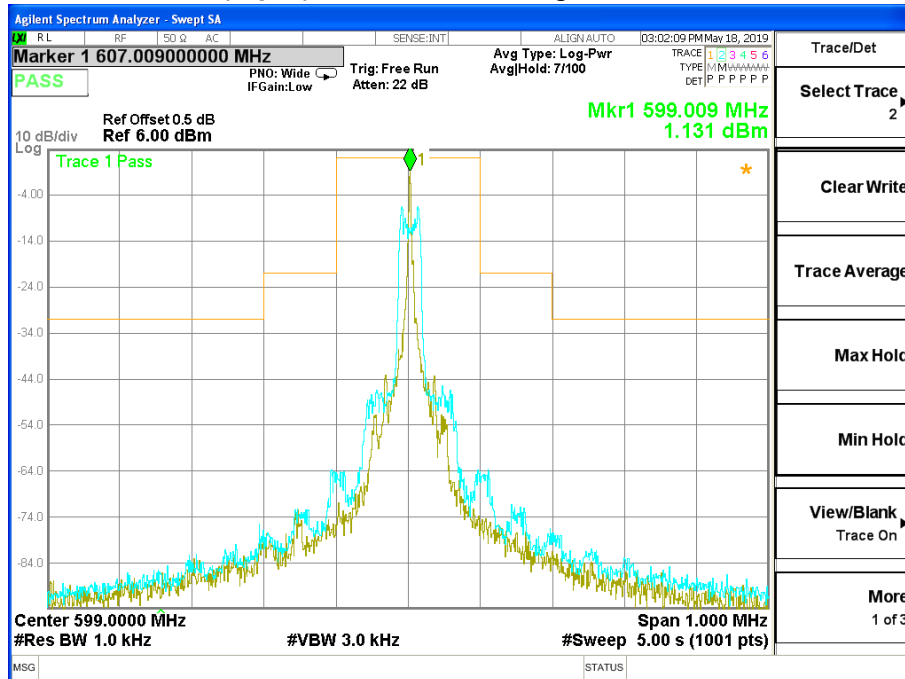


## (Digital) Emission Mask Mid Channel





## (Digital) Emission Mask High Channel



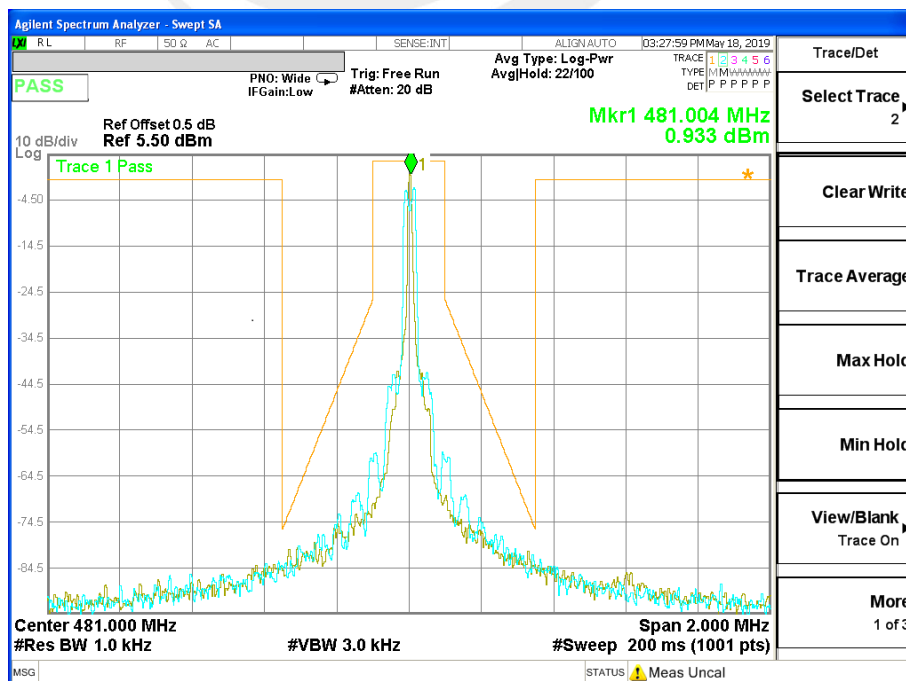
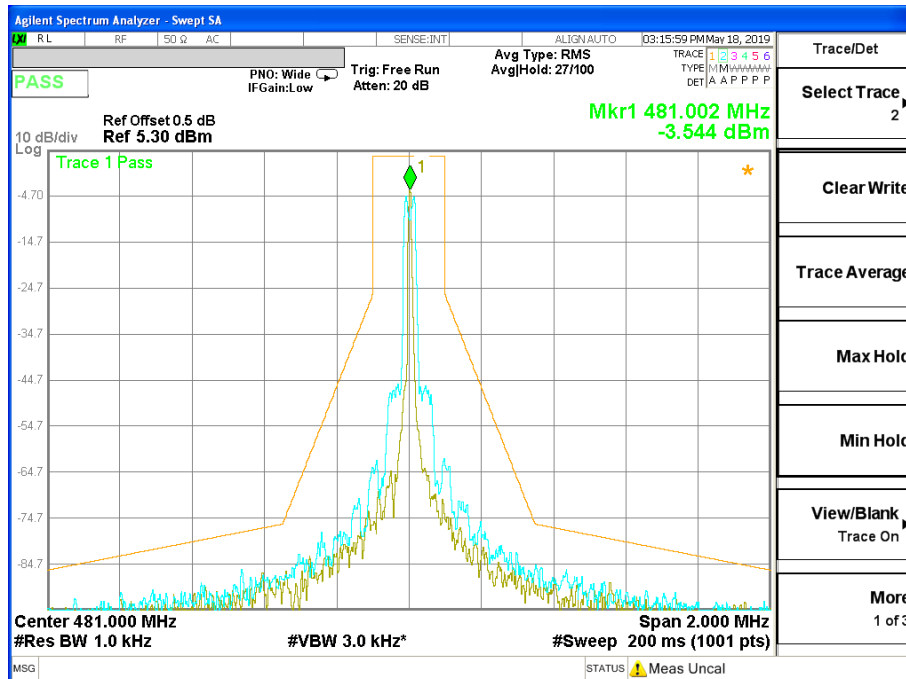


## Emission Mask II

ETSI EN 300 422-1 V1.5.1 Clause 8.3.1.2 The Maximum Measurement of Necessary Bandwidth Test Plot:

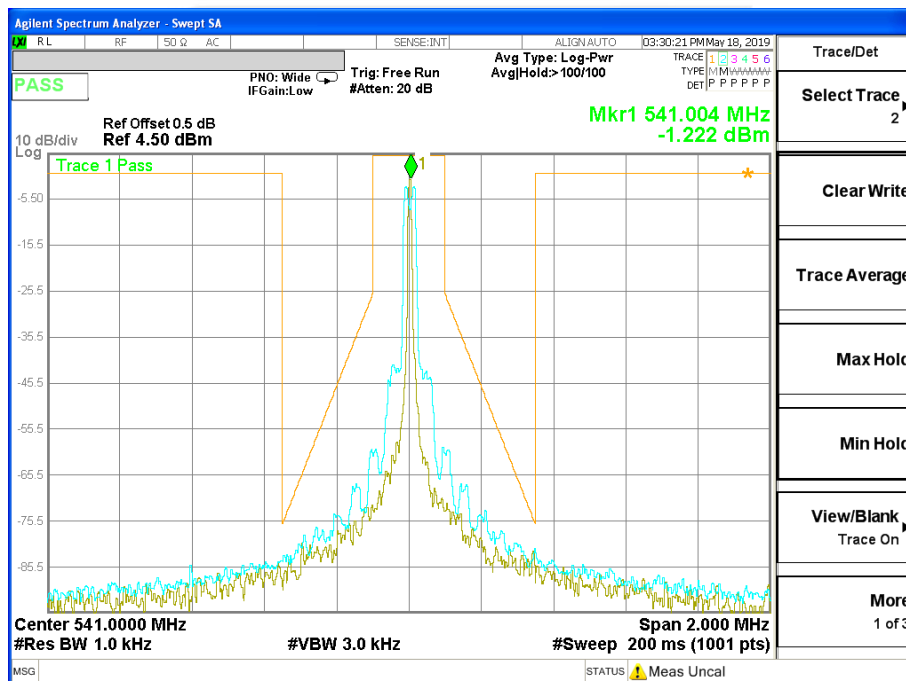
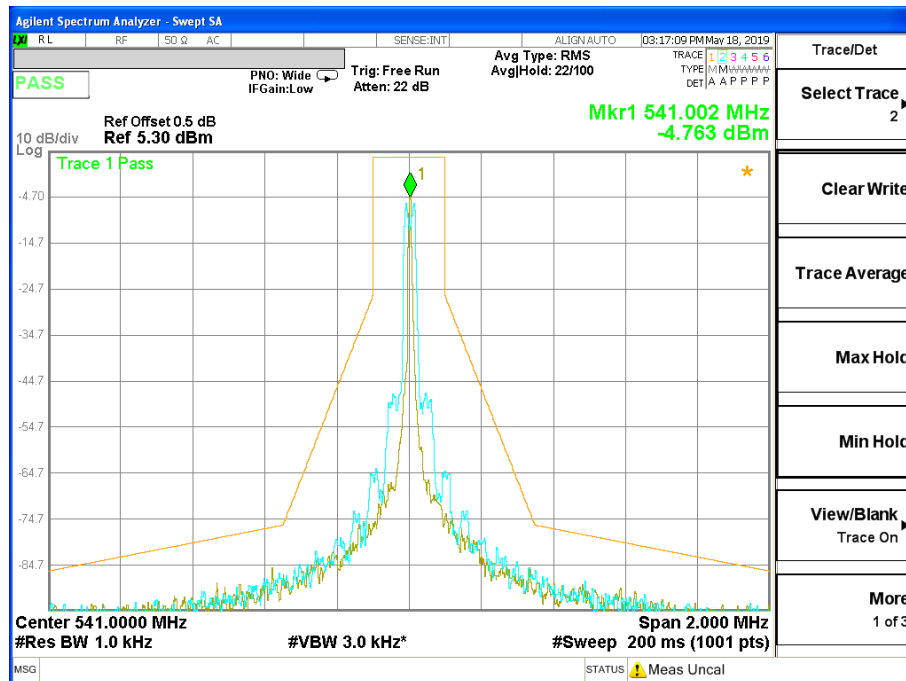
| Frequency  | Declared Bandwidth | B/2 | 0.35B |
|------------|--------------------|-----|-------|
| 514.56 MHz | 100K               | 50K | 35K   |
| 553.51 MHz | 100K               | 50K | 35K   |
| 595.46 MHz | 100K               | 50K | 35K   |

### Low CH



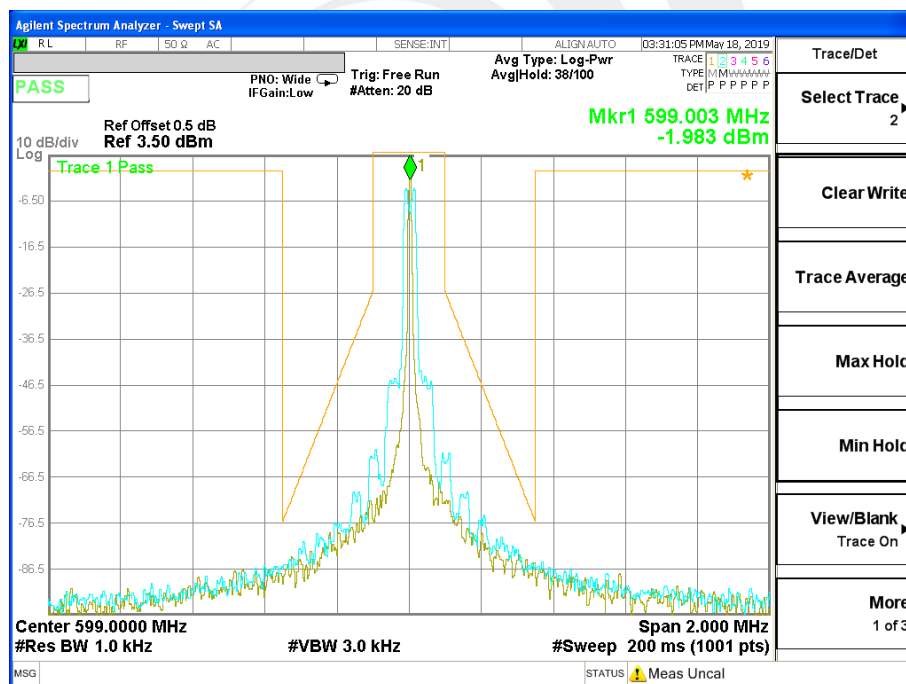
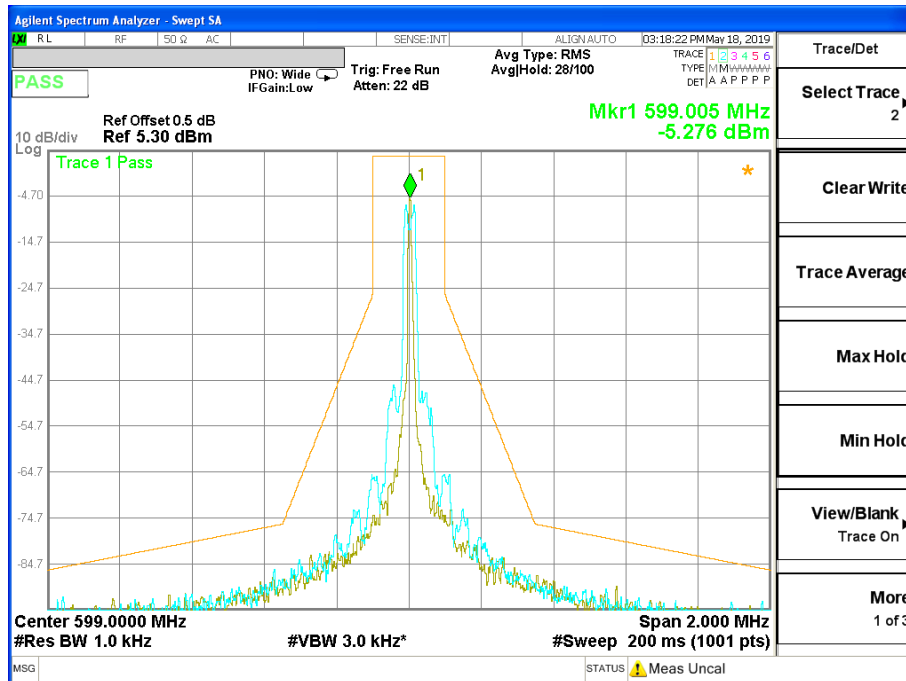


## Mid CH





## High CH

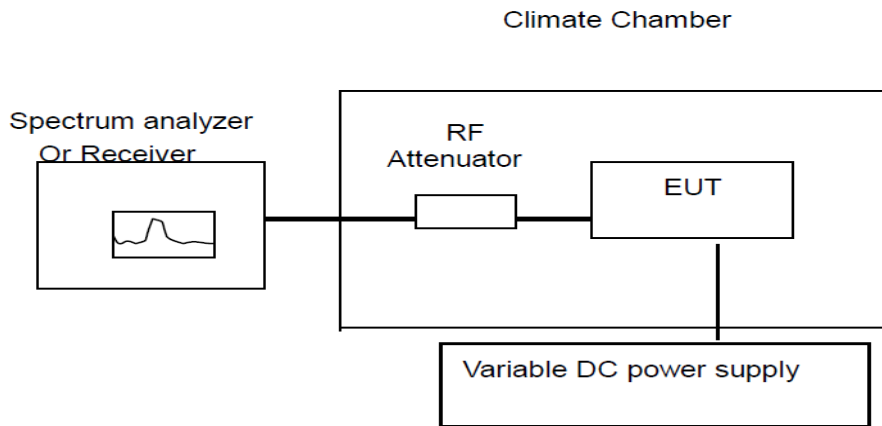


#### 4.4 FREQUENCY STABILITY VS. TEMPERATURE & VOLTAGE

##### TEST LIMIT

According to CFR 47 section 74.861 e (4), the frequency tolerance of the transmitter shall be 0.005 percent.

##### TEST CONFIGURATION



##### TEST PROCEDURE

The EUT was connected to an external DC power supply and the RF output was connected to a frequency counter via feed through attenuators. The EUT was placed inside the temperature chamber. The DC leads and the RF output cable, exited the chamber through an opening made for that purpose.

After the temperature stabilized the frequency output was recorded from the counter.

An external variable DC power supply was connected to the battery terminals of the equipment under test.

- b. For hand carried, battery powered equipment primary supply voltage was reduced to the battery operating end point as specified by the manufacturer. The output frequency was recorded for each battery voltage.

**TEST RESULTS**

- (1) Frequency stability versus input voltage (Supply Nominal voltage is DC 3.7V)  
(2) Frequency stability versus input voltage (Supply battery operating end point which shall be specified by the manufacturer DC 4.2V)

| Reference Frequency: 481MHz |                              |                      |                     |
|-----------------------------|------------------------------|----------------------|---------------------|
| Power Supply                | Environment Temperature (°C) | Frequency Error (Hz) | Frequency Error (%) |
| 3.33V, DC                   | 20                           | 12997                | 0.002702            |
| 3.7V, DC                    | 20                           | 13000                | 0.002703            |
| 4.2V, DC                    | 20                           | 12998                | 0.002702            |
| BEP                         | 20                           | 13000                | 0.002703            |

| Reference Frequency: 481MHz |                                                           |                     |           |         |
|-----------------------------|-----------------------------------------------------------|---------------------|-----------|---------|
| Environment Temperature(°C) | Frequency Deviation measured with time Elapse(30 minutes) |                     |           |         |
|                             | Frequency Error (Hz)                                      | Frequency Error (%) | Limit (%) | Results |
| 50                          | 13000                                                     | 0.002703            | 0.00500   | PASS    |
| 40                          | 12998                                                     | 0.002702            |           |         |
| 30                          | 12997                                                     | 0.002702            |           |         |
| 20                          | 13000                                                     | 0.002703            |           |         |
| 10                          | 12998                                                     | 0.002702            |           |         |
| 0                           | 13000                                                     | 0.002703            |           |         |
| -10                         | 12999                                                     | 0.002702            |           |         |
| -20                         | 12998                                                     | 0.002702            |           |         |
| -30                         | 12999                                                     | 0.002702            |           |         |



| Reference Frequency: 541MHz |                              |                      |                     |
|-----------------------------|------------------------------|----------------------|---------------------|
| Power Supply                | Environment Temperature (°C) | Frequency Error (Hz) | Frequency Error (%) |
| 3.33V, DC                   | 20                           | 13000                | 0.002403            |
| 3.7V, DC                    | 20                           | 13000                | 0.002403            |
| 4.2V, DC                    | 20                           | 13000                | 0.002403            |
| BEP                         | 20                           | 12999                | 0.002403            |

| Reference Frequency: 541MHz |                                                           |                     |           |         |
|-----------------------------|-----------------------------------------------------------|---------------------|-----------|---------|
| Environment Temperature(°C) | Frequency Deviation measured with time Elapse(30 minutes) |                     |           |         |
|                             | Frequency Error (Hz)                                      | Frequency Error (%) | Limit (%) | Results |
| 50                          | 12999                                                     | 0.002403            | 0.00500   | PASS    |
| 40                          | 12999                                                     | 0.002403            |           |         |
| 30                          | 13000                                                     | 0.002403            |           |         |
| 20                          | 13000                                                     | 0.002403            |           |         |
| 10                          | 13000                                                     | 0.002403            |           |         |
| 0                           | 12999                                                     | 0.002403            |           |         |
| -10                         | 12997                                                     | 0.002402            |           |         |
| -20                         | 12998                                                     | 0.002403            |           |         |
| -30                         | 12999                                                     | 0.002403            |           |         |



| Reference Frequency: 599MHz |                              |                      |                     |
|-----------------------------|------------------------------|----------------------|---------------------|
| Power Supply                | Environment Temperature (°C) | Frequency Error (Hz) | Frequency Error (%) |
| 3.33V, DC                   | 20                           | 13000                | 0.002170            |
| 3.7V, DC                    | 20                           | 13000                | 0.002170            |
| 4.2V, DC                    | 20                           | 13000                | 0.002170            |
| BEP                         | 20                           | 12999                | 0.002170            |

| Reference Frequency: 599MHz |                                                           |                     |           |         |
|-----------------------------|-----------------------------------------------------------|---------------------|-----------|---------|
| Environment Temperature(°C) | Frequency Deviation measured with time Elapse(30 minutes) |                     |           |         |
|                             | Frequency Error (Hz)                                      | Frequency Error (%) | Limit (%) | Results |
| 50                          | 12999                                                     | 0.002170            | 0.00500   | PASS    |
| 40                          | 12998                                                     | 0.002170            |           |         |
| 30                          | 13000                                                     | 0.002170            |           |         |
| 20                          | 13000                                                     | 0.002170            |           |         |
| 10                          | 13000                                                     | 0.002170            |           |         |
| 0                           | 12999                                                     | 0.002170            |           |         |
| -10                         | 12997                                                     | 0.002170            |           |         |
| -20                         | 12998                                                     | 0.002170            |           |         |
| -30                         | 12997                                                     | 0.002170            |           |         |



#### 4.5 OCCUPIED BANDWIDTH

##### TEST LIMIT

According to CFR 47 section 74.861 e (5), the operating bandwidth shall not exceed 200 KHz.  
Near the carrier an emission mask is defined by the standard.

##### TEST CONFIGURATION



##### TEST PROCEDURE

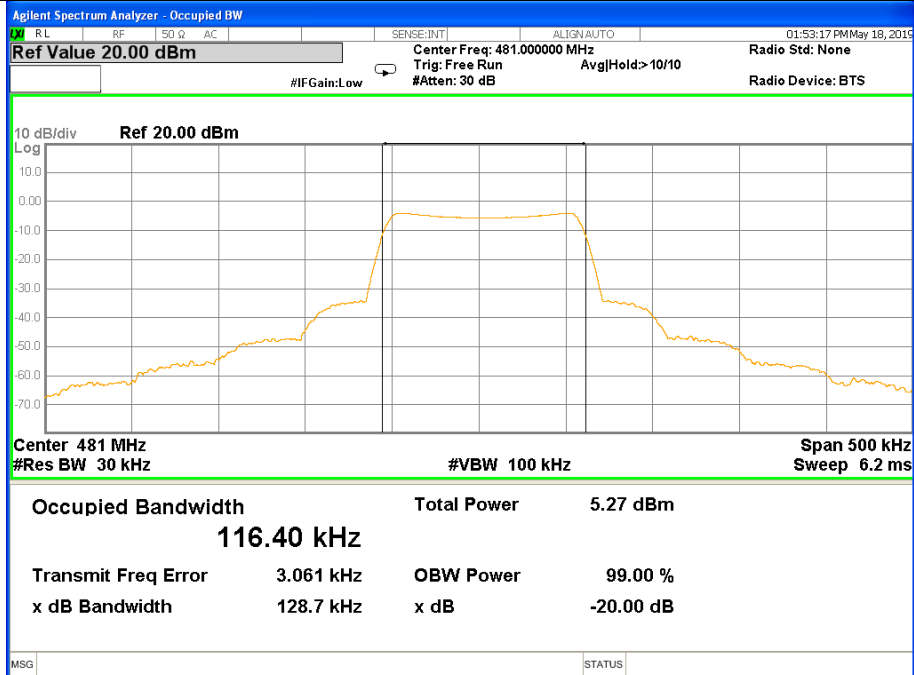
- a. The RF output of the transceiver was connected to the input of the spectrum analyzer through sufficient attenuation.  
Set Occupied Bandwidth was measured with a occupied bandwidth function of the analyzer.
- b. The near the carrier emissions are measured by normal power measurement function of the analyzer.
- c. Set SPA Max hold. Mark peak, 99%.



## TEST RESULT

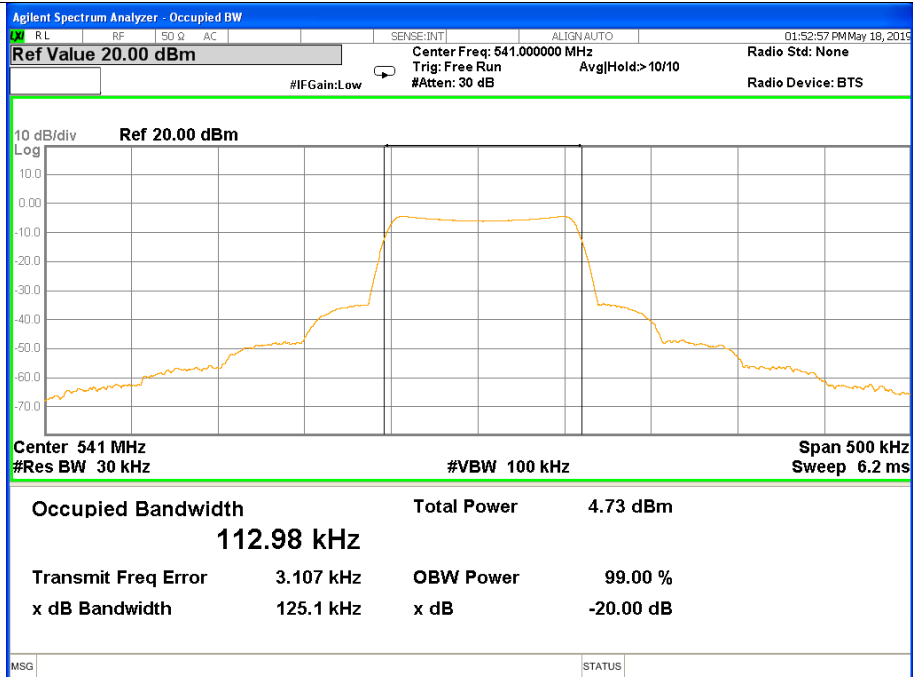
| Frequency(MHz) | Occupied Bandwidth(KHz) | Limit(KHz) |
|----------------|-------------------------|------------|
| 481            | 116.40                  | 200        |
| 541            | 112.98                  | 200        |
| 599            | 113.10                  | 200        |

## (Digital) Occupied bandwidth of Low Channel (Maximum)

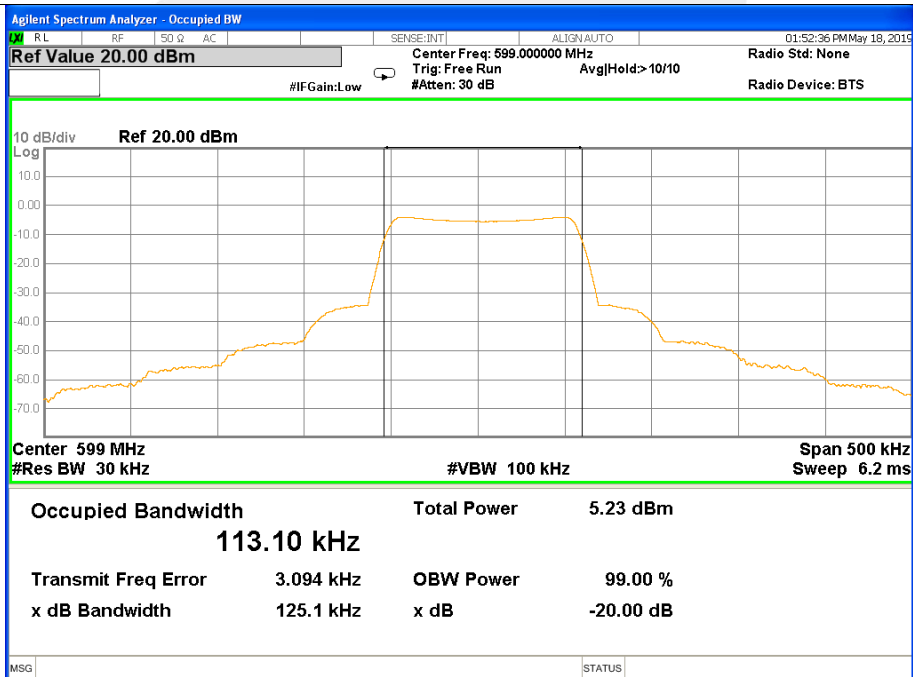




## (Digital) Occupied bandwidth of Mid Channel (Maximum)



## (Digital) Occupied bandwidth of High Channel (Maximum)



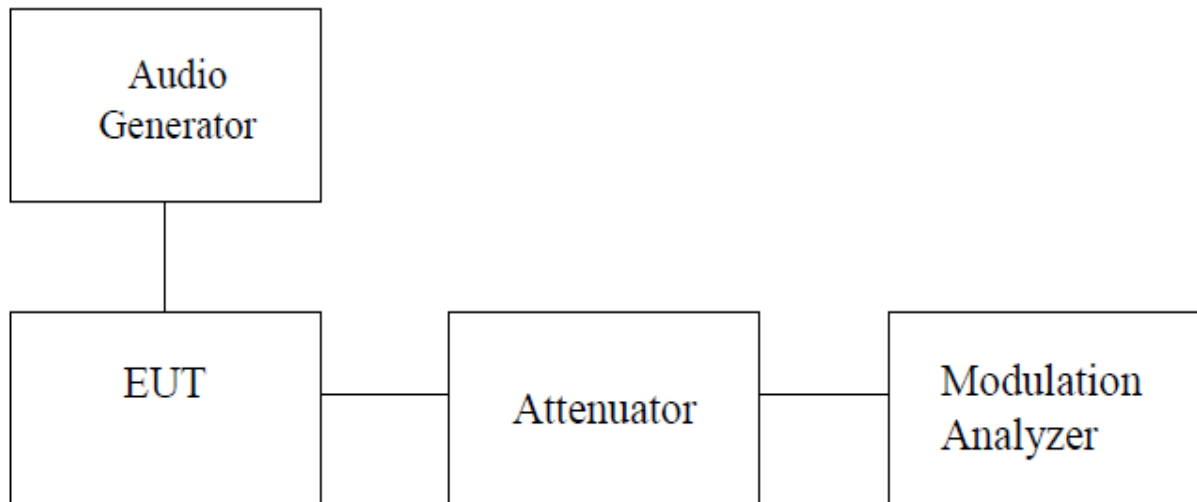
## 4.6 AUDIO FREQUENCY RESPONSE

### TEST LIMIT

The audio frequency response is the degree of closeness to which the frequency deviation of the transmitter follows a prescribed characteristic. The frequency response of the audio modulation part is measured over a frequency range of 100 Hz to 5000 Hz.

According to CFR 47 section 74.861 e (1), any form of modulation may be used. A maximum deviation of  $\pm 75$  KHz is permitted when frequency modulation is employed.

### TEST CONFIGURATION



### TEST PROCEDURE

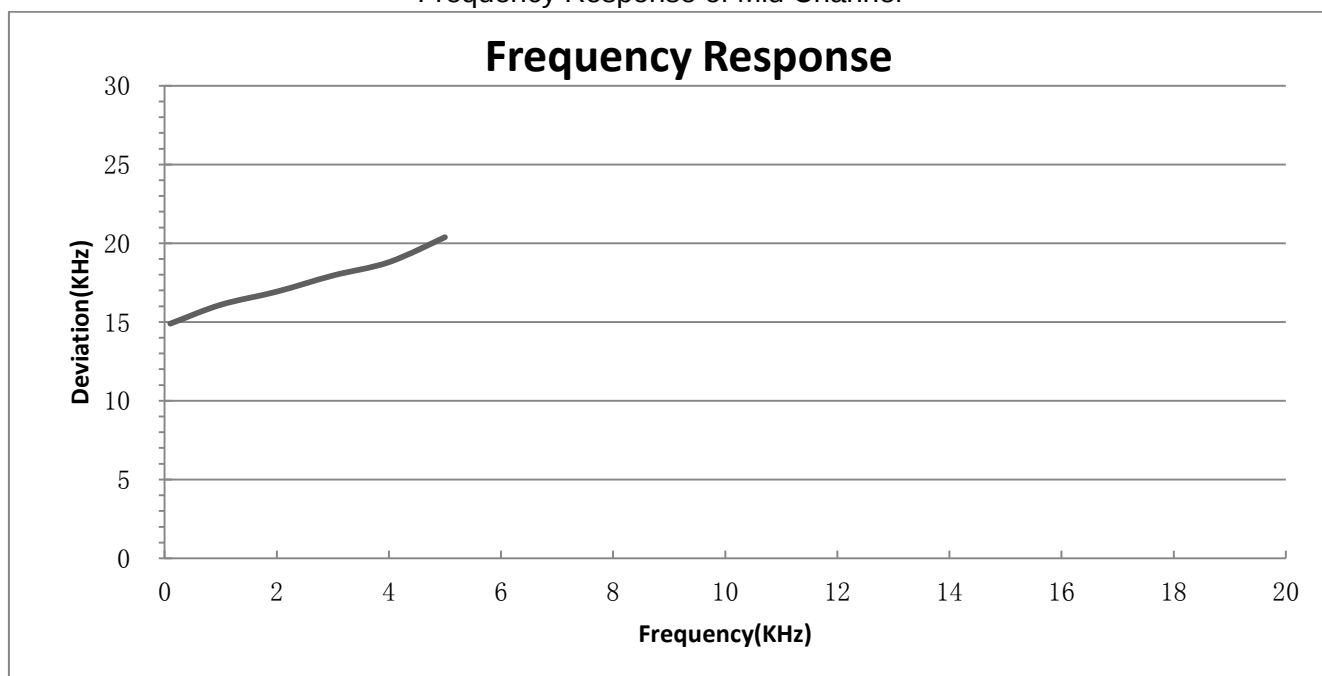
- a. The audio frequency response is the degree of the closeness to which the frequency deviation of the transmitter follows prescribed characteristics.
- b. The frequency response of the audio modulation part is measured over a frequency range of 100Hz to 5000 Hz.
- c. For 1000 Hz tone reference signal the audio generator level is adjusted to get 20% of the rated system deviation.  
The deviations obtained over the frequency range from 100 HZ to 5000 Hz are recorded and
- d. compared with the reference deviation as follows:  
$$\text{Audio Frequency Response} = 20 \log (\text{DEV freq} / \text{Dev ref})$$

**TEST RESULT**

Audio Frequency Response:

| Frequency(KHz) | Deviation(KHz) |
|----------------|----------------|
| 0.1            | 14.89          |
| 1              | 15.69          |
| 2              | 16.86          |
| 3              | 17.81          |
| 4              | 18.69          |
| 5              | 20.11          |

Frequency Response of Mid Channel



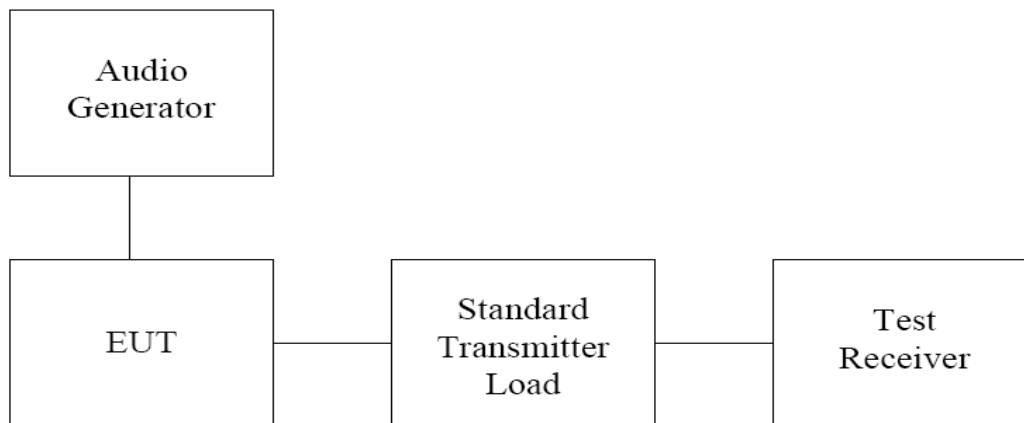
#### 4.7 MODULATION DEVIATION

##### TEST LIMIT

According to CFR 47 section 2.1047 a, for Voice modulation communication equipment, the frequency response of the audio modulation circuit over a range of 100 to 5000 Hz shall be measured.

According to CFR 47 section 74.861 e (3), any form of modulation may be used. A maximum deviation of  $\pm 75$  KHz is permitted when frequency modulation is employed.

##### TEST CONFIGURATION



##### TEST PROCEDURE

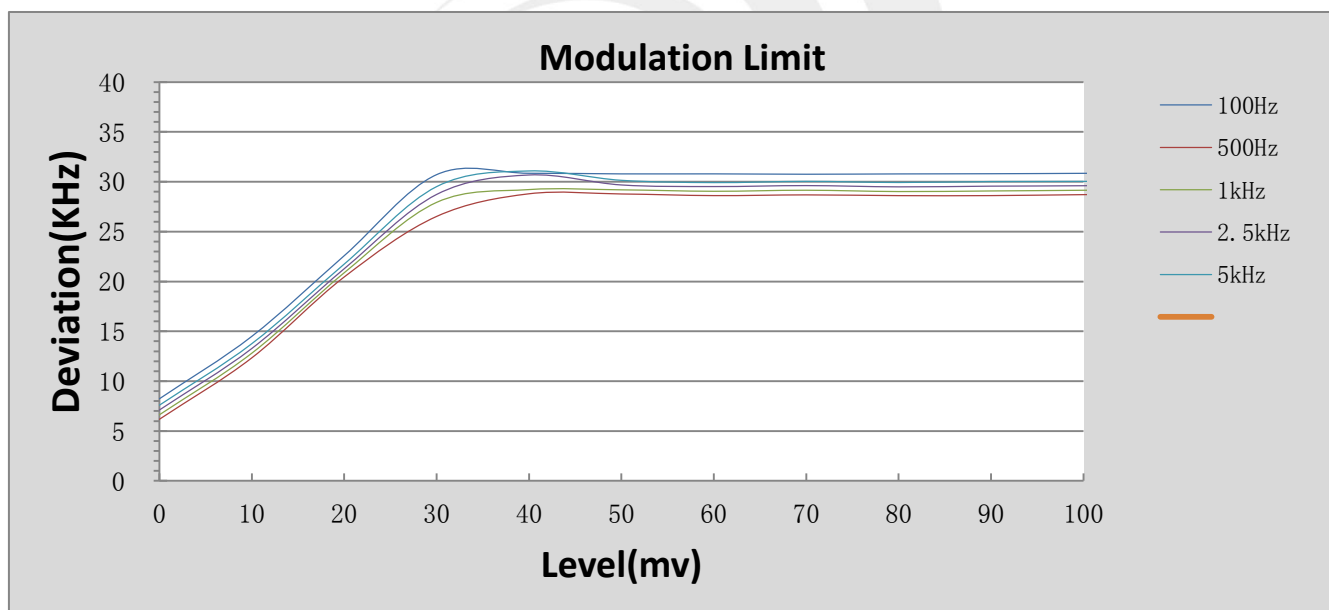
- a. Modulation limits is the transmitter circuit's ability to limit the transmitter from producing deviations in excess of rated system deviation.
- b. The audio signal generator is connected to the audio input of the EUT with its full rating.
- c. The modulation response is measured at certain modulation frequencies, related to 1000 Hz reference signal.
- d. Tests are performed for positive and negative modulation.

**TEST RESULT**

## Modulation Deviation

| Level(mv) | 100Hz | 500Hz | 1kHz  | 2.5kHz | 5kHz  |
|-----------|-------|-------|-------|--------|-------|
| 0         | 8.23  | 6.16  | 6.61  | 7.09   | 7.58  |
| 10        | 14.32 | 12.22 | 12.69 | 13.11  | 13.57 |
| 20        | 22.62 | 20.58 | 20.98 | 21.48  | 21.96 |
| 30        | 30.87 | 26.71 | 28.15 | 28.95  | 29.70 |
| 40        | 30.60 | 28.57 | 29.02 | 30.44  | 30.85 |
| 50        | 30.69 | 28.66 | 29.07 | 29.47  | 29.97 |
| 60        | 30.68 | 28.67 | 29.10 | 29.57  | 30.06 |
| 70        | 30.62 | 28.45 | 28.89 | 29.33  | 29.73 |
| 80        | 30.67 | 28.64 | 29.09 | 29.58  | 30.00 |
| 90        | 30.59 | 28.51 | 28.95 | 29.36  | 29.80 |
| 100       | 30.65 | 28.62 | 29.07 | 29.51  | 30.00 |
| 110       | 30.70 | 28.60 | 29.07 | 29.57  | 30.01 |

## Modulation Deviation of Mid Channel



## 4.8 RF OUTPUT POWER

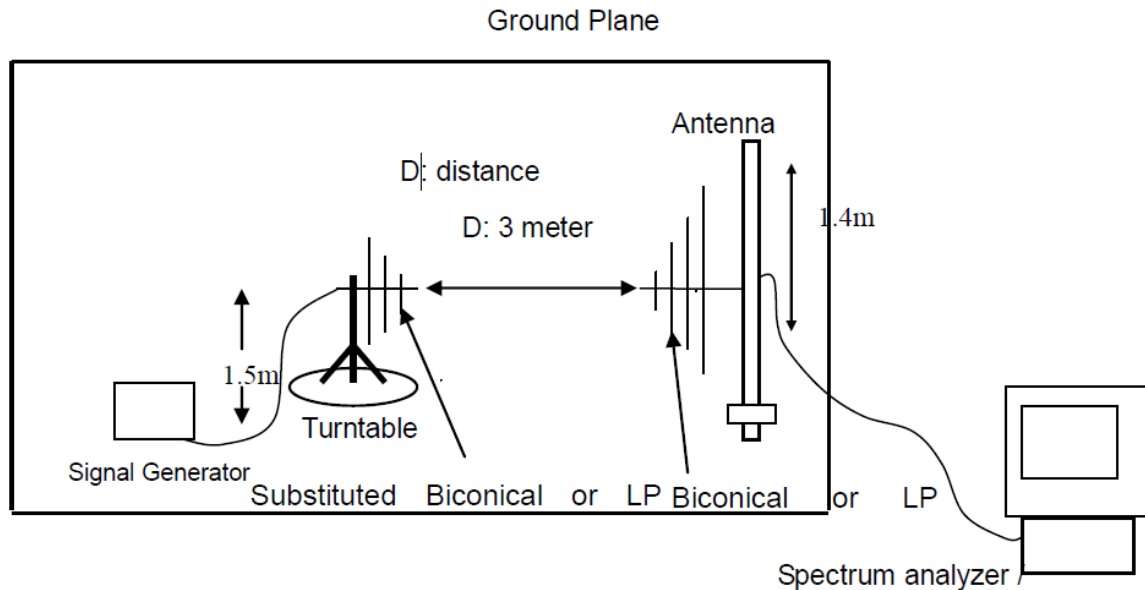
### TEST LIMIT

According to CFR 47 section 74.861 e (1), the power of the measured unmodulated carrier power at the output of the transmitter power amplifier (antenna input power) may not exceed the following:

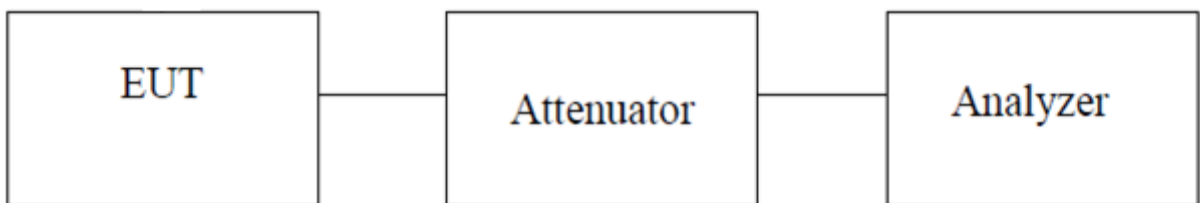
- (i) 54-72, 76-88, and 174-216 MHz bands: 50 mW EIRP
- (ii) 470-608 and 614-698: 250 mW conducted power
- (iii) 600 MHz duplex gap: 20 mW EIRP

### TEST CONFIGURATION

#### Radiation



#### Conduction



### TEST PROCEDURE(Radiation)

- a. On a test site, the EUT shall be placed on a turntable and in the position closest to the normal use as declared by the user.
- b. The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the transmitter.
- c. The output of the antenna shall be connected to the measuring receiver and either a peak or quasi-peak detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.
- d. The transmitter shall be switched on; if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.
- e. The test antenna shall be raised and lowered through the specified range of height until the measuring receiver detects a maximum signal level.
- f. The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
- g. The test antenna shall be raised and lowered again through the specified range of height until the measuring receiver detects a maximum signal level.



- h The maximum signal level detected by the measuring receiver shall be noted.
- i The measurement shall be repeated with the test antenna set to horizontal polarization.
- j Replace the antenna with a proper Antenna (substitution antenna).
- k The substitution antenna shall be oriented for vertical polarization and, if necessary, the length of the substitution antenna shall be adjusted to correspond to the frequency of transmitting.
- l The substitution antenna shall be connected to a calibrated signal generator.
- m If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
- n The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.
- o The input signal to substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.
- p The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
- q The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.

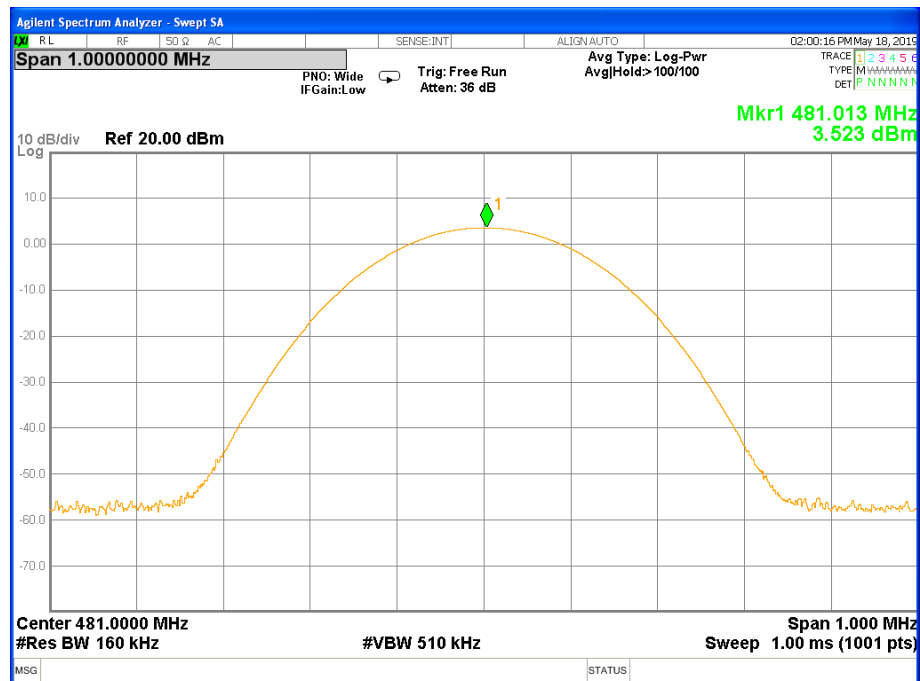
#### TEST PROCEDURE (Conduction)

- a. The RF output of the transceiver was connected to the input of the spectrum analyzer through sufficient attenuation.
- b. Set the RBW  $>20\text{BW}$ , VBW  $>3\text{RBW}$ .
- c. Detector = peak.
- d. Sweep time = auto couple.
- e. Trace mode = max hold.
- f. Allow trace to fully stabilize.
- g. Use the peak marker function to determine the maximum amplitude level.

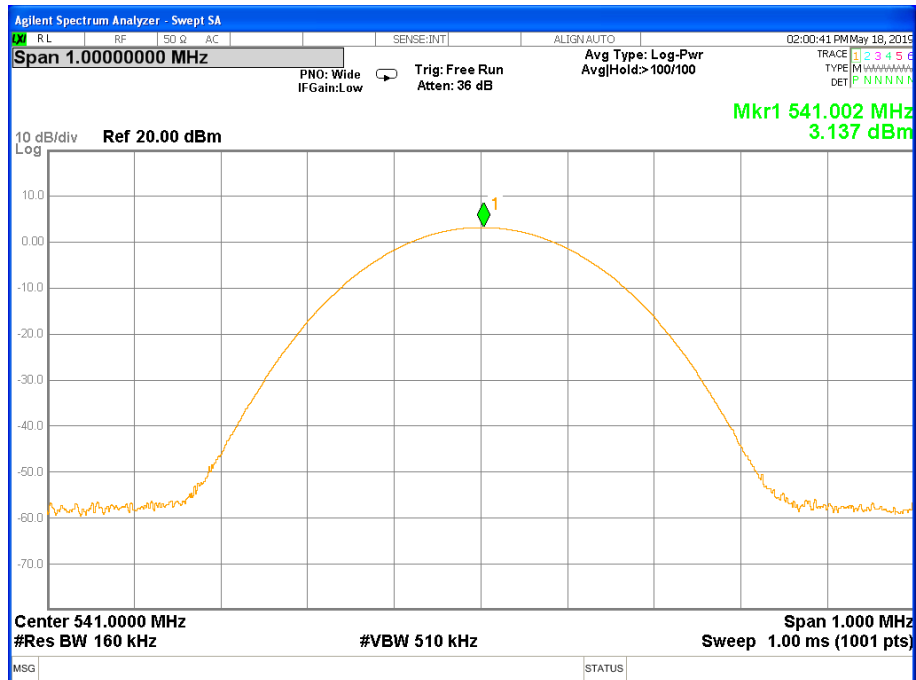
## TEST RESULT

| Frequency Channel (MHz) | Peak Output Power (dBm) | Transmitter Power (mW) | Limits (mW) |
|-------------------------|-------------------------|------------------------|-------------|
| 481                     | 3.523                   | 2.251                  | 250         |
| 541                     | 3.137                   | 2.059                  | 250         |
| 599                     | 2.575                   | 1.809                  | 250         |

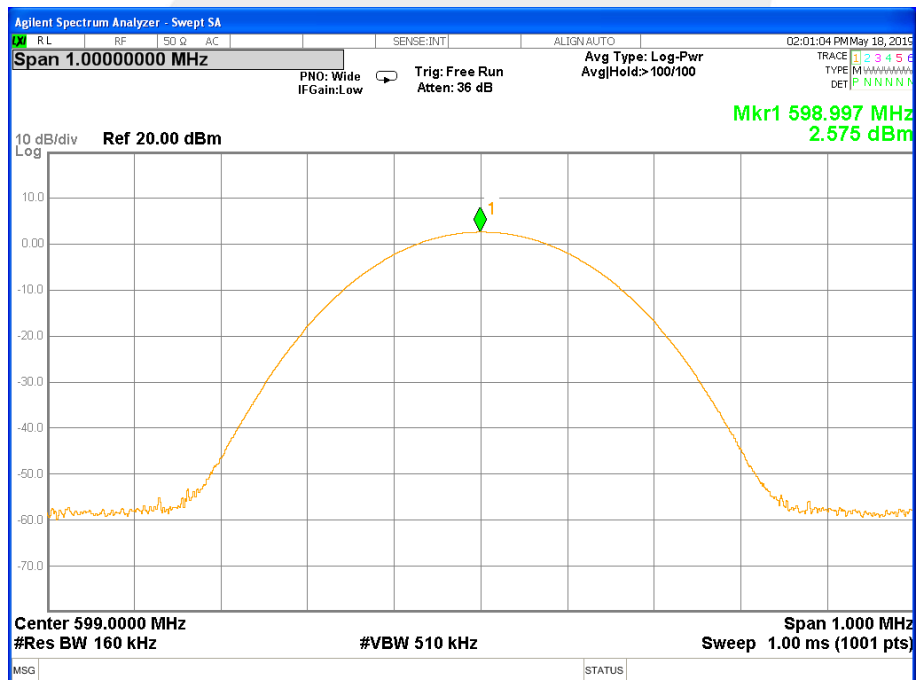
## Low Channel



## Mid Channel



## High Channel





## PHOTOS OF TEST SETUP

Note: See test photos in setup photo document for the actual connections between Product and support equipment.

※※※※※END OF THE REPORT※※※※※

