



# TEST REPORT

**APPLICANT** : MiMOMax Wireless Limited  
**PRODUCT NAME** : 900MHz TornadoX Transceiver  
**MODEL NAME** : MWL-TORNADOX-BGCD  
**BRAND NAME** : Ubiik Mimomax  
**FCC ID** : XMK-MMXTRNXB012  
**STANDARD(S)** : 47 CFR Part 2  
                  : 47 CFR Part 24  
**RECEIPT DATE** : 2024-06-20  
**TEST DATE** : 2024-07-11 to 2025-01-08  
**ISSUE DATE** : 2025-07-14

Tested by:

Gan Jing ( Rapporteur)

Approved by:

Shen Junsheng( Supervisor)

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## DIRECTORY

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| Change History |            |                   |
|----------------|------------|-------------------|
| Issue          | Date       | Reason for change |
| 1.0            | 2025-07-14 | First edition     |



# 1. Technical Information

**Note:** Provide by applicant.

## 1.1. Applicant and Manufacturer Information

|                              |   |
|------------------------------|---|
| <b>Applicant:</b>            | MiMOMax Wireless Limited                          |
| <b>Applicant Address:</b>    | 540 Wairakei Road, Christchurch 8053, New Zealand |
| <b>Manufacturer:</b>         | MiMOMax Wireless Limited                          |
| <b>Manufacturer Address:</b> | 540 Wairakei Road, Christchurch 8053, New Zealand |

## 1.2. Equipment Under Test (EUT) Description

|                                   |                               |            |  |
|-----------------------------------|-------------------------------|------------|--|
| <b>Product Name:</b>              | 900MHz TornadoX Transceiver   |            |  |
| <b>EUT Serial No:</b>             | (N/A, marked 1# by test site) |            |  |
| <b>Hardware Version:</b>          | P001                          |            |  |
| <b>Software Version:</b>          | TRN_04.08.04                  |            |  |
| <b>Operating Frequency Range:</b> | 901-902 MHz, 2Tx/2Rx          |            |  |
| <b>Channel Bandwidth:</b>         | 12.5kHz; 25kHz; 50kHz         |            |  |
| <b>Modulation Type:</b>           | QPSK; 16QAM; 64QAM; 256QAM    |            |  |
| <b>Operating Voltage:</b>         | 10.5-60V                      |            |  |
| <b>Antenna Gain:</b>              | Omni Antenna                  | 2.5 dBi    |  |
|                                   |                               | 4.0 dBi    |  |
|                                   |                               | 6.0 dBi    |  |
|                                   |                               | 8.0 dBi    |  |
|                                   | Panel Antenna                 | 8.0 dBi    |  |
|                                   |                               | 10.0 dBi   |  |
|                                   |                               | 12.0 dBi   |  |
| <b>Emission Designator:</b>       | Parabolic Antenna             | 16.0 dBi   |  |
|                                   |                               | 21.5 dBi   |  |
|                                   | BW(kHz)                       | Designator |  |
|                                   | 12.5kHz                       | 10K0W1W    |  |
|                                   | 25.0kHz                       | 20K0W1W    |  |
|                                   | 50.0kHz                       | 42K0W1W    |  |



## 1.3. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 2 and Part 24 for the EUT FCC ID Certification:

| No. | Identity       | Document Title  |
|-----|----------------|---|
| 1   | 47 CFR Part 2  | Frequency Allocations and Radio Treaty Matters; General Rules and Regulations |
| 2   | 47 CFR Part 24 | Personal Communications Services  |

Test detailed items/section required by FCC rules and results are listed as below:

| Section          | Description   | Test Engineer | Result | Method Determination /Remark |
|------------------|---|---------------|--------|------------------------------|
| 2.1046<br>24.132 | Transmitter<br>Conducted Output<br>Power and ERP/EIRP | Gan Jing      | PASS   | No deviation                 |
| 2.1049           | Occupied Bandwidth                                    | Gan Jing      | PASS   | No deviation                 |
| 2.1051<br>24.133 | Conducted Spurious<br>Emissions                       | Gan Jing      | PASS   | No deviation                 |
| 2.1053<br>24.133 | Radiated Spurious<br>Emissions                        | Li Hanbin     | PASS   | No deviation                 |
| 2.1055<br>24.135 | Frequency stability                                   | Gan Jing      | PASS   | No deviation                 |

**Note 1:** The TornadoX Transceiver complies with FCC 47 CFR Part 2 and Part 24 when tested in accordance with the test methods described in 47 CFR Part 2 and Part 24.

**Note 2:** The TornadoX Transceiver supports 2 Tx antenna ports, which was defined as Channel H &Channel V separately.

**Note 3:** The path loss during the conducted RF test is calibrated to correct the results by the Ext Gain setting. The Ext Gain contains two parts that cable loss of 0.7B and attenuator of 30.0dB.

**Note 4:** When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% confidence intervals.

**Note 5:** The prototype has two kinds of power under different conditions, we define Type 1 in the case of 28dBm power and Type 2 in the case of 34dBm power. In this report, we have recorded the test data of type 2.



## 1.4. Environmental Conditions

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

|                        |         |
|------------------------|---------|
| Temperature (°C):      | 15 - 35 |
| Relative Humidity (%): | 30 -60  |



## 2. Summary Test Results And Description

### 2.1. Radio Frequency Power Output and E.R.P.

#### 2.1.1. Test result

##### Type 1:

Nominal Frequency: 901.5 MHz Tx Port: Channel H

| Channel Bandwidth (kHz) | Modulation Type | Voltage (Vdc) | Measured Power (dBm) | Measured Power (Watt) | Rated Power (Watt) | E.R.P. (ANT Gain = 4.0dBi) |       | E.R.P. (ANT Gain = 12.0dBi) |       |
|-------------------------|-----------------|---------------|----------------------|-----------------------|--------------------|----------------------------|-------|-----------------------------|-------|
|                         |                 |               |                      |                       |                    | dBm                        | Watt  | dBm                         | Watt  |
| 12.5                    | QPSK            | 24            | 27.82                | 0.605                 | 0.63               | 29.67                      | 0.927 | 37.67                       | 5.848 |
| 12.5                    | 16QAM           | 24            | 27.66                | 0.583                 | 0.63               | 29.51                      | 0.893 | 37.51                       | 5.636 |
| 12.5                    | 64QAM           | 24            | 28.19                | 0.659                 | 0.63               | 30.04                      | 1.009 | 38.04                       | 6.368 |
| 12.5                    | 256QAM          | 24            | 28.21                | 0.662                 | 0.63               | 30.06                      | 1.014 | 38.06                       | 6.397 |
| <hr/>                   |                 |               |                      |                       |                    |                            |       |                             |       |
| 25.0                    | QPSK            | 24            | 27.60                | 0.575                 | 0.63               | 29.45                      | 0.881 | 37.45                       | 5.559 |
| 25.0                    | 16QAM           | 24            | 27.80                | 0.603                 | 0.63               | 29.65                      | 0.923 | 37.65                       | 5.821 |
| 25.0                    | 64QAM           | 24            | 28.23                | 0.665                 | 0.63               | 30.08                      | 1.019 | 38.08                       | 6.427 |
| 25.0                    | 256QAM          | 24            | 28.11                | 0.647                 | 0.63               | 29.96                      | 0.991 | 37.96                       | 6.252 |
| <hr/>                   |                 |               |                      |                       |                    |                            |       |                             |       |
| 50.0                    | QPSK            | 24            | 27.28                | 0.535                 | 0.63               | 29.13                      | 0.818 | 37.13                       | 5.164 |
| 50.0                    | 16QAM           | 24            | 27.26                | 0.532                 | 0.63               | 29.11                      | 0.815 | 37.11                       | 5.140 |
| 50.0                    | 64QAM           | 24            | 27.45                | 0.556                 | 0.63               | 29.30                      | 0.851 | 37.30                       | 5.370 |
| 50.0                    | 256QAM          | 24            | 27.67                | 0.585                 | 0.63               | 29.52                      | 0.895 | 37.52                       | 5.649 |

Nominal Frequency: 901.5 MHz Tx Port: Channel V

| Channel Bandwidth (kHz) | Modulation Type | Voltage (Vdc) | Measured Power (dBm) | Measured Power (Watt) | Rated Power (Watt) | E.R.P. (ANT Gain = 4.0dBi) |       | E.R.P. (ANT Gain = 12.0dBi) |       |
|-------------------------|-----------------|---------------|----------------------|-----------------------|--------------------|----------------------------|-------|-----------------------------|-------|
|                         |                 |               |                      |                       |                    | dBm                        | Watt  | dBm                         | Watt  |
| 12.5                    | QPSK            | 24            | 27.99                | 0.630                 | 0.63               | 29.84                      | 0.964 | 37.84                       | 6.081 |
| 12.5                    | 16QAM           | 24            | 27.76                | 0.597                 | 0.63               | 29.61                      | 0.914 | 37.61                       | 5.768 |
| 12.5                    | 64QAM           | 24            | 28.25                | 0.668                 | 0.63               | 30.10                      | 1.023 | 38.10                       | 6.457 |
| 12.5                    | 256QAM          | 24            | 28.29                | 0.675                 | 0.63               | 30.14                      | 1.033 | 38.14                       | 6.516 |
| <hr/>                   |                 |               |                      |                       |                    |                            |       |                             |       |
| 25.0                    | QPSK            | 24            | 28.19                | 0.659                 | 0.63               | 30.04                      | 1.009 | 38.04                       | 6.368 |



|       |        |    |       |       |      |       |       |       |       |
|-------|--------|----|-------|-------|------|-------|-------|-------|-------|
| 25.0  | 16QAM  | 24 | 28.05 | 0.638 | 0.63 | 29.90 | 0.977 | 37.90 | 6.166 |
| 25.0  | 64QAM  | 24 | 27.94 | 0.622 | 0.63 | 29.79 | 0.953 | 37.79 | 6.012 |
| 25.0  | 256QAM | 24 | 28.31 | 0.678 | 0.63 | 30.16 | 1.038 | 38.16 | 6.546 |
| <hr/> |        |    |       |       |      |       |       |       |       |
| 50.0  | QPSK   | 24 | 28.00 | 0.631 | 0.63 | 29.85 | 0.966 | 37.85 | 6.095 |
| 50.0  | 16QAM  | 24 | 27.84 | 0.608 | 0.63 | 29.69 | 0.931 | 37.69 | 5.875 |
| 50.0  | 64QAM  | 24 | 28.05 | 0.638 | 0.63 | 29.90 | 0.977 | 37.90 | 6.166 |
| 50.0  | 256QAM | 24 | 28.43 | 0.697 | 0.63 | 30.28 | 1.067 | 38.28 | 6.730 |

**Type 2:****Nominal Frequency: 901.5 MHz Tx Port: Channel H**

| Channel Bandwidth (kHz) | Modulation Type | Voltage (Vdc) | Measured Power (dBm) | Measured Power (Watt) | Rated Power (Watt) | E.R.P. (ANT Gain = 4.0dBi) |       | E.R.P. (ANT Gain = 6.0dBi) |       |
|-------------------------|-----------------|---------------|----------------------|-----------------------|--------------------|----------------------------|-------|----------------------------|-------|
|                         |                 |               |                      |                       |                    | dBm                        | Watt  | dBm                        | Watt  |
| 12.5                    | QPSK            | 24            | 33.66                | 2.323                 | 2.50               | 35.51                      | 3.556 | 37.51                      | 5.636 |
| 12.5                    | 16QAM           | 24            | 33.61                | 2.296                 | 2.50               | 35.46                      | 3.516 | 37.46                      | 5.572 |
| 12.5                    | 64QAM           | 24            | 33.91                | 2.460                 | 2.50               | 35.76                      | 3.767 | 37.76                      | 5.970 |
| 12.5                    | 256QAM          | 24            | 33.72                | 2.355                 | 2.50               | 35.57                      | 3.606 | 37.57                      | 5.715 |
| <hr/>                   |                 |               |                      |                       |                    |                            |       |                            |       |
| 25.0                    | QPSK            | 24            | 34.02                | 2.523                 | 2.50               | 35.87                      | 3.864 | 37.87                      | 6.124 |
| 25.0                    | 16QAM           | 24            | 33.77                | 2.382                 | 2.50               | 35.62                      | 3.648 | 37.62                      | 5.781 |
| 25.0                    | 64QAM           | 24            | 34.08                | 2.559                 | 2.50               | 35.93                      | 3.917 | 37.93                      | 6.209 |
| 25.0                    | 256QAM          | 24            | 33.91                | 2.460                 | 2.50               | 35.76                      | 3.767 | 37.76                      | 5.970 |
| <hr/>                   |                 |               |                      |                       |                    |                            |       |                            |       |
| 50.0                    | QPSK            | 24            | 33.73                | 2.360                 | 2.50               | 35.58                      | 3.614 | 37.58                      | 5.728 |
| 50.0                    | 16QAM           | 24            | 33.91                | 2.460                 | 2.50               | 35.76                      | 3.767 | 37.76                      | 5.970 |
| 50.0                    | 64QAM           | 24            | 33.83                | 2.415                 | 2.50               | 35.68                      | 3.698 | 37.68                      | 5.861 |
| 50.0                    | 256QAM          | 24            | 34.12                | 2.582                 | 2.50               | 35.97                      | 3.954 | 37.97                      | 6.266 |

**Nominal Frequency: 901.5 MHz Tx Port: Channel V**

| Channel Bandwidth (kHz) | Modulation Type | Voltage (Vdc) | Measured Power (dBm) | Measured Power (Watt) | Rated Power (Watt) | E.R.P. (ANT Gain = 4.0dBi) |       | E.R.P. (ANT Gain = 6.0dBi) |       |
|-------------------------|-----------------|---------------|----------------------|-----------------------|--------------------|----------------------------|-------|----------------------------|-------|
|                         |                 |               |                      |                       |                    | dBm                        | Watt  | dBm                        | Watt  |
| 12.5                    | QPSK            | 24            | 33.90                | 2.455                 | 2.50               | 35.75                      | 3.758 | 37.75                      | 5.957 |
| 12.5                    | 16QAM           | 24            | 33.74                | 2.366                 | 2.50               | 35.59                      | 3.622 | 37.59                      | 5.741 |
| 12.5                    | 64QAM           | 24            | 34.10                | 2.570                 | 2.50               | 35.95                      | 3.936 | 37.95                      | 6.237 |
| 12.5                    | 256QAM          | 24            | 33.75                | 2.371                 | 2.50               | 35.60                      | 3.631 | 37.60                      | 5.754 |



| 25.0  | QPSK   | 24 | 33.49 | 2.234 | 2.50 | 35.34 | 3.420 | 37.34 | 5.420 |
|-------|--------|----|-------|-------|------|-------|-------|-------|-------|
| 25.0  | 16QAM  | 24 | 33.56 | 2.270 | 2.50 | 35.41 | 3.475 | 37.41 | 5.508 |
| 25.0  | 64QAM  | 24 | 33.85 | 2.427 | 2.50 | 35.70 | 3.715 | 37.70 | 5.888 |
| 25.0  | 256QAM | 24 | 33.82 | 2.410 | 2.50 | 35.67 | 3.690 | 37.67 | 5.848 |
| <hr/> |        |    |       |       |      |       |       |       |       |
| 50.0  | QPSK   | 24 | 34.09 | 2.564 | 2.50 | 35.94 | 3.926 | 37.94 | 6.223 |
| 50.0  | 16QAM  | 24 | 34.14 | 2.594 | 2.50 | 35.99 | 3.972 | 37.99 | 6.295 |
| 50.0  | 64QAM  | 24 | 34.16 | 2.606 | 2.50 | 36.01 | 3.990 | 38.01 | 6.324 |
| 50.0  | 256QAM | 24 | 34.18 | 2.618 | 2.50 | 36.03 | 4.009 | 38.03 | 6.353 |

**Note1:** Measurements were carried out at the RF output terminals of the transmitter using spectrum analyzer. The path loss during the conducted RF test is calibrated to correct the results by the Ext Gain setting. The Ext Gain contains two parts that cable loss of 0.7B and attenuator of 30.0dB.

**Note 2:** The transmitter has a rated output power of .2.512 Watt (34dBm).The measured power has been shown to be within +/- 1 dB of the rated power.

**Note3:**E.I.R.P. (dBm) = Conducted Output Power (dBm) + Antenna Gain (dBi); E.R.P. (dBm) = E.I.R.P. (dBm) - 2.15.

**Note4:** Part 24 does not specify the transmitter output power.

Stations transmitting in the 901-902 MHz band are limited to 7 watts e.r.p.

**Note 5:** The product's antenna is a special MIMO antenna with cross-polarization which is able to transmit and receive on both the vertical and horizontal polarizations at the same time, the MIMO antennas are essentially two antennas in one.

**Note 6:** According to KDB 662911, the MIMO directional gain is the gain of an individual antenna.

**Note 7:** The DUT transmitter ports are completely uncorrelated. According to KDB 662911 the conducted power or E.R.P is measured on each port individually and it complies with the regulations.

**Note 8:** This product is based on the interactive calculation of erp limits and conducted power. In the 901-902MHz range, an antenna with a maximum gain of 12dBi can be used when the conducted power is 28dBm, or an antenna with a maximum gain of 6dBi can be used when the conducted power is 34dBm to meet the erp requirements.



## 2.2. Occupied Bandwidth

### 2.2.1. Definition

#### Emission Designator:

| Frequency (MHz) | BW(kHz) | Designator |
|-----------------|---------|------------|
| 901-902MHz      | 12.5kHz | 10K0W1W    |
|                 | 25.0kHz | 20K0W1W    |
|                 | 50.0kHz | 42K0W1W    |

Note: The above data combined with uncertainty and rounding calculations are consistent with the actual test data.

According to FCC section 2.1049, the occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

Occupied bandwidth is also known as the 99% emission bandwidth.

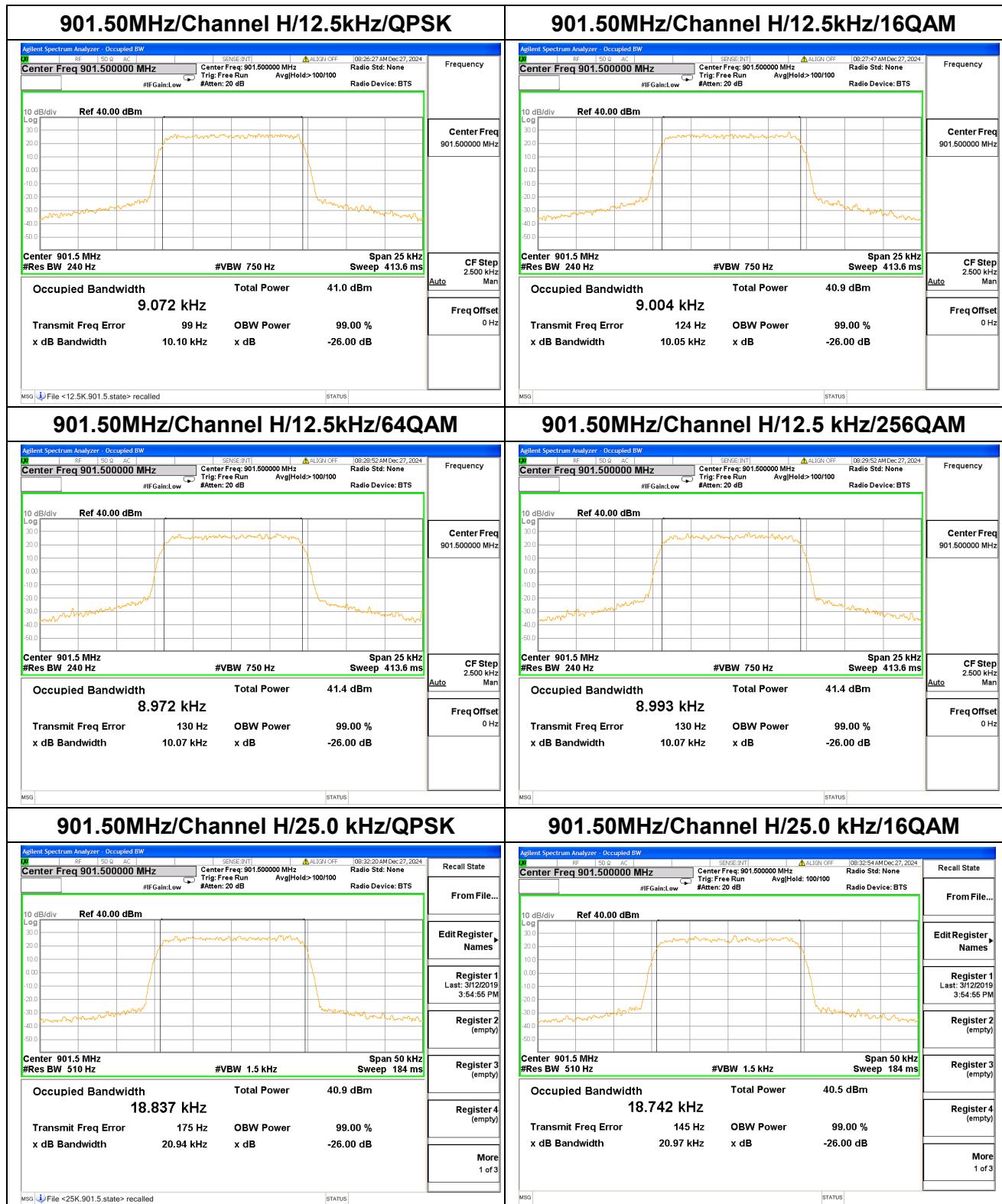
### 2.2.2. Test Description

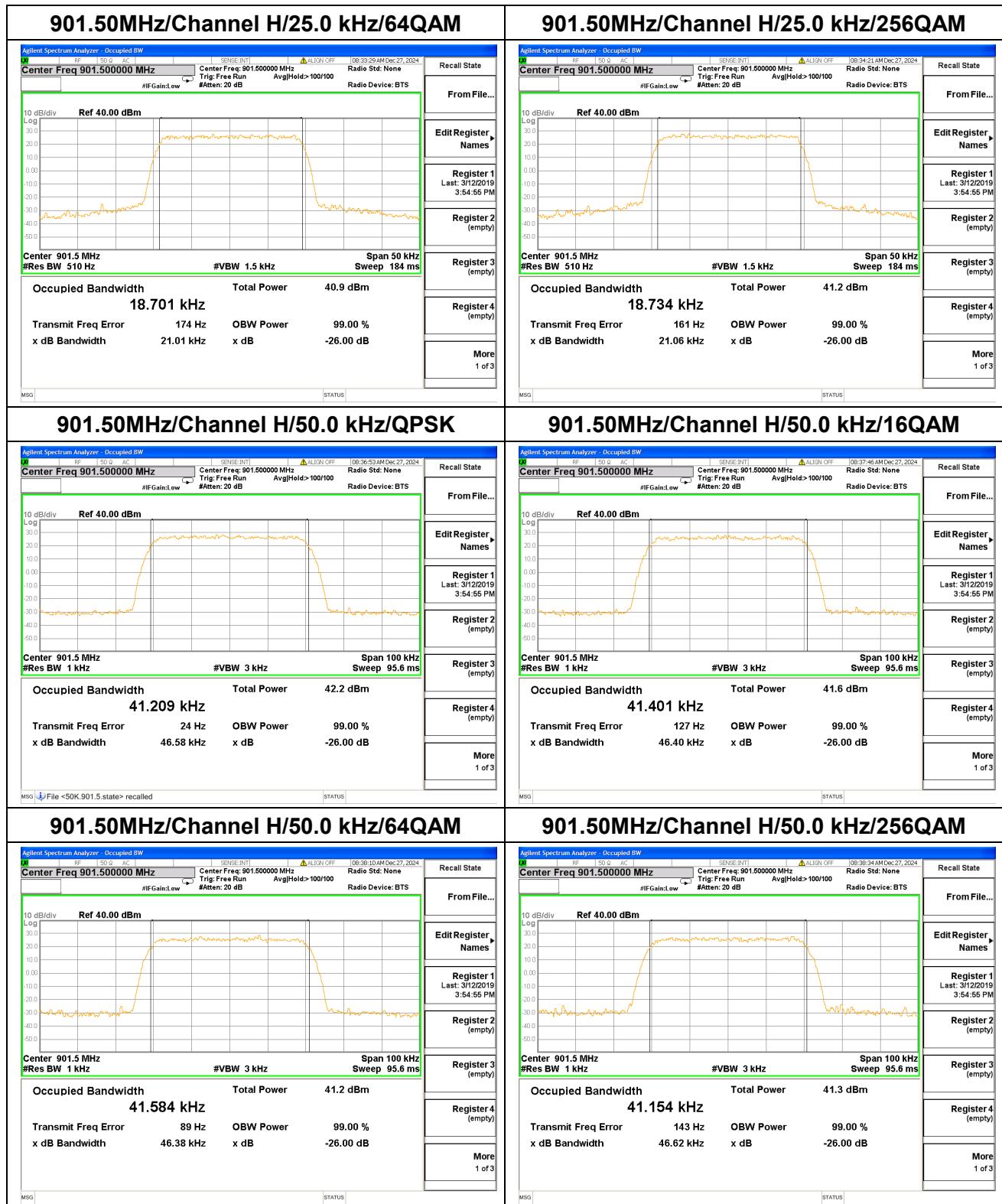
Measurements have been made of each modulation type using a spectrum analyzer operating in occupied bandwidth mode.

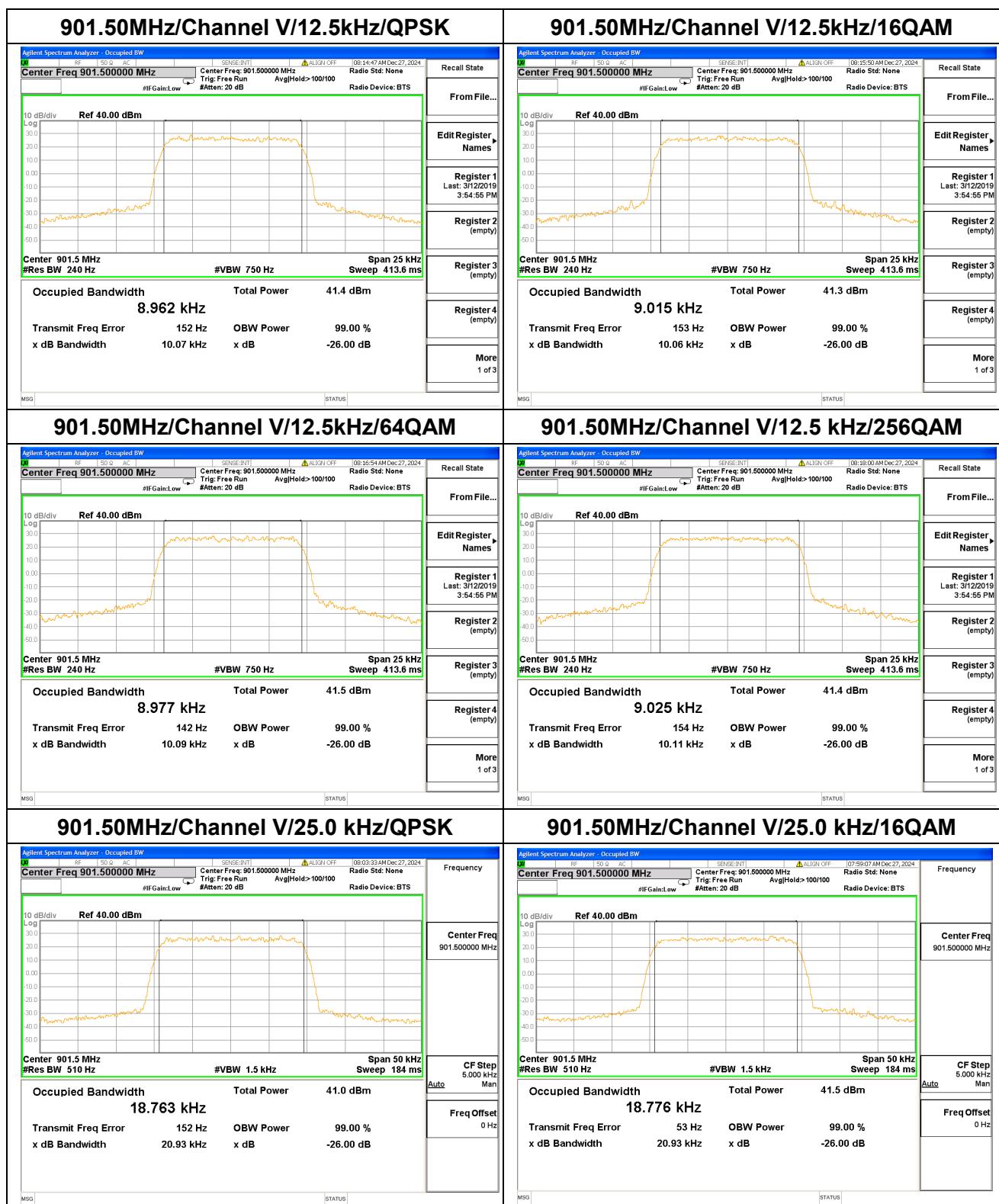


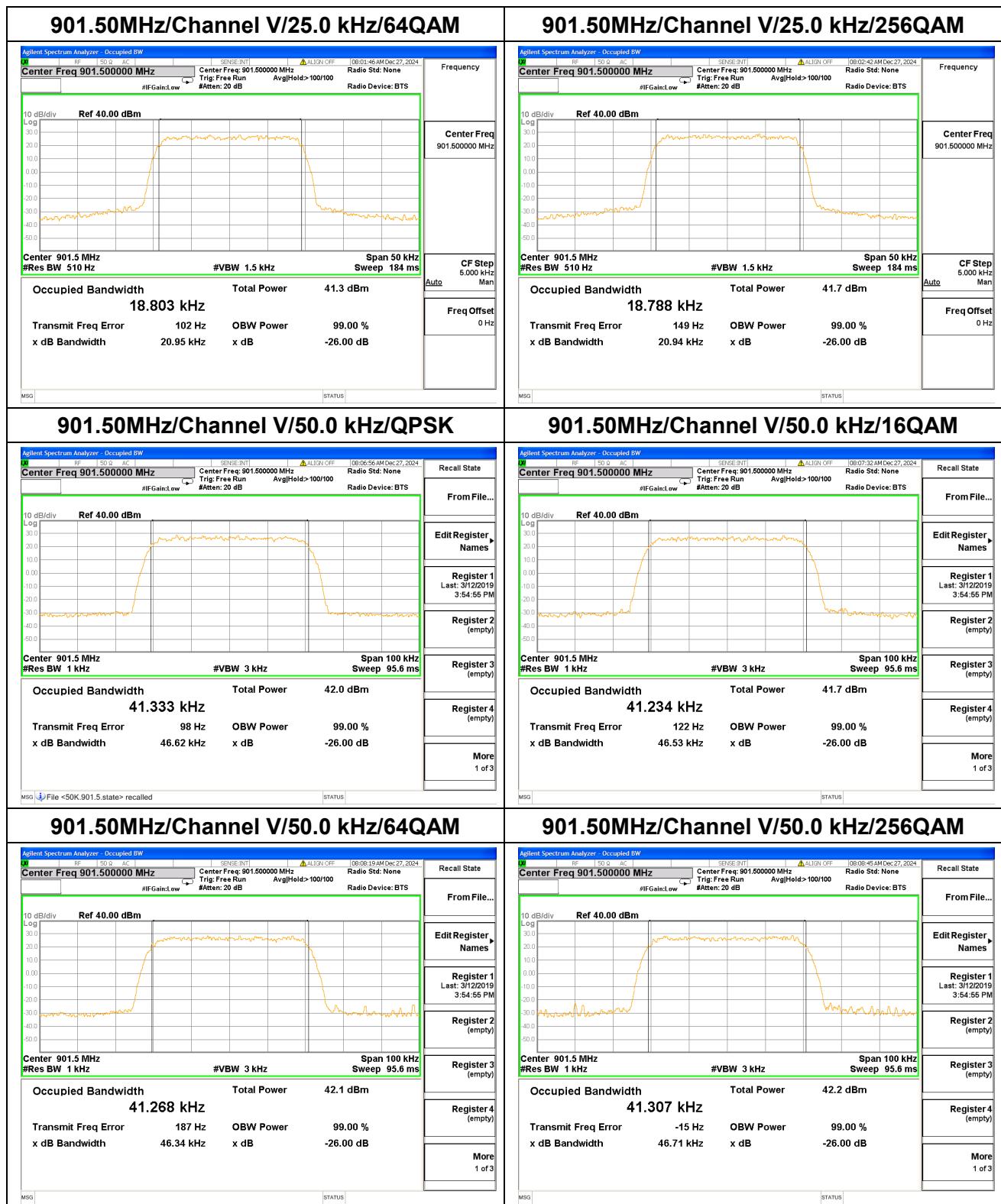
### 2.2.3. Test Result

| 901.50 MHz |                        |               |                         |
|------------|------------------------|---------------|-------------------------|
| Tx Port    | Channel Bandwidth(kHz) | Emission Type | Occupied Bandwidth(kHz) |
| H          | 12.5                   | QPSK          | 9.072                   |
|            |                        | 16QAM         | 9.004                   |
|            |                        | 64QAM         | 8.972                   |
|            |                        | 256QAM        | 8.993                   |
|            | 25.0                   | QPSK          | 18.837                  |
|            |                        | 16QAM         | 18.742                  |
|            |                        | 64QAM         | 18.701                  |
|            |                        | 256QAM        | 18.743                  |
|            | 50.0                   | QPSK          | 41.209                  |
|            |                        | 16QAM         | 41.401                  |
|            |                        | 64QAM         | 41.584                  |
|            |                        | 256QAM        | 41.154                  |
| V          | 12.5                   | QPSK          | 8.962                   |
|            |                        | 16QAM         | 9.015                   |
|            |                        | 64QAM         | 8.977                   |
|            |                        | 256QAM        | 9.025                   |
|            | 25.0                   | QPSK          | 18.763                  |
|            |                        | 16QAM         | 18.776                  |
|            |                        | 64QAM         | 18.803                  |
|            |                        | 256QAM        | 18.788                  |
|            | 50.0                   | QPSK          | 41.333                  |
|            |                        | 16QAM         | 41.234                  |
|            |                        | 64QAM         | 41.268                  |
|            |                        | 256QAM        | 41.307                  |











## 2.3. Spurious Emissions At Antenna Terminals

### 2.3.1. Test Requirement

According to FCC section 2.1051, 24.131 and 24. 133(a) section

The authorized bandwidth of narrowband PCS channels will be 10 kHz for 12.5 kHz channels and 45 kHz for 50 kHz channels. For aggregated adjacent channels, a maximum authorized bandwidth of 5 kHz less than the total aggregated channel width is permitted.

For transmitters authorized a bandwidth greater than 10 kHz:

1. On any frequency outside the authorized bandwidth and removed from the edge of the authorized bandwidth by a displacement frequency (fd in kHz) of up to and including 40 kHz: at least  $116 \text{ Log10} ((fd + 10)/6.1)$  decibels or 50 plus  $10 \text{ Log10} (P)$  decibels or 70 decibels, whichever is the lesser attenuation;
2. On any frequency outside the authorized bandwidth and removed from the edge of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 40 kHz: at least  $43 + 10 \text{ Log10} (P)$  decibels or 80 decibels, whichever is the lesser attenuation;

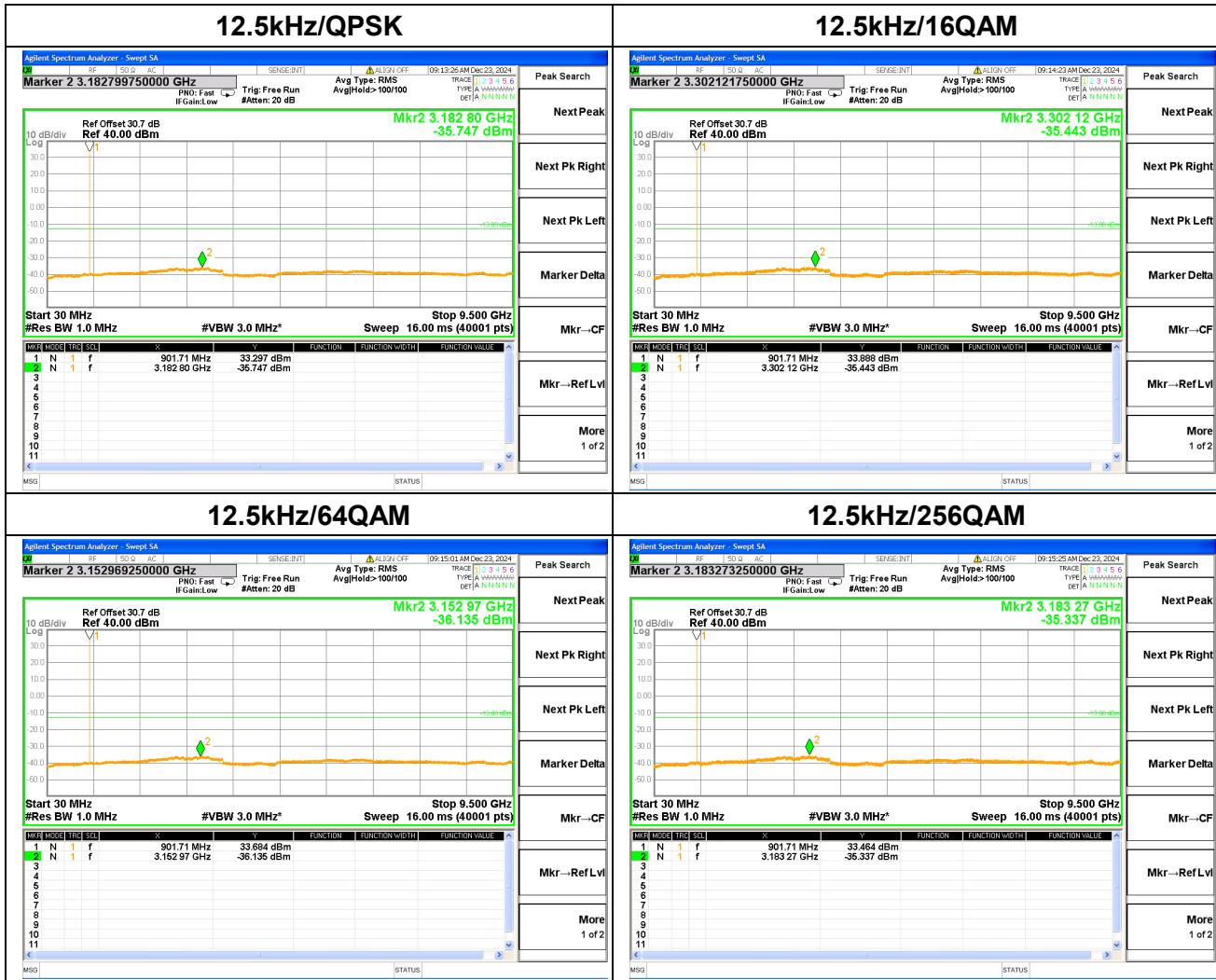
For transmitters authorized a bandwidth of 10 kHz:

1. On any frequency outside the authorized bandwidth and removed from the edge of the authorized bandwidth by a displacement frequency (fd in kHz) of up to and including 20 kHz: at least  $116 \times \text{Log10} ((fd + 5)/3.05)$  decibels or  $50 + 10 \times \text{Log10} (P)$  decibels or 70 decibels, whichever is the lesser attenuation;
2. On any frequency outside the authorized bandwidth and removed from the edge of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 20 kHz: at least  $43 + 10 \text{ Log10} (P)$  decibels or 80 decibels, whichever is the lesser attenuation.



### 2.3.2. Test Result

Nominal Frequency: 901.50 MHz Tx Port: Channel H





## 25.0kHz/QPSK



## 25.0kHz /16QAM



## 25.0kHz /64QAM



## 25.0kHz /256QAM



## 50.0kHz/QPSK

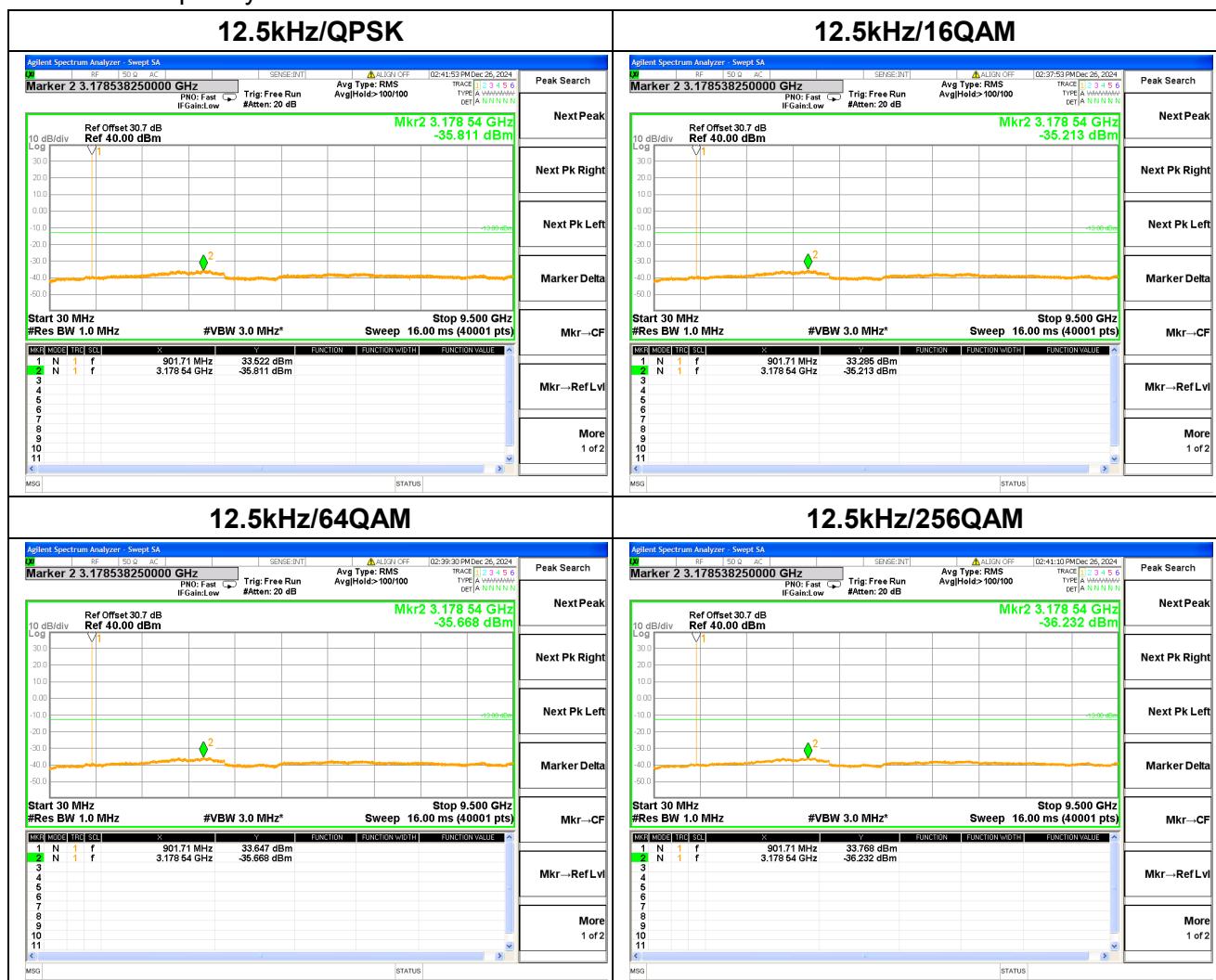


## 50.0kHz /16QAM



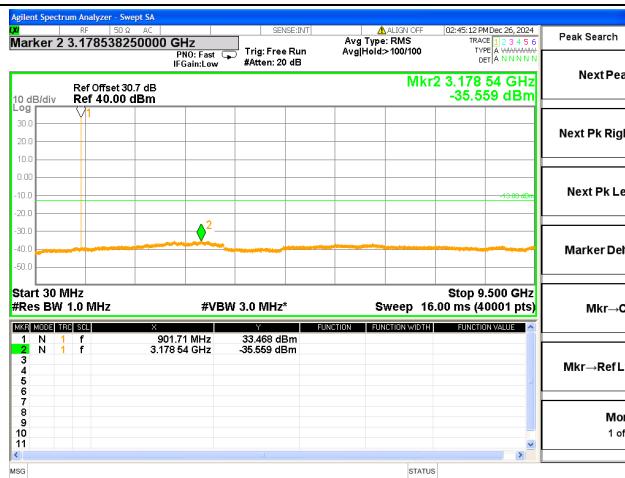


Nominal Frequency: 901.50 MHz Tx Port: Channel V

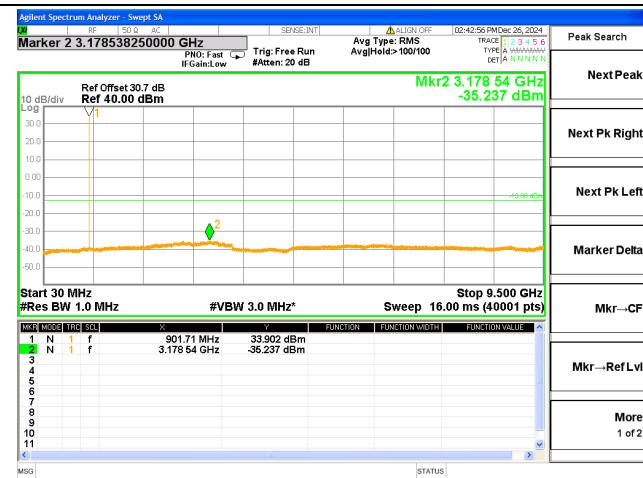




## 25.0kHz/QPSK



## 25.0kHz /16QAM



## 25.0kHz /64QAM



## 25.0kHz /256QAM



## 50.0kHz/QPSK

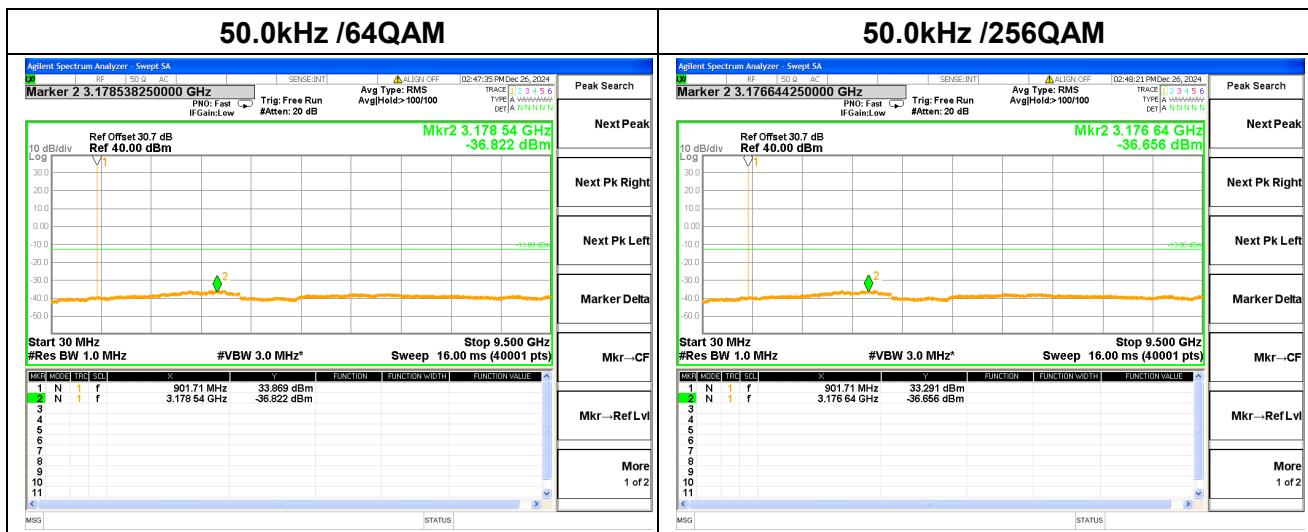


## 50.0kHz /16QAM





REPORT No.: SZ24060163W01



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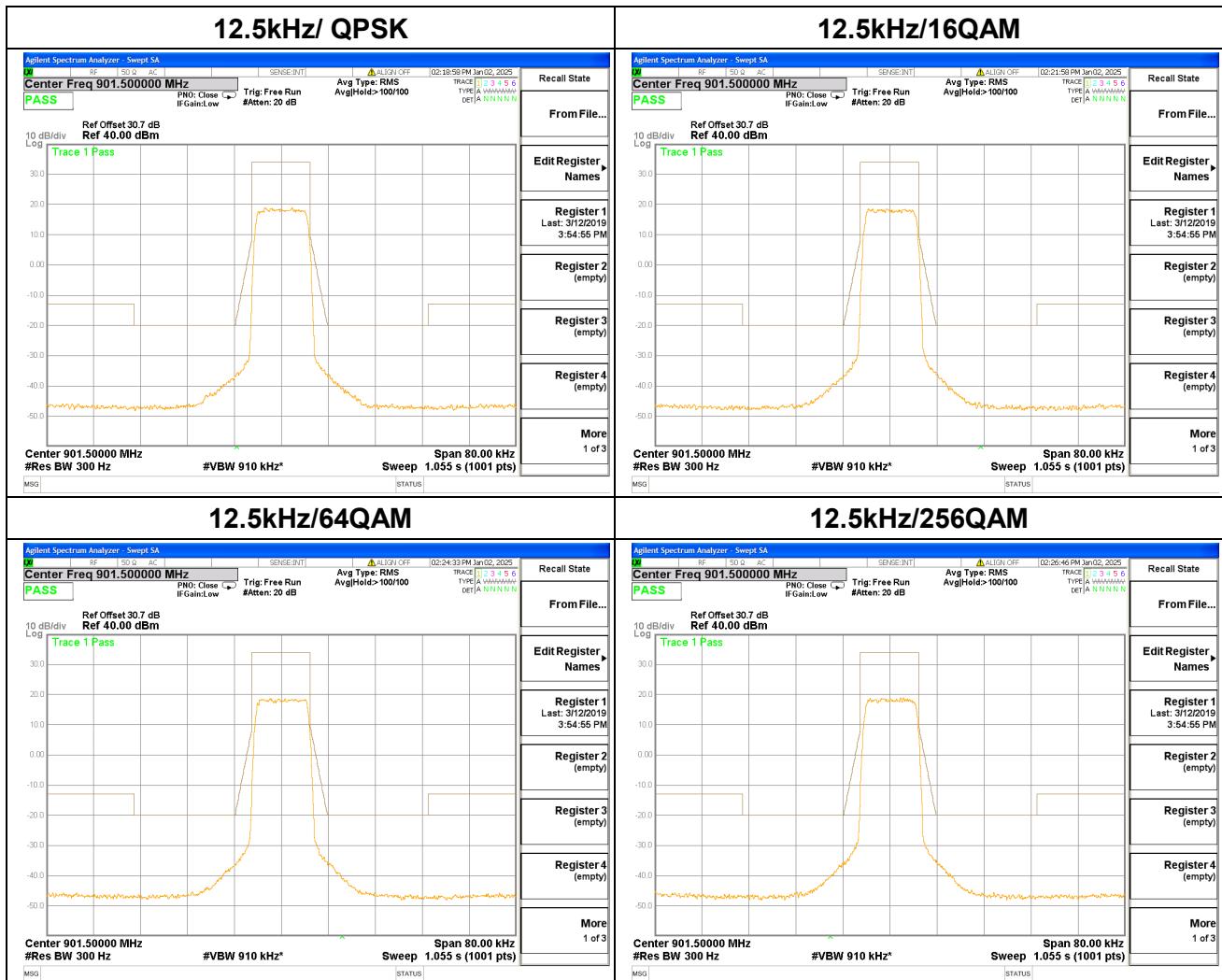
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REPORT No.: SZ24060163W01

Nominal Frequency: 901.50 MHz Tx Port: Channel H

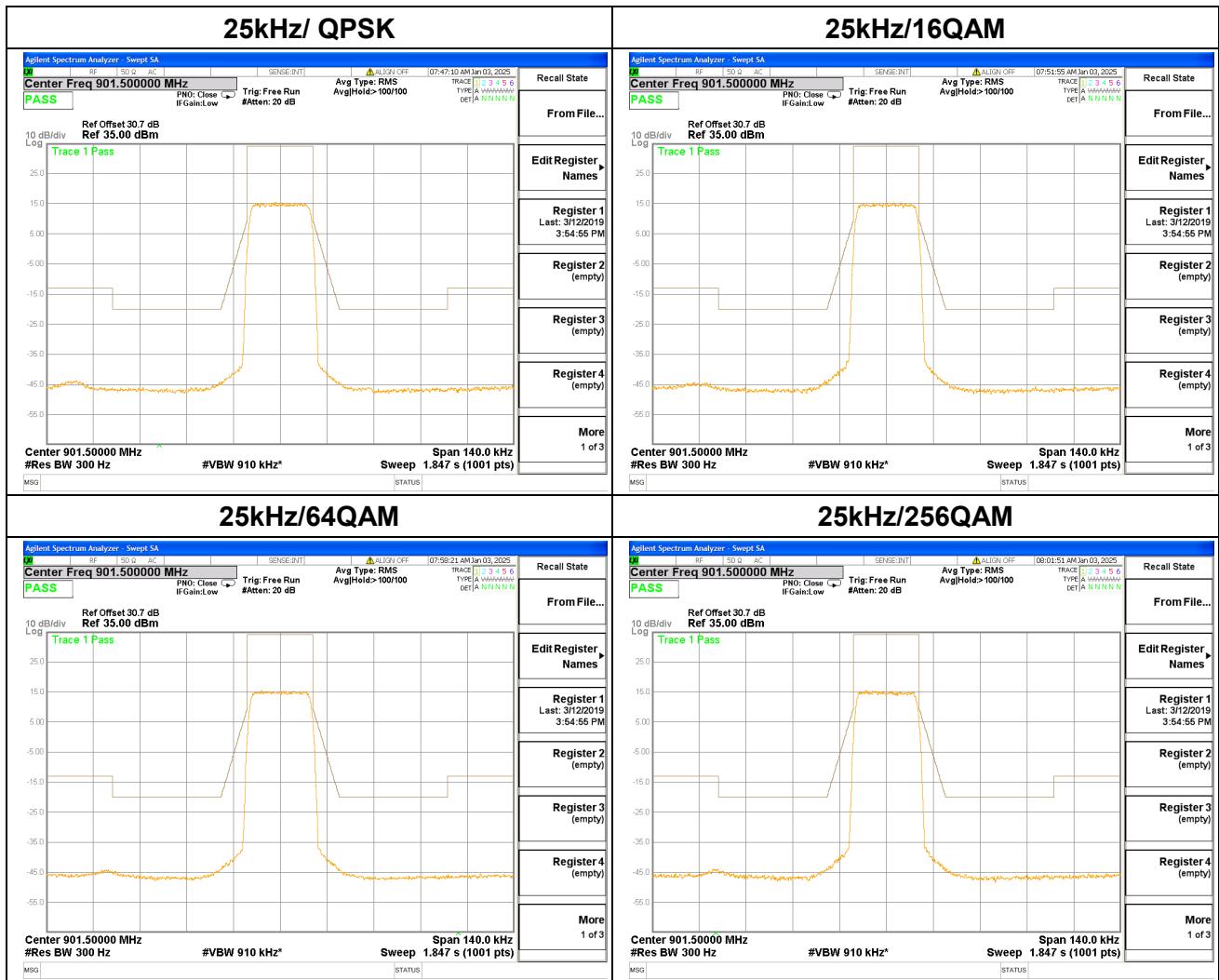
**MORLAB**

Shenzhen Morlab Communication Technology Co., Ltd.  
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Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China

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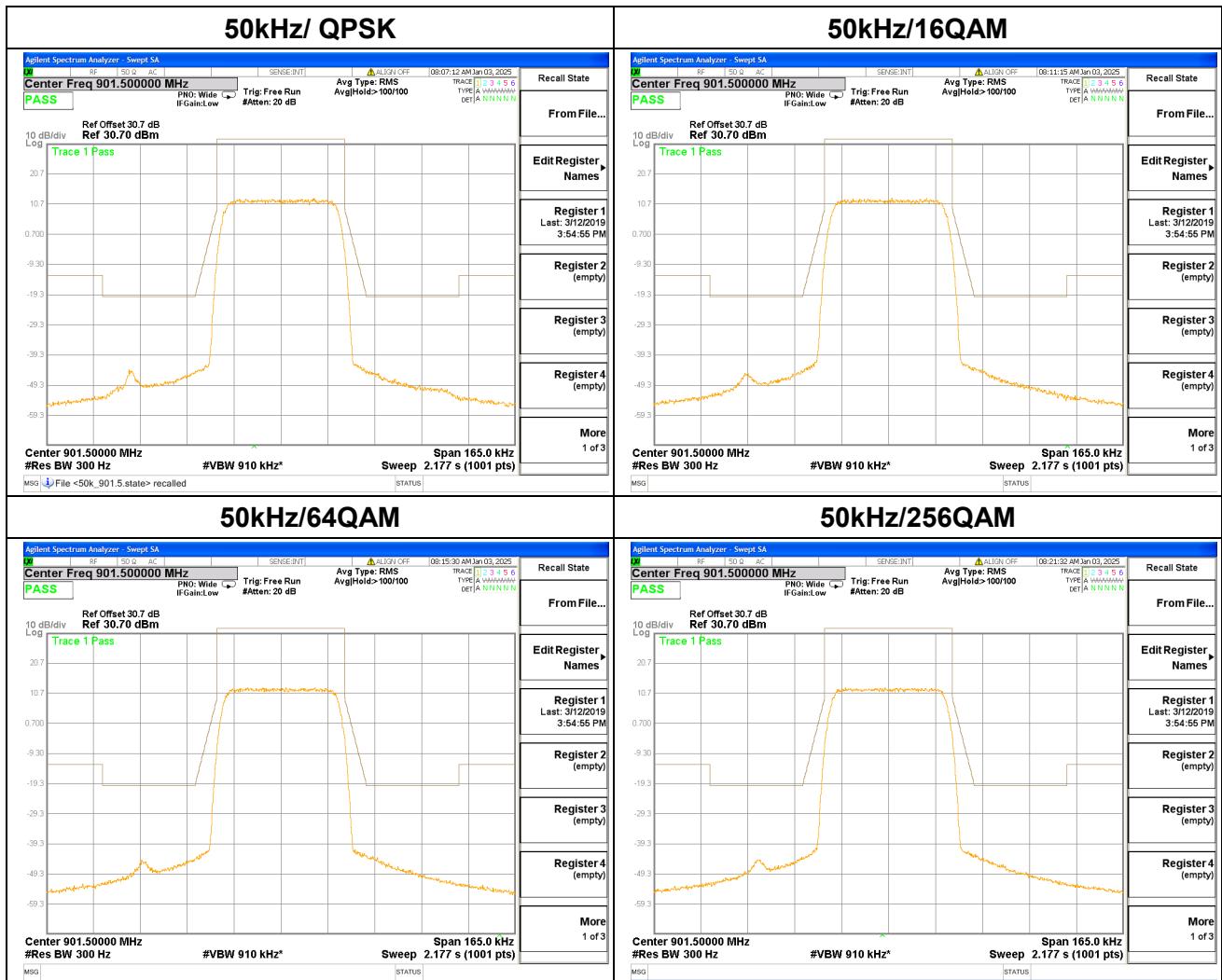


REPORT No.: SZ24060163W01

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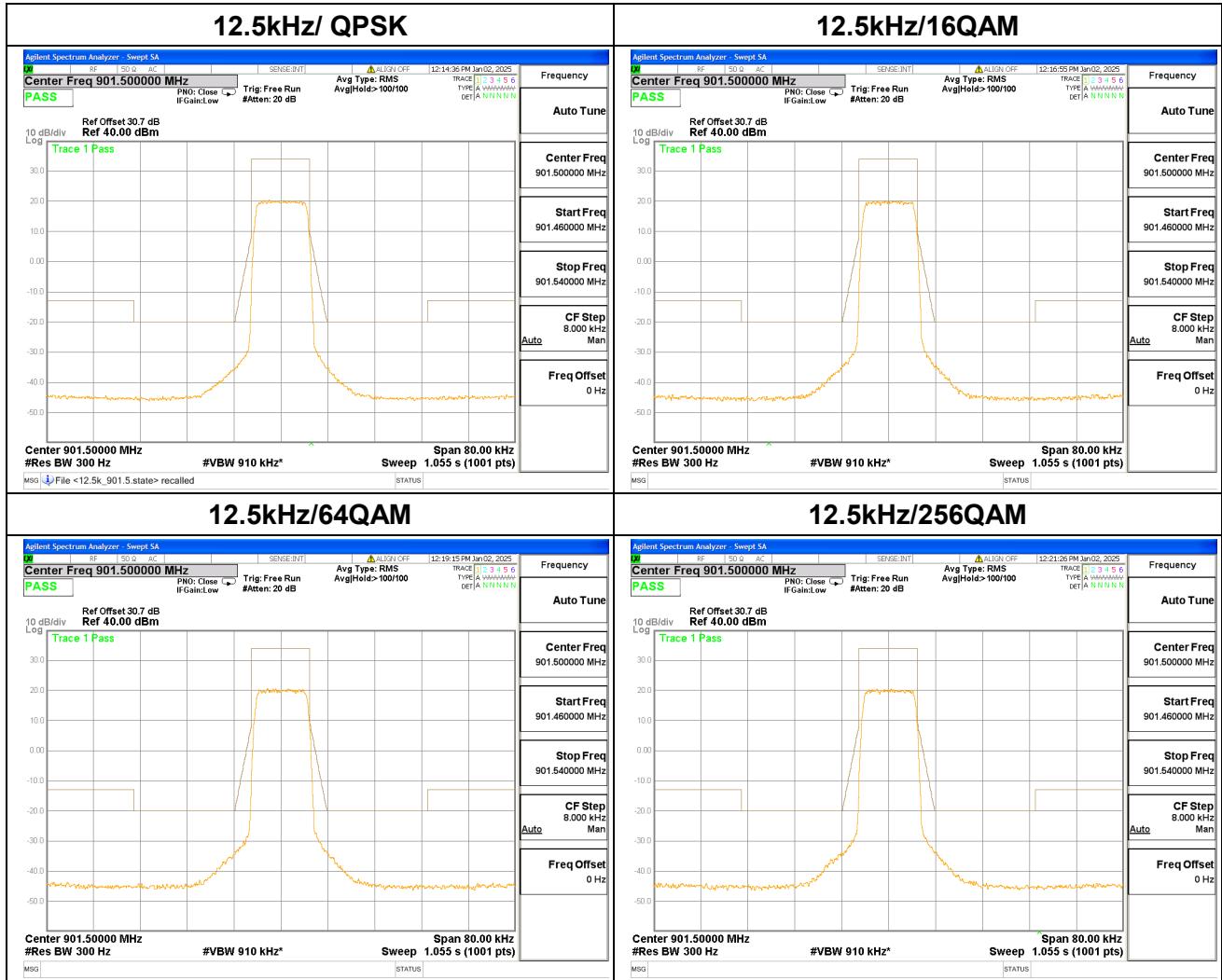
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REPORT No.: SZ24060163W01

Nominal Frequency: 901.50 MHz Tx Port: Channel V

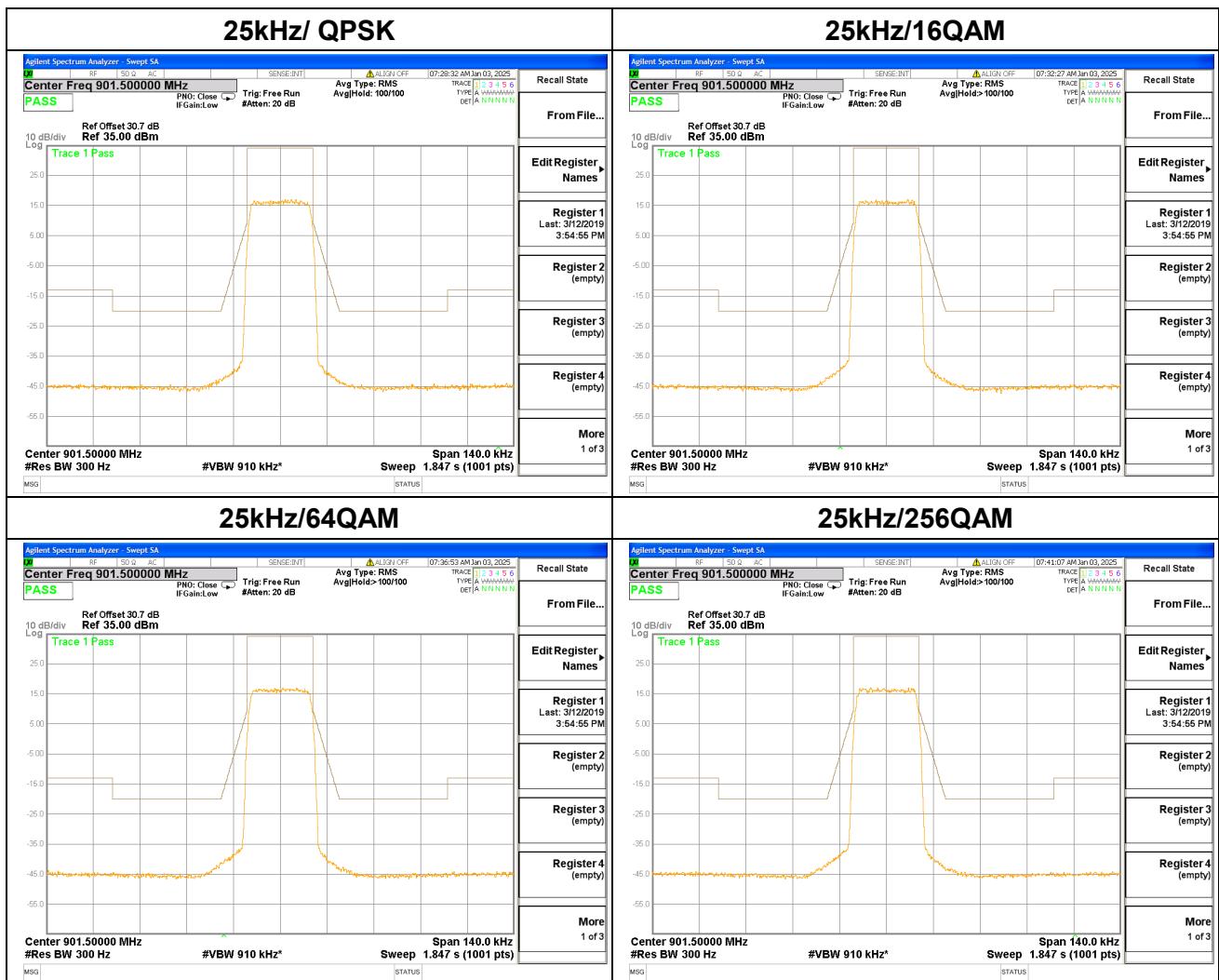
**MORLAB**

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REPORT No.: SZ24060163W01

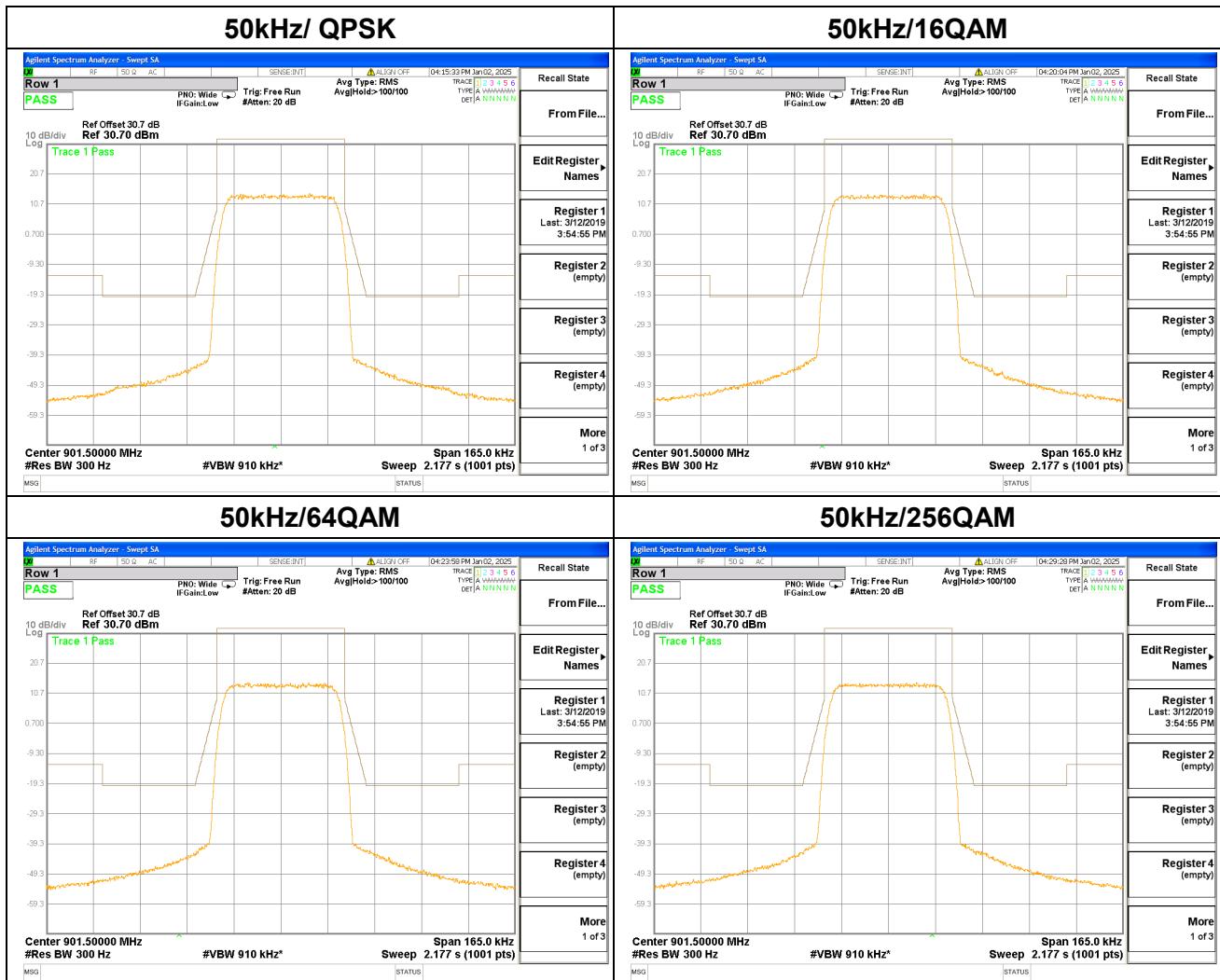
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## 2.4. Radiated Spurious Emissions

### 2.4.1. Requirement

According to FCC section 2.1053 and section 24.133(a). For operations in the 901-902 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power within the licensed band(s) of operation, measured in watts, in accordance with the following:

- (1) On any frequency outside the 901-902 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB;

### 2.4.2. Test Result

**Note 1:** No discrete emissions were detected.

**Note 2:** The power of the EUT transmitting frequency should be ignored.

**Note 3:** N/A means the frequency is the basic frequency; they are no need to verdict.

**Note 4:** For measurements below 1GHz the resolution bandwidth is set to 100kHz for peak detection measurements. For measurements above 1GHz the resolution bandwidth is set to 1MHz for peak measurements.

**Note 5:** All bandwidth and modulation were considered and evaluated respectively by performing full test, only the worst cases were recorded in this test report.

**Note 6:** The received power level is the measured power adjusted for measurement antenna gain, connecting cable loss, and any external signal amplification or attenuation used in the test configuration. Mathematically, as in Equation:

$$P_R = P_{\text{meas}} - G_R + L_C - G_{\text{amp}}$$

where

$P_{\text{meas}}$  measured power level, in dBm;

$G_R$  gain of the receive (measurement) antenna, in dBi;

$L_C$  signal loss in the measurement cable, in dB;

$G_{\text{amp}}$  value of external amplification, in dB.

## Type 1:

| Nominal Frequency 901.5MHz, 50kHz BW, 256QAM |            |          |             |         |         |
|--|------------|----------|-------------|---------|---------|
| No.  | Fre.(MHz)  | PK (dBm) | Limit (dBm) | Antenna | Verdict |
| 1  | 901.545    | -12.19   | -13.00      | H       | PASS    |
| 2  | 1329.5     | -54.03   | -13.00      | H       | PASS    |
| 3  | 2136.75    | -50.50   | -13.00      | H       | PASS    |
| 4  | 3229.624   | -51.09   | -13.00      | H       | PASS    |
| 5  | 3605.9928  | -45.90   | -13.00      | H       | PASS    |
| 6  | 4426.9838  | -52.78   | -13.00      | H       | PASS    |
| 7  | 6197.6724  | -57.99   | -13.00      | H       | PASS    |
| 8  | 12189.8345 | -63.90   | -13.00      | H       | PASS    |

| Nominal Frequency 901.5MHz, 50kHz BW, 256QAM |           |          |             |         |         |
|--|-----------|----------|-------------|---------|---------|
| No.  | Fre.(MHz) | PK (dBm) | Limit (dBm) | Antenna | Verdict |
| 1  | 901.545   | -20.76   | -13.00      | V       | NA      |
| 2  | 1802.75   | -49.12   | -13.00      | V       | PASS    |
| 3  | 2135.5    | -42.97   | -13.00      | V       | PASS    |
| 4  | 2247.75   | -50.81   | -13.00      | V       | PASS    |
| 5  | 3227.6739 | -44.73   | -13.00      | V       | PASS    |
| 6  | 3605.9928 | -41.51   | -13.00      | V       | PASS    |
| 7  | 3993.0872 | -48.81   | -13.00      | V       | PASS    |



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|    |            |        |        |   |      |
|----|------------|--------|--------|---|------|
| 8  | 4426.9838  | -49.54 | -13.00 | V | PASS |
| 9  | 4507.4254  | -48.37 | -13.00 | V | PASS |
| 10 | 6197.6724  | -53.03 | -13.00 | V | PASS |
| 11 | 6310.778   | -52.87 | -13.00 | V | PASS |
| 12 | 12359.0054 | -63.91 | -13.00 | V | PASS |

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## Type 2:

| Nominal Frequency 901.5MHz, 50kHz BW, 256QAM |           |          |             |         |         |
|--|-----------|----------|-------------|---------|---------|
| No.  | Fre.(MHz) | PK (dBm) | Limit (dBm) | Antenna | Verdict |
| 1  | 901.060   | -30.30   | -13.00      | H       | NA      |
| 2  | 1802.881  | -41.46   | -13.00      | H       | PASS    |
| 3  | 2280.512  | -41.56   | -13.00      | H       | PASS    |
| 4  | 4977.378  | -47.49   | -13.00      | H       | PASS    |
| 5  | 7271.695  | -43.47   | -13.00      | H       | PASS    |
| 6  | 10197.272 | -38.08   | -13.00      | H       | PASS    |

| Nominal Frequency 901.5MHz, 50kHz BW, 256QAM |           |          |             |         |         |
|--|-----------|----------|-------------|---------|---------|
| No.  | Fre.(MHz) | PK (dBm) | Limit (dBm) | Antenna | Verdict |
| 1  | 901.060   | -19.10   | -13.00      | V       | NA      |
| 2  | 1802.881  | -38.38   | -13.00      | V       | PASS    |
| 3  | 2188.956  | -41.99   | -13.00      | V       | PASS    |
| 4  | 4870.322  | -48.18   | -13.00      | V       | PASS    |
| 5  | 7275.386  | -44.32   | -13.00      | V       | PASS    |
| 6  | 11762.502 | -38.01   | -13.00      | V       | PASS    |



## 2.5. Frequency Stability

### 2.5.1. Requirement

According to FCC section 2.1055 and FCC section 24.135.e frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. According to FCC section 24.135, the test conditions are:

The frequency stability of the transmitter shall be maintained within  $\pm 0.0001$  percent ( $\pm 1$  ppm) of the center frequency over a temperature variation of  $-30$  °Celsius to  $+ 50$  °Celsius at normal supply voltage, and over a variation in the primary supply voltage of 85 percent to 115 percent of the rated supply voltage at a temperature of  $20$  °Celsius..

### 2.5.2. Test Results

| 901.5MHz QPSK 12.5kHz         |             |           |                |                 |        |
|-------------------------------|-------------|-----------|----------------|-----------------|--------|
| Limit =Within Authorized Band |             |           |                |                 |        |
| Voltage (%)                   | Power (VDC) | Temp (°C) | Fre. Dev. (Hz) | Deviation (ppm) | Result |
| 100                           | 24.0        | +20(Ref)  | 17             | 0.019           | PASS   |
| 100                           |             | -40       | 11             | 0.012           |        |
| 100                           |             | -30       | 19             | <b>0.021</b>    |        |
| 100                           |             | -20       | -14            | -0.016          |        |
| 100                           |             | -10       | 9              | 0.010           |        |
| 100                           |             | 0         | 16             | 0.018           |        |
| 100                           |             | +10       | 16             | 0.018           |        |
| 100                           |             | +20       | 13             | 0.014           |        |
| 100                           |             | +30       | 19             | <b>0.021</b>    |        |
| 100                           |             | +40       | 15             | 0.017           |        |
| 100                           |             | +50       | -1             | -0.001          |        |
| 100                           |             | +60       | 17             | 0.019           |        |
| 100                           |             | +70       | 16             | 0.018           |        |
| 115                           | 27.6        | +20       | 14             | 0.016           |        |
| 85                            | 20.4        | +20       | 14             | 0.016           |        |



| 901.5MHz QPSK 25.0kHz         |             |           |                |                 |        |
|-------------------------------|-------------|-----------|----------------|-----------------|--------|
| Limit =Within Authorized Band |             |           |                |                 |        |
| Voltage (%)                   | Power (VDC) | Temp (°C) | Fre. Dev. (Hz) | Deviation (ppm) | Result |
| 100                           | 24.0        | +20(Ref)  | 17             | 0.019           | PASS   |
| 100                           |             | -40       | 2              | 0.002           |        |
| 100                           |             | -30       | 17             | 0.019           |        |
| 100                           |             | -20       | 15             | 0.017           |        |
| 100                           |             | -10       | -16            | -0.018          |        |
| 100                           |             | 0         | 15             | 0.017           |        |
| 100                           |             | +10       | 15             | 0.017           |        |
| 100                           |             | +20       | -6             | -0.007          |        |
| 100                           |             | +30       | 13             | 0.014           |        |
| 100                           |             | +40       | -12            | -0.013          |        |
| 100                           |             | +50       | 14             | 0.016           |        |
| 100                           |             | +60       | 18             | <b>0.020</b>    |        |
| 100                           |             | +70       | -20            | -0.022          |        |
| 115                           | 27.6        | +20       | 9              | 0.010           |        |
| 85                            | 20.4        | +20       | 15             | 0.017           |        |



## 901.5MHz QPSK 50.0kHz

Limit =Within Authorized Band

| Voltage (%) | Power (VDC) | Temp (°C) | Fre. Dev. (Hz) | Deviation (ppm) | Result |
|-------------|-------------|-----------|----------------|-----------------|--------|
| 100         | 24.0        | +20(Ref)  | 14             | 0.016           | PASS   |
| 100         |             | -40       | 14             | 0.016           |        |
| 100         |             | -30       | 20             | <b>0.022</b>    |        |
| 100         |             | -20       | 13             | 0.014           |        |
| 100         |             | -10       | 6              | 0.007           |        |
| 100         |             | 0         | 19             | 0.021           |        |
| 100         |             | +10       | -2             | -0.002          |        |
| 100         |             | +20       | 20             | <b>0.022</b>    |        |
| 100         |             | +30       | 13             | 0.014           |        |
| 100         |             | +40       | 15             | 0.017           |        |
| 100         |             | +50       | 19             | 0.021           |        |
| 100         |             | +60       | -5             | -0.006          |        |
| 100         |             | +70       | 18             | 0.020           |        |
| 115         | 27.6        | +20       | 17             | 0.019           |        |
| 85          | 20.4        | +20       | -13            | -0.014          |        |



## Annex A Test Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for test performed on the EUT as specified in CISPR 16-1-2:

| Test items                          | Uncertainty |
|-------------------------------------|-------------|
| Output Power                        | ±2.22 dB    |
| Bandwidth                           | ±5%         |
| Conducted Spurious Emission         | ±2.77 dB    |
| Band Edge                           | ±2.77 dB    |
| Equivalent Isotropic Radiated Power | ±2.22 dB    |
| Radiated Spurious Emissions         | ±6 dB       |

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



## Annex B Testing Laboratory Information

### 1. Identification of the Responsible Testing Laboratory

|                            |  |
|----------------------------|--|
| <b>Company Name:</b>       | Shenzhen Morlab Communications Technology Co., Ltd.  |
| <b>Laboratory Address:</b> | FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China |
| <b>Telephone:</b>          | +86 755 36698555   |
| <b>Facsimile:</b>          | +86 755 36698525   |

### 2. Identification of the Responsible Testing Location

|                 |  |
|-----------------|--|
| <b>Name:</b>    | Shenzhen Morlab Communications Technology Co., Ltd.  |
| <b>Address:</b> | FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China |

### 3. Facilities and Accreditations

All measurement facilities used to collect the measurement data are located at FL.3, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10-2013 and CISPR Publication 22; the FCC designation number is CN1192, the test firm registration number is 226174.



#### 4. Test Equipment Utilized

##### 4.1 Conducted Test Equipment

| Equipment Name         | Serial No.             | Type            | Manufacturer | Cal. Date  | Cal. Due   |
|------------------------|------------------------|-----------------|--------------|------------|------------|
| Power Splitter         | NW521                  | 1506A           | Weinschel    | N/A        | N/A        |
| Attenuator 1           | (N/A.)                 | 30.0dB          | Resnet       | N/A        | N/A        |
| Attenuator 2           | (N/A.)                 | 30.0dB          | Resnet       | N/A        | N/A        |
| EXA Signal Analyzer    | MY51511149             | N9020A          | Agilent      | 2024.06.19 | 2025.06.18 |
| RF Cable (30MHz-26GHz) | CB01                   | RF01            | Morlab       | N/A        | N/A        |
| Coaxial Cable          | CB02                   | RF02            | Morlab       | N/A        | N/A        |
| SMA Connector          | CN01                   | RF03            | HUBER-SUHNER | N/A        | N/A        |
| Temperature Chamber    | S022177101<br>00089002 | KMT-36LF<br>1A0 | KOMEG        | 2024.09.11 | 2025.09.10 |

##### 4.2 List of Software Used

| Description | Manufacturer | Software Version |
|-------------|--------------|------------------|
| MORLAB EMCR | MORLAB       | V1.2             |



#### 4.3 Radiated Test Equipment

| Equipment Name              | Serial No.  | Type          | Manufacturer  | Cal. Date  | Cal. Due   |
|-----------------------------|-------------|---------------|---------------|------------|------------|
| Bi-Log Antenna              | 9163-274    | VULB 9163     | SCHWARZBECK   | 2024.06.29 | 2025.06.28 |
| Horn Antenna                | 9120D-963   | BBHA 9120D    | SCHWARZBECK   | 2024.06.03 | 2025.06.02 |
| Signal Analyzer             | MY56060145  | N9020A        | Agilent       | 2024.05.30 | 2025.05.29 |
| 6db Attenuator              | E191001     | BW-N6W5+      | Mini-circuits | 2024.09.11 | 2025.09.10 |
| Preamplifier (2GHz-18GHz)   | 61171/61172 | S020180L32 03 | LUCIX CORP.   | 2024.05.30 | 2025.05.29 |
| Preamplifier (10MHz-6GHz)   | 46732       | S10M100L38 02 | LUCIX CORP.   | 2024.05.30 | 2025.05.29 |
| RF Coaxial Cable (DC-18GHz) | MRE001      | PE330         | Pasternack    | 2024.05.30 | 2025.05.29 |
| RF Coaxial Cable (DC-18GHz) | MRE002      | CLU18         | Pasternack    | 2024.05.30 | 2025.05.29 |
| RF Coaxial Cable (DC-18GHz) | MRE003      | CLU18         | Pasternack    | 2024.05.30 | 2025.05.29 |

— END OF REPORT —