

# RADIO PERFORMANCE TEST REPORT

**Test Report No.** : OT-245-RWD-026  
**Reception No.** : 2308002605  
**Applicant** : LANDROAD Inc.  
**Address** : B-107, 109, Ballyong-ro, Deokjin-gu, jeonju-si, Jeollabuk-do, South Korea  
**Manufacturer** : LANDROAD Inc.  
**Address** : B-107, 109, Ballyong-ro, Deokjin-gu, jeonju-si, Jeollabuk-do, South Korea  
**Type of Equipment** : LTE CatM1 based Sensor node  
**FCC ID** : 2BGJWROADRAINLTEN  
**Model Name** : RoaDrain LTEN  
**Multiple Model Name** : N/A  
**Serial number** : N/A  
**Total page of Report** : 154 pages (including this page)  
**Date of Incoming** : January 15, 2024  
**Date of Issuing** : May 23, 2024

## SUMMARY

The equipment complies with the regulation; **Part 2, Part 24 Subpart E**

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

This report is not correlated with the "KS Q ISO/IEC 17025 and KOLAS accreditation" of Korean Laboratory Accreditation Scheme.





Tested by  
 Ju-Yun, Park / Sr. Engineer  
 ONETECH Corp.

Reviewed by  
 Tae-Ho, Kim / Chief Engineer  
 ONETECH Corp.

Approved by  
 Jae-Ho, Lee / Chief Engineer  
 ONETECH Corp.

## CONTENTS

### PAGE

|                                                                         |           |
|-------------------------------------------------------------------------|-----------|
| <b>1. VERIFICATION OF COMPLIANCE .....</b>                              | <b>7</b>  |
| <b>2. TEST SUMMARY.....</b>                                             | <b>8</b>  |
| 2.1 TEST ITEMS AND RESULTS .....                                        | 8         |
| 2.2 ADDITIONS, DEVIATIONS, EXCLUSIONS FROM STANDARDS.....               | 8         |
| 2.3 RELATED SUBMITTAL(S) / GRANT(S) .....                               | 8         |
| 2.4 PURPOSE OF THE TEST .....                                           | 8         |
| 2.5 TEST METHODOLOGY.....                                               | 8         |
| 2.6 TEST FACILITY.....                                                  | 8         |
| <b>3. GENERAL INFORMATION.....</b>                                      | <b>9</b>  |
| 3.1 PRODUCT DESCRIPTION.....                                            | 9         |
| 3.2 ALTERNATIVE TYPE(S)/MODEL(S); ALSO COVERED BY THIS TEST REPORT..... | 9         |
| <b>4. EUT MODIFICATIONS.....</b>                                        | <b>9</b>  |
| <b>5. SYSTEM TEST CONFIGURATION .....</b>                               | <b>10</b> |
| 5.1 JUSTIFICATION.....                                                  | 10        |
| 5.2 PERIPHERAL EQUIPMENT .....                                          | 10        |
| 5.3 MODE OF OPERATION DURING THE TEST .....                             | 11        |
| 5.4 FREQUENCY LIST OF LOW/MIDDLE/HIGH CHANNELS .....                    | 14        |
| 5.5 CONFIGURATION OF TEST SYSTEM.....                                   | 14        |
| <b>6. PRELIMINARY TEST .....</b>                                        | <b>15</b> |
| 6.1 GENERAL RADIATED EMISSIONS TESTS .....                              | 15        |
| 6.2 MEASUREMENT UNCERTAINTY .....                                       | 15        |
| <b>7. CONDUCTED OUTPUT POWER .....</b>                                  | <b>16</b> |
| 7.1 OPERATING ENVIRONMENT .....                                         | 16        |
| 7.2 TEST SET-UP .....                                                   | 16        |
| 7.3 TEST DATE .....                                                     | 16        |
| 7.4 TEST FOR BAND 2_BANDWIDTH 1.4 MHz .....                             | 17        |
| 7.5 TEST FOR BAND 2_BANDWIDTH 3 MHz .....                               | 17        |
| 7.6 TEST FOR BAND 2_BANDWIDTH 5 MHz .....                               | 18        |
| 7.7 TEST FOR BAND 2_BANDWIDTH 10 MHz .....                              | 19        |
| 7.8 TEST FOR BAND 2_BANDWIDTH 15 MHz .....                              | 20        |
| 7.9 TEST FOR BAND 2_BANDWIDTH 20 MHz .....                              | 21        |
| <b>8. EQUIVALENT ISOTROPIC RADIATED POWER .....</b>                     | <b>22</b> |

|                                                  |    |
|--------------------------------------------------|----|
| 8.1 OPERATING ENVIRONMENT .....                  | 22 |
| 8.2 METHODS OF MEASUREMENT .....                 | 22 |
| 8.3 LIMITS .....                                 | 22 |
| 8.4 TEST SET-UP .....                            | 22 |
| 8.6 TEST DATA FOR BAND 2_BANDWIDTH 1.4 MHz.....  | 23 |
| 8.7 TEST DATA FOR BAND 2_BANDWIDTH 3 MHz.....    | 24 |
| 8.8 TEST DATA FOR BAND 2_BANDWIDTH 5 MHz.....    | 25 |
| 8.9 TEST DATA FOR BAND 2_BANDWIDTH 10 MHz.....   | 26 |
| 8.10 TEST DATA FOR BAND 2_BANDWIDTH 15 MHz.....  | 27 |
| 8.10 TEST DATA FOR BAND 2_BANDWIDTH 20 MHz.....  | 28 |
| 9. RADIATED SPURIOUS EMISSIONS .....             | 29 |
| 9.1 OPERATING ENVIRONMENT .....                  | 29 |
| 9.2 TEST SET-UP .....                            | 29 |
| 9.3 TEST DATE .....                              | 29 |
| 9.4 TEST DATA FOR BAND 2_BANDWIDTH 1.4 MHz.....  | 30 |
| 9.5 TEST DATA FOR BAND 2_BANDWIDTH 3 MHz.....    | 31 |
| 9.6 TEST DATA FOR BAND 2_BANDWIDTH 5 MHz.....    | 32 |
| 9.7 TEST DATA FOR BAND 2_BANDWIDTH 10 MHz.....   | 33 |
| 9.8 TEST DATA FOR BAND 2_BANDWIDTH 15 MHz.....   | 34 |
| 9.9 TEST DATA FOR BAND 2_BANDWIDTH 20 MHz.....   | 35 |
| 10. PEAK-TO-AVERAGE RATIO .....                  | 36 |
| 10.1 OPERATING ENVIRONMENT .....                 | 36 |
| 10.2 TEST SET-UP .....                           | 36 |
| 10.3 TEST DATE .....                             | 36 |
| 10.4 TEST DATA FOR BAND 2_BANDWIDTH 1.4 MHz..... | 37 |
| 10.5 TEST DATA FOR BAND 2_BANDWIDTH 3 MHz.....   | 40 |
| 10.6 TEST DATA FOR BAND 2_BANDWIDTH 5 MHz.....   | 43 |
| 10.7 TEST DATA FOR BAND 2_BANDWIDTH 10 MHz.....  | 46 |
| 10.8 TEST DATA FOR BAND 2_BANDWIDTH 15 MHz.....  | 49 |
| 10.9 TEST DATA FOR BAND 2_BANDWIDTH 20 MHz.....  | 52 |
| 11. OCCUPIED BANDWIDTH.....                      | 55 |
| 11.1 OPERATING ENVIRONMENT .....                 | 55 |
| 11.2 TEST SET-UP .....                           | 55 |
| 11.3 TEST DATE .....                             | 55 |
| 11.4 TEST DATA FOR BAND 2_BANDWIDTH 1.4 MHz..... | 56 |
| 11.5 TEST DATA FOR BAND 2_BANDWIDTH 3 MHz.....   | 59 |

|                                                                                |            |
|--------------------------------------------------------------------------------|------------|
| 11.6 TEST DATA FOR BAND 2_BANDWIDTH 5 MHz.....                                 | 62         |
| 11.7 TEST DATA FOR BAND 2_BANDWIDTH 10 MHz.....                                | 65         |
| 11.8 TEST DATA FOR BAND 2_BANDWIDTH 15 MHz.....                                | 68         |
| 11.9 TEST DATA FOR BAND 2_BANDWIDTH 20 MHz.....                                | 71         |
| <b>12. CONDUCTED BAND EDGE .....</b>                                           | <b>74</b>  |
| 12.1 OPERATING ENVIRONMENT .....                                               | 74         |
| 12.2 TEST SET-UP .....                                                         | 74         |
| 12.3 METHODS OF MEASUREMENT .....                                              | 74         |
| 12.4 LIMITS .....                                                              | 74         |
| 12.5 TEST DATE .....                                                           | 74         |
| 12.6 TEST DATA FOR BAND 2_BANDWIDTH 1.4 MHz.....                               | 75         |
| 12.7 TEST DATA FOR BAND 2_BANDWIDTH 3 MHz.....                                 | 77         |
| 12.8 TEST DATA FOR BAND 2_BANDWIDTH 5 MHz.....                                 | 79         |
| 12.9 TEST DATA FOR BAND 2_BANDWIDTH 10 MHz.....                                | 81         |
| 12.10 TEST DATA FOR BAND 2_BANDWIDTH 15 MHz.....                               | 83         |
| 12.11 TEST DATA FOR BAND 2_BANDWIDTH 20 MHz.....                               | 85         |
| <b>13. CONDUCTED SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMIANL .....</b> | <b>87</b>  |
| 13.1 OPERATING ENVIRONMENT .....                                               | 87         |
| 13.2 TEST SET-UP .....                                                         | 87         |
| 13.3 LIMITS .....                                                              | 87         |
| 13.4 TEST DATE .....                                                           | 87         |
| 13.5 TEST DATA.....                                                            | 88         |
| 13.5.1 Test data for Band 2_Bandwidth 1.4 MHz_QPSK .....                       | 88         |
| 13.5.2 Test data for Band 2_Bandwidth 1.4 MHz_16QAM.....                       | 93         |
| 13.5.3 Test data for Band 2_Bandwidth 3 MHz_QPSK .....                         | 98         |
| 13.5.4 Test data for Band 2_Bandwidth 3 MHz_16QAM.....                         | 103        |
| 13.5.5 Test data for Band 2_Bandwidth 5 MHz_QPSK .....                         | 108        |
| 13.5.6 Test data for Band 2_Bandwidth 5 MHz_16QAM.....                         | 113        |
| 13.5.7 Test data for Band 2_Bandwidth 10 MHz_QPSK .....                        | 118        |
| 13.5.8 Test data for Band 2_Bandwidth 10 MHz_16QAM.....                        | 123        |
| 13.5.9 Test data for Band 2_Bandwidth 15 MHz_QPSK .....                        | 128        |
| 13.5.10 Test data for Band 2_Bandwidth 15 MHz_16QAM.....                       | 133        |
| 13.5.11 Test data for Band 2_Bandwidth 20 MHz_QPSK .....                       | 138        |
| 13.5.12 Test data for Band 2_Bandwidth 20 MHz_16QAM.....                       | 143        |
| <b>14. FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE .....</b>        | <b>148</b> |
| 14.1 OPERATING ENVIRONMENT .....                                               | 148        |

|                                          |     |
|------------------------------------------|-----|
| 14.2 TEST SET-UP .....                   | 148 |
| 14.3 TEST DATE .....                     | 148 |
| 14.4 TEST DATA FOR VOLTAGE(V) .....      | 149 |
| 14.5 TEST DATA FOR TEMPERATURE(°C) ..... | 151 |
| 15. LIST OF TEST EQUIPMENT .....         | 154 |

**Revision History**

| Rev. No. | Issue Report No. | Issued Date  | Revisions       | Section Affected |
|----------|------------------|--------------|-----------------|------------------|
| 0        | OT-245-RWD-026   | May 23, 2024 | Initial Release | All              |
|          |                  |              |                 |                  |
|          |                  |              |                 |                  |

## 1. VERIFICATION OF COMPLIANCE

Applicant : LANDROAD Inc.  
 Address : B-107, 109, Ballyong-ro, Deokjin-gu, jeonju-si, Jeollabuk-do, South Korea  
 Contact Person : Juhwan Lee  
 Telephone No. : +82-10-6319-4565  
 FCC ID : 2BGJWROADRAINLTEN  
 Model Name : RoaDrain LTEN  
 Serial Number : N/A  
 Date : May 23, 2024

|                                                         |                                              |
|---------------------------------------------------------|----------------------------------------------|
| EQUIPMENT CLASS                                         | PCB-PCS Licensed Transmitter                 |
| EQUIPMENT DESCRIPTION                                   | LTE CatM1 based Sensor node                  |
| THIS REPORT CONCERNS                                    | Original Grant                               |
| MEASUREMENT PROCEDURES                                  | ANSI C63.26:2015, KDB Publication 971168 D01 |
| TYPE OF EQUIPMENT TESTED                                | Pre-Production                               |
| KIND OF EQUIPMENT<br>AUTHORIZATION REQUESTED            | Certification                                |
| EQUIPMENT WILL BE OPERATED<br>UNDER FCC RULES PART(S)   | FCC Part 2, Part 24 Subpart E                |
| Modifications on the Equipment to Achieve<br>Compliance | None                                         |
| Final Test was Conducted On                             | 3 m Semi Anechoic Chamber                    |

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

## 2. TEST SUMMARY

### 2.1 Test items and results

| SECTION                                  | TEST ITEMS                                                         | RESULTS              |
|------------------------------------------|--------------------------------------------------------------------|----------------------|
| 2.1049                                   | Occupied Bandwidth                                                 | Met the Limit / PASS |
| 2.1051, 24.238(a)                        | Band Edge<br>/ Spurious and Harmonic Emissions at Antenna Termianl | Met the Limit / PASS |
| 2.1046                                   | Conducted Output Power                                             | Met the Limit / PASS |
| 24.232(d),<br>KDB Publication 971168 D01 | Peak-to-Average Ratio                                              | Met the Limit / PASS |
| 2.1055, 24.235                           | Frequency stability                                                | Met the Limit / PASS |
| 24.232(c)                                | Equivalent Isotropic Radiated Power                                | Met the Limit / PASS |
| 2.1053, 24.238(a)                        | Radiated Spurious and Harmonic Emissions                           | Met the Limit / PASS |

### 2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

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

Original submittal only

### 2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in Part 24 Subpart E.

### 2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.26:2015. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

### 2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea.

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-20122/ C-14617/ G-10666/ T-11842

ISED (Innovation, Science and Economic Development Canada) – Registration No. Site# 3736A-3

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation NO. KT085

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

### 3. GENERAL INFORMATION

#### 3.1 Product Description

The LANDROAD Inc., Model RoaDrain LTEN (referred to as the EUT in this report) is a LTE CatM1 based Sensor node.

Product specification information described herein was obtained from product data sheet or user's manual.

|                                                    |                             |                                               |                       |
|----------------------------------------------------|-----------------------------|-----------------------------------------------|-----------------------|
| DEVICE TYPE                                        | LTE CatM1 based Sensor node |                                               |                       |
| OPERATING FREQUENCY                                | LTE Band 2                  | TX                                            | 1 850 MHz ~ 1 910 MHz |
|                                                    |                             | RX                                            | 1 930 MHz ~ 1 990 MHz |
|                                                    | LTE Band 12                 | TX                                            | 699 MHz ~ 716 MHz     |
|                                                    |                             | RX                                            | 729 MHz ~ 746 MHz     |
| LTE Channel Bandwidth                              | LTE Band 2                  | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz |                       |
|                                                    | LTE Band 12                 | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz                 |                       |
| Modulation Type                                    | QPSK, 16QAM                 |                                               |                       |
| Maximum EIRP Power                                 | LTE Band 2                  | 22.45 dBm                                     |                       |
|                                                    | LTE Band 12                 | 22.91 dBm                                     |                       |
| ANTENNA TYPE                                       | Dipole Antenna              |                                               |                       |
| ANTENNA GAIN                                       | LTE Band 2                  | 3.5 dBi                                       |                       |
|                                                    | LTE Band 12                 | 2.5 dBi                                       |                       |
| List of each Osc. or crystal Freq.(Freq. >= 1 MHz) | 32.768 kHz, 8.0 MHz         |                                               |                       |

#### 3.2 Alternative type(s)/model(s); also covered by this test report.

-. None

### 4. EUT MODIFICATIONS

-. None

## 5. SYSTEM TEST CONFIGURATION

### 5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

| DEVICE TYPE | MANUFACTURER | MODEL/PART NUMBER | FCC ID |
|-------------|--------------|-------------------|--------|
| Main Board  | N/A          | N/A               | N/A    |
| Battery     | N/A          | N/A               | N/A    |
| Antenna     | N/A          | N/A               | N/A    |

### 5.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

| Model     | Manufacturer | Description     | Connected to |
|-----------|--------------|-----------------|--------------|
| PWS-3003D | Protek       | DC Power Supply | EUT          |

### 5.3 Mode of operation during the test

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis, and antenna ports. The worst case was found when positioned as the table below.

Following channel(s) was (were) selected for the final test as listed below:

| Band       | EIRP    | Radiated Emission |
|------------|---------|-------------------|
| LTE Band 2 | X-plane | X-axis            |

#### Test Mode: LTE Band 2

| Test Item                           | Channel Bandwidth | Modulation     | Mode                            | Test Channel   |
|-------------------------------------|-------------------|----------------|---------------------------------|----------------|
| Equivalent Isotropic Radiated Power | 1.4 MHz           | QPSK,<br>16QAM | 1 RB / 0 RB Offset / 0 RB Index | Low Channel    |
|                                     | 3 MHz             |                |                                 | Middle Channel |
|                                     | 5 MHz             |                |                                 |                |
|                                     | 10 MHz            |                |                                 |                |
|                                     | 15 MHz            |                |                                 | High Channel   |
|                                     | 20 MHz            |                |                                 |                |
| Frequency stability                 | 1.4 MHz           | QPSK           | 6 RB / 0 RB Offset / 0 RB Index | Low Channel    |
|                                     | 3 MHz             |                |                                 | -              |
|                                     | 5 MHz             |                |                                 |                |
|                                     | 10 MHz            |                |                                 |                |
|                                     | 15 MHz            |                |                                 | High Channel   |
|                                     | 20 MHz            |                |                                 |                |
| Occupied Bandwidth                  | 1.4 MHz           | QPSK,<br>16QAM | 6 RB / 0 RB Offset / 0 RB Index | Low Channel    |
|                                     | 3 MHz             |                |                                 | Middle Channel |
|                                     | 5 MHz             |                |                                 |                |
|                                     | 10 MHz            |                |                                 |                |
|                                     | 15 MHz            |                |                                 | High Channel   |
|                                     | 20 MHz            |                |                                 |                |

| Test Item | Channel Bandwdith | Modulation     | Mode                             | Test Channel |
|-----------|-------------------|----------------|----------------------------------|--------------|
| Band Edge | 1.4 MHz           | QPSK,<br>16QAM | 1 RB / 0 RB Offset / 0 RB Index  | Low Channel  |
|           |                   |                | 6 RB / 0 RB Offset / 0 RB Index  |              |
|           |                   |                | 1 RB / 5 RB Offset / 0 RB Index  | High Channel |
|           |                   |                | 6 RB / 0 RB Offset / 0 RB Index  |              |
|           | 3 MHz             |                | 1 RB / 0 RB Offset / 0 RB Index  | Low Channel  |
|           |                   |                | 6 RB / 0 RB Offset / 0 RB Index  |              |
|           |                   |                | 1 RB / 5 RB Offset / 1 RB Index  | High Channel |
|           |                   |                | 6 RB / 0 RB Offset / 1 RB Index  |              |
|           | 5 MHz             |                | 1 RB / 0 RB Offset / 0 RB Index  | Low Channel  |
|           |                   |                | 6 RB / 0 RB Offset / 0 RB Index  |              |
|           |                   |                | 1 RB / 5 RB Offset / 3 RB Index  | High Channel |
|           |                   |                | 6 RB / 0 RB Offset / 3 RB Index  |              |
|           | 10 MHz            |                | 1 RB / 0 RB Offset / 0 RB Index  | Low Channel  |
|           |                   |                | 6 RB / 0 RB Offset / 0 RB Index  |              |
|           |                   |                | 1 RB / 5 RB Offset / 7 RB Index  | High Channel |
|           |                   |                | 6 RB / 0 RB Offset / 7 RB Index  |              |
|           | 15 MHz            |                | 1 RB / 0 RB Offset / 0 RB Index  | Low Channel  |
|           |                   |                | 6 RB / 0 RB Offset / 0 RB Index  |              |
|           |                   |                | 1 RB / 5 RB Offset / 11 RB Index | High Channel |
|           |                   |                | 6 RB / 0 RB Offset / 11 RB Index |              |
|           | 20 MHz            |                | 1 RB / 0 RB Offset / 0 RB Index  | Low Channel  |
|           |                   |                | 6 RB / 0 RB Offset / 0 RB Index  |              |
|           |                   |                | 1 RB / 5 RB Offset / 15 RB Index | High Channel |
|           |                   |                | 6 RB / 0 RB Offset / 15 RB Index |              |

| Test Item                                           | Channel Bandwidth | Modulation     | Mode                                                               | Test Channel   |
|-----------------------------------------------------|-------------------|----------------|--------------------------------------------------------------------|----------------|
| Peak-to-Average Ratio                               | 1.4 MHz           | QPSK,<br>16QAM | 1 RB / 0 RB Offset / 0 RB Index<br>6 RB / 0 RB Offset / 0 RB Index | Low Channel    |
|                                                     | 3 MHz             |                |                                                                    | Middle Channel |
|                                                     | 5 MHz             |                |                                                                    |                |
|                                                     | 10 MHz            |                |                                                                    | High Channel   |
|                                                     | 15 MHz            |                |                                                                    |                |
|                                                     | 20 MHz            |                |                                                                    |                |
| Spurious and Harmonic Emissions at Antenna Terminal | 1.4 MHz           | QPSK,<br>16QAM | 1 RB / 0 RB Offset / 0 RB Index                                    | Low Channel    |
|                                                     | 3 MHz             |                |                                                                    | Middle Channel |
|                                                     | 5 MHz             |                |                                                                    |                |
|                                                     | 10 MHz            |                |                                                                    | High Channel   |
|                                                     | 15 MHz            |                |                                                                    |                |
|                                                     | 20 MHz            |                |                                                                    |                |
| Radiated Spurious and Harmonic Emissions            | 1.4 MHz           | QPSK           | 1 RB / 0 RB Offset / 0 RB Index                                    | Low Channel    |
|                                                     | 3 MHz             |                |                                                                    | Middle Channel |
|                                                     | 5 MHz             |                |                                                                    |                |
|                                                     | 10 MHz            |                |                                                                    | High Channel   |
|                                                     | 15 MHz            |                |                                                                    |                |
|                                                     | 20 MHz            |                |                                                                    |                |

| Test Item           | Channel Bandwidth | QPSK    | 16QAM   |
|---------------------|-------------------|---------|---------|
| Emission Designator | 1.4 MHz           | 1M12G7D | 1M10W7D |
|                     | 3 MHz             | 1M12G7D | 1M10W7D |
|                     | 5 MHz             | 1M12G7D | 1M14W7D |
|                     | 10 MHz            | 1M14G7D | 1M12W7D |
|                     | 15 MHz            | 1M14G7D | 1M14W7D |
|                     | 20 MHz            | 1M12G7D | 1M16W7D |

## 5.4 Frequency List of Low/Middle/High Channels

| LTE Band 2 Channel and Frequency List |                     |             |             |             |
|---------------------------------------|---------------------|-------------|-------------|-------------|
| Bandwidth                             | Channel / Frequency | Low         | Middle      | High        |
| 1.4 MHz                               | Channel             | 18607       | 18900       | 19193       |
|                                       | Frequency           | 1 850.7 MHz | 1 880.0 MHz | 1 909.3 MHz |
| 3 MHz                                 | Channel             | 18615       | 18900       | 19185       |
|                                       | Frequency           | 1 851.5 MHz | 1 880.0 MHz | 1 908.5 MHz |
| 5 MHz                                 | Channel             | 18625       | 18900       | 19175       |
|                                       | Frequency           | 1 852.5 MHz | 1 880.0 MHz | 1 907.5 MHz |
| 10 MHz                                | Channel             | 18650       | 18900       | 19150       |
|                                       | Frequency           | 1 855.0 MHz | 1 880.0 MHz | 1 905.0 MHz |
| 15 MHz                                | Channel             | 18675       | 18900       | 19125       |
|                                       | Frequency           | 1 857.5 MHz | 1 880.0 MHz | 1 902.5 MHz |
| 20 MHz                                | Channel             | 18700       | 18900       | 19100       |
|                                       | Frequency           | 1 860.0 MHz | 1 880.0 MHz | 1 900.0 MHz |

## 5.5 Configuration of Test System

**Radiated Emission Test:** Preliminary radiated emissions test were conducted using the procedure in ANSI C63.26: 2015 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 m Semi Anechoic Chamber.

The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

## 6. PRELIMINARY TEST

### 6.1 General Radiated Emissions Tests

During Preliminary Test, the following operating mode was investigated.

| Operation Mode    | The Worse operating condition (Please check one only) |
|-------------------|-------------------------------------------------------|
| Transmitting Mode | X                                                     |

### 6.2 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of  $k = 2$  to indicate a 95 % level of confidence.

The measurement data shown herein meets or exceeds the  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

| Parameter                              | Expanded Uncertainty (dB) |
|----------------------------------------|---------------------------|
| Conducted Output Power                 | 0.68                      |
| Conducted Spurious Emission < 26.5 GHz | 1.60                      |
| Radiated Disturbance (9 kHz ~ 30 MHz)  | 4.09                      |
| Radiated Disturbance (30 MHz ~ 1 GHz)  | 3.98                      |
| Radiated Disturbance (1 GHz ~ 18 GHz)  | 5.56                      |
| Radiated Disturbance (18 GHz ~ 40 GHz) | 5.65                      |

## 7. CONDUCTED OUTPUT POWER

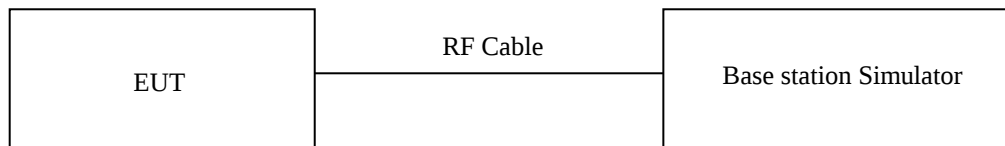
### 7.1 Operating environment

Temperature : 22 °C  
Relative humidity : 45 % R.H.

### 7.2 Test set-up

Conducted Output Power is tested in accordance with KDB971168 D01 Power Meas License Digital Systems v03, April 9, 2018, Section 5.2.

A base station simulator was used to establish communication with the EUT, and Spectrum analyzer was used for test results. This device was tested under all configurations and the highest power is reported. Conducted Output Powers of EUT are reported below.



### 7.3 Test Date

January 15, 2024 ~ February 08, 2024

## 7.4 Test for Band 2\_Bandwidth 1.4 MHz

-. Test Result : Pass

Conducted Average Output Power (dBm)

| RB<br>Size | RB<br>Offset | RB<br>Index | QPSK        |             |             | 16QAM       |             |             |
|------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|            |              |             | LOW         | MIDDLE      | HIGH        | LOW         | MIDDLE      | HIGH        |
|            |              |             | 1 850.7 MHz | 1 880.0 MHz | 1 909.3 MHz | 1 850.7 MHz | 1 880.0 MHz | 1 909.3 MHz |
| 1          | 0            | 0           | 22.17       | 21.94       | 22.00       | 21.23       | 21.04       | 21.05       |
| 1          | 5            | 0           | 22.14       | 21.90       | 21.99       | 21.16       | 21.01       | 21.01       |
| 4          | 0            | 0           | 20.98       | 20.77       | 20.76       | 20.21       | 20.11       | 20.14       |
| 4          | 2            | 0           | 21.12       | 20.92       | 20.94       | 20.34       | 20.18       | 20.19       |
| 6          | 0            | 0           | 20.19       | 20.21       | 20.21       | 20.15       | 20.05       | 20.13       |

## 7.5 Test for Band 2\_Bandwidth 3 MHz

-. Test Result : Pass

Conducted Average Output Power (dBm)

| RB<br>Size | RB<br>Offset | RB<br>Index | QPSK        |             |             | 16QAM       |             |             |
|------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|            |              |             | LOW         | MIDDLE      | HIGH        | LOW         | MIDDLE      | HIGH        |
|            |              |             | 1 851.5 MHz | 1 880.0 MHz | 1 908.5 MHz | 1 851.5 MHz | 1 880.0 MHz | 1 908.5 MHz |
| 1          | 0            | 0           | 22.19       | 21.98       | 22.03       | 21.15       | 20.96       | 21.01       |
| 1          | 5            | 0           | 22.14       | 21.95       | 22.01       | 21.14       | 20.95       | 20.98       |
| 1          | 0            | 1           | 22.17       | 21.96       | 22.01       | 21.13       | 20.94       | 20.98       |
| 1          | 5            | 1           | 22.18       | 21.95       | 22.01       | 21.14       | 20.92       | 20.96       |
| 4          | 0            | 0           | 21.04       | 20.83       | 20.91       | 20.35       | 20.16       | 20.21       |
| 4          | 2            | 0           | 21.17       | 20.93       | 21.00       | 20.35       | 20.14       | 20.20       |
| 4          | 0            | 1           | 21.02       | 20.77       | 20.87       | 20.27       | 20.09       | 20.18       |
| 4          | 2            | 1           | 21.13       | 20.93       | 21.05       | 20.35       | 20.09       | 20.20       |
| 6          | 0            | 0           | 20.13       | 19.95       | 19.91       | 20.31       | 20.07       | 20.16       |
| 6          | 0            | 1           | 20.09       | 19.92       | 20.04       | 20.32       | 20.08       | 20.23       |

## 7.6 Test for Band 2\_Bandwidth 5 MHz

-. Test Result : Pass

Conducted Average Output Power (dBm)

| RB<br>Size | RB<br>Offset | RB<br>Index | QPSK        |             |             | 16QAM       |             |             |
|------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|            |              |             | LOW         | MIDDLE      | HIGH        | LOW         | MIDDLE      | HIGH        |
|            |              |             | 1 852.5 MHz | 1 880.0 MHz | 1 907.5 MHz | 1 852.5 MHz | 1 880.0 MHz | 1 907.5 MHz |
| 1          | 0            | 0           | 22.25       | 22.13       | 22.06       | 22.45       | 22.27       | 22.25       |
| 1          | 5            | 0           | 22.20       | 22.02       | 22.03       | 22.38       | 22.17       | 22.23       |
| 1          | 0            | 1           | 22.06       | 22.04       | 22.04       | 22.44       | 22.23       | 22.23       |
| 1          | 5            | 1           | 22.18       | 22.05       | 22.02       | 22.38       | 22.24       | 22.21       |
| 1          | 0            | 3           | 22.20       | 22.06       | 22.04       | 22.43       | 22.22       | 22.19       |
| 1          | 5            | 3           | 22.10       | 21.93       | 21.91       | 22.34       | 22.14       | 22.13       |
| 4          | 0            | 0           | 21.02       | 20.83       | 20.86       | 20.31       | 20.16       | 20.14       |
| 4          | 2            | 0           | 21.08       | 20.93       | 20.90       | 20.34       | 20.24       | 20.21       |
| 4          | 0            | 3           | 21.13       | 20.88       | 20.93       | 20.38       | 20.18       | 20.19       |
| 4          | 2            | 3           | 21.08       | 20.88       | 20.87       | 20.37       | 20.23       | 20.18       |
| 6          | 0            | 0           | 21.06       | 20.84       | 20.83       | 20.05       | 20.11       | 19.92       |
| 6          | 0            | 3           | 21.08       | 20.90       | 20.94       | 20.12       | 20.18       | 20.05       |

## 7.7 Test for Band 2\_Bandwidth 10 MHz

-. Test Result : Pass

Conducted Average Output Power (dBm)

| RB<br>Size | RB<br>Offset | RB<br>Index | QPSK        |             |             | 16QAM       |             |             |
|------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|            |              |             | LOW         | MIDDLE      | HIGH        | LOW         | MIDDLE      | HIGH        |
|            |              |             | 1 855.0 MHz | 1 880.0 MHz | 1 905.0 MHz | 1 855.0 MHz | 1 880.0 MHz | 1 905.0 MHz |
| 1          | 0            | 0           | 22.04       | 22.20       | 21.89       | 22.26       | 22.44       | 22.01       |
| 1          | 5            | 0           | 22.03       | 22.15       | 21.84       | 22.17       | 22.38       | 21.98       |
| 1          | 0            | 3           | 22.01       | 22.16       | 21.85       | 22.22       | 22.39       | 22.01       |
| 1          | 5            | 3           | 22.02       | 22.16       | 21.83       | 22.25       | 22.42       | 22.01       |
| 1          | 0            | 7           | 21.84       | 22.17       | 21.84       | 22.05       | 22.38       | 21.98       |
| 1          | 5            | 7           | 21.86       | 22.16       | 21.84       | 22.10       | 22.43       | 22.01       |
| 4          | 0            | 0           | 21.85       | 22.01       | 21.64       | 21.16       | 21.30       | 21.01       |
| 4          | 2            | 0           | 21.80       | 21.99       | 21.64       | 21.14       | 21.28       | 21.01       |
| 4          | 0            | 7           | 21.71       | 22.08       | 21.63       | 21.01       | 21.36       | 20.99       |
| 4          | 2            | 7           | 21.69       | 22.06       | 21.67       | 20.98       | 21.34       | 21.03       |
| 6          | 0            | 0           | 20.89       | 21.03       | 20.63       | 19.80       | 20.05       | 19.88       |
| 6          | 0            | 7           | 20.67       | 21.04       | 20.59       | 19.72       | 20.10       | 19.91       |

## 7.8 Test for Band 2\_Bandwidth 15 MHz

-. Test Result : Pass

Conducted Average Output Power (dBm)

| RB<br>Size | RB<br>Offset | RB<br>Index | QPSK        |             |             | 16QAM       |             |             |
|------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|            |              |             | LOW         | MIDDLE      | HIGH        | LOW         | MIDDLE      | HIGH        |
|            |              |             | 1 857.5 MHz | 1 880.0 MHz | 1 902.5 MHz | 1 857.5 MHz | 1 880.0 MHz | 1 902.5 MHz |
| 1          | 0            | 0           | 21.91       | 21.74       | 21.79       | 22.08       | 21.94       | 21.98       |
| 1          | 5            | 0           | 21.90       | 21.68       | 21.72       | 22.07       | 21.84       | 21.86       |
| 1          | 0            | 5           | 21.83       | 21.70       | 21.73       | 22.04       | 21.89       | 21.91       |
| 1          | 5            | 5           | 21.84       | 21.71       | 21.74       | 22.04       | 21.90       | 21.91       |
| 1          | 0            | 11          | 21.57       | 21.72       | 21.75       | 21.78       | 21.89       | 21.93       |
| 1          | 5            | 11          | 21.57       | 21.72       | 21.77       | 21.77       | 21.91       | 21.96       |
| 4          | 0            | 0           | 21.73       | 21.51       | 21.52       | 22.07       | 21.84       | 21.92       |
| 4          | 2            | 0           | 21.75       | 21.56       | 21.60       | 22.03       | 21.85       | 21.92       |
| 4          | 0            | 11          | 21.40       | 21.55       | 21.59       | 21.67       | 21.88       | 21.96       |
| 4          | 2            | 11          | 21.39       | 21.56       | 21.61       | 21.71       | 21.89       | 21.94       |
| 6          | 0            | 0           | 21.87       | 21.53       | 21.51       | 21.84       | 21.70       | 21.60       |
| 6          | 0            | 11          | 21.40       | 21.56       | 21.63       | 21.51       | 21.75       | 21.63       |

## 7.9 Test for Band 2\_Bandwidth 20 MHz

-. Test Result : Pass

Conducted Average Output Power (dBm)

| RB<br>Size | RB<br>Offset | RB<br>Index | QPSK        |             |             | 16QAM       |             |             |
|------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|            |              |             | LOW         | MIDDLE      | HIGH        | LOW         | MIDDLE      | HIGH        |
|            |              |             | 1 860.0 MHz | 1 880.0 MHz | 1 900.0 MHz | 1 860.0 MHz | 1 880.0 MHz | 1 900.0 MHz |
| 1          | 0            | 0           | 21.88       | 21.73       | 21.77       | 22.08       | 21.96       | 21.96       |
| 1          | 5            | 0           | 21.77       | 21.65       | 21.73       | 22.05       | 21.84       | 21.92       |
| 1          | 0            | 7           | 21.70       | 21.65       | 21.76       | 21.87       | 21.87       | 21.94       |
| 1          | 5            | 7           | 21.69       | 21.67       | 21.74       | 21.89       | 21.91       | 21.88       |
| 1          | 0            | 15          | 21.63       | 21.70       | 21.75       | 21.79       | 21.89       | 21.89       |
| 1          | 5            | 15          | 21.63       | 21.69       | 21.75       | 21.83       | 21.86       | 21.87       |
| 4          | 0            | 0           | 21.68       | 21.48       | 21.56       | 21.98       | 21.83       | 21.87       |
| 4          | 2            | 0           | 21.68       | 21.44       | 21.55       | 21.95       | 21.81       | 21.93       |
| 4          | 0            | 15          | 21.42       | 21.54       | 21.54       | 21.82       | 21.91       | 21.93       |
| 4          | 2            | 15          | 21.48       | 21.58       | 21.61       | 21.85       | 21.89       | 21.89       |
| 6          | 0            | 0           | 21.71       | 21.49       | 21.56       | 21.90       | 21.57       | 21.74       |
| 6          | 0            | 15          | 21.44       | 21.51       | 21.54       | 21.64       | 21.63       | 21.81       |

## 8. EQUIVALENT ISOTROPIC RADIATED POWER

### 8.1 Operating environment

Temperature : 22 °C  
Relative humidity : 45 % R.H.

### 8.2 Methods of Measurement

1. The testing follows ANSI C63.26 (2015) Section 5.5.3.
2. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
3. The substitution antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value” of step 2. Record the power level of S.G.
4. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution antenna power can be Calculated. E.R.P power = E.I.P.R power - 2.15 dBi.

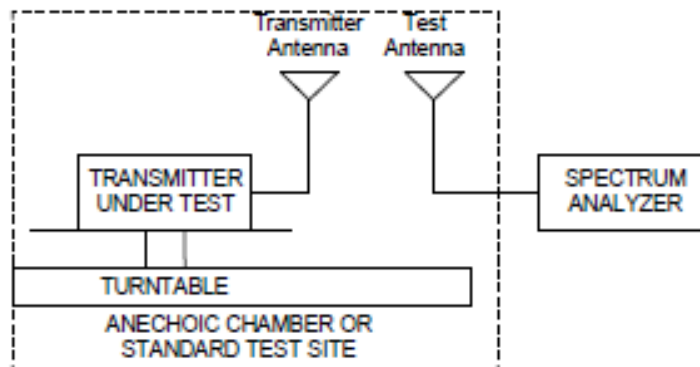
### 8.3 Limits

Rule Part 24.232(c) Mobile and portable stations are limited to 2 watts EIRP.

|       |              |
|-------|--------------|
| Limit | 2 W (33 dBm) |
|-------|--------------|

### 8.4 Test set-up

The EUT and measurement equipment were set up as shown in the diagram below.



### 8.5 Test Date

January 15, 2024 ~ February 08, 2024

## 8.6 Test data for Band 2\_Bandwidth 1.4 MHz

-. Test Result : Pass

| Frequency<br>(MHz)         | Substituted Level<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Ant Gain<br>(dBi) | EIRP<br>(dBm) | Limits<br>(dBm) | Margin<br>(dB) |
|----------------------------|----------------------------|--------------------|--------------------|-------------------|---------------|-----------------|----------------|
| <b>Test Data for QPSK</b>  |                            |                    |                    |                   |               |                 |                |
| 1 850.7                    | 14.91                      | H                  | 3.62               | 10.00             | 21.30         | 33.00           | 11.71          |
|                            | 14.01                      | V                  | 3.62               | 10.00             | 20.40         | 33.00           | 12.61          |
| 1 880.0                    | 14.54                      | H                  | 3.62               | 10.00             | 20.93         | 33.00           | 12.08          |
|                            | 13.86                      | V                  | 3.62               | 10.00             | 20.25         | 33.00           | 12.76          |
| 1 909.3                    | 14.68                      | H                  | 3.71               | 10.00             | 20.97         | 33.00           | 12.03          |
|                            | 13.96                      | V                  | 3.71               | 10.00             | 20.25         | 33.00           | 12.75          |
| <b>Test Data for 16QAM</b> |                            |                    |                    |                   |               |                 |                |
| 1 850.7                    | 13.83                      | H                  | 3.62               | 10.00             | 20.22         | 33.00           | 12.79          |
|                            | 13.21                      | V                  | 3.62               | 10.00             | 19.60         | 33.00           | 13.41          |
| 1 880.0                    | 13.76                      | H                  | 3.62               | 10.00             | 20.15         | 33.00           | 12.86          |
|                            | 13.29                      | V                  | 3.62               | 10.00             | 19.68         | 33.00           | 13.33          |
| 1 909.3                    | 13.65                      | H                  | 3.71               | 10.00             | 19.94         | 33.00           | 13.06          |
|                            | 12.96                      | V                  | 3.71               | 10.00             | 19.25         | 33.00           | 13.75          |

Remark: "H": Horizontal, "V": Vertical

## 8.7 Test data for Band 2\_Bandwidth 3 MHz

-. Test Result : Pass

| Frequency<br>(MHz)         | Substituted Level<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Ant Gain<br>(dBi) | EIRP<br>(dBm) | Limits<br>(dBm) | Margin<br>(dB) |
|----------------------------|----------------------------|--------------------|--------------------|-------------------|---------------|-----------------|----------------|
| <b>Test Data for QPSK</b>  |                            |                    |                    |                   |               |                 |                |
| 1 851.5                    | 15.70                      | H                  | 3.62               | 10.00             | 22.09         | 33.00           | 10.92          |
|                            | 14.80                      | V                  | 3.62               | 10.00             | 21.19         | 33.00           | 11.82          |
| 1 880.0                    | 14.89                      | H                  | 3.62               | 10.00             | 21.28         | 33.00           | 11.73          |
|                            | 13.68                      | V                  | 3.62               | 10.00             | 20.07         | 33.00           | 12.94          |
| 1 908.5                    | 14.50                      | H                  | 3.71               | 10.00             | 20.79         | 33.00           | 12.21          |
|                            | 13.67                      | V                  | 3.71               | 10.00             | 19.96         | 33.00           | 13.04          |
| <b>Test Data for 16QAM</b> |                            |                    |                    |                   |               |                 |                |
| 1 851.5                    | 14.35                      | H                  | 3.62               | 10.00             | 20.74         | 33.00           | 12.27          |
|                            | 13.85                      | V                  | 3.62               | 10.00             | 20.24         | 33.00           | 12.77          |
| 1 880.0                    | 14.68                      | H                  | 3.62               | 10.00             | 21.07         | 33.00           | 11.94          |
|                            | 13.32                      | V                  | 3.62               | 10.00             | 19.71         | 33.00           | 13.30          |
| 1 908.5                    | 14.18                      | H                  | 3.71               | 10.00             | 20.47         | 33.00           | 12.53          |
|                            | 13.16                      | V                  | 3.71               | 10.00             | 19.45         | 33.00           | 13.55          |

Remark: "H": Horizontal, "V": Vertical

## 8.8 Test data for Band 2\_Bandwidth 5 MHz

-. Test Result : Pass

| Frequency<br>(MHz)         | Substituted Level<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Ant Gain<br>(dBi) | EIRP<br>(dBm) | Limits<br>(dBm) | Margin<br>(dB) |
|----------------------------|----------------------------|--------------------|--------------------|-------------------|---------------|-----------------|----------------|
| <b>Test Data for QPSK</b>  |                            |                    |                    |                   |               |                 |                |
| 1 852.5                    | 14.81                      | H                  | 3.62               | 10.00             | 21.20         | 33.00           | 11.81          |
|                            | 13.65                      | V                  | 3.62               | 10.00             | 20.04         | 33.00           | 12.97          |
| 1 880.0                    | 13.66                      | H                  | 3.62               | 10.00             | 20.05         | 33.00           | 12.96          |
|                            | 12.51                      | V                  | 3.62               | 10.00             | 18.90         | 33.00           | 14.11          |
| 1 907.5                    | 13.20                      | H                  | 3.71               | 10.00             | 19.49         | 33.00           | 13.51          |
|                            | 12.38                      | V                  | 3.71               | 10.00             | 18.67         | 33.00           | 14.33          |
| <b>Test Data for 16QAM</b> |                            |                    |                    |                   |               |                 |                |
| 1 852.5                    | 14.85                      | H                  | 3.62               | 10.00             | 21.24         | 33.00           | 11.77          |
|                            | 13.69                      | V                  | 3.62               | 10.00             | 20.08         | 33.00           | 12.93          |
| 1 880.0                    | 14.63                      | H                  | 3.62               | 10.00             | 21.02         | 33.00           | 11.99          |
|                            | 13.36                      | V                  | 3.62               | 10.00             | 19.75         | 33.00           | 13.26          |
| 1 907.5                    | 13.47                      | H                  | 3.71               | 10.00             | 19.76         | 33.00           | 13.24          |
|                            | 12.46                      | V                  | 3.71               | 10.00             | 18.75         | 33.00           | 14.25          |

Remark: "H": Horizontal, "V": Vertical

## 8.9 Test data for Band 2\_Bandwidth 10 MHz

-. Test Result : Pass

| Frequency<br>(MHz)         | Substituted Level<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Ant Gain<br>(dBi) | EIRP<br>(dBm) | Limits<br>(dBm) | Margin<br>(dB) |
|----------------------------|----------------------------|--------------------|--------------------|-------------------|---------------|-----------------|----------------|
| <b>Test Data for QPSK</b>  |                            |                    |                    |                   |               |                 |                |
| 1 855.0                    | 14.75                      | H                  | 3.62               | 10.00             | 21.14         | 33.00           | 11.87          |
|                            | 13.62                      | V                  | 3.62               | 10.00             | 20.01         | 33.00           | 13.00          |
| 1 880.0                    | 14.98                      | H                  | 3.62               | 10.00             | 21.37         | 33.00           | 11.64          |
|                            | 13.86                      | V                  | 3.62               | 10.00             | 20.25         | 33.00           | 12.76          |
| 1 905.0                    | 13.96                      | H                  | 3.71               | 10.00             | 20.25         | 33.00           | 12.75          |
|                            | 12.98                      | V                  | 3.71               | 10.00             | 19.27         | 33.00           | 13.73          |
| <b>Test Data for 16QAM</b> |                            |                    |                    |                   |               |                 |                |
| 1 855.0                    | 15.08                      | H                  | 3.62               | 10.00             | 21.47         | 33.00           | 11.54          |
|                            | 13.76                      | V                  | 3.62               | 10.00             | 20.15         | 33.00           | 12.86          |
| 1 880.0                    | 15.09                      | H                  | 3.62               | 10.00             | 21.48         | 33.00           | 11.53          |
|                            | 14.26                      | V                  | 3.62               | 10.00             | 20.65         | 33.00           | 12.36          |
| 1 905.0                    | 14.67                      | H                  | 3.71               | 10.00             | 20.96         | 33.00           | 12.04          |
|                            | 13.51                      | V                  | 3.71               | 10.00             | 19.80         | 33.00           | 13.20          |

Remark: "H": Horizontal, "V": Vertical

## 8.10 Test data for Band 2\_Bandwidth 15 MHz

-. Test Result : Pass

| Frequency<br>(MHz)         | Substituted Level<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Ant Gain<br>(dBi) | EIRP<br>(dBm) | Limits<br>(dBm) | Margin<br>(dB) |
|----------------------------|----------------------------|--------------------|--------------------|-------------------|---------------|-----------------|----------------|
| <b>Test Data for QPSK</b>  |                            |                    |                    |                   |               |                 |                |
| 1 857.5                    | 14.68                      | H                  | 3.62               | 10.00             | 21.07         | 33.00           | 11.94          |
|                            | 13.67                      | V                  | 3.62               | 10.00             | 20.06         | 33.00           | 12.95          |
| 1 880.0                    | 14.53                      | H                  | 3.62               | 10.00             | 20.92         | 33.00           | 12.09          |
|                            | 13.75                      | V                  | 3.62               | 10.00             | 20.14         | 33.00           | 12.87          |
| 1 902.5                    | 13.56                      | H                  | 3.71               | 10.00             | 19.85         | 33.00           | 13.15          |
|                            | 12.68                      | V                  | 3.71               | 10.00             | 18.97         | 33.00           | 14.03          |
| <b>Test Data for 16QAM</b> |                            |                    |                    |                   |               |                 |                |
| 1 857.5                    | 14.92                      | H                  | 3.62               | 10.00             | 21.31         | 33.00           | 11.70          |
|                            | 13.84                      | V                  | 3.62               | 10.00             | 20.23         | 33.00           | 12.78          |
| 1 880.0                    | 14.89                      | H                  | 3.62               | 10.00             | 21.28         | 33.00           | 11.73          |
|                            | 13.86                      | V                  | 3.62               | 10.00             | 20.25         | 33.00           | 12.76          |
| 1 902.5                    | 13.72                      | H                  | 3.71               | 10.00             | 20.01         | 33.00           | 12.99          |
|                            | 12.83                      | V                  | 3.71               | 10.00             | 19.12         | 33.00           | 13.88          |

Remark: "H": Horizontal, "V": Vertical

## 8.10 Test data for Band 2\_Bandwidth 20 MHz

-. Test Result : Pass

| Frequency<br>(MHz)         | Substituted Level<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Ant Gain<br>(dBi) | EIRP<br>(dBm) | Limits<br>(dBm) | Margin<br>(dB) |
|----------------------------|----------------------------|--------------------|--------------------|-------------------|---------------|-----------------|----------------|
| <b>Test Data for QPSK</b>  |                            |                    |                    |                   |               |                 |                |
| 1 860.0                    | 14.67                      | H                  | 3.62               | 10.00             | 21.06         | 33.00           | 11.95          |
|                            | 13.72                      | V                  | 3.62               | 10.00             | 20.11         | 33.00           | 12.90          |
| 1 880.0                    | 14.53                      | H                  | 3.62               | 10.00             | 20.92         | 33.00           | 12.09          |
|                            | 13.61                      | V                  | 3.62               | 10.00             | 20.00         | 33.00           | 13.01          |
| 1 900.0                    | 13.11                      | H                  | 3.71               | 10.00             | 19.40         | 33.00           | 13.60          |
|                            | 12.06                      | V                  | 3.71               | 10.00             | 18.35         | 33.00           | 14.65          |
| <b>Test Data for 16QAM</b> |                            |                    |                    |                   |               |                 |                |
| 1 860.0                    | 14.96                      | H                  | 3.62               | 10.00             | 21.35         | 33.00           | 11.66          |
|                            | 13.88                      | V                  | 3.62               | 10.00             | 20.27         | 33.00           | 12.74          |
| 1 880.0                    | 14.72                      | H                  | 3.62               | 10.00             | 21.11         | 33.00           | 11.90          |
|                            | 13.85                      | V                  | 3.62               | 10.00             | 20.24         | 33.00           | 12.77          |
| 1 900.0                    | 13.56                      | H                  | 3.71               | 10.00             | 19.85         | 33.00           | 13.15          |
|                            | 12.21                      | V                  | 3.71               | 10.00             | 18.50         | 33.00           | 14.50          |

Remark: "H": Horizontal, "V": Vertical

## 9. RADIATED SPURIOUS EMISSIONS

### 9.1 Operating environment

Temperature : 22 °C  
Relative humidity : 45 % R.H.

### 9.2 Test set-up

Radiated emission measurements are performed in the Semi-Anechoic chamber. The equipment under test is placed on a non-conductive table 3-meters away from the receive antenna in accordance with ANSI C63.26 (2015) Section 5.5.3. The turntable is rotated through 360°, and the receiving antenna scans in order to determine the level of the maximized emission. The level and position of the maximized emission is recorded with the spectrum analyzer using RMS detector.

A vertically polarized half-wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated.

The power is calculated by the following formula;

$$P_d(\text{dBm}) = P_g(\text{dBm}) - \text{cable loss (dB)} + \text{antenna gain (dB)}$$

Where:  $P_d$  is the dipole equivalent power and  $P_g$  is the generator output power into the substitution antenna.

The maximum EIRP is calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps are repeated with the receiving antenna in both vertical and horizontal polarization. the difference between the gain of the horn and an isotropic antenna are taken into consideration

#### Limits

Rule Part 24.238(a) specifies that “on any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log_{10}(P)$  dB.”

$$\begin{aligned} &= P(W) - [43 + 10\log(P)](\text{dB}) \\ &= [30+10\text{Log}(P)] (\text{dBm}) - [43 + 10\log(P)](\text{dB}) \\ &= -13 \text{ dBm} \end{aligned}$$

|       |         |
|-------|---------|
| Limit | -13 dBm |
|-------|---------|

#### Radiated spurious emissions

1. Frequency Range : 9 kHz ~ 10th Harmonics of highest channel fundamental frequency.
2. The EUT was setup to maximum output power. The 100 kHz RBW was used to scan from 30 MHz to 1 GHz. Also, the 1 MHz RBW was used to scan from 1 GHz to 20 GHz. The high, low and a middle channel were tested for out of band measurements.

### 9.3 Test Date

January 15, 2024 ~ February 08, 2024

#### 9.4 Test data for Band 2\_Bandwidth 1.4 MHz

-. Detector : RMS

-. Measurement distance : 3 m

-. Result : PASSED

| Frequency<br>(MHz)                  | Substituted Level<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Ant Gain<br>(dBi) | Corrected Reading<br>(dBm) | Limits<br>(dBm) | Margin<br>(dB) |
|-------------------------------------|----------------------------|--------------------|--------------------|-------------------|----------------------------|-----------------|----------------|
| <b>Test Data for Low Channel</b>    |                            |                    |                    |                   |                            |                 |                |
| 3 701.40                            | -67.17                     | H                  | 5.29               | 12.30             | -60.16                     | -13.00          | 47.16          |
| 5 552.10                            | -66.36                     | V                  | 6.59               | 13.10             | -59.85                     | -13.00          | 46.85          |
| 7 402.80                            | -64.59                     | H                  | 7.86               | 11.20             | -61.25                     | -13.00          | 48.25          |
| 9 253.50                            | -63.21                     | V                  | 8.96               | 11.00             | -61.17                     | -13.00          | 48.17          |
| 11 104.20                           | -60.96                     | V                  | 9.72               | 11.10             | -59.58                     | -13.00          | 46.58          |
| <b>Test Data for Middle Channel</b> |                            |                    |                    |                   |                            |                 |                |
| 3 760.00                            | -70.37                     | H                  | 5.29               | 12.30             | -63.36                     | -13.00          | 50.36          |
| 5 640.00                            | -66.70                     | V                  | 6.69               | 13.30             | -60.09                     | -13.00          | 47.09          |
| 7 520.00                            | -66.98                     | V                  | 7.94               | 11.30             | -63.62                     | -13.00          | 50.62          |
| 9 400.00                            | -64.16                     | V                  | 8.92               | 10.80             | -62.27                     | -13.00          | 49.27          |
| 11 280.00                           | -62.02                     | H                  | 9.86               | 11.30             | -60.58                     | -13.00          | 47.58          |
| <b>Test Data for High Channel</b>   |                            |                    |                    |                   |                            |                 |                |
| 3 818.60                            | -66.62                     | H                  | 5.36               | 12.40             | -59.58                     | -13.00          | 46.58          |
| 5 727.90                            | -66.64                     | V                  | 6.81               | 13.30             | -60.15                     | -13.00          | 47.15          |
| 7 637.20                            | -65.50                     | H                  | 8.05               | 11.50             | -62.05                     | -13.00          | 49.05          |
| 9 546.50                            | -63.02                     | V                  | 9.27               | 11.20             | -61.08                     | -13.00          | 48.08          |
| 11 455.80                           | -61.68                     | V                  | 9.83               | 11.30             | -60.21                     | -13.00          | 47.21          |

Remark: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst case was found in QPSK modulation

3. Rule Part 24.238(a) specifies that “on any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log_{10}(P)$  dB.”

Limit :  $33.00 - 43 + 10 \log_{10}(2.00) = -13$  dBm

“C.L” : Cable Loss, “H”: Horizontal, “V”: Vertical

### 9.5 Test data for Band 2\_Bandwidth 3 MHz

-. Detector : RMS

-. Measurement distance : 3 m

-. Result : PASSED

| Frequency<br>(MHz)                  | Substituted Level<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Ant Gain<br>(dBi) | Corrected Reading<br>(dBm) | Limits<br>(dBm) | Margin<br>(dB) |
|-------------------------------------|----------------------------|--------------------|--------------------|-------------------|----------------------------|-----------------|----------------|
| <b>Test Data for Low Channel</b>    |                            |                    |                    |                   |                            |                 |                |
| 3 703.00                            | -69.16                     | V                  | 5.29               | 12.30             | -62.15                     | -13.00          | 49.15          |
| 5 554.50                            | -64.13                     | H                  | 6.59               | 13.10             | -57.62                     | -13.00          | 44.62          |
| 7 406.00                            | -62.60                     | V                  | 7.86               | 11.20             | -59.26                     | -13.00          | 46.26          |
| 9 257.50                            | -62.09                     | V                  | 8.96               | 11.00             | -60.05                     | -13.00          | 47.05          |
| 11 109.00                           | -60.56                     | V                  | 9.72               | 11.10             | -59.18                     | -13.00          | 46.18          |
| <b>Test Data for Middle Channel</b> |                            |                    |                    |                   |                            |                 |                |
| 3 760.00                            | -73.43                     | V                  | 5.29               | 12.30             | -66.42                     | -13.00          | 53.42          |
| 5 640.00                            | -65.75                     | H                  | 6.69               | 13.30             | -59.14                     | -13.00          | 46.14          |
| 7 520.00                            | -62.97                     | H                  | 7.94               | 11.30             | -59.61                     | -13.00          | 46.61          |
| 9 400.00                            | -62.27                     | V                  | 8.92               | 10.80             | -60.38                     | -13.00          | 47.38          |
| 11 280.00                           | -60.62                     | V                  | 9.86               | 11.30             | -59.18                     | -13.00          | 46.18          |
| <b>Test Data for High Channel</b>   |                            |                    |                    |                   |                            |                 |                |
| 3 817.00                            | -72.45                     | V                  | 5.36               | 12.40             | -65.41                     | -13.00          | 52.41          |
| 5 725.50                            | -65.44                     | H                  | 6.81               | 13.30             | -58.95                     | -13.00          | 45.95          |
| 7 634.00                            | -62.96                     | H                  | 8.05               | 11.50             | -59.51                     | -13.00          | 46.51          |
| 9 542.50                            | -61.56                     | V                  | 9.27               | 11.20             | -59.62                     | -13.00          | 46.62          |
| 11 451.00                           | -61.69                     | V                  | 9.83               | 11.30             | -60.22                     | -13.00          | 47.22          |

Remark: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst case was found in QPSK modulation

3. Rule Part 24.238(a) specifies that “on any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log_{10}(P)$  dB.”

Limit :  $33.00 - 43 + 10 \log_{10}(2.00) = -13$  dBm

“C.L” : Cable Loss, “H”: Horizontal, “V”: Vertical

## 9.6 Test data for Band 2\_Bandwidth 5 MHz

-. Detector : RMS

-. Measurement distance : 3 m

-. Result : PASSED

| Frequency<br>(MHz)                  | Substituted Level<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Ant Gain<br>(dBi) | Corrected Reading<br>(dBm) | Limits<br>(dBm) | Margin<br>(dB) |
|-------------------------------------|----------------------------|--------------------|--------------------|-------------------|----------------------------|-----------------|----------------|
| <b>Test Data for Low Channel</b>    |                            |                    |                    |                   |                            |                 |                |
| 3 705.00                            | -72.30                     | V                  | 5.29               | 12.30             | -65.29                     | -13.00          | 52.29          |
| 5 557.50                            | -65.30                     | H                  | 6.59               | 13.10             | -58.79                     | -13.00          | 45.79          |
| 7 410.00                            | -67.33                     | H                  | 7.86               | 11.20             | -63.99                     | -13.00          | 50.99          |
| 9 262.50                            | -64.66                     | V                  | 8.96               | 11.00             | -62.62                     | -13.00          | 49.62          |
| 11 115.00                           | -61.78                     | H                  | 9.72               | 11.10             | -60.40                     | -13.00          | 47.40          |
| <b>Test Data for Middle Channel</b> |                            |                    |                    |                   |                            |                 |                |
| 3 760.00                            | -72.77                     | H                  | 5.29               | 12.30             | -65.76                     | -13.00          | 52.76          |
| 5 640.00                            | -64.60                     | V                  | 6.69               | 13.30             | -57.99                     | -13.00          | 44.99          |
| 7 520.00                            | -66.36                     | H                  | 7.94               | 11.30             | -63.00                     | -13.00          | 50.00          |
| 9 400.00                            | -64.22                     | H                  | 8.92               | 10.80             | -62.33                     | -13.00          | 49.33          |
| 11 280.00                           | -61.51                     | V                  | 9.86               | 11.30             | -60.07                     | -13.00          | 47.07          |
| <b>Test Data for High Channel</b>   |                            |                    |                    |                   |                            |                 |                |
| 3 815.00                            | -76.35                     | H                  | 5.36               | 12.40             | -69.31                     | -13.00          | 56.31          |
| 5 722.50                            | -64.84                     | V                  | 6.81               | 13.30             | -58.35                     | -13.00          | 45.35          |
| 7 630.00                            | -67.41                     | H                  | 8.05               | 11.50             | -63.96                     | -13.00          | 50.96          |
| 9 537.50                            | -63.86                     | H                  | 9.27               | 11.20             | -61.92                     | -13.00          | 48.92          |
| 11 445.00                           | -61.65                     | H                  | 9.83               | 11.30             | -60.18                     | -13.00          | 47.18          |

Remark: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst case was found in QPSK modulation

3. Rule Part 24.238(a) specifies that “on any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log_{10}(P)$  dB.”

Limit :  $33.00 - 43 + 10 \log_{10}(2.00) = -13$  dBm

“C.L” : Cable Loss, “H”: Horizontal, “V”: Vertical

## 9.7 Test data for Band 2\_Bandwidth 10 MHz

-. Detector : RMS

-. Measurement distance : 3 m

-. Result : PASSED

| Frequency<br>(MHz)           | Substituted Level<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Ant Gain<br>(dBi) | Corrected Reading<br>(dBm) | Limits<br>(dBm) | Margin<br>(dB) |
|------------------------------|----------------------------|--------------------|--------------------|-------------------|----------------------------|-----------------|----------------|
| Test Data for Low Channel    |                            |                    |                    |                   |                            |                 |                |
| 3 710.00                     | -72.07                     | V                  | 5.29               | 12.30             | -65.06                     | -13.00          | 52.06          |
| 5 565.00                     | -67.21                     | V                  | 6.59               | 13.10             | -60.70                     | -13.00          | 47.70          |
| 7 420.00                     | -66.31                     | H                  | 7.86               | 11.20             | -62.97                     | -13.00          | 49.97          |
| 9 275.00                     | -63.83                     | V                  | 8.96               | 11.00             | -61.79                     | -13.00          | 48.79          |
| 11 130.00                    | -61.47                     | H                  | 9.72               | 11.10             | -60.09                     | -13.00          | 47.09          |
| Test Data for Middle Channel |                            |                    |                    |                   |                            |                 |                |
| 3 760.00                     | -74.45                     | H                  | 5.29               | 12.30             | -67.44                     | -13.00          | 54.44          |
| 5 640.00                     | -63.29                     | H                  | 6.69               | 13.30             | -56.68                     | -13.00          | 43.68          |
| 7 520.00                     | -66.77                     | V                  | 7.94               | 11.30             | -63.41                     | -13.00          | 50.41          |
| 9 400.00                     | -63.62                     | H                  | 8.92               | 10.80             | -61.73                     | -13.00          | 48.73          |
| 11 280.00                    | -62.36                     | V                  | 9.86               | 11.30             | -60.92                     | -13.00          | 47.92          |
| Test Data for High Channel   |                            |                    |                    |                   |                            |                 |                |
| 3 810.00                     | -70.65                     | V                  | 5.36               | 12.40             | -63.61                     | -13.00          | 50.61          |
| 5 715.00                     | -57.71                     | V                  | 6.81               | 13.30             | -51.22                     | -13.00          | 38.22          |
| 7 620.00                     | -67.27                     | V                  | 8.05               | 11.50             | -63.82                     | -13.00          | 50.82          |
| 9 525.00                     | -63.79                     | V                  | 9.27               | 11.20             | -61.85                     | -13.00          | 48.85          |
| 11 430.00                    | -61.73                     | H                  | 9.83               | 11.30             | -60.26                     | -13.00          | 47.26          |

Remark: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst case was found in QPSK modulation

3. Rule Part 24.238(a) specifies that “on any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log_{10}(P)$  dB.”

Limit :  $33.00 - 43 + 10 \log_{10}(2.00) = -13$  dBm

“C.L” : Cable Loss, “H”: Horizontal, “V”: Vertical

### 9.8 Test data for Band 2\_Bandwidth 15 MHz

-. Detector : RMS

-. Measurement distance : 3 m

-. Result : PASSED

| Frequency<br>(MHz)                  | Substituted Level<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Ant Gain<br>(dBi) | Corrected Reading<br>(dBm) | Limits<br>(dBm) | Margin<br>(dB) |
|-------------------------------------|----------------------------|--------------------|--------------------|-------------------|----------------------------|-----------------|----------------|
| <b>Test Data for Low Channel</b>    |                            |                    |                    |                   |                            |                 |                |
| 3 715.00                            | -75.65                     | H                  | 5.29               | 12.30             | -68.64                     | -13.00          | 55.64          |
| 5 572.50                            | -68.05                     | V                  | 6.59               | 13.10             | -61.54                     | -13.00          | 48.54          |
| 7 430.00                            | -67.07                     | H                  | 7.86               | 11.20             | -63.73                     | -13.00          | 50.73          |
| 9 287.50                            | -64.52                     | H                  | 8.96               | 11.00             | -62.48                     | -13.00          | 49.48          |
| 11 145.00                           | -61.56                     | H                  | 9.72               | 11.10             | -60.18                     | -13.00          | 47.18          |
| <b>Test Data for Middle Channel</b> |                            |                    |                    |                   |                            |                 |                |
| 3 760.00                            | -74.80                     | H                  | 5.29               | 12.30             | -67.79                     | -13.00          | 54.79          |
| 5 640.00                            | -60.99                     | V                  | 6.69               | 13.30             | -54.38                     | -13.00          | 41.38          |
| 7 520.00                            | -67.38                     | H                  | 7.94               | 11.30             | -64.02                     | -13.00          | 51.02          |
| 9 400.00                            | -64.55                     | H                  | 8.92               | 10.80             | -62.66                     | -13.00          | 49.66          |
| 11 280.00                           | -61.60                     | V                  | 9.86               | 11.30             | -60.16                     | -13.00          | 47.16          |
| <b>Test Data for High Channel</b>   |                            |                    |                    |                   |                            |                 |                |
| 3 805.00                            | -76.54                     | V                  | 5.36               | 12.40             | -69.50                     | -13.00          | 56.50          |
| 5 707.50                            | -61.57                     | V                  | 6.81               | 13.30             | -55.08                     | -13.00          | 42.08          |
| 7 610.00                            | -67.28                     | H                  | 8.05               | 11.50             | -63.83                     | -13.00          | 50.83          |
| 9 512.50                            | -63.71                     | V                  | 9.27               | 11.20             | -61.77                     | -13.00          | 48.77          |
| 11 415.00                           | -61.66                     | H                  | 9.83               | 11.30             | -60.19                     | -13.00          | 47.19          |

Remark: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst case was found in QPSK modulation

3. Rule Part 24.238(a) specifies that “on any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log_{10}(P)$  dB.”

Limit :  $33.00 - 43 + 10 \log_{10}(2.00) = -13$  dBm

“C.L” : Cable Loss, “H”: Horizontal, “V”: Vertical

## 9.9 Test data for Band 2\_Bandwidth 20 MHz

-. Detector : RMS

-. Measurement distance : 3 m

-. Result : PASSED

| Frequency<br>(MHz)           | Substituted Level<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Ant Gain<br>(dBi) | Corrected Reading<br>(dBm) | Limits<br>(dBm) | Margin<br>(dB) |
|------------------------------|----------------------------|--------------------|--------------------|-------------------|----------------------------|-----------------|----------------|
| Test Data for Low Channel    |                            |                    |                    |                   |                            |                 |                |
| 3 720.00                     | -73.98                     | V                  | 5.29               | 12.30             | -66.97                     | -13.00          | 53.97          |
| 5 580.00                     | -66.01                     | V                  | 6.59               | 13.10             | -59.50                     | -13.00          | 46.50          |
| 7 440.00                     | -66.51                     | H                  | 7.86               | 11.20             | -63.17                     | -13.00          | 50.17          |
| 9 300.00                     | -63.85                     | V                  | 8.96               | 11.00             | -61.81                     | -13.00          | 48.81          |
| 11 160.00                    | -61.62                     | H                  | 9.72               | 11.10             | -60.24                     | -13.00          | 47.24          |
| Test Data for Middle Channel |                            |                    |                    |                   |                            |                 |                |
| 3 760.00                     | -69.90                     | V                  | 5.29               | 12.30             | -62.89                     | -13.00          | 49.89          |
| 5 640.00                     | -70.66                     | H                  | 6.69               | 13.30             | -64.05                     | -13.00          | 51.05          |
| 7 520.00                     | -67.42                     | H                  | 7.94               | 11.30             | -64.06                     | -13.00          | 51.06          |
| 9 400.00                     | -63.77                     | V                  | 8.92               | 10.80             | -61.88                     | -13.00          | 48.88          |
| 11 280.00                    | -61.51                     | V                  | 9.86               | 11.30             | -60.07                     | -13.00          | 47.07          |
| Test Data for High Channel   |                            |                    |                    |                   |                            |                 |                |
| 3 800.00                     | -70.18                     | V                  | 5.36               | 12.40             | -63.14                     | -13.00          | 50.14          |
| 5 700.00                     | -59.76                     | V                  | 6.81               | 13.30             | -53.27                     | -13.00          | 40.27          |
| 7 600.00                     | -67.17                     | H                  | 7.94               | 11.30             | -63.81                     | -13.00          | 50.81          |
| 9 500.00                     | -63.61                     | V                  | 9.25               | 11.00             | -61.86                     | -13.00          | 48.86          |
| 11 400.00                    | -61.71                     | H                  | 9.83               | 11.30             | -60.24                     | -13.00          | 47.24          |

Remark: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst case was found in QPSK modulation

3. Rule Part 24.238(a) specifies that “on any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log_{10}(P)$  dB.”

Limit :  $33.00 - 43 + 10 \log_{10}(2.00) = -13$  dBm

“C.L” : Cable Loss, “H”: Horizontal, “V”: Vertical

## 10. PEAK-TO-AVERAGE RATIO

### 10.1 Operating environment

Temperature : 22 °C  
Relative humidity : 45 % R.H.

### 10.2 Test set-up

Peak to Average Power Ratio is tested in accordance with KDB971168 D01 Power Meas License Digital Systems v03, April 9, 2018, Section 5.7.

#### - Section 5.7.2 Measurement of peak power in a broadband noise-like signal using CCDF

- a) Set resolution/measurement bandwidth  $\geq$  OBW or specified reference bandwidth.
- b) Set the number of counts to a value that stabilizes the measured CCDF curve.
- c) Set the measurement interval as follows:
  - 1) For continuous transmissions, set to the greater of  $[10 \times (\text{number of points in sweep}) \times (\text{transmission symbol period})]$  or 1 ms.
  - 2) For burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize. Set the measurement interval to a time that is less than or equal to the burst duration.
  - 3) If there are several carriers in a single antenna port, the peak power shall be determined for each individual carrier (by disabling the other carriers while measuring the required carrier) and the total peak power calculated from the sum of the individual carrier peak powers.
- d) Record the maximum PAPR level associated with a probability of 0.1%.
- e) The peak power level is calculated from the sum of the PAPR value from step d) to the measured average power.

#### - Section 5.7.3 Alternate Procedure for PAPR

Some regulatory requirements specify a PAPR limit when the output power limits are specified in terms of average power. If it becomes necessary to provide measurement data to demonstrate compliance to a PAPR limit, then the appropriate procedure from those provided in 5.2.3 shall be utilized to determine the peak power (or peak PSD) and the appropriate procedure from those provided in 5.2.4 shall be used to determine the average power (or average PSD). The data from these measurements is then used in Equation (2) to determine the PAPR of a narrowband CW-like signal. See 5.2.3.4 for guidance on determining the PAPR of a broadband noise-like signal.

$$\text{PAPR (dB)} = P_{\text{Pk}} (\text{dBm or dBW}) - P_{\text{Avg}} (\text{dBm or dBW})$$

where

PAPR peak-to-average power ratio, in dB

$P_{\text{Pk}}$  measured peak power or peak PSD level, in dBm or dBW

$P_{\text{Avg}}$  measured average power or average PSD level, in dBm or dBW

### 10.3 Test Date

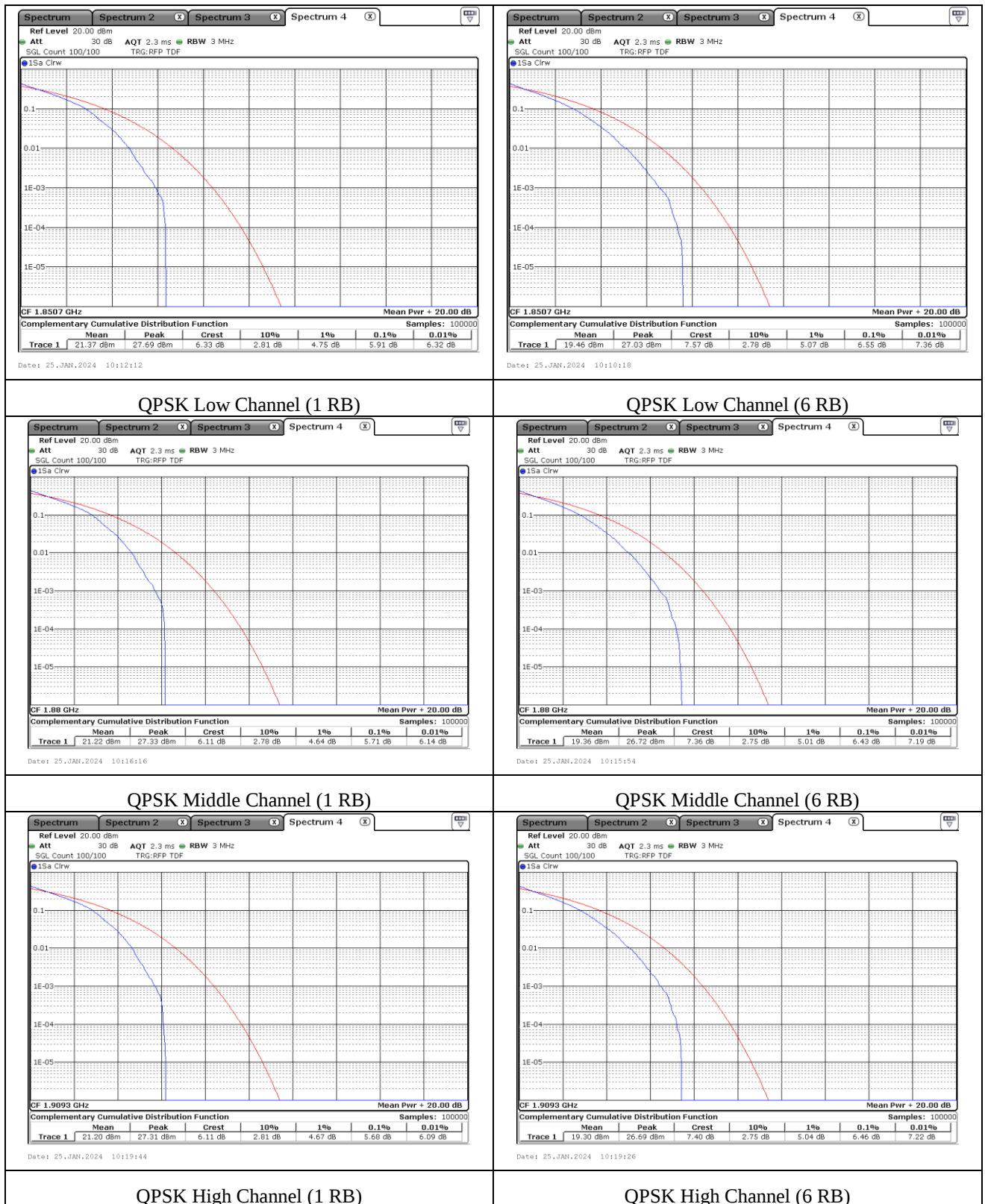
January 15, 2024 ~ February 08, 2024

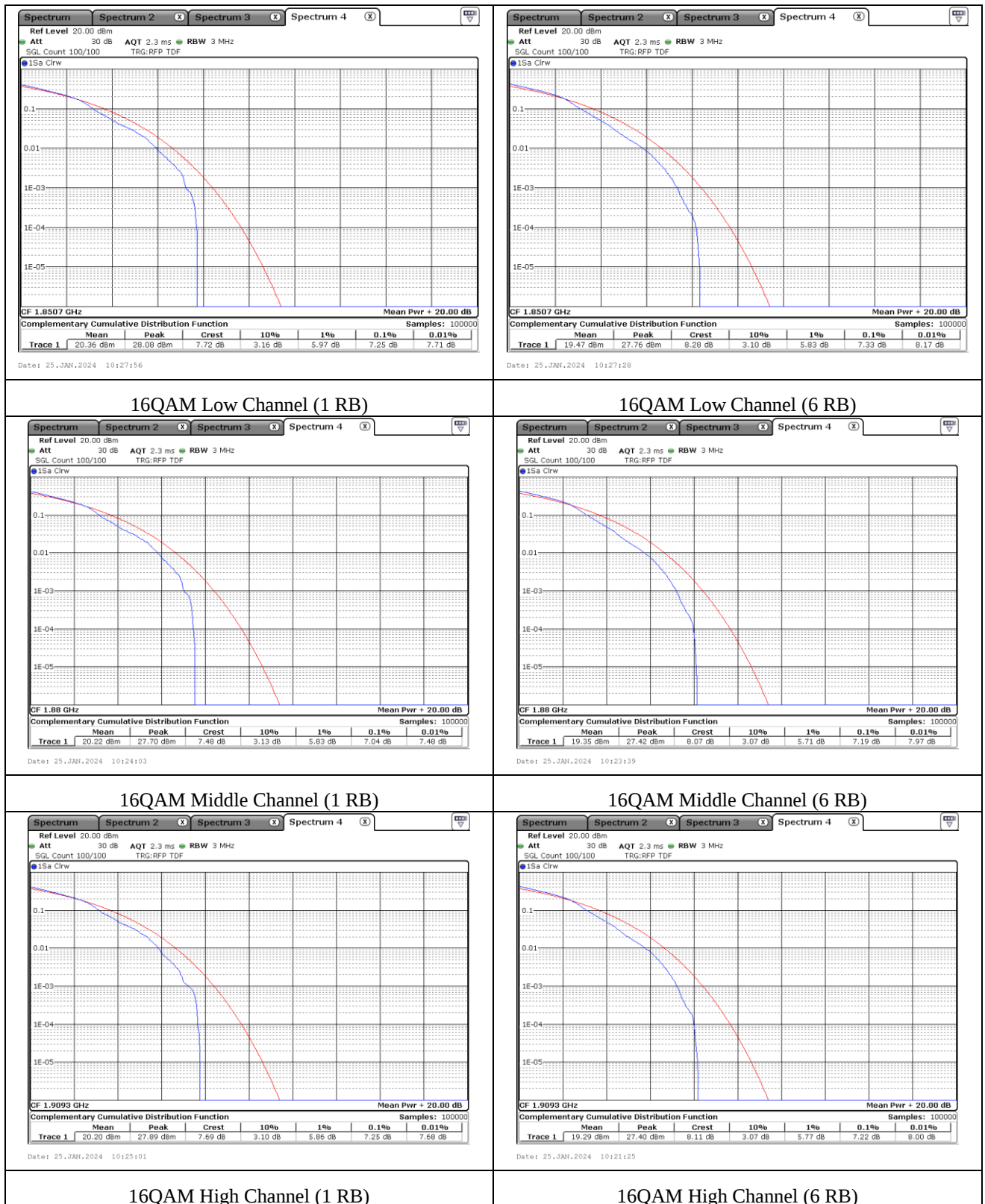
#### 10.4 Test data for Band 2\_Bandwidth 1.4 MHz

-. Test Result : Pass

| Test Mode               | Channel     | Peak-Average Ratio(PAR)<br>CCDF 0.1 % | Limit<br>(dB) | Result |
|-------------------------|-------------|---------------------------------------|---------------|--------|
| <b>LTE Band 2 QPSK</b>  |             |                                       |               |        |
| 1 RB                    | 1 850.7 MHz | 5.91                                  | 13.00         | Pass   |
|                         | 1 880.0 MHz | 5.71                                  | 13.00         | Pass   |
|                         | 1 909.3 MHz | 5.68                                  | 13.00         | Pass   |
| 6 RB                    | 1 850.7 MHz | 6.55                                  | 13.00         | Pass   |
|                         | 1 880.0 MHz | 6.43                                  | 13.00         | Pass   |
|                         | 1 909.3 MHz | 6.46                                  | 13.00         | Pass   |
| <b>LTE Band 2 16QAM</b> |             |                                       |               |        |
| 1 RB                    | 1 850.7 MHz | 7.25                                  | 13.00         | Pass   |
|                         | 1 880.0 MHz | 7.04                                  | 13.00         | Pass   |
|                         | 1 909.3 MHz | 7.25                                  | 13.00         | Pass   |
| 6 RB                    | 1 850.7 MHz | 7.33                                  | 13.00         | Pass   |
|                         | 1 880.0 MHz | 7.19                                  | 13.00         | Pass   |
|                         | 1 909.3 MHz | 7.22                                  | 13.00         | Pass   |

Remark: Measured the using CCDFof spectrum analyzer.



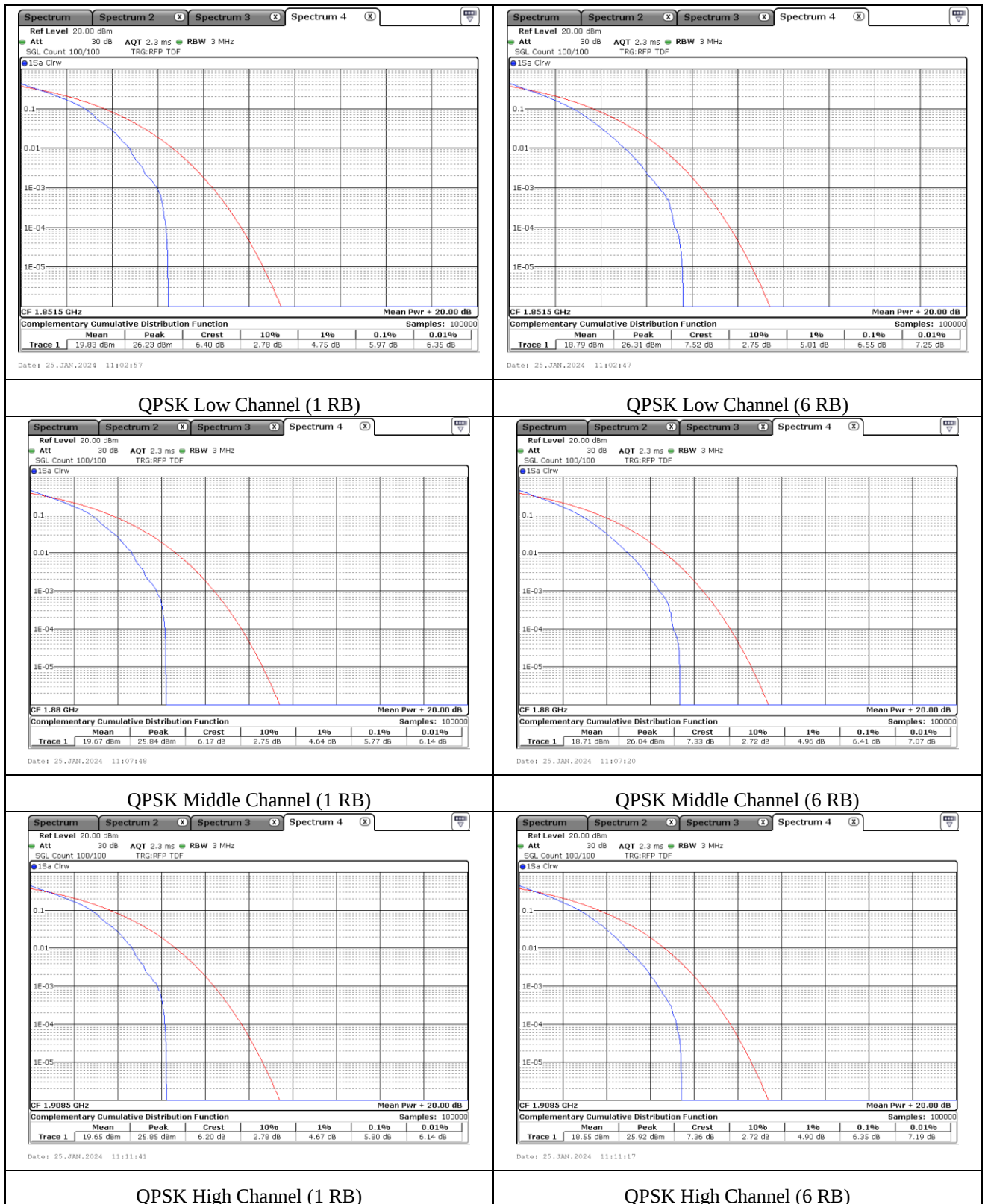


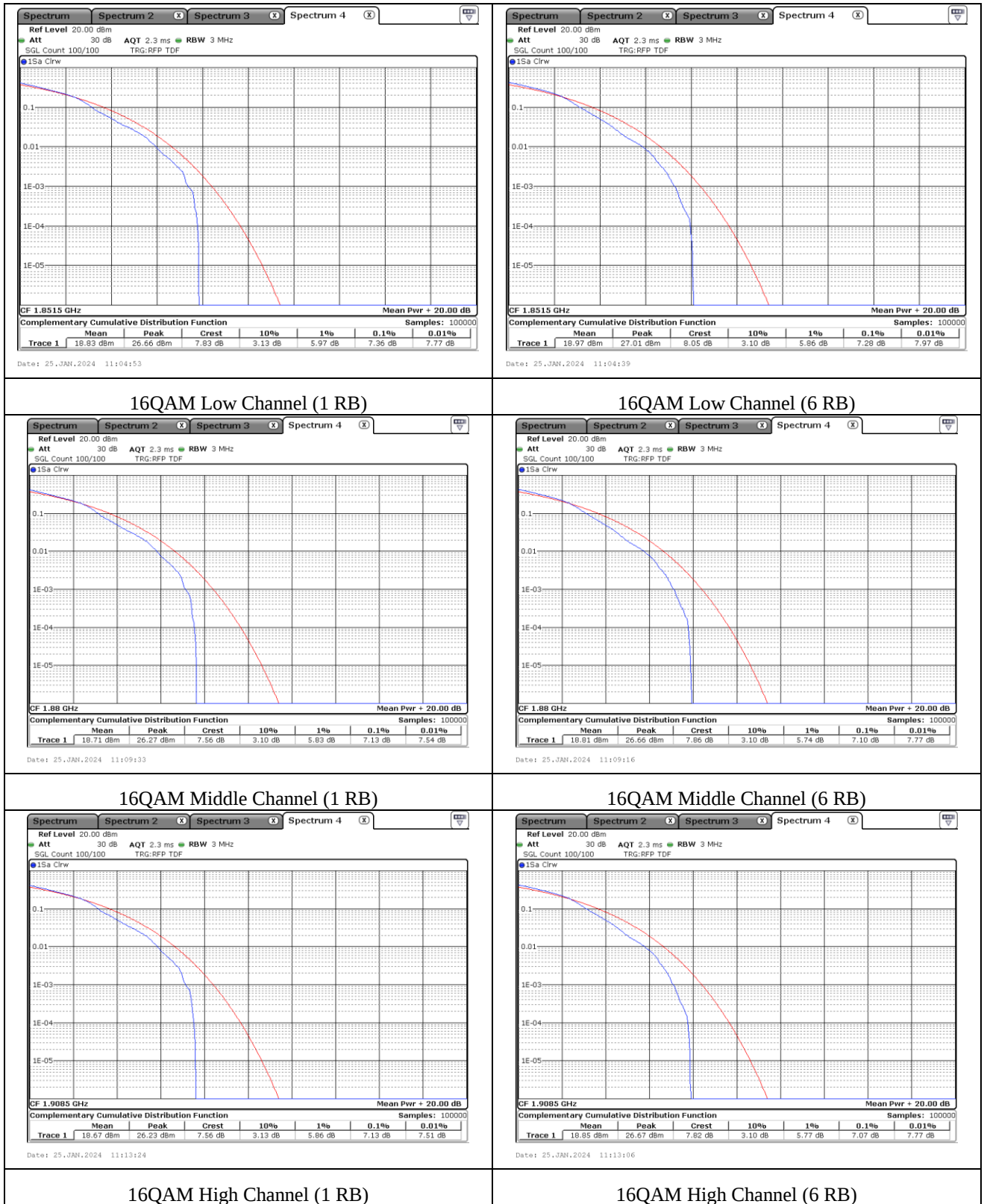
### 10.5 Test data for Band 2\_Bandwidth 3 MHz

-. Test Result : Pass

| Test Mode               | Channel     | Peak-Average Ratio(PAR)<br>CCDF 0.1 % | Limit<br>(dB) | Result |
|-------------------------|-------------|---------------------------------------|---------------|--------|
| <b>LTE Band 2 QPSK</b>  |             |                                       |               |        |
| 1 RB                    | 1 851.5 MHz | 5.97                                  | 13.00         | Pass   |
|                         | 1 880.0 MHz | 5.77                                  | 13.00         | Pass   |
|                         | 1 908.5 MHz | 5.80                                  | 13.00         | Pass   |
| 6 RB                    | 1 851.5 MHz | 6.55                                  | 13.00         | Pass   |
|                         | 1 880.0 MHz | 6.41                                  | 13.00         | Pass   |
|                         | 1 908.5 MHz | 6.35                                  | 13.00         | Pass   |
| <b>LTE Band 2 16QAM</b> |             |                                       |               |        |
| 1 RB                    | 1 851.5 MHz | 7.36                                  | 13.00         | Pass   |
|                         | 1 880.0 MHz | 7.13                                  | 13.00         | Pass   |
|                         | 1 908.5 MHz | 7.13                                  | 13.00         | Pass   |
| 6 RB                    | 1 851.5 MHz | 7.28                                  | 13.00         | Pass   |
|                         | 1 880.0 MHz | 7.10                                  | 13.00         | Pass   |
|                         | 1 908.5 MHz | 7.07                                  | 13.00         | Pass   |

Remark: Measured the using CCDFof spectrum analyzer.



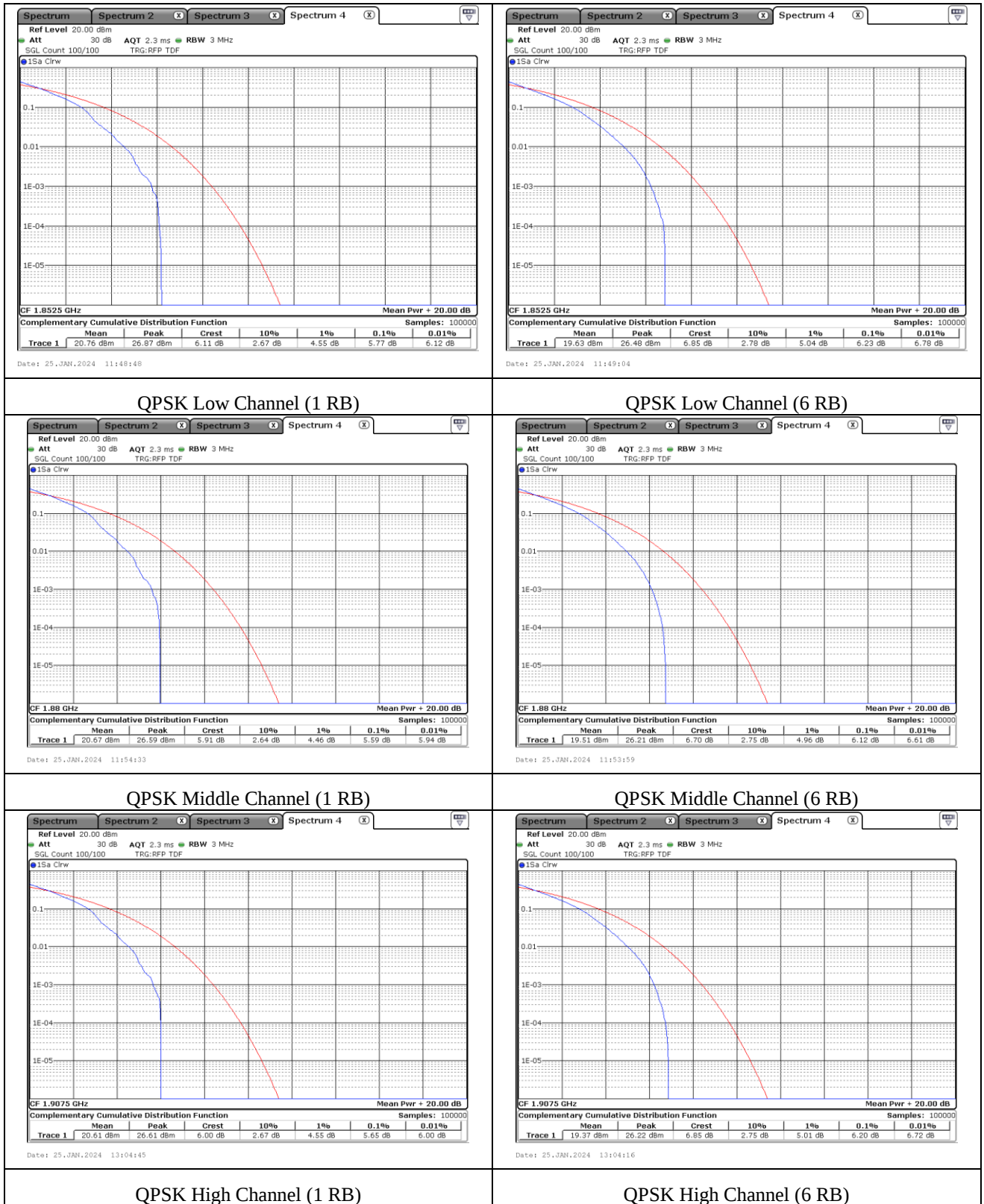


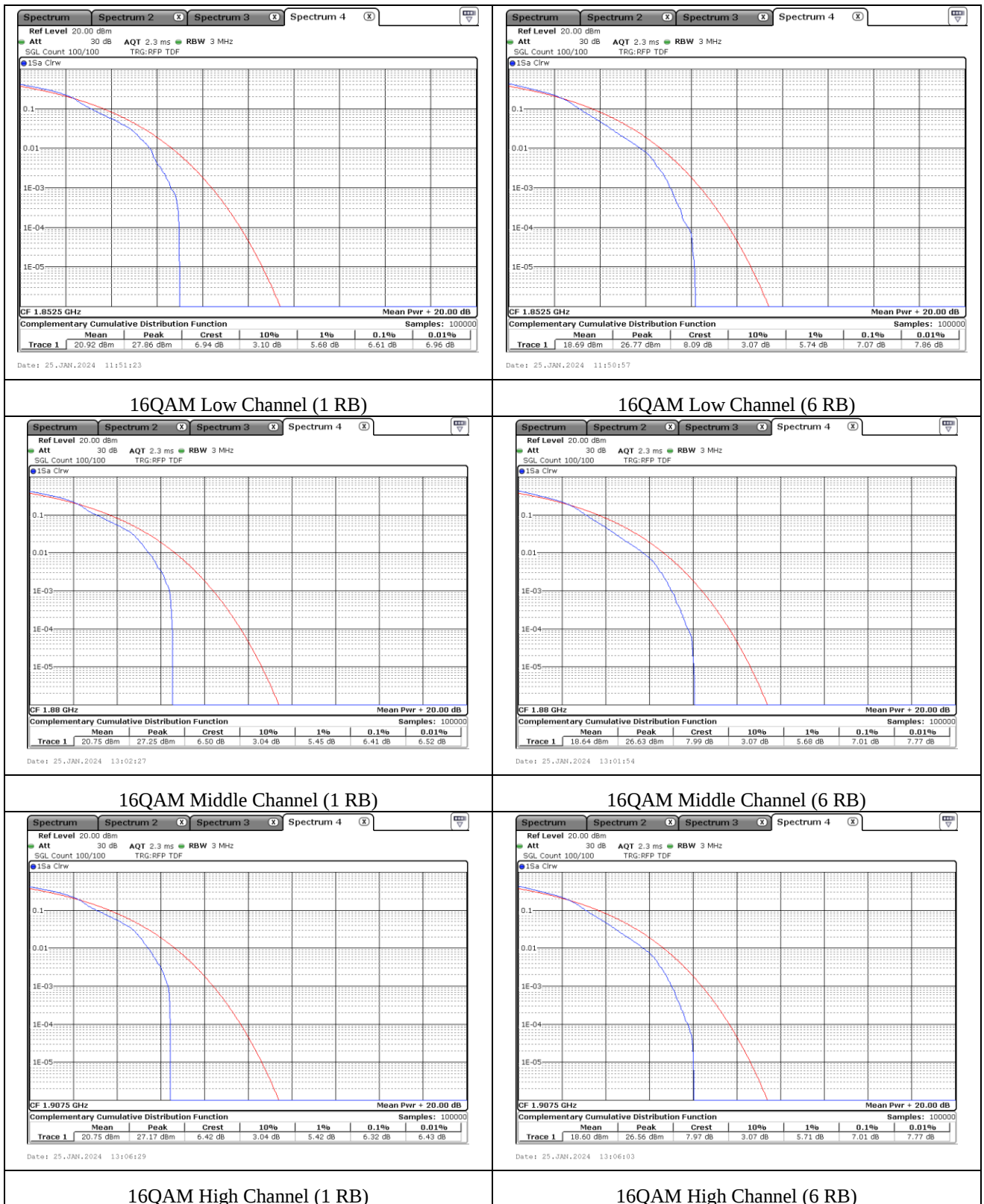
## 10.6 Test data for Band 2\_Bandwidth 5 MHz

-. Test Result : Pass

| Test Mode               | Channel     | Peak-Average Ratio(PAR)<br>CCDF 0.1 % | Limit<br>(dB) | Result |
|-------------------------|-------------|---------------------------------------|---------------|--------|
| <b>LTE Band 2 QPSK</b>  |             |                                       |               |        |
| 1 RB                    | 1 852.5 MHz | 5.77                                  | 13.00         | Pass   |
|                         | 1 880.0 MHz | 5.59                                  | 13.00         | Pass   |
|                         | 1 907.5 MHz | 5.65                                  | 13.00         | Pass   |
| 6 RB                    | 1 852.5 MHz | 6.23                                  | 13.00         | Pass   |
|                         | 1 880.0 MHz | 6.12                                  | 13.00         | Pass   |
|                         | 1 907.5 MHz | 6.20                                  | 13.00         | Pass   |
| <b>LTE Band 2 16QAM</b> |             |                                       |               |        |
| 1 RB                    | 1 852.5 MHz | 6.61                                  | 13.00         | Pass   |
|                         | 1 880.0 MHz | 6.41                                  | 13.00         | Pass   |
|                         | 1 907.5 MHz | 6.32                                  | 13.00         | Pass   |
| 6 RB                    | 1 852.5 MHz | 7.07                                  | 13.00         | Pass   |
|                         | 1 880.0 MHz | 7.01                                  | 13.00         | Pass   |
|                         | 1 907.5 MHz | 7.01                                  | 13.00         | Pass   |

Remark: Measured the using CCDFof spectrum analyzer.



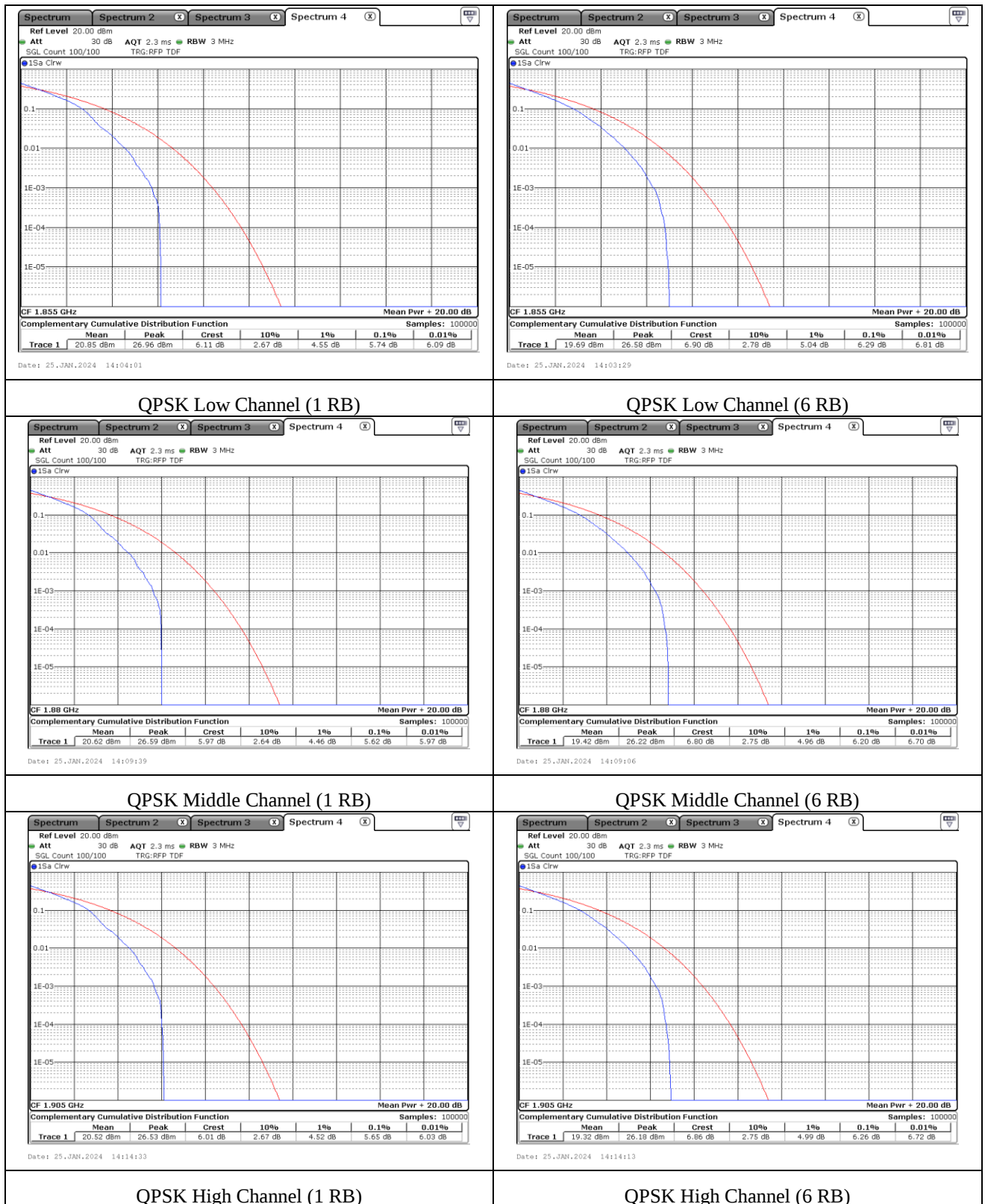


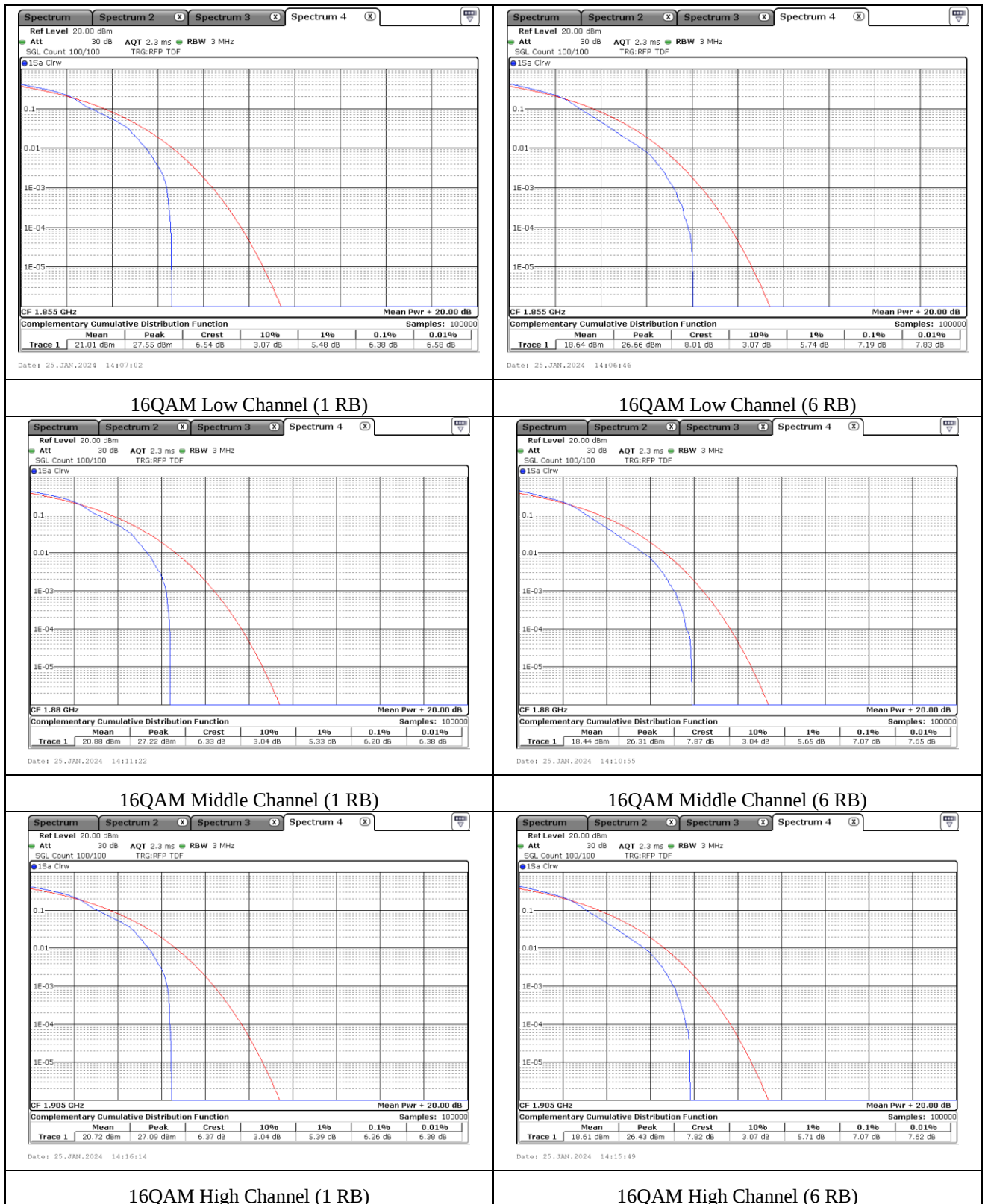
### 10.7 Test data for Band 2\_Bandwidth 10 MHz

-. Test Result : Pass

| Test Mode               | Channel     | Peak-Average Ratio(PAR)<br>CCDF 0.1 % | Limit<br>(dB) | Result |
|-------------------------|-------------|---------------------------------------|---------------|--------|
| <b>LTE Band 2 QPSK</b>  |             |                                       |               |        |
| 1 RB                    | 1 855.0 MHz | 5.74                                  | 13.00         | Pass   |
|                         | 1 880.0 MHz | 5.62                                  | 13.00         | Pass   |
|                         | 1 905.0 MHz | 5.65                                  | 13.00         | Pass   |
| 6 RB                    | 1 855.0 MHz | 6.29                                  | 13.00         | Pass   |
|                         | 1 880.0 MHz | 6.20                                  | 13.00         | Pass   |
|                         | 1 905.0 MHz | 6.26                                  | 13.00         | Pass   |
| <b>LTE Band 2 16QAM</b> |             |                                       |               |        |
| 1 RB                    | 1 855.0 MHz | 6.38                                  | 13.00         | Pass   |
|                         | 1 880.0 MHz | 6.20                                  | 13.00         | Pass   |
|                         | 1 905.0 MHz | 6.26                                  | 13.00         | Pass   |
| 6 RB                    | 1 855.0 MHz | 7.19                                  | 13.00         | Pass   |
|                         | 1 880.0 MHz | 7.07                                  | 13.00         | Pass   |
|                         | 1 905.0 MHz | 7.07                                  | 13.00         | Pass   |

Remark: Measured the using CCDFof spectrum analyzer.





### 10.8 Test data for Band 2\_Bandwidth 15 MHz

-. Test Result : Pass

| Test Mode               | Channel     | Peak-Average Ratio(PAR)<br>CCDF 0.1 % | Limit<br>(dB) | Result |
|-------------------------|-------------|---------------------------------------|---------------|--------|
| <b>LTE Band 2 QPSK</b>  |             |                                       |               |        |
| 1 RB                    | 1 857.5 MHz | 5.62                                  | 13.00         | Pass   |
|                         | 1 880.0 MHz | 5.45                                  | 13.00         | Pass   |
|                         | 1 902.5 MHz | 5.57                                  | 13.00         | Pass   |
| 6 RB                    | 1 857.5 MHz | 5.88                                  | 13.00         | Pass   |
|                         | 1 880.0 MHz | 5.74                                  | 13.00         | Pass   |
|                         | 1 902.5 MHz | 5.77                                  | 13.00         | Pass   |
| <b>LTE Band 2 16QAM</b> |             |                                       |               |        |
| 1 RB                    | 1 857.5 MHz | 6.43                                  | 13.00         | Pass   |
|                         | 1 880.0 MHz | 6.23                                  | 13.00         | Pass   |
|                         | 1 902.5 MHz | 6.23                                  | 13.00         | Pass   |
| 6 RB                    | 1 857.5 MHz | 6.23                                  | 13.00         | Pass   |
|                         | 1 880.0 MHz | 6.09                                  | 13.00         | Pass   |
|                         | 1 902.5 MHz | 6.23                                  | 13.00         | Pass   |

Remark: Measured the using CCDFof spectrum analyzer.

