

# TEST REPORT

of

FCC Part 2 Subpart J, Part 90 Subpart S

FCC ID: XHG-RT410

Equipment Under Test : Mobile Hotspot  
Model Name : RT410  
Variant Model Name(s) : -  
Applicant : Franklin Technology Inc.  
Manufacturer : Franklin Technology Inc.  
Date of Receipt : 2020.09.15  
Date of Test(s) : 2020.09.16 ~ 2020.10.29  
Date of Issue : 2020.10.29

In the configuration tested, the EUT complied with the standards specified above. This test report does not assure KOLAS accreditation.

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- 2) The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received.
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Tested by:

  
Murphy Kim

Technical  
Manager:

  
Jungmin Yang

**SGS Korea Co., Ltd. Gunpo Laboratory**

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## 1. General Information

### 1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

- 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- Designation number: KR0150

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Phone No. : +82 31 688 0901

Fax No. : +82 31 688 0921

### 1.2. Details of Applicant

Applicant : Franklin Technology Inc.

Address : 906 JEI Platz, 186, Gasan digital 1-ro, Gumcheon-Gu, Seoul, South Korea, 08502

Contact Person : Lee, James

Phone No. : +82 70 8228 6445

### 1.3. Details of Manufacturer

Company : Same as applicant

Address : Same as applicant

### 1.4. Description of EUT

|                             |                                |
|-----------------------------|--------------------------------|
| <b>Kind of Product</b>      | Mobile Hotspot                 |
| <b>Model Name</b>           | RT410                          |
| <b>Power Supply</b>         | DC 3.8 V                       |
| <b>Rated Power</b>          | LTE Band 26: 23 dB m           |
| <b>Frequency Range</b>      | LTE Band 26: 814 MHz ~ 824 MHz |
| <b>Modulation Technique</b> | QPSK, 16QAM                    |
| <b>Antenna Type</b>         | FPCB type antenna              |
| <b>Antenna gain</b>         | 1.07 dB i                      |

## 1.5. Test Equipment List

| Equipment                | Manufacturer               | Model                                | S/N                   | Cal. Date     | Cal. Interval | Cal. Due      |
|--------------------------|----------------------------|--------------------------------------|-----------------------|---------------|---------------|---------------|
| Signal Generator         | Agilent                    | E8257D                               | MY51501169            | Nov. 21, 2019 | Annual        | Nov. 21, 2020 |
| Spectrum Analyzer        | R&S                        | FSV30                                | 103455                | Dec. 22, 2019 | Annual        | Dec. 22, 2020 |
| Mobile Test Unit         | R&S                        | CMW500                               | 144034                | Feb. 28, 2020 | Annual        | Feb. 28, 2021 |
| Power Meter              | Anritsu                    | ML2495A                              | 1223004               | Jun. 01, 2020 | Annual        | Jun. 01, 2021 |
| Power Sensor             | Anritsu                    | MA2411B                              | 1207272               | Jun. 01, 2020 | Annual        | Jun. 01, 2021 |
| Directional Coupler      | KRYTAR                     | 152613                               | 122660                | Jun. 11, 2020 | Annual        | Jun. 11, 2021 |
| Temperature Chamber      | ESPEC CORP.                | PL-1J                                | 15000793              | Jun. 02, 2020 | Annual        | Jun. 02, 2021 |
| High Pass Filter         | Wainwright Instrument GmbH | WHKX10-900-1000-18000-40SS           | 7                     | Mar. 04, 2020 | Annual        | Mar. 04, 2021 |
| DC Power Supply          | Agilent                    | U8002A                               | MY49030063            | Feb. 03, 2020 | Annual        | Feb. 03, 2021 |
| Preamplifier             | H.P.                       | 8447F                                | 2944A03909            | Aug. 06, 2020 | Annual        | Aug. 06, 2021 |
| Signal Conditioning Unit | R&S                        | SCU-18                               | 10117                 | Jun. 10, 2020 | Annual        | Jun. 10, 2021 |
| Loop Antenna             | SCHWARZBECK MESSELEKTRONIK | FMZB 1519                            | 1519-039              | Aug. 23, 2017 | Biennial      | Aug. 23, 2019 |
| Bilog Antenna            | SCHWARZBECK MESSELEKTRONIK | VULB9163                             | 396                   | Mar. 21, 2019 | Biennial      | Mar. 21, 2021 |
| Horn Antenna             | R&S                        | HF906                                | 100326                | Feb. 14, 2020 | Annual        | Feb. 14, 2021 |
| Antenna Master           | Innco systems GmbH         | MA4640-XP-ET                         | N/A                   | N.C.R.        | N/A           | N.C.R.        |
| Turn Table               | Innco systems GmbH         | DS 1200S                             | N/A                   | N.C.R.        | N/A           | N.C.R.        |
| Controller               | Innco systems GmbH         | CONTROLLER CO3000-4P                 | CO3000/963/38330516/L | N.C.R.        | N/A           | N.C.R.        |
| Anechoic Chamber         | SY Corporation             | L × W × H<br>(9.6 m × 6.4 m × 6.4 m) | N/A                   | N.C.R.        | N/A           | N.C.R.        |
| Coaxial Cable            | RFONE                      | SFX086-NMNM-5M (5m)                  | 20200323001           | Aug. 10, 2020 | Semi-annual   | Feb. 10, 2021 |
| Coaxial Cable            | RFONE                      | PL520-NMNM-10M (10 m)                | 20200324001           | Aug. 10, 2020 | Semi-annual   | Feb. 10, 2021 |
| Coaxial Cable            | Rosenberger                | LA1-C006-1500                        | 131014 01/20          | Aug. 21, 2020 | Semi-annual   | Feb. 21, 2021 |
| Coaxial Cable            | Rosenberger                | LA1-C006-1500                        | 131014 05/20          | Aug. 21, 2020 | Semi-annual   | Feb. 21, 2021 |
| Coaxial Cable            | Rosenberger                | LA1-C006-1500                        | 131014 10/20          | Aug. 21, 2020 | Semi-annual   | Feb. 21, 2021 |

### ► Support Equipment

| Description | Manufacturer | Model | Serial Number |
|-------------|--------------|-------|---------------|
| N/A         | -            | -     | -             |

## 1.6. Summary of Test Results

The EUT has been tested according to the following specifications:

| APPLIED STANDARD: FCC Part 2 and 90 |                                       |                   |
|-------------------------------------|---------------------------------------|-------------------|
| Section                             | Test Item                             | Result            |
| §2.1046<br>§90.635(b)               | RF Radiated Output Power              | Complied          |
| §2.1053<br>§90.691(a)               | Spurious Radiated Emission            | Complied          |
| §2.1046                             | Conducted Output Power                | N/A <sup>1)</sup> |
| §2.1049                             | Occupied Bandwidth                    | Complied          |
| §90.691(a)                          | Spurious Emission at Antenna Terminal | Complied          |
| §90.691(a)                          | Band Edge                             | Complied          |
| §2.1055<br>§90.213(a)               | Frequency Stability                   | Complied          |

**Note;**

1) Refer to SAR Report.

## 1.7. Sample Calculation for Offset

Where relevant, the following sample calculation is provided:

### 1.7.1. Conducted Test

Offset value (dB) = Directional Coupler (dB) + Cable loss (dB)

### 1.7.2. Radiation Test

- E.I.R.P. (dB m) = Measured level (dB $\mu$ V) + Antenna factor (dB/m) + Cable loss (dB) + 20 Log D - 104.5; where D is the measurement distance in meters.
- E.R.P. (dB m) = E.I.R.P. (dB m) - 2.15 (dB)

## 1.8. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| Parameter                          | Uncertainty |
|------------------------------------|-------------|
| Radiated Emission, 9 kHz to 30 MHz | ± 3.59 dB   |
| Radiated Emission, below 1 GHz     | ± 5.88 dB   |
| Radiated Emission, above 1 GHz     | ± 5.94 dB   |

Uncertainty figures are valid to a confidence level of 95 %.

## 1.9. Test Report Revision

| Revision | Report Number        | Date of Issue | Description |
|----------|----------------------|---------------|-------------|
| 0        | F690501-RF-RTL001276 | 2020.10.29    | Initial     |

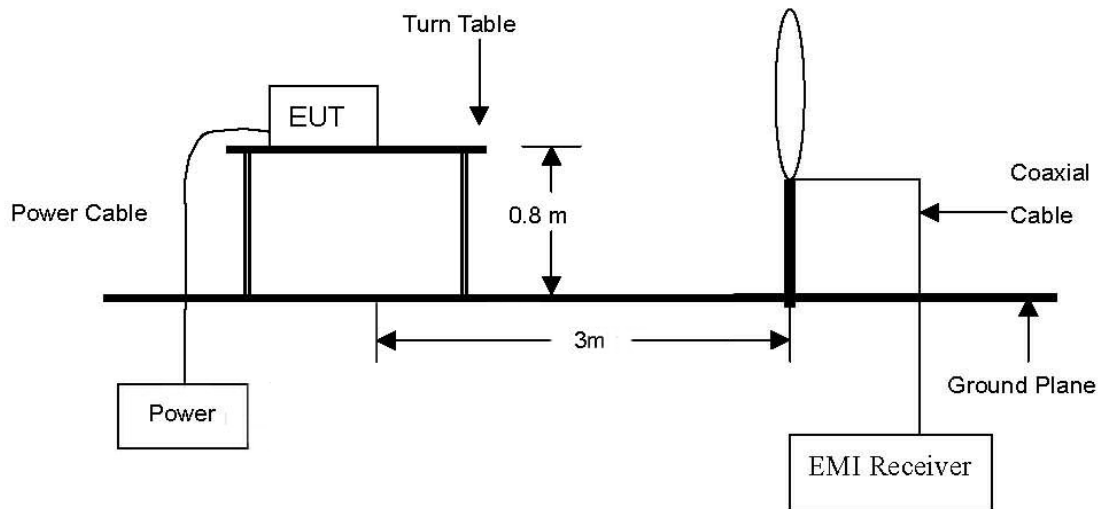
## 1.10. Emission Designator and Max Power

| Mode        | Frequency Range (MHz) | Modulation | Emission Designator | E.R.P. / E.I.R.P. |                |
|-------------|-----------------------|------------|---------------------|-------------------|----------------|
|             |                       |            |                     | Max power (dB m)  | Max power (mW) |
| LTE Band 26 | 814.7 ~ 823.3         | QPSK       | 1M10G7D             | 24.05             | 254.10         |
|             |                       | 16QAM      | 1M10D7D             | 23.05             | 201.84         |
|             | 815.5 ~ 822.5         | QPSK       | 2M69G7D             | 23.96             | 248.89         |
|             |                       | 16QAM      | 2M69D7D             | 22.93             | 196.34         |
|             | 816.5 ~ 821.5         | QPSK       | 4M50G7D             | 24.20             | 263.03         |
|             |                       | 16QAM      | 4M51D7D             | 23.62             | 230.14         |
|             | 819.0                 | QPSK       | 8M91G7D             | 23.74             | 236.59         |
|             |                       | 16QAM      | 8M93D7D             | 22.99             | 199.07         |
|             | 821.5                 | QPSK       | 13M5G7D             | 23.99             | 250.61         |
|             |                       | 16QAM      | 13M5D7D             | 23.23             | 210.38         |

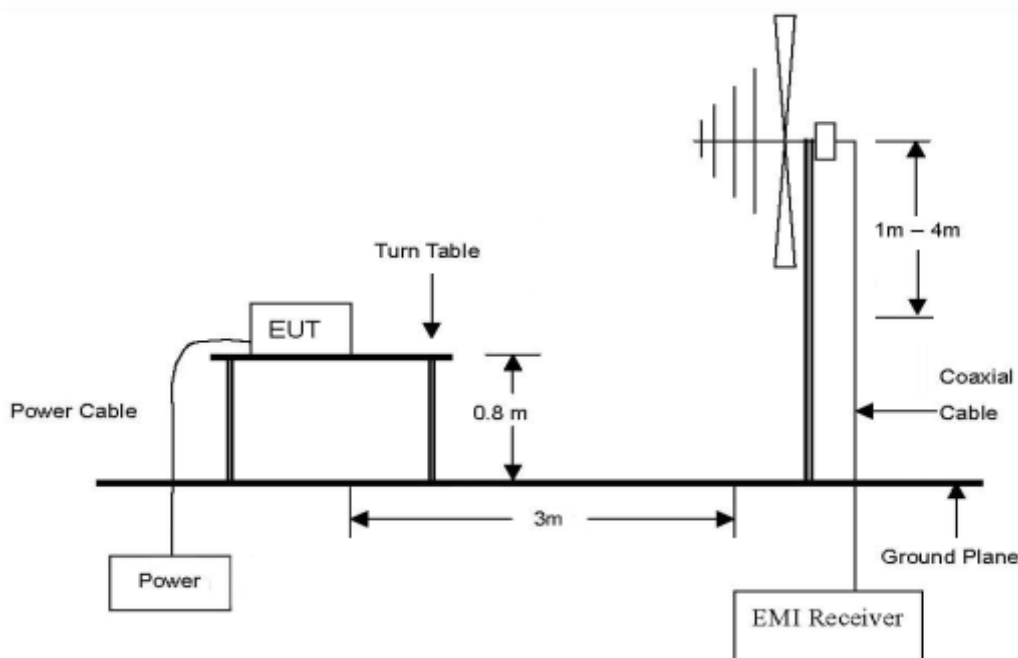
## 2. RF Radiated Output Power & Spurious Radiated Emission

### 2.1. Test Setup

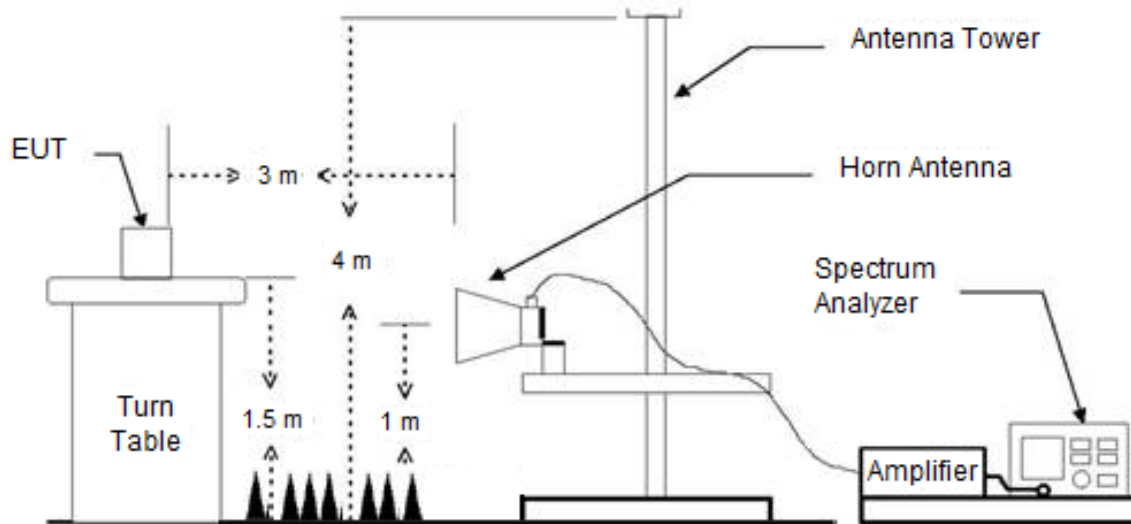
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 MHz to 30 MHz.



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 9 GHz.



## 2.2. Limit

### 2.2.1. Limit of Radiated Output Power

- §90.635(b), The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw).

### 2.2.2. Limit of Spurious Radiated Emission

- §90.691(a), Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $116 \log_{10}(f/6.1)$  decibels or  $50 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

**2.3. Test Procedure: Based on ANSI/TIA 603E: 2016 and ANSI C63.26-2015, KDB 971168 D01 Power Meas License Digital Systems v03r01.**

1. On a test site, the EUT shall be placed at 0.8 m or 1.5 m height on a turn table, and in the position close to normal use as declared by the applicant.
2. The test antenna shall be oriented initially for vertical polarization located 3 m from EUT to correspond to the fundamental frequency of the transmitter.
3. The output of the test antenna shall be connected to the measuring receiver and the peak detector is used for the measurement.
4. The maximized power level is recorded using the spectrum analyzer "Channel Power" function with the integration band set to the emissions occupied bandwidth,  $RBW = 1-5\%$  of the OBW (not to exceed 1 MHz),  $VBW \geq 3 \times RBW$ , Detector = power averaging (rms), sweep time = auto, trace average at least 100 traces in power averaging (rms) mode, per the guidelines of KDB 971168 D01 Power Meas License Digital Systems v03r01.
5. Radiated spurious emissions measurement method was set as follows:  
RBW = 100 kHz for emissions below 1 GHz and 1 MHz for emissions above 1 GHz,  $VBW \geq 3 \times RBW$ ,  
Detector = RMS, trace mode = max hold, per the guidelines of KDB 971168 D01 Power Meas License Digital Systems v03r01.
6. The transmitter shall be switched on, the measuring receiver shall be tuned to the frequency of the transmitter under test.
7. The test antenna shall be raised and lowered through the specified range of height until the maximum signal level is detected by the measuring receiver.
8. The transmitter shall be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
9. The test antenna shall be raised and lowered again through the specified range of height until the maximum signal level is detected by the measuring receiver.
10. The maximum signal level detected by the measuring receiver shall be noted.
11. In necessary, the input attenuator setting on the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
12. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
13. The measurement shall be repeated with the test antenna orientated for horizontal polarization.

## 2.4. Test Result for RF Radiated Output Power

Ambient temperature : (23 ± 1) °C  
Relative humidity : 47 % R.H.

### LTE band 26 (1.4 MHz)

| Frequency (MHz) | Mode  | Measured Level (dBμV) | Ant. Pol. | AF (dB/m) | CL (dB) | E (dBμV/m) | CF (dB) | E.R.P. |        |
|-----------------|-------|-----------------------|-----------|-----------|---------|------------|---------|--------|--------|
|                 |       |                       |           |           |         |            |         | (dB m) | (mW)   |
| 814.70          | QPSK  | 89.36                 | H         | 26.80     | 5.30    | 121.46     | -97.41  | 24.05  | 254.10 |
| 814.70          |       | 88.46                 | V         | 26.80     | 5.30    | 120.56     | -97.41  | 23.15  | 206.54 |
| 823.30          |       | 89.15                 | H         | 26.87     | 5.36    | 121.38     | -97.41  | 23.97  | 249.46 |
| 823.30          |       | 88.19                 | V         | 26.87     | 5.36    | 120.42     | -97.41  | 23.01  | 199.99 |
| 814.70          | 16QAM | 88.17                 | H         | 26.80     | 5.30    | 120.27     | -97.41  | 22.86  | 193.20 |
| 814.70          |       | 87.24                 | V         | 26.80     | 5.30    | 119.34     | -97.41  | 21.93  | 155.96 |
| 823.30          |       | 88.23                 | H         | 26.87     | 5.36    | 120.46     | -97.41  | 23.05  | 201.84 |
| 823.30          |       | 87.27                 | V         | 26.87     | 5.36    | 119.50     | -97.41  | 22.09  | 161.81 |

\*1 RB size / 0 Offset

### LTE band 26 (3 MHz)

| Frequency (MHz) | Mode  | Measured Level (dBμV) | Ant. Pol. | AF (dB/m) | CL (dB) | E (dBμV/m) | CF (dB) | E.R.P. |        |
|-----------------|-------|-----------------------|-----------|-----------|---------|------------|---------|--------|--------|
|                 |       |                       |           |           |         |            |         | (dB m) | (mW)   |
| 815.50          | QPSK  | 89.26                 | H         | 26.80     | 5.31    | 121.37     | -97.41  | 23.96  | 248.89 |
| 815.50          |       | 88.46                 | V         | 26.80     | 5.31    | 120.57     | -97.41  | 23.16  | 207.01 |
| 822.50          |       | 89.06                 | H         | 26.85     | 5.36    | 121.27     | -97.41  | 23.86  | 243.22 |
| 822.50          |       | 88.23                 | V         | 26.85     | 5.36    | 120.44     | -97.41  | 23.03  | 200.91 |
| 815.50          | 16QAM | 88.08                 | H         | 26.80     | 5.31    | 120.19     | -97.41  | 22.78  | 189.67 |
| 815.50          |       | 87.32                 | V         | 26.80     | 5.31    | 119.43     | -97.41  | 22.02  | 159.22 |
| 822.50          |       | 88.13                 | H         | 26.85     | 5.36    | 120.34     | -97.41  | 22.93  | 196.34 |
| 822.50          |       | 87.32                 | V         | 26.85     | 5.36    | 119.53     | -97.41  | 22.12  | 162.93 |

\*1 RB size / 0 Offset

**LTE band 26 (5 MHz)**

| Frequency (MHz) | Mode  | Measured Level (dB $\mu$ V) | Ant. Pol. | AF (dB/m) | CL (dB) | E (dB $\mu$ V/m) | CF (dB) | E.R.P. |        |
|-----------------|-------|-----------------------------|-----------|-----------|---------|------------------|---------|--------|--------|
|                 |       |                             |           |           |         |                  |         | (dB m) | (mW)   |
| 816.50          | QPSK  | 89.49                       | H         | 26.80     | 5.32    | 121.61           | -97.41  | 24.20  | 263.03 |
| 816.50          |       | 88.54                       | V         | 26.80     | 5.32    | 120.66           | -97.41  | 23.25  | 211.35 |
| 821.50          |       | 88.88                       | H         | 26.83     | 5.35    | 121.06           | -97.41  | 23.65  | 231.74 |
| 821.50          |       | 87.94                       | V         | 26.83     | 5.35    | 120.12           | -97.41  | 22.71  | 186.64 |
| 816.50          | 16QAM | 88.91                       | H         | 26.80     | 5.32    | 121.03           | -97.41  | 23.62  | 230.14 |
| 816.50          |       | 87.48                       | V         | 26.80     | 5.32    | 119.60           | -97.41  | 22.19  | 165.58 |
| 821.50          |       | 88.03                       | H         | 26.83     | 5.35    | 120.21           | -97.41  | 22.80  | 190.55 |
| 821.50          |       | 87.16                       | V         | 26.83     | 5.35    | 119.34           | -97.41  | 21.93  | 155.96 |

\*1 RB size / 0 Offset

**LTE band 26 (10 MHz)**

| Frequency (MHz) | Mode  | Measured Level (dB $\mu$ V) | Ant. Pol. | AF (dB/m) | CL (dB) | E (dB $\mu$ V/m) | CF (dB) | E.R.P. |        |
|-----------------|-------|-----------------------------|-----------|-----------|---------|------------------|---------|--------|--------|
|                 |       |                             |           |           |         |                  |         | (dB m) | (mW)   |
| 819.00          | QPSK  | 89.01                       | H         | 26.80     | 5.34    | 121.15           | -97.41  | 23.74  | 236.59 |
| 819.00          |       | 88.34                       | V         | 26.80     | 5.34    | 120.48           | -97.41  | 23.07  | 202.77 |
| 819.00          | 16QAM | 88.26                       | H         | 26.80     | 5.34    | 120.40           | -97.41  | 22.99  | 199.07 |
| 819.00          |       | 87.32                       | V         | 26.80     | 5.34    | 119.46           | -97.41  | 22.05  | 160.32 |

\*1 RB size / 0 Offset

**LTE band 26 (15 MHz)**

| Frequency (MHz) | Mode  | Measured Level (dB $\mu$ V) | Ant. Pol. | AF (dB/m) | CL (dB) | E (dB $\mu$ V/m) | CF (dB) | E.R.P. |        |
|-----------------|-------|-----------------------------|-----------|-----------|---------|------------------|---------|--------|--------|
|                 |       |                             |           |           |         |                  |         | (dB m) | (mW)   |
| 821.50          | QPSK  | 89.22                       | H         | 26.83     | 5.35    | 121.40           | -97.41  | 23.99  | 250.61 |
| 821.50          |       | 88.45                       | V         | 26.83     | 5.35    | 120.63           | -97.41  | 23.22  | 209.89 |
| 821.50          | 16QAM | 88.46                       | H         | 26.83     | 5.35    | 120.64           | -97.41  | 23.23  | 210.38 |
| 821.50          |       | 87.36                       | V         | 26.83     | 5.35    | 119.54           | -97.41  | 22.13  | 163.31 |

\*1 RB size / 0 Offset

**Remark;**

1. AF = Antenna Factor, CL = Cable Loss, CF = Conversion Factor.
2. E (dB $\mu$ V/m) = Measured Level (dB $\mu$ V) + Antenna Factor (dB/m) + Cable Loss (dB).
3. E.I.R.P. (dB m) = E (dB $\mu$ V/m) + CF (dB).
4. E.R.P. (dB m) = E (dB $\mu$ V/m) + CF (dB) - 2.15 (dB); where E.R.P. and E.I.R.P. are expressed in consistent units.
5. CF (dB) = 20 log D - 104.8; where D is the measurement distance in meters, According to KDB 971168 D01 v03r01 5.8.4.

## 2.5. Spurious Radiated Emission

### LTE band 26 (1.4 MHz - QPSK)

| Frequency (MHz)          | Measured Level (dBμV) | Ant. Pol. | AF (dB/m) | AMP+CL (dB) | E (dBμV/m) | CF (dB) | E.R.P. (dB m) | Limit (dB m) | Margin (dB) |
|--------------------------|-----------------------|-----------|-----------|-------------|------------|---------|---------------|--------------|-------------|
| Low Channel (814.7 MHz)  |                       |           |           |             |            |         |               |              |             |
| 1 628.73                 | 52.68                 | H         | 25.46     | -36.93      | 41.21      | -97.41  | -56.20        | -13          | 43.20       |
| High Channel (823.3 MHz) |                       |           |           |             |            |         |               |              |             |
| 1 645.72                 | 56.33                 | H         | 25.73     | -36.82      | 45.24      | -97.41  | -52.17        | -13          | 39.17       |

\*1 RB size / 0 Offset

### LTE band 26 (3 MHz - QPSK)

| Frequency (MHz)          | Measured Level (dBμV) | Ant. Pol. | AF (dB/m) | AMP+CL (dB) | E (dBμV/m) | CF (dB) | E.R.P. (dB m) | Limit (dB m) | Margin (dB) |
|--------------------------|-----------------------|-----------|-----------|-------------|------------|---------|---------------|--------------|-------------|
| Low Channel (815.5 MHz)  |                       |           |           |             |            |         |               |              |             |
| 1 628.58                 | 52.21                 | H         | 25.46     | -36.93      | 40.74      | -97.41  | -56.67        | -13          | 43.67       |
| High Channel (822.5 MHz) |                       |           |           |             |            |         |               |              |             |
| 1 642.45                 | 56.12                 | H         | 25.68     | -36.84      | 44.96      | -97.41  | -52.45        | -13          | 39.45       |

\*1 RB size / 0 Offset

### LTE band 26 (5 MHz - QPSK)

| Frequency (MHz)          | Measured Level (dBμV) | Ant. Pol. | AF (dB/m) | AMP+CL (dB) | E (dBμV/m) | CF (dB) | E.R.P. (dB m) | Limit (dB m) | Margin (dB) |
|--------------------------|-----------------------|-----------|-----------|-------------|------------|---------|---------------|--------------|-------------|
| Low Channel (816.5 MHz)  |                       |           |           |             |            |         |               |              |             |
| 1 628.83                 | 52.45                 | H         | 25.46     | -36.93      | 40.98      | -97.41  | -56.43        | -13          | 43.43       |
| High Channel (821.5 MHz) |                       |           |           |             |            |         |               |              |             |
| 1 638.45                 | 54.94                 | H         | 25.62     | -36.87      | 43.69      | -97.41  | -53.72        | -13          | 40.72       |

\*1 RB size / 0 Offset

### LTE band 26 (10 MHz - QPSK)

| Frequency (MHz)            | Measured Level (dBμV) | Ant. Pol. | AF (dB/m) | AMP+CL (dB) | E (dBμV/m) | CF (dB) | E.R.P. (dB m) | Limit (dB m) | Margin (dB) |
|----------------------------|-----------------------|-----------|-----------|-------------|------------|---------|---------------|--------------|-------------|
| Middle Channel (819.0 MHz) |                       |           |           |             |            |         |               |              |             |
| 1 629.13                   | 52.49                 | H         | 25.47     | -36.93      | 41.03      | -97.41  | -56.38        | -13          | 43.38       |

\*1 RB size / 0 Offset

**LTE band 26 (15 MHz - QPSK)**

| Frequency<br>(MHz)         | Measured<br>Level<br>(dBμV) | Ant.<br>Pol. | AF<br>(dB/m) | AMP+CL<br>(dB) | E<br>(dBμV/m) | CF<br>(dB) | E.R.P.<br>(dB m) | Limit<br>(dB m) | Margin<br>(dB) |
|----------------------------|-----------------------------|--------------|--------------|----------------|---------------|------------|------------------|-----------------|----------------|
| Middle Channel (821.5 MHz) |                             |              |              |                |               |            |                  |                 |                |
| 1 629.78                   | 51.95                       | H            | 25.48        | -36.93         | 40.50         | -97.41     | -56.91           | -13             | 43.91          |

\*1 RB size / 0 Offset

**Remark;**

1. AF = Antenna Factor, AMP= Amplifier Gain, CL = Cable Loss, CF = Conversion Factor.
2. E (dBμV/m) = Measured Level (dBμV) + Antenna Factor (dB/m) + AMP (dB) + Cable Loss (dB).
3. E.I.R.P. (dB m) = E (dBμV/m) + CF (dB).
4. E.R.P. (dB m) = E (dBμV/m) + CF (dB) - 2.15 (dB); where E.R.P. and E.I.R.P. are expressed in consistent units.
5. CF (dB) = 20 log D - 104.8; where D is the measurement distance in meters, According to KDB 971168 D01 v03r01 5.8.4.

### 3. Occupied Bandwidth

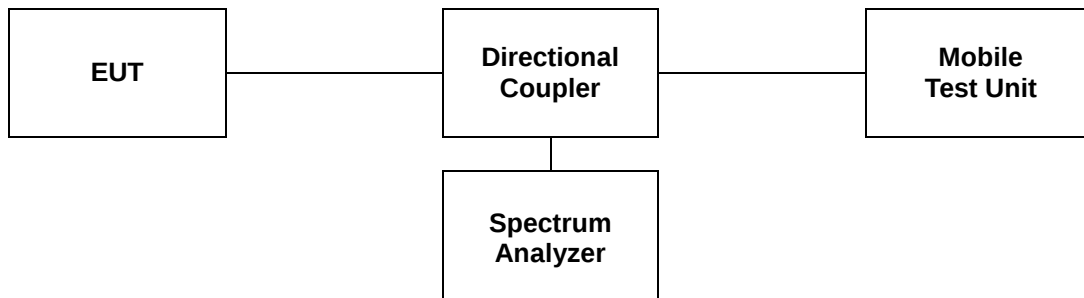
#### 3.1. Limit

CFR 47, Section FCC §2.1049.

#### 3.2. Test Procedure

The test follows section 5.4.4 of ANSI C63.26-2015.

- The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation. products including the emission skirts (typically a span of  $1.5 \times \text{OBW}$  is sufficient).
- The nominal IF filter 3 dB bandwidth (RBW) shall be in the range of 1 % to 5 % of the anticipated OBW, and the VBW shall be set  $\geq 3 \times \text{RBW}$ .
- Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3.
- Set the detection mode to peak, and the trace mode to max-hold.
- If the instrument does not have a 99 % OBW function, recover the trace data points and sum directly in linear power terms. Place the recovered amplitude data points, beginning at the lowest frequency, in a running sum until 0.5 % of the total is reached. Record that frequency as the lower OBW frequency. Repeat the process until 99.5 % of the total is reached and record that frequency as the upper OBW frequency. The 99 % power OBW can be determined by computing the difference these two frequencies.
- The OBW shall be reported and plot(s) of the measuring instrument display shall be provided with the test report. The frequency and amplitude axis and scale shall be clearly labeled. Tabular data can be reported in addition to the plot(s).



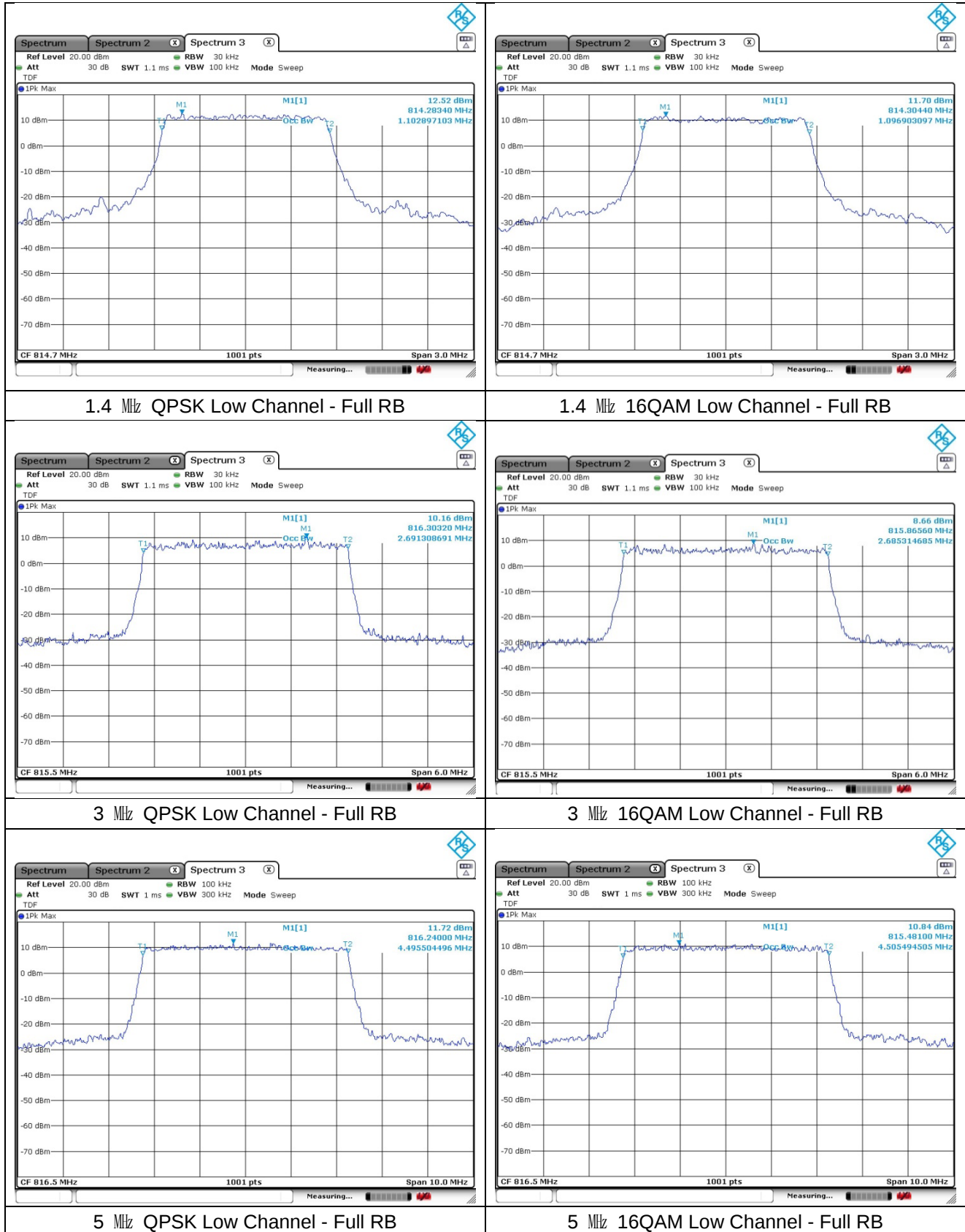
### 3.3 Test Results

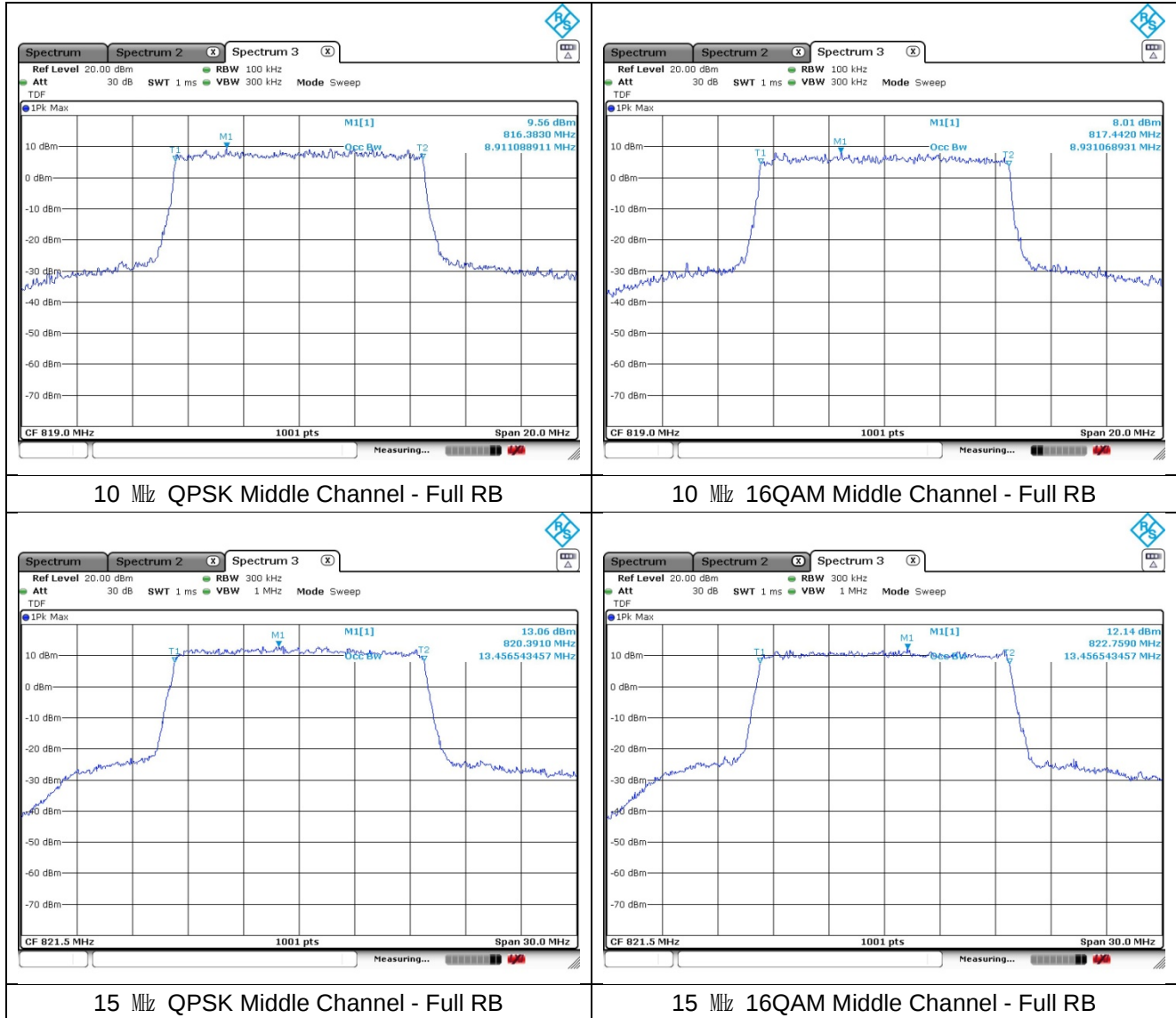
Ambient temperature : (23 ± 1) °C  
 Relative humidity : 47 % R.H.

| Band | Bandwidth<br>(MHz) | Frequency<br>(MHz) | Occupied Bandwidth<br>(MHz) |        |
|------|--------------------|--------------------|-----------------------------|--------|
|      |                    |                    | QPSK                        | 16QAM  |
| 26   | 1.4                | 814.7              | 1.103                       | 1.097  |
|      | 3                  | 815.5              | 2.691                       | 2.685  |
|      | 5                  | 816.5              | 4.496                       | 4.505  |
|      | 10                 | 819.0              | 8.911                       | 8.931  |
|      | 15                 | 821.5              | 13.457                      | 13.457 |

## - Test plots

### LTE band 26



**LTE band 26**


## 4. Spurious Emissions at Antenna Terminal

### 4.1. Limit

- §90.691(a), Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

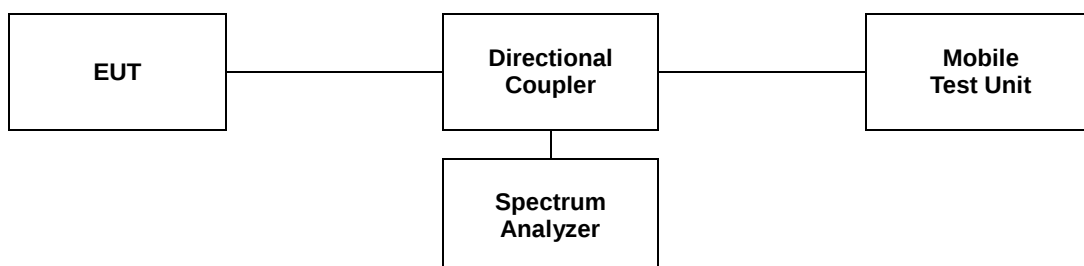
(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $116 \log_{10}(f/6.1)$  decibels or  $50 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

### 4.2. Test Procedure

The test follows section 5.7 of ANSI C63.26-2015.

1. Start frequency was set to 9 kHz and stop frequency was set to at least 10\* the fundamental frequency.
2. Detector = Peak.
3. Trace mode = Max hold.
4. Sweep time = Auto couple.
5. The trace was allowed to stabilize.
6. Please see notes below for RBW and VBW settings.
7. For plots showing conducted spurious emissions from 9 kHz to 9 GHz, all path loss of wide frequency range was investigated and compensated to spectrum analyzer as correction factor.



#### Note;

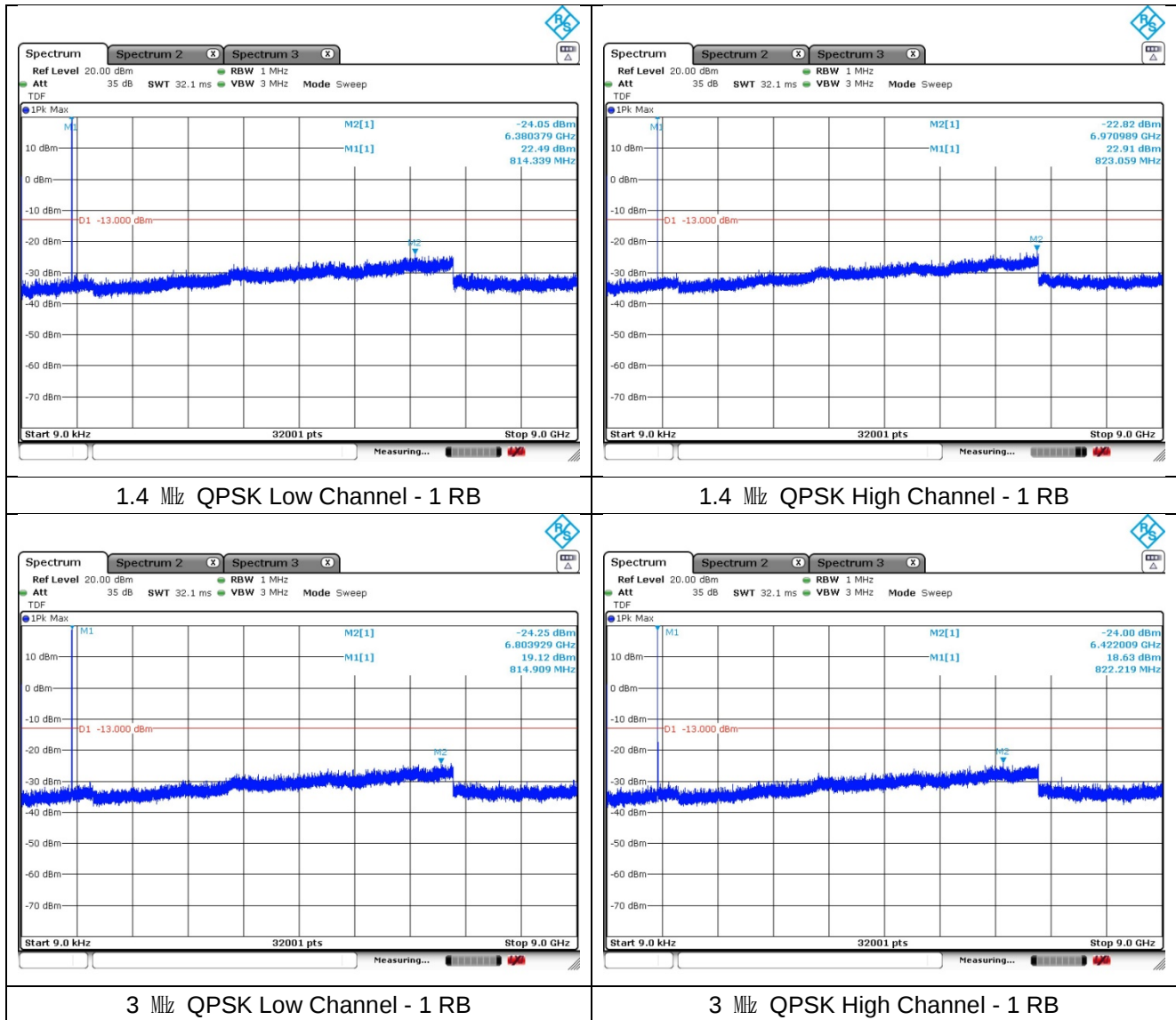
Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and frequencies greater than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two point, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

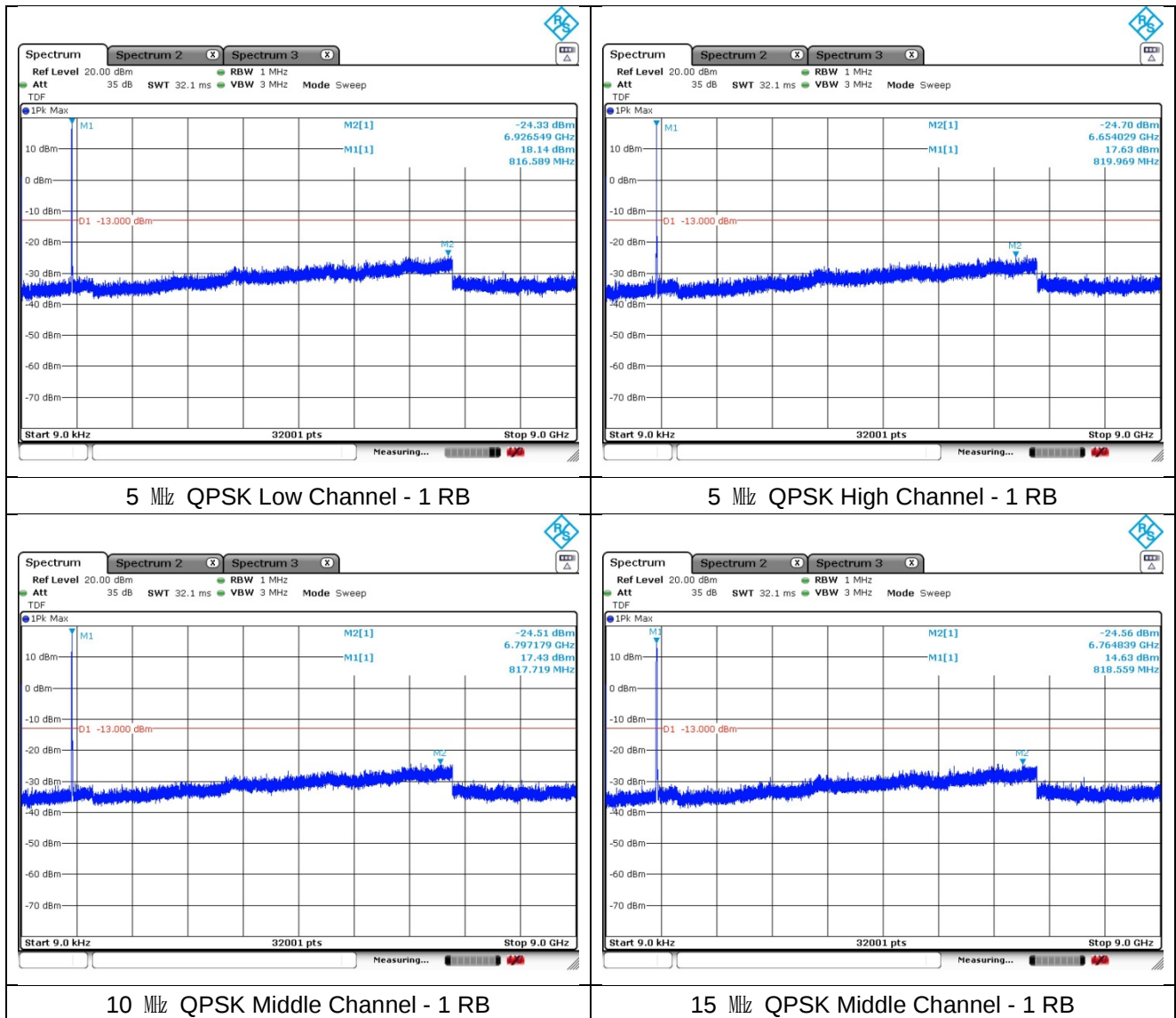
### 4.3. Test Results

Ambient temperature : (23 ± 1) °C  
 Relative humidity : 47 % R.H.

#### - Test plots

##### LTE band 26





## 5. Band Edge

### 5.1. Limit

- §90.691(a), Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

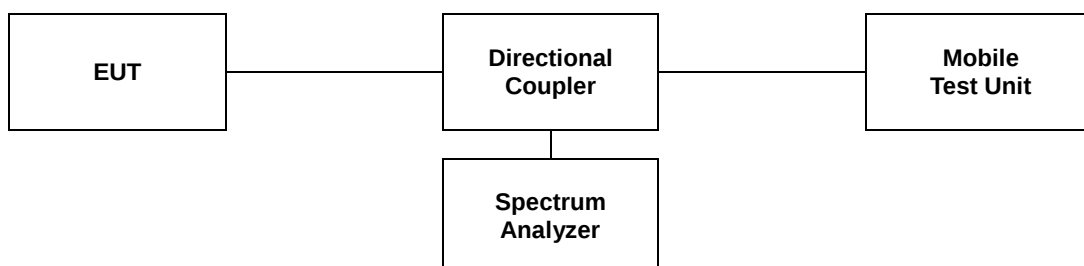
(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $116 \log_{10}(f/6.1)$  decibels or  $50 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

### 5.2. Test Procedure

The test follows section 5.7.2 of ANSI C63.26-2015.

- Span was set large enough so as to capture all out of band emissions near the band edge.
- RBW  $\geq 1\%$  of OBW.
- VBW  $\geq 3 \times$  RBW.
- Detector = RMS.
- Trace mode = Average.
- Sweep time = Auto.
- The trace was allowed to stabilize.
- All path loss of frequency range was investigated and compensated to spectrum analyzer as TDF function.



#### Note;

Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and frequencies greater than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

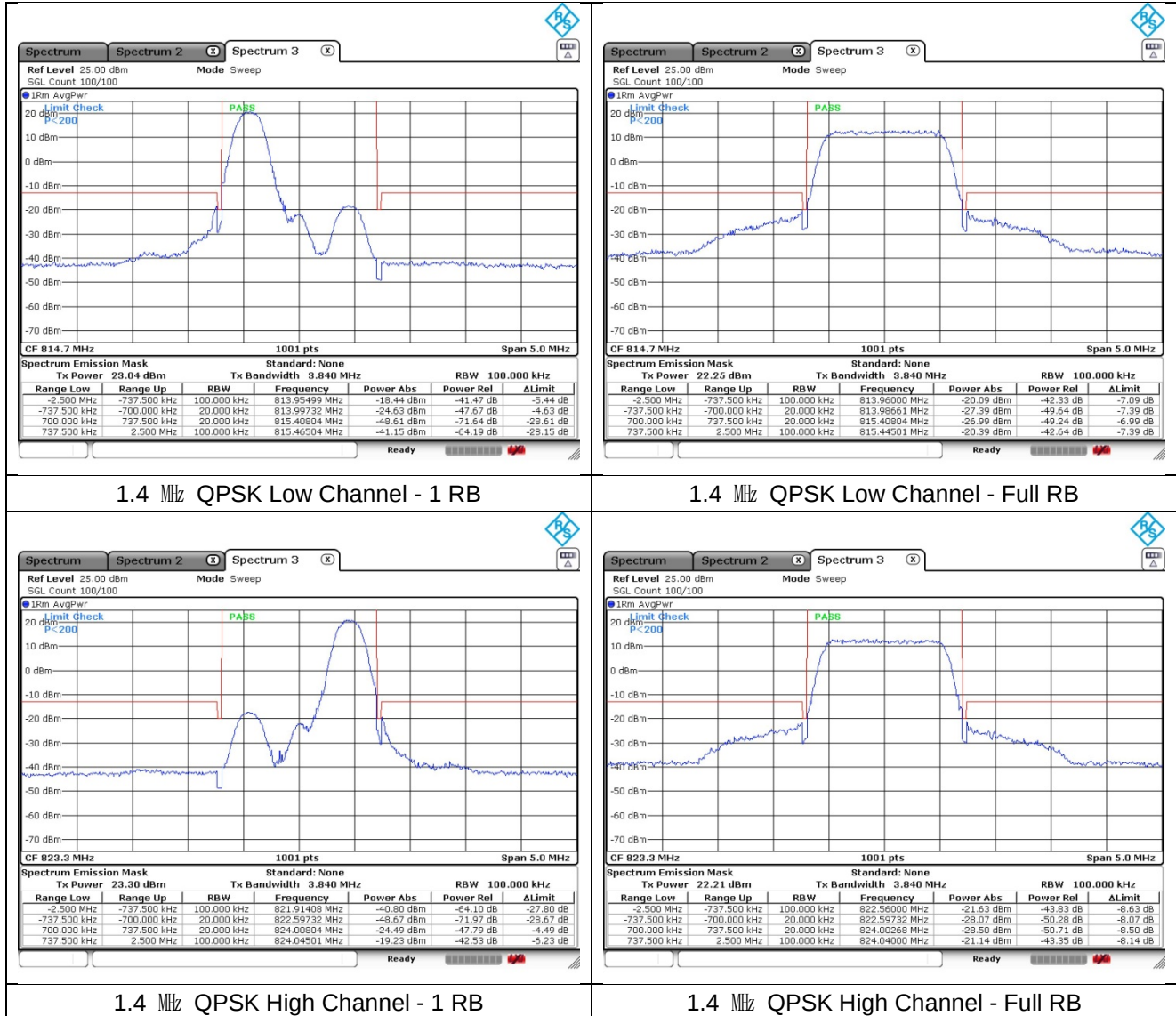
### 5.3. Test Results

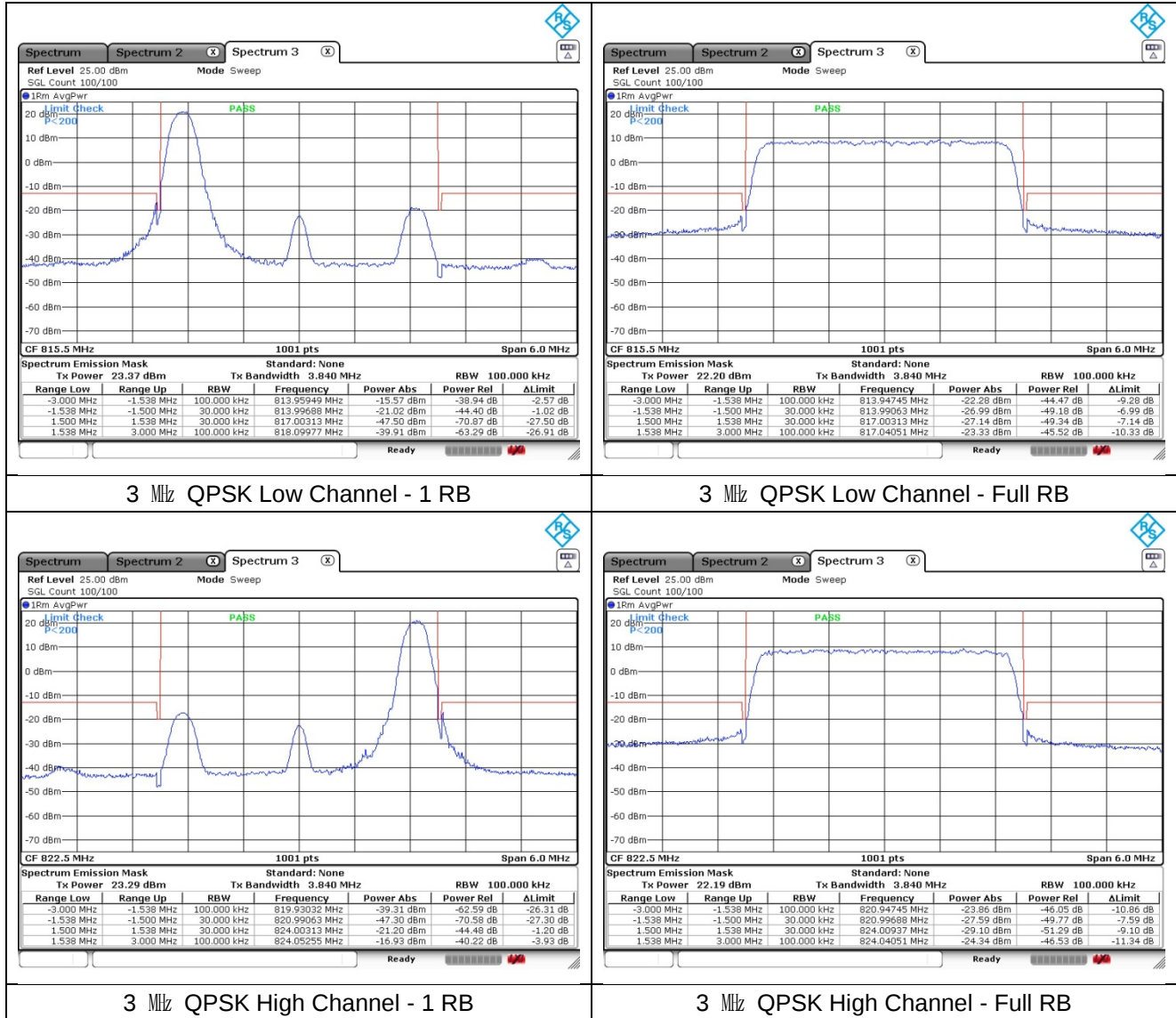
Ambient temperature : (23 ± 1) °C

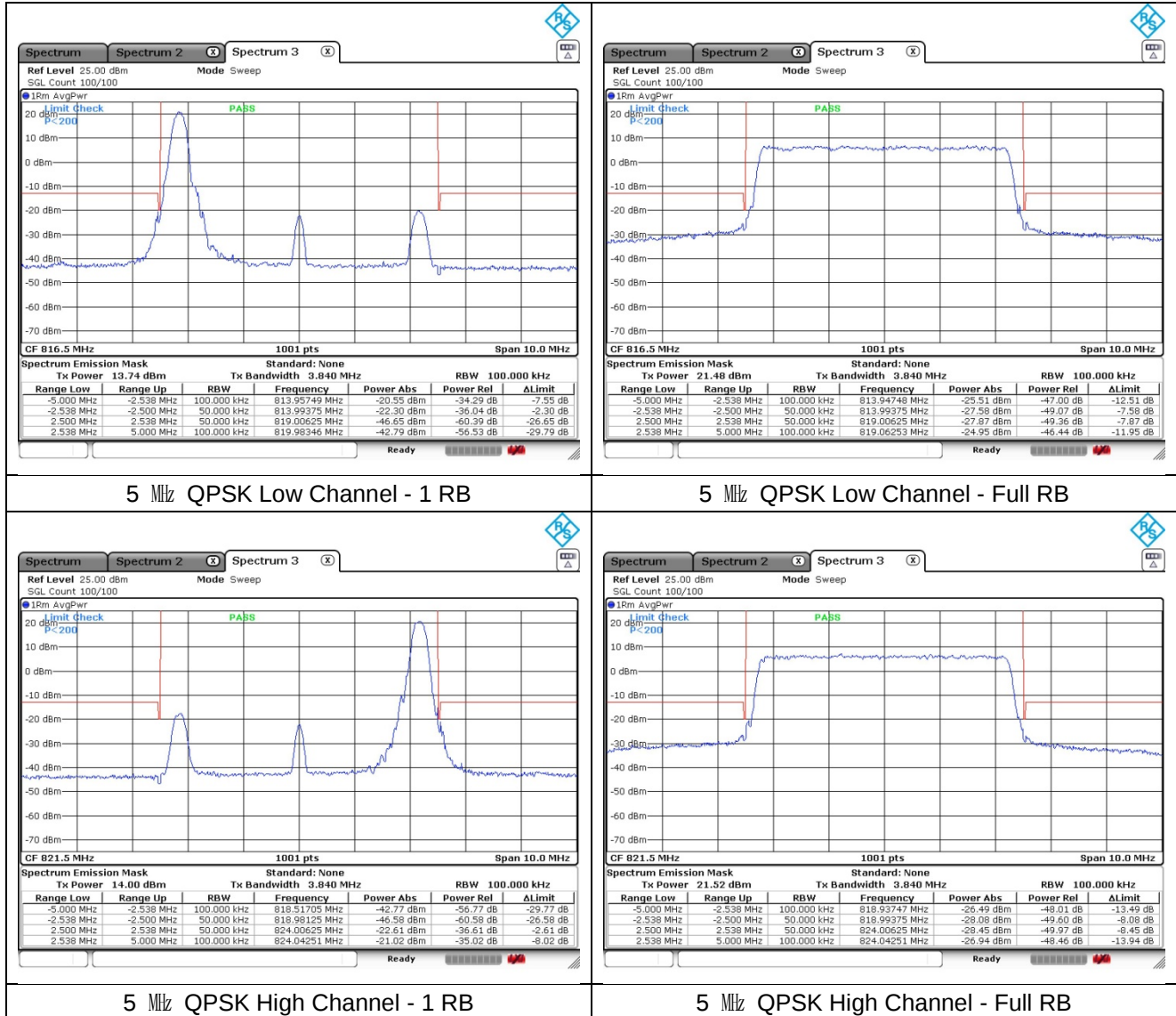
Relative humidity : 47 % R.H.

#### - Test plots

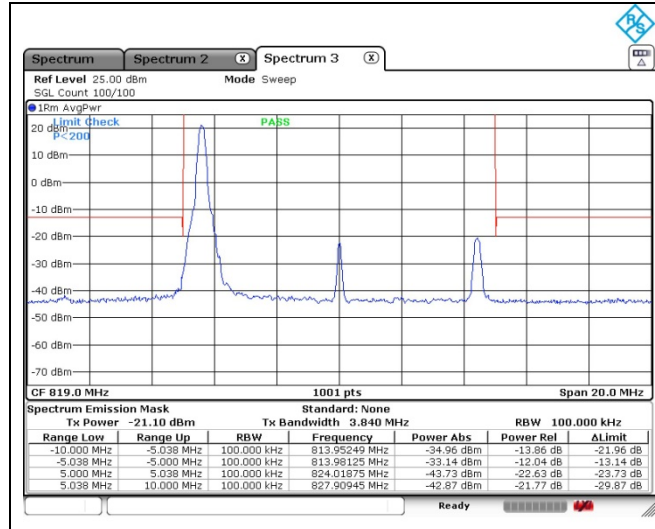
##### LTE band 26



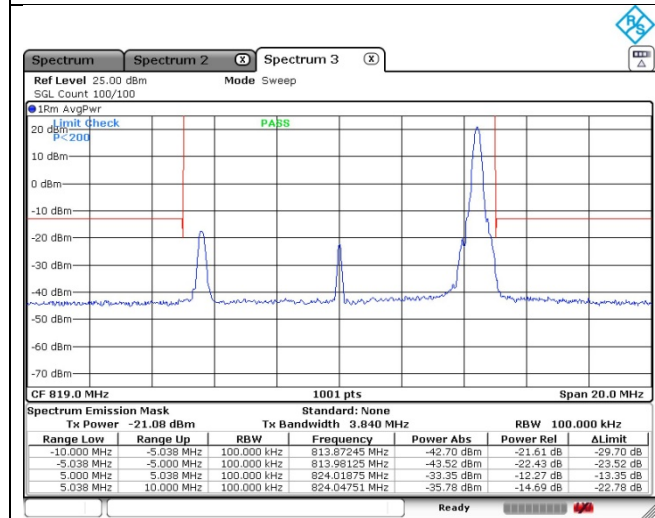
**LTE band 26**


**LTE band 26**


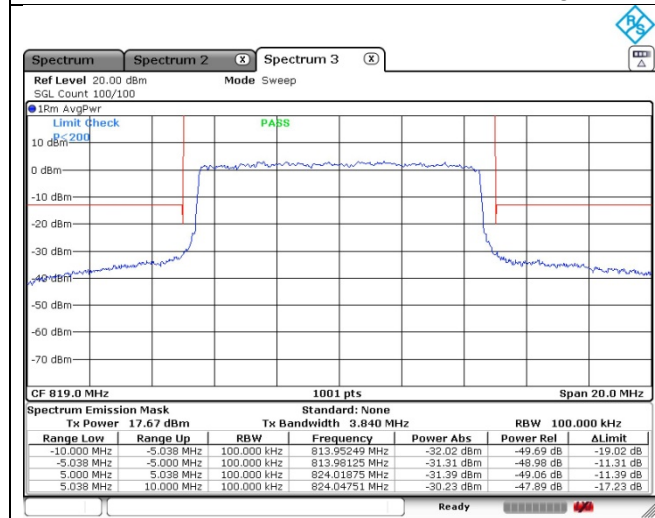
**LTE band 26**



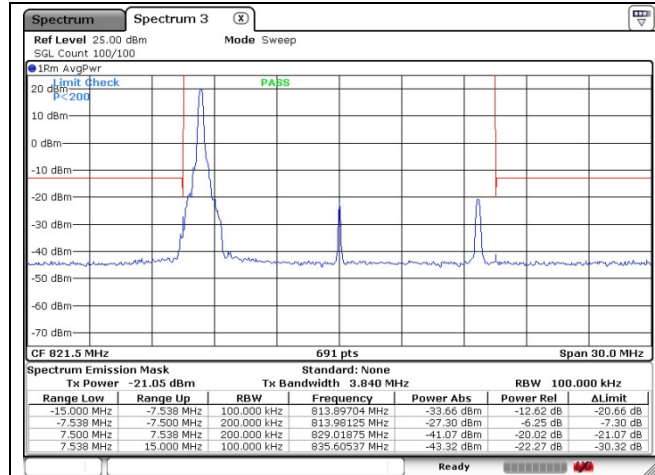
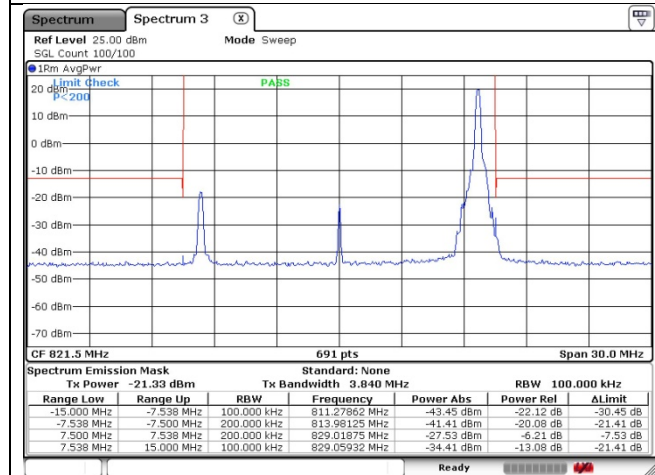
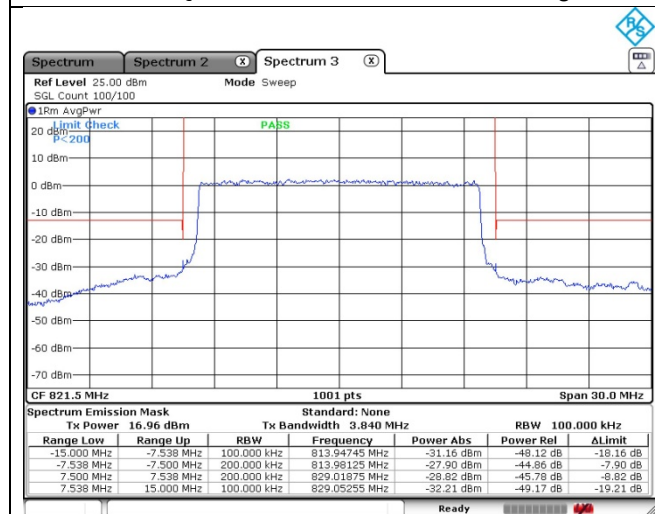
**10 MHz QPSK Middle Channel - 1 RB Low**



**10 MHz QPSK Middle Channel - 1 RB High**



**10 MHz QPSK Middle Channel - Full RB**

**LTE band 26**

**15 MHz QPSK Middle Channel - 1 RB Low**

**15 MHz QPSK Middle Channel - 1 RB High**

**15 MHz QPSK Middle Channel - Full RB**

## 6. Frequency Stability

### 6.1. Limit

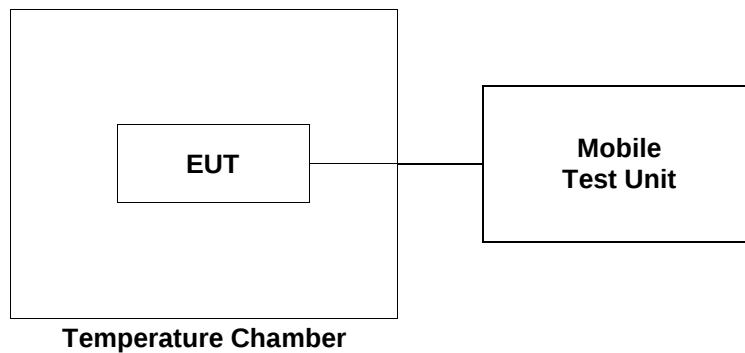
- § 2.1055(a), § 2.1055(d) & following:

- §90.213, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following table.

For Mobile devices operating in the 809 to 824 MHz band at a power level 2 Watts or less, the limit specified in Table is +/- 2.5 ppm.

### 6.2. Test Procedure

1. Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to a Mobile Test Unit via feed-through attenuators.
2. The EUT was placed inside the temperature chamber.
3. After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from Mobile Test Unit.



### 6.3. Test Results

Ambient temperature : (23 ± 1) °C  
 Relative humidity : 47 % R.H.

| Operating Frequency: 821.5 MHz          |                    |                                    |          |
|-----------------------------------------|--------------------|------------------------------------|----------|
| Frequency Stability versus Temperature  |                    |                                    |          |
| Environment Temperature (°C)            | Power Supplied (V) | Frequency Measure with Time Elapse |          |
|                                         |                    | Frequency Error (Hz)               | ppm      |
| 50                                      | 3.8                | -5                                 | -0.006 1 |
| 40                                      |                    | 4                                  | 0.004 9  |
| 30                                      |                    | 4                                  | 0.004 9  |
| 20 (Ref.)                               |                    | -7                                 | -        |
| 10                                      |                    | 3                                  | 0.003 7  |
| 0                                       |                    | 6                                  | 0.007 3  |
| -10                                     |                    | -4                                 | -0.004 9 |
| -20                                     |                    | -5                                 | -0.006 1 |
| -30                                     |                    | -6                                 | -0.007 3 |
| Frequency Stability versus Power Supply |                    |                                    |          |
| Environment Temperature (°C)            | Power Supplied (V) | Frequency Measure with Time Elapse |          |
|                                         |                    | Frequency Error (Hz)               | ppm      |
| 20                                      | 4.37               | 6                                  | 0.007 3  |
|                                         | 3.40 (End point)   | -5                                 | -0.006 1 |

- End of the Test Report -