

# TEST REPORT

of

FCC Part 90 Subpart S

FCC ID: BEJTM05GTJN

Equipment Under Test : Car Telematics Device  
Model Name : TA4HEB-N  
Applicant : LG Electronics USA  
Manufacturer : LG Electronics USA  
Date of Receipt : 2018.08.01  
Date of Test(s) : 2018.08.02 ~ 2019.03.22  
Date of Issue : 2019.04.12

In the configuration tested, the EUT complied with the standards specified above.

Tested By:



Nancy Park

Date:

2019.04.12

Technical  
Manager:



Hyunchoe You

Date:

2019.04.12

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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

All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>.

Phone No. : +82 31 688 0901

Fax No. : +82 31 688 0921

### 1.2. Details of Applicant

Applicant : LG Electronics USA

Address : 1000 Sylvan Avenue, Englewood Cliffs, New Jersey, United States, 07632

Contact Person : Han, Kyung-su

Phone No. : +2 201 472 2623

### 1.3. Details of Manufacturer

Company : LG Electronics Inc.

Address : 10, Magokjungang 10-ro, Gangseo-gu, Seoul, Korea, 07796

### 1.4. Description of EUT

|                     |                                                                                                                                                                                                                                     |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Kind of Product     | Car Telematics Device                                                                                                                                                                                                               |
| Model Name          | TA4HEB-N                                                                                                                                                                                                                            |
| Power Supply        | DC 12 V                                                                                                                                                                                                                             |
| Rated Power         | LTE Band 26: 23 dB m                                                                                                                                                                                                                |
| Frequency Range     | LTE Band 26: 814 MHz ~ 824 MHz                                                                                                                                                                                                      |
| Emission Designator | LTE Band 26 (1.4 MHz): 1M09G7D (QPSK) / 1M10W7D (16QAM)<br>LTE Band 26 (3 MHz): 2M69G7D (QPSK) / 2M69W7D (16QAM)<br>LTE Band 26 (5 MHz): 4M52G7D (QPSK) / 4M50W7D (16QAM)<br>LTE Band 26 (10 MHz): 8M94G7D (QPSK) / 8M97W7D (16QAM) |

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RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

## 1.5. Test Equipment List

| Equipment           | Manufacturer               | Model                                | S/N                   | Cal. Date     | Cal. Interval | Cal. Due      |
|---------------------|----------------------------|--------------------------------------|-----------------------|---------------|---------------|---------------|
| Signal Generator    | Agilent                    | E8257D                               | MY51501169            | Jul. 03, 2018 | Annual        | Jul. 03, 2019 |
| Spectrum Analyzer   | R&S                        | FSV30                                | 103102                | Jun. 11, 2018 | Annual        | Jun. 11, 2019 |
| Mobile Test Unit    | R&S                        | CMW500                               | 144035                | Feb. 19, 2019 | Annual        | Feb. 19, 2020 |
| Power Meter         | Anritsu                    | ML2495A                              | 1223004               | Jun. 12, 2018 | Annual        | Jun. 12, 2019 |
| Power Sensor        | Anritsu                    | MA2411B                              | 1207272               | Jun. 12, 2018 | Annual        | Jun. 12, 2019 |
| Directional Coupler | KRYTAR                     | 152613                               | 140972                | Jun. 14, 2018 | Annual        | Jun. 14, 2019 |
| Temperature Chamber | ESPEC CORP.                | PL-1J                                | 15000793              | Jun. 14, 2018 | Annual        | Jun. 14, 2019 |
| High Pass Filter    | Wainwright Instrument GmbH | WHKX10-900-1000-18000-40SS           | 7                     | Mar. 12, 2019 | Annual        | Mar. 12, 2020 |
| DC Power Supply     | R&S                        | HMP2020                              | 019258024             | Nov. 06, 2018 | Annual        | Nov. 06, 2019 |
| Preamplifier        | H.P.                       | 8447F                                | 2944A03909            | Aug. 07, 2018 | Annual        | Aug. 07, 2019 |
| Preamplifier        | Agilent                    | 8449B                                | 3008A01932            | Feb. 22, 2019 | Annual        | Feb. 22, 2020 |
| Preamplifier        | MITEQ Inc.                 | JS44-18004000-35-8P                  | 1546891               | May 13, 2018  | Annual        | May 13, 2019  |
| Test Receiver       | R&S                        | ESU26                                | 100109                | Jan. 31, 2019 | Annual        | Jan. 31, 2020 |
| Bilog Antenna       | SCHWARZBECK MESSELEKTRONIK | VULB9163                             | 01126                 | Mar. 26, 2018 | Biennial      | Mar. 26, 2020 |
| Horn Antenna        | R&S                        | HF906                                | 100326                | Feb. 14, 2018 | Biennial      | Feb. 14, 2020 |
| Horn Antenna        | SCHWARZBECK MESSELEKTRONIK | BBHA9170                             | BBHA9170223           | Sep. 10, 2018 | Biennial      | Sep. 10, 2020 |
| Antenna Master      | Innco systems GmbH         | MM4000                               | 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.        |

### ► Support equipment

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

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## 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                | Complied |
| §2.1049                             | Occupied Bandwidth                    | Complied |
| §2.1051<br>§90.691(a)               | Spurious Emission at Antenna Terminal | Complied |
| §90.691(a)                          | Band Edge                             | Complied |
| §2.1055<br>§90.213(a)               | Frequency Stability                   | Complied |

## 1.7. Test Report Revision

| Revision | Report number          | Date of Issue | Description                                                                   |
|----------|------------------------|---------------|-------------------------------------------------------------------------------|
| 0        | F690501/RF-RTL013640   | 2019.03.28    | Initial                                                                       |
| 1        | F690501/RF-RTL013640-1 | 2019.04.12    | Revised the standard corresponding to Part 22 and Deleted the 15MHz test data |

## 1.8. Sample Calculation for Offset

Where relevant, the following sample calculation is provided:

### 1.8.1. Conducted Test

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

### 1.8.2. Radiation Test

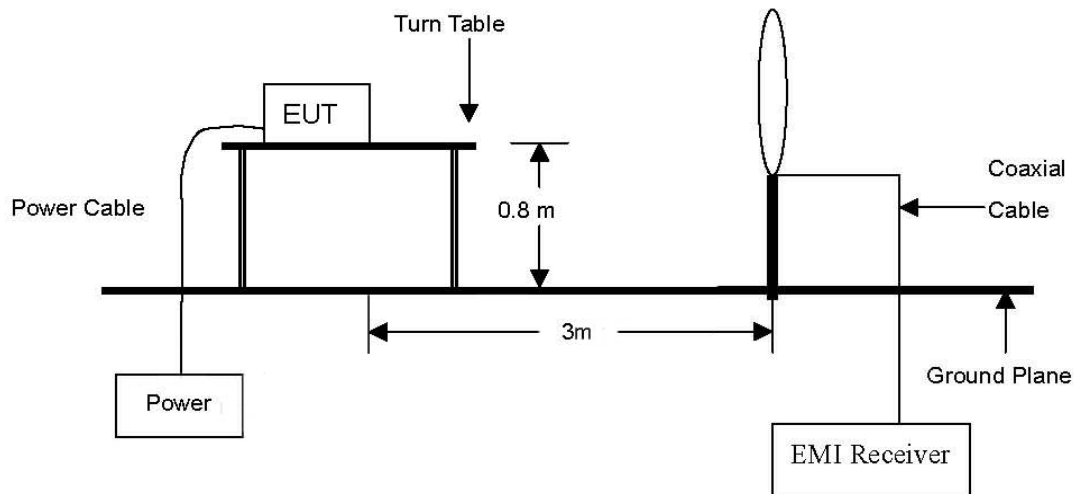
E.R.P. = [S.G level + Amp.] (dB m) - Cable loss (dB) + Ant. gain (dB d)

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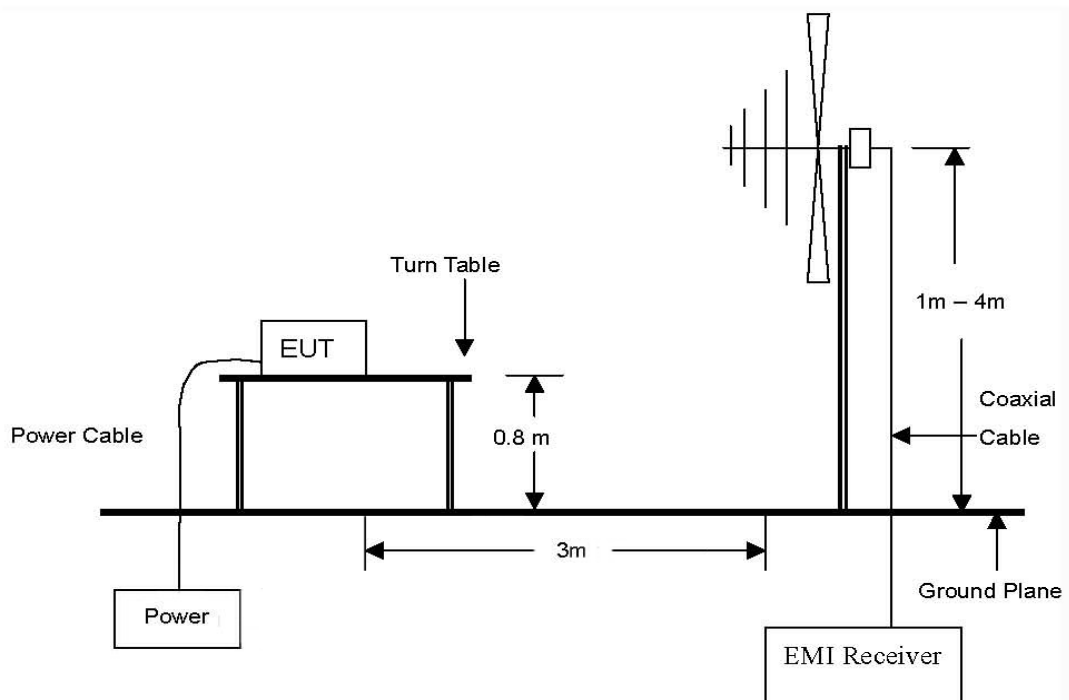
## 2. RF Radiated Output Power & Spurious Radiated Emission

## 2.1. Test Setup

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

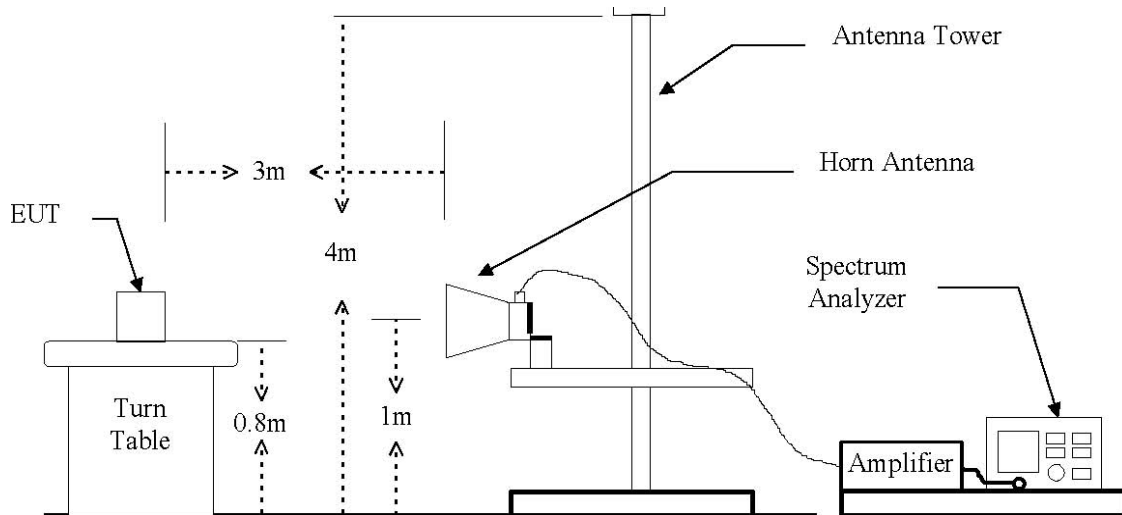


The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz.

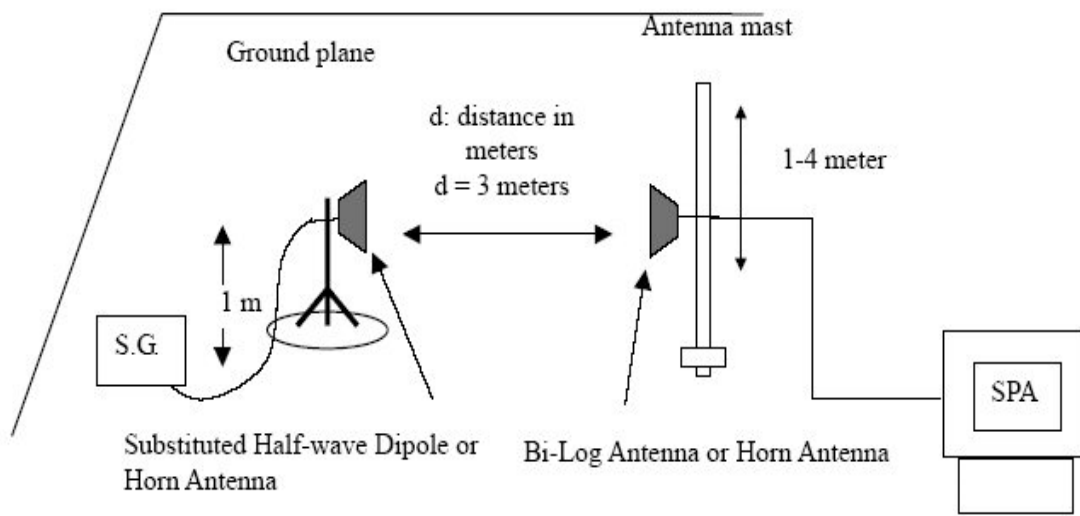


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The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 9 GHz.



The diagram below shows the test setup for substituted method.



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## 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.

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### 2.3. Test procedure: Based on ANSI/TIA 603E: 2016

1. On a test site, the EUT shall be placed at 80 cm 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 Publication 971168 D01 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 = Peak, trace mode = max hold, per the guidelines of KDB Publication 971168 D01 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. The EUT was replaced by half-wave dipole (1 GHz below) or horn antenna (1 GHz above) connected to a signal generator.
12. In necessary, the input attenuator setting on the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
13. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
14. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, which is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
15. The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
16. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.

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## 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 - QPSK)

| Frequency<br>(MHz) | Ant. Pol.<br>(H/V) | S.G level<br>+ Amp.<br>(dB m) | Cable loss<br>(dB) | Ant. gain<br>(dB d) | E.R.P. |       |
|--------------------|--------------------|-------------------------------|--------------------|---------------------|--------|-------|
|                    |                    |                               |                    |                     | (dB m) | (mW)  |
| 814.70             | H                  | 21.68                         | 3.23               | -3.41               | 15.04  | 31.92 |
| 814.70             | V                  | 23.69                         | 3.23               | -3.41               | 17.05  | 50.70 |
| 823.30             | H                  | 24.14                         | 3.22               | -4.71               | 16.21  | 41.78 |
| 823.30             | V                  | 25.82                         | 3.22               | -4.71               | 17.89  | 61.52 |

\* 1.4 BW 1RB size / 0 Offset for B26

### LTE band 26 (1.4 MHz - 16QAM)

| Frequency<br>(MHz) | Ant. Pol.<br>(H/V) | S.G level<br>+ Amp.<br>(dB m) | Cable loss<br>(dB) | Ant. gain<br>(dB d) | E.R.P. |       |
|--------------------|--------------------|-------------------------------|--------------------|---------------------|--------|-------|
|                    |                    |                               |                    |                     | (dB m) | (mW)  |
| 814.70             | H                  | 21.05                         | 3.23               | -3.41               | 14.41  | 27.61 |
| 814.70             | V                  | 23.06                         | 3.23               | -3.41               | 16.42  | 43.85 |
| 823.30             | H                  | 23.05                         | 3.22               | -4.71               | 15.12  | 32.51 |
| 823.30             | V                  | 24.82                         | 3.22               | -4.71               | 16.89  | 48.87 |

\* 1.4 BW 1RB size / 0 Offset for B26

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

| Frequency<br>(MHz) | Ant. Pol.<br>(H/V) | S.G level<br>+ Amp.<br>(dB m) | Cable loss<br>(dB) | Ant. gain<br>(dB d) | E.R.P. |       |
|--------------------|--------------------|-------------------------------|--------------------|---------------------|--------|-------|
|                    |                    |                               |                    |                     | (dB m) | (mW)  |
| 815.50             | H                  | 21.81                         | 3.21               | -3.53               | 15.07  | 32.14 |
| 815.50             | V                  | 24.07                         | 3.21               | -3.53               | 17.33  | 54.08 |
| 822.50             | H                  | 23.88                         | 3.19               | -4.59               | 16.10  | 40.74 |
| 822.50             | V                  | 25.62                         | 3.19               | -4.59               | 17.84  | 60.81 |

\* 3 BW 1RB size / 0 Offset for B26

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A4(210 mm x 297 mm)

**LTE band 26 (3 MHz - 16QAM)**

| Frequency<br>(MHz) | Ant. Pol.<br>(H/V) | S.G level<br>+ Amp.<br>(dB m) | Cable loss<br>(dB) | Ant. gain<br>(dB d) | E.R.P. |       |
|--------------------|--------------------|-------------------------------|--------------------|---------------------|--------|-------|
|                    |                    |                               |                    |                     | (dB m) | (mW)  |
| 815.50             | H                  | 21.12                         | 3.21               | -3.53               | 14.38  | 27.42 |
| 815.50             | V                  | 23.17                         | 3.21               | -3.53               | 16.43  | 43.95 |
| 822.50             | H                  | 22.76                         | 3.19               | -4.59               | 14.98  | 31.48 |
| 822.50             | V                  | 24.62                         | 3.19               | -4.59               | 16.84  | 48.31 |

\* 3 BW 1RB size / 0 Offset for B26

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

| Frequency<br>(MHz) | Ant. Pol.<br>(H/V) | S.G level<br>+ Amp.<br>(dB m) | Cable loss<br>(dB) | Ant. gain<br>(dB d) | E.R.P. |       |
|--------------------|--------------------|-------------------------------|--------------------|---------------------|--------|-------|
|                    |                    |                               |                    |                     | (dB m) | (mW)  |
| 816.50             | H                  | 21.76                         | 3.19               | -3.68               | 14.89  | 30.83 |
| 816.50             | V                  | 23.94                         | 3.19               | -3.68               | 17.07  | 50.93 |
| 821.50             | H                  | 23.34                         | 3.16               | -4.44               | 15.74  | 37.50 |
| 821.50             | V                  | 25.16                         | 3.16               | -4.44               | 17.56  | 57.02 |

\* 5 BW 1RB size / 0 Offset for B26

**LTE band 26 (5 MHz - 16QAM)**

| Frequency<br>(MHz) | Ant. Pol.<br>(H/V) | S.G level<br>+ Amp.<br>(dB m) | Cable loss<br>(dB) | Ant. gain<br>(dB d) | E.R.P. |       |
|--------------------|--------------------|-------------------------------|--------------------|---------------------|--------|-------|
|                    |                    |                               |                    |                     | (dB m) | (mW)  |
| 816.50             | H                  | 21.35                         | 3.19               | -3.68               | 14.48  | 28.05 |
| 816.50             | V                  | 23.34                         | 3.19               | -3.68               | 16.47  | 44.36 |
| 821.50             | H                  | 22.40                         | 3.16               | -4.44               | 14.80  | 30.20 |
| 821.50             | V                  | 24.24                         | 3.16               | -4.44               | 16.64  | 46.13 |

\* 5 BW 1RB size / 0 Offset for B26

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A4(210 mm x 297 mm)

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

| Frequency<br>(MHz) | Ant. Pol.<br>(H/V) | S.G level<br>+ Amp.<br>(dB m) | Cable loss<br>(dB) | Ant. gain<br>(dB d) | E.R.P. |       |
|--------------------|--------------------|-------------------------------|--------------------|---------------------|--------|-------|
|                    |                    |                               |                    |                     | (dB m) | (mW)  |
| 819.00             | H                  | 22.34                         | 3.14               | -4.06               | 15.14  | 32.66 |
| 819.00             | V                  | 24.02                         | 3.14               | -4.06               | 16.82  | 48.08 |

\* 10 BW 1RB size / 0 Offset for B26

**LTE band 26 (10 MHz - 16QAM)**

| Frequency<br>(MHz) | Ant. Pol.<br>(H/V) | S.G level<br>+ Amp.<br>(dB m) | Cable loss<br>(dB) | Ant. gain<br>(dB d) | E.R.P. |       |
|--------------------|--------------------|-------------------------------|--------------------|---------------------|--------|-------|
|                    |                    |                               |                    |                     | (dB m) | (mW)  |
| 819.00             | H                  | 21.30                         | 3.14               | -4.06               | 14.10  | 25.70 |
| 819.00             | V                  | 23.36                         | 3.14               | -4.06               | 16.16  | 41.30 |

\* 10 BW 1RB size / 0 Offset for B26

**Remark;**

1. E.R.P. = [S.G level + Amp.] (dB m) - Cable loss (dB) + Ant. gain (dB d)
2. This device was tested under all bandwidths, RB configurations and modulations.
3. The data reported in the table above was measured in worst case.

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A4(210 mm x 297 mm)

## 2.5. Spurious radiated emission

- Measured output Power: 17.89 dB m = 0.061 5 W
- Modulation Signal: LTE band 26 (1.4 MHz - QPSK)
- Distance: 3 meters
- Limit:  $43 + 10 \log_{10}(W) = 30.89$  dB c

| Frequency<br>(MHz)       | Ant. Pol.<br>(H/V) | S.G level<br>+ Amp.<br>(dB m) | Cable loss<br>(dB) | Ant. gain<br>(dB d) | E.R.P.<br>(dB m) | Limit<br>(dB m) | Margin<br>(dB) |
|--------------------------|--------------------|-------------------------------|--------------------|---------------------|------------------|-----------------|----------------|
| Low Channel (814.7 MHz)  |                    |                               |                    |                     |                  |                 |                |
| Below<br>1 000.00        | H                  | -                             | -                  | -                   | Not<br>detected  | -               | -              |
| Above<br>1 000.00        | V                  | -                             | -                  | -                   | Not<br>detected  | -               | -              |
| High Channel (823.3 MHz) |                    |                               |                    |                     |                  |                 |                |
| Below<br>1 000.00        | H                  | -                             | -                  | -                   | Not<br>detected  | -               | -              |
| Above<br>1 000.00        | V                  | -                             | -                  | -                   | Not<br>detected  | -               | -              |

\* 1.4 BW 1RB size / 0 Offset for B26

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A4(210 mm x 297 mm)

- Measured output Power: 17.84 dB m = 0.060 8 W
- Modulation Signal: LTE band 26 (3 MHz - QPSK)
- Distance: 3 meters
- Limit:  $43 + 10 \log_{10}(W) = 30.84$  dB c

| Frequency<br>(MHz)       | Ant. Pol.<br>(H/V) | S.G level<br>+ Amp.<br>(dB m) | Cable loss<br>(dB) | Ant. gain<br>(dB d) | E.R.P.<br>(dB m) | Limit<br>(dB m) | Margin<br>(dB) |
|--------------------------|--------------------|-------------------------------|--------------------|---------------------|------------------|-----------------|----------------|
| Low Channel (815.5 MHz)  |                    |                               |                    |                     |                  |                 |                |
| Below<br>1 000.00        | H                  | -                             | -                  | -                   | Not<br>detected  | -               | -              |
| Above<br>1 000.00        | V                  | -                             | -                  | -                   | Not<br>detected  | -               | -              |
| High Channel (822.5 MHz) |                    |                               |                    |                     |                  |                 |                |
| Below<br>1 000.00        | H                  | -                             | -                  | -                   | Not<br>detected  | -               | -              |
| Above<br>1 000.00        | V                  | -                             | -                  | -                   | Not<br>detected  | -               | -              |

\* 3 BW 1RB size / 0 Offset for B26

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SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

- Measured output Power: 17.56 dB m = 0.057 0 W
- Modulation Signal: LTE band 26 (5 MHz - QPSK)
- Distance: 3 meters
- Limit:  $43 + 10 \log_{10}(W) = 30.56$  dB c

| Frequency<br>(MHz)       | Ant. Pol.<br>(H/V) | S.G level<br>+ Amp.<br>(dB m) | Cable loss<br>(dB) | Ant. gain<br>(dB d) | E.R.P.<br>(dB m) | Limit<br>(dB m) | Margin<br>(dB) |
|--------------------------|--------------------|-------------------------------|--------------------|---------------------|------------------|-----------------|----------------|
| Low Channel (816.5 MHz)  |                    |                               |                    |                     |                  |                 |                |
| Below<br>1 000.00        | H                  | -                             | -                  | -                   | Not<br>detected  | -               | -              |
| Above<br>1 000.00        | V                  | -                             | -                  | -                   | Not<br>detected  | -               | -              |
| High Channel (821.5 MHz) |                    |                               |                    |                     |                  |                 |                |
| Below<br>1 000.00        | H                  | -                             | -                  | -                   | Not<br>detected  | -               | -              |
| Above<br>1 000.00        | V                  | -                             | -                  | -                   | Not<br>detected  | -               | -              |

\* 5 BW 1RB size / 0 Offset for B26

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RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

- Measured output Power: 16.82 dB m = 0.048 1 W
- Modulation Signal: LTE band 26 (10 MHz - QPSK)
- Distance: 3 meters
- Limit:  $43 + 10 \log_{10}(W) = 29.82$  dB c

| Frequency<br>(MHz)         | Ant. Pol.<br>(H/V) | S.G level<br>+ Amp.<br>(dB m) | Cable loss<br>(dB) | Ant. gain<br>(dB d) | E.R.P.<br>(dB m) | Limit<br>(dB m) | Margin<br>(dB) |
|----------------------------|--------------------|-------------------------------|--------------------|---------------------|------------------|-----------------|----------------|
| Middle Channel (819.0 MHz) |                    |                               |                    |                     |                  |                 |                |
| Below<br>1 000.00          | -                  | -                             | -                  | -                   | Not<br>detected  | -               | -              |
| Above<br>1 000.00          | -                  | -                             | -                  | -                   | Not<br>detected  | -               | -              |

\* 10 BW 1RB size / 0 Offset for B26

#### Remark;

1. E.R.P. = S.G level (dB m) - Cable loss (dB) + Ant. gain (dB d)
2. This device was tested under all bandwidths, RB configurations, and modulations.
3. The data reported in the table above was measured in worst case.

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### 3. Conducted Output Power

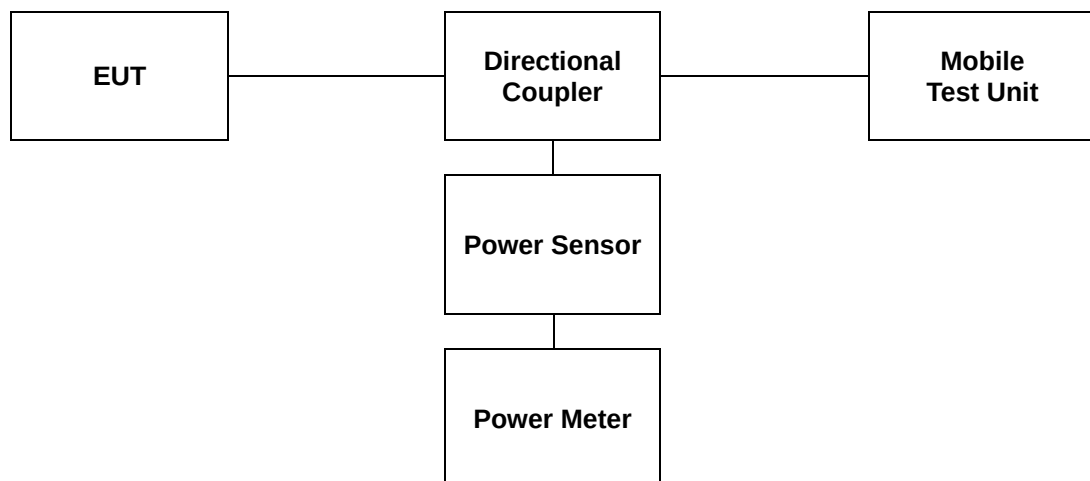
#### 3.1. Limit

CFR 47, Section FCC §2.1046 and IC RSS-Gen Issue 5 6.12.

#### 3.2. Test Procedure

Output power shall be measured at the RF output terminals for all configurations.

1. The RF output of the transmitter was connected to the input of the mobile test unit in order to establish communication with the EUT.
2. The EUT was set up for the max. output power with pseudo random data modulation by using mobile test unit parameters.
3. The measurement performed using a wideband RF power meter.
4. This EUT was tested under all configurations and the highest power was investigated and reported.



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### 3.3. Test Result

Ambient temperature : (23 ± 1) °C

Relative humidity : 47 % R.H.

| Band | Bandwidth<br>(MHz) | RB<br>Size | RB<br>Offset | QPSK  |       | 16QAM |       |
|------|--------------------|------------|--------------|-------|-------|-------|-------|
|      |                    |            |              | 26697 | 26783 | 26697 | 26783 |
|      |                    |            |              | 814.7 | 823.3 | 814.7 | 823.3 |
| 26   | 1.4                | 1          | 0            | 22.01 | 22.10 | 21.08 | 21.25 |
|      |                    | 1          | 3            | 22.06 | 22.15 | 21.30 | 21.26 |
|      |                    | 1          | 5            | 22.09 | 22.14 | 21.20 | 21.31 |
|      |                    | 3          | 0            | 22.04 | 22.10 | 21.04 | 21.23 |
|      |                    | 3          | 2            | 22.07 | 22.16 | 21.07 | 21.30 |
|      |                    | 3          | 3            | 22.07 | 22.16 | 21.13 | 21.34 |
|      |                    | 6          | 0            | 21.17 | 21.13 | 20.22 | 20.15 |
|      | Bandwidth<br>(MHz) | RB<br>Size | RB<br>Offset | 26705 | 26775 | 26705 | 26775 |
|      |                    |            |              | 815.5 | 822.5 | 815.5 | 822.5 |
|      | 3                  | 1          | 0            | 22.07 | 22.15 | 21.20 | 21.26 |
|      |                    | 1          | 8            | 22.10 | 22.16 | 21.31 | 21.33 |
|      |                    | 1          | 14           | 22.04 | 22.16 | 21.22 | 21.30 |
|      |                    | 8          | 0            | 21.19 | 21.19 | 20.22 | 20.17 |
|      |                    | 8          | 4            | 21.18 | 21.23 | 20.25 | 20.22 |
|      |                    | 8          | 7            | 21.12 | 21.20 | 20.16 | 20.19 |
|      |                    | 15         | 0            | 21.21 | 21.20 | 20.21 | 20.20 |
|      | Bandwidth<br>(MHz) | RB<br>Size | RB<br>Offset | 26715 | 25765 | 26715 | 25765 |
|      |                    |            |              | 816.5 | 821.5 | 816.5 | 821.5 |
|      | 5                  | 1          | 0            | 22.11 | 22.06 | 21.21 | 21.32 |
|      |                    | 1          | 12           | 22.14 | 22.26 | 21.33 | 21.46 |
|      |                    | 1          | 24           | 22.02 | 22.15 | 21.17 | 21.39 |
|      |                    | 12         | 0            | 21.18 | 21.22 | 20.20 | 20.20 |
|      |                    | 12         | 7            | 21.20 | 21.26 | 20.22 | 20.25 |
|      |                    | 12         | 13           | 21.14 | 21.18 | 20.15 | 20.13 |
|      |                    | 25         | 0            | 21.15 | 21.22 | 20.18 | 20.23 |
|      | Bandwidth<br>(MHz) | RB<br>Size | RB<br>Offset | 26740 |       | 26740 |       |
|      |                    |            |              | 819.0 |       | 819.0 |       |
|      | 10                 | 1          | 0            | 22.02 |       | 21.15 |       |
|      |                    | 1          | 25           | 22.11 |       | 21.29 |       |
|      |                    | 1          | 49           | 21.92 |       | 21.09 |       |
|      |                    | 25         | 0            | 21.14 |       | 20.13 |       |
|      |                    | 25         | 12           | 21.21 |       | 20.20 |       |
|      |                    | 25         | 25           | 21.18 |       | 20.16 |       |
|      |                    | 50         | 0            | 20.14 |       | 20.14 |       |

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## 4. Occupied Bandwidth 99 %

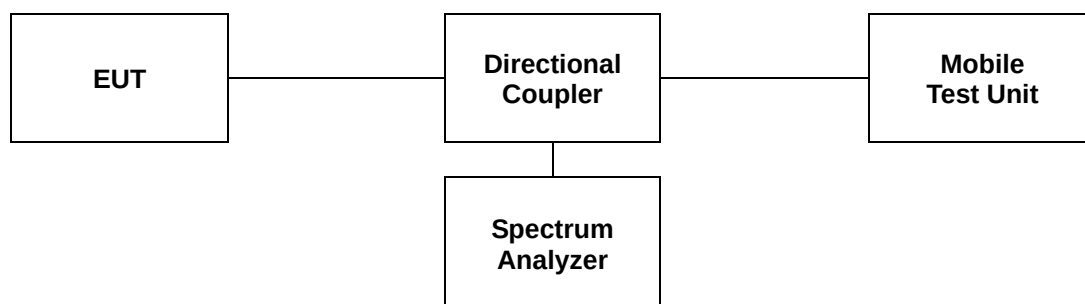
### 4.1. Limit

CFR 47, Section FCC §2.1049

### 4.2. Test Procedure

The test follows section 4.2 of FCC KDB Publication 971168 D01 v03r01.

- 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).



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### 4.3 Test Results

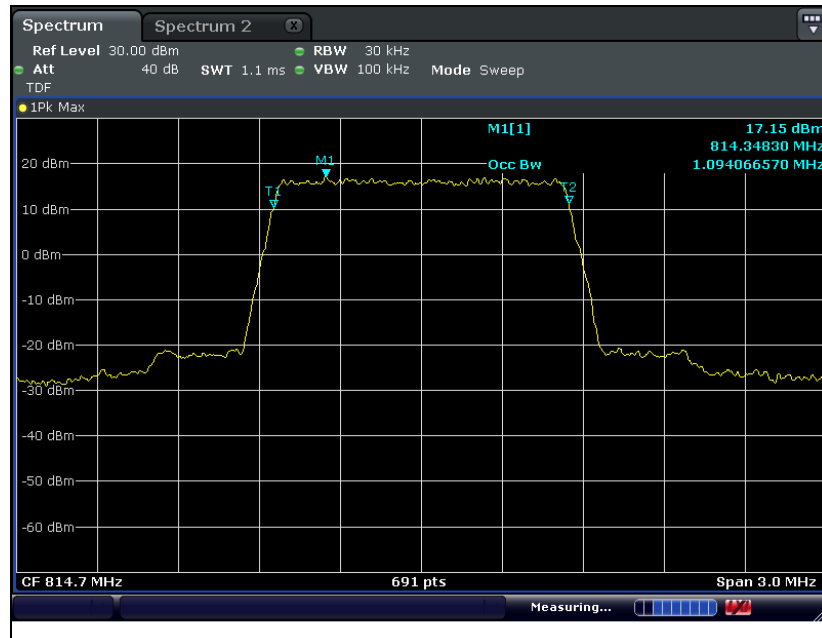
Ambient temperature : (23 ± 1) °C  
Relative humidity : 47 % R.H.

| Band         | Frequency (MHz) | Occupied Bandwidth (MHz) |       |
|--------------|-----------------|--------------------------|-------|
|              |                 | QPSK                     | 16QAM |
| 26 (1.4 MHz) | 814.7           | 1.094                    | 1.098 |
|              | 823.3           | 1.094                    | 1.094 |
| 26 (3 MHz)   | 815.5           | 2.692                    | 2.692 |
|              | 822.5           | 2.692                    | 2.692 |
| 26 (5 MHz)   | 816.5           | 4.515                    | 4.501 |
|              | 821.5           | 4.501                    | 4.501 |
| 26 (10 MHz)  | 819.0           | 8.944                    | 8.973 |

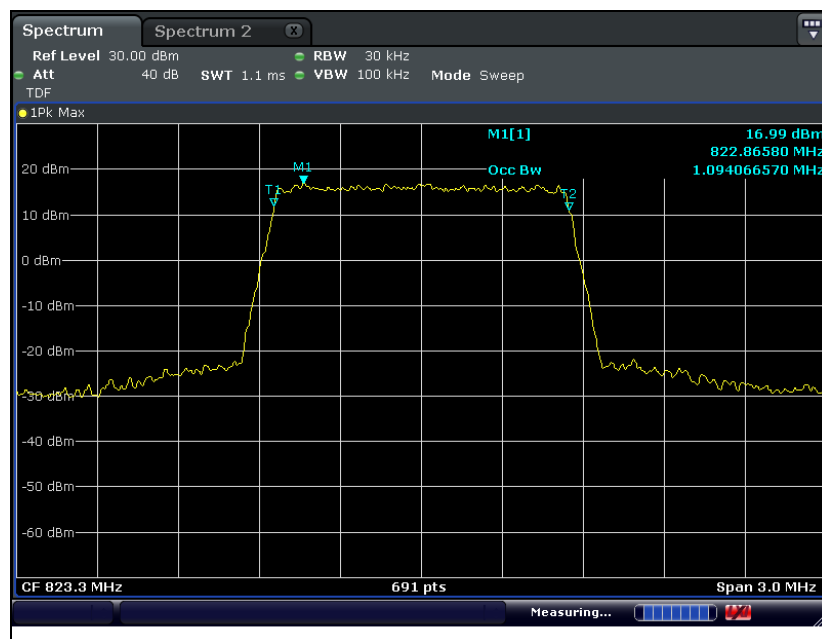
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**LTE band 26 (1.4 MHz - QPSK)**

Low Channel



High Channel



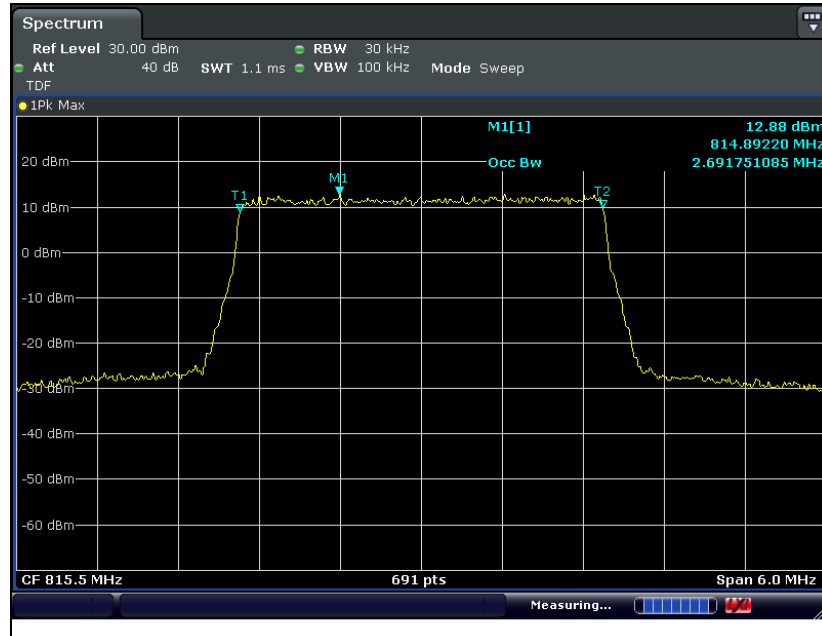
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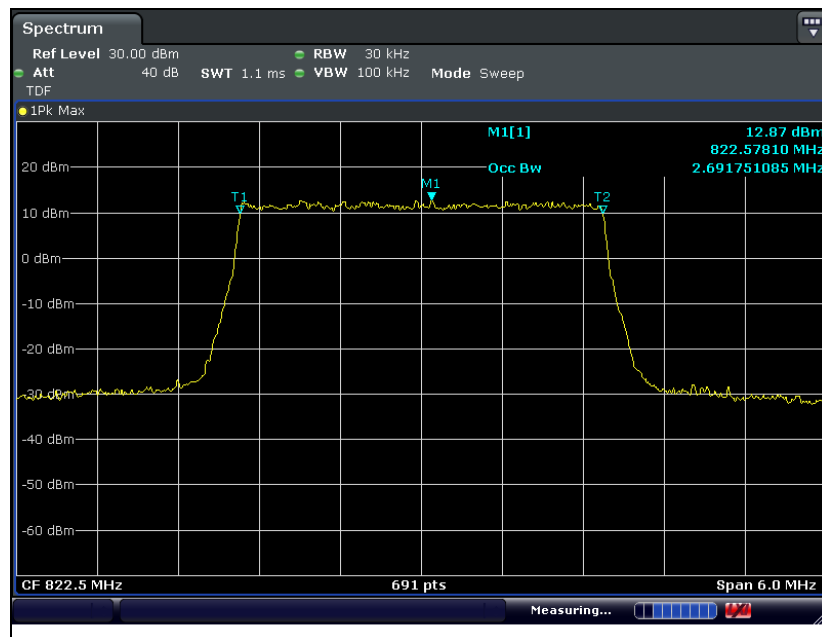


## LTE band 26 (3 MHz - 16QAM)

### Low Channel



### High Channel

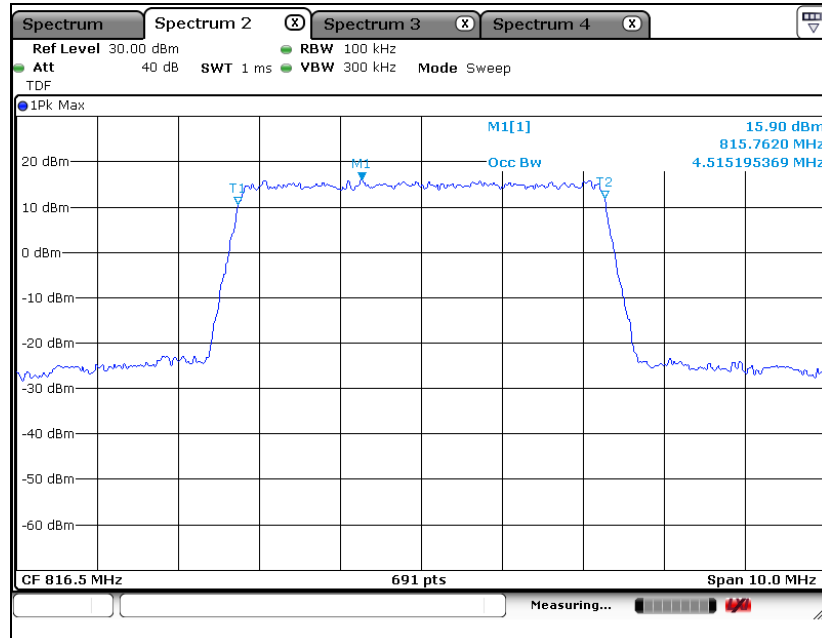


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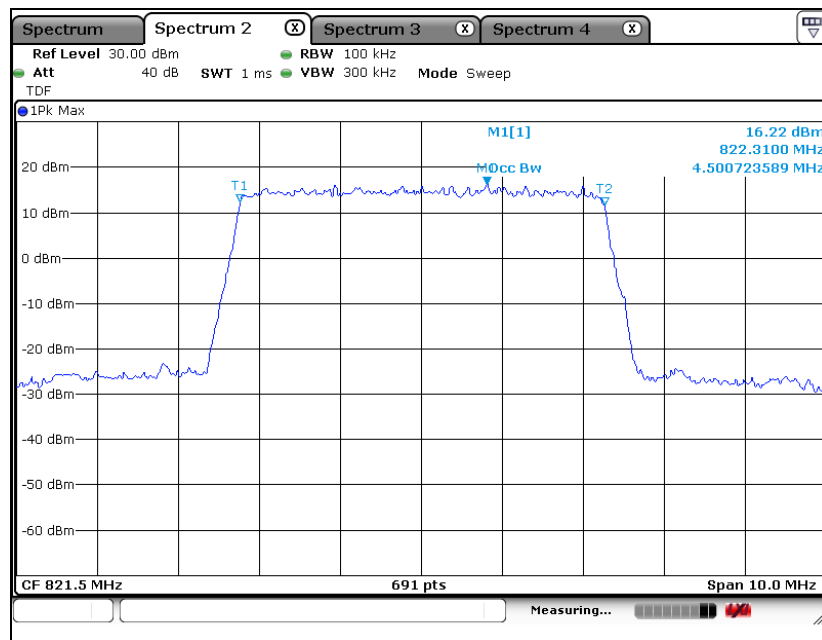


## LTE band 26 (5 MHz - QPSK)

### Low Channel



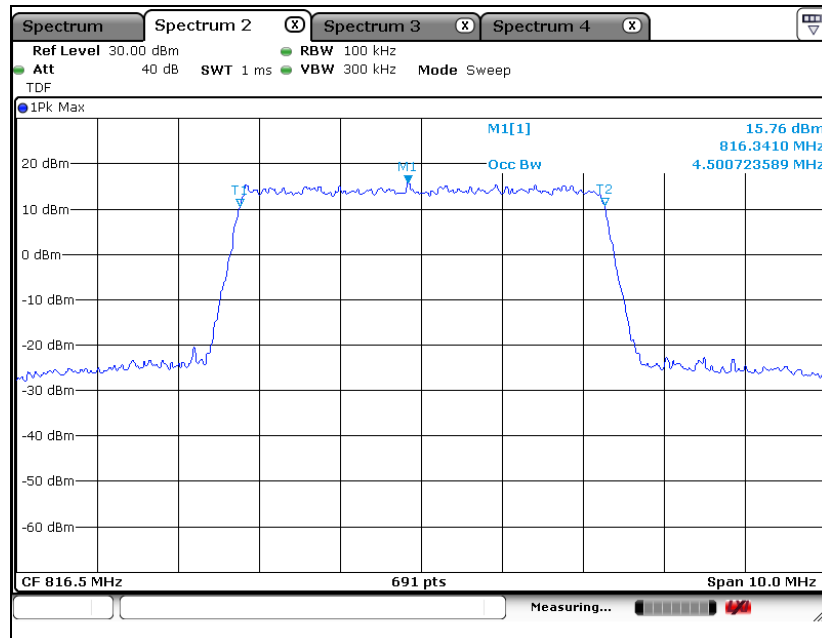
### High Channel



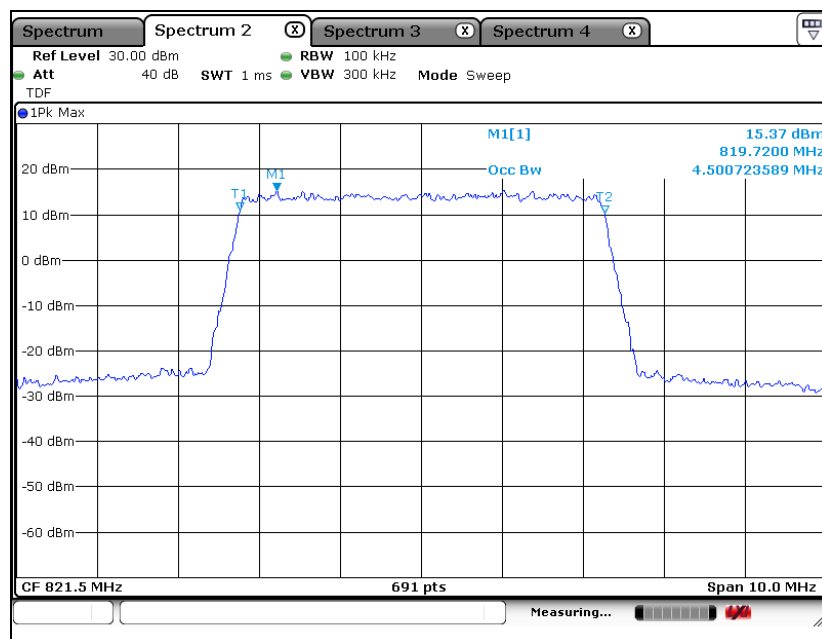
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## LTE band 26 (5 MHz - 16QAM)

### Low Channel



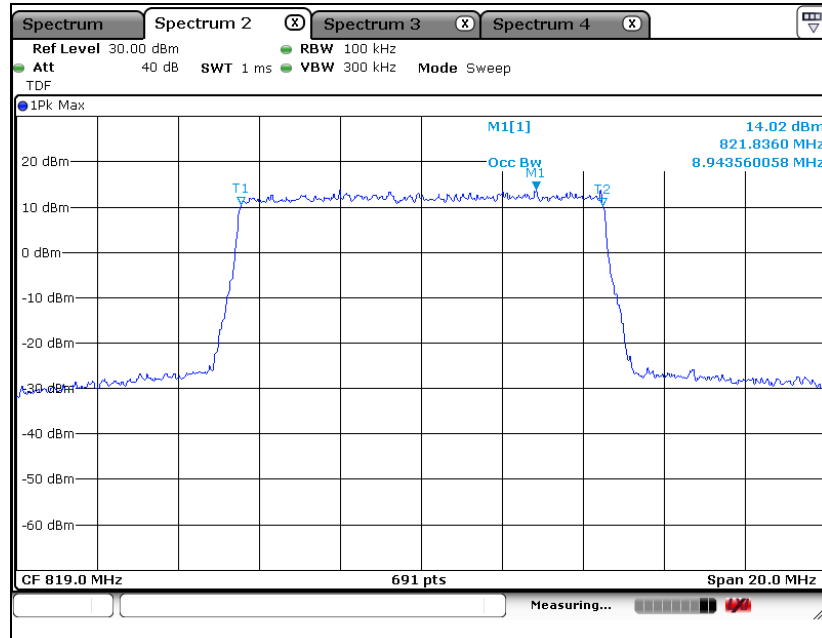
### High Channel



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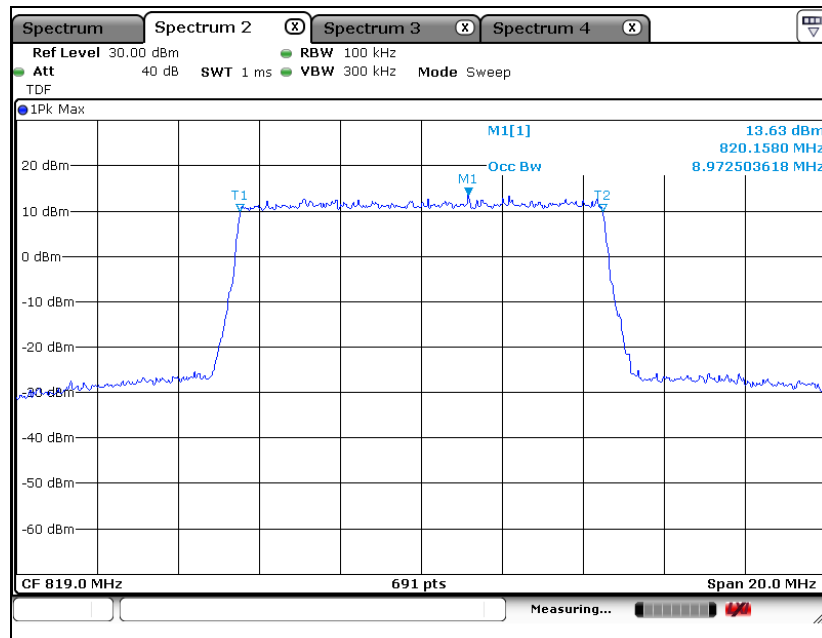
## LTE band 26 (10 MHz - QPSK)

Middle Channel



## LTE band 26 (10 MHz - 16QAM)

Middle Channel



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## 5. Spurious Emissions at Antenna Terminal

### 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.

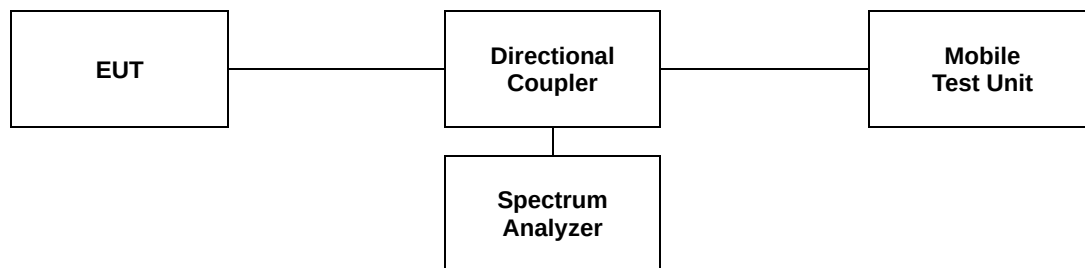
(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency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

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## 5.2. Test Procedure

The test follows section 6 of FCC KDB Publication 971168 D01 v03r01.

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.

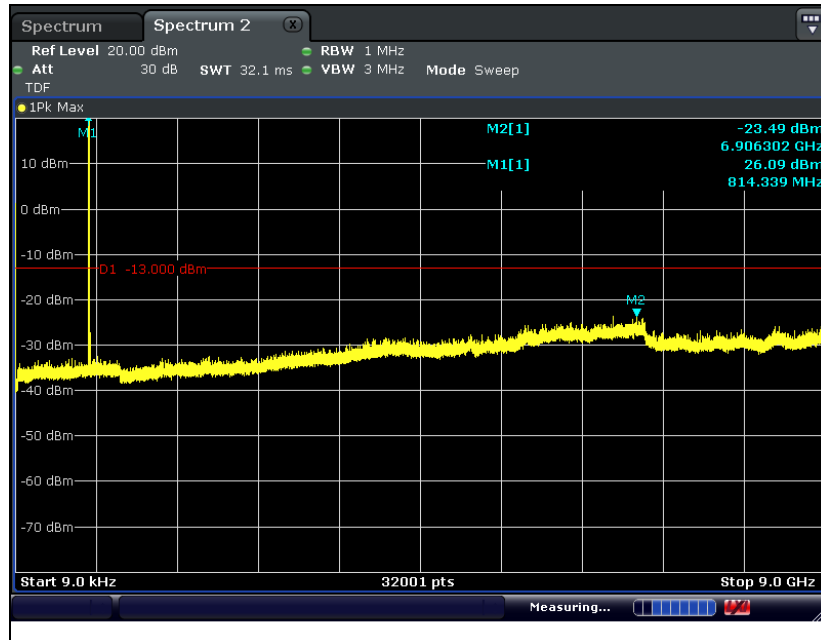
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## 5.3. Test Results

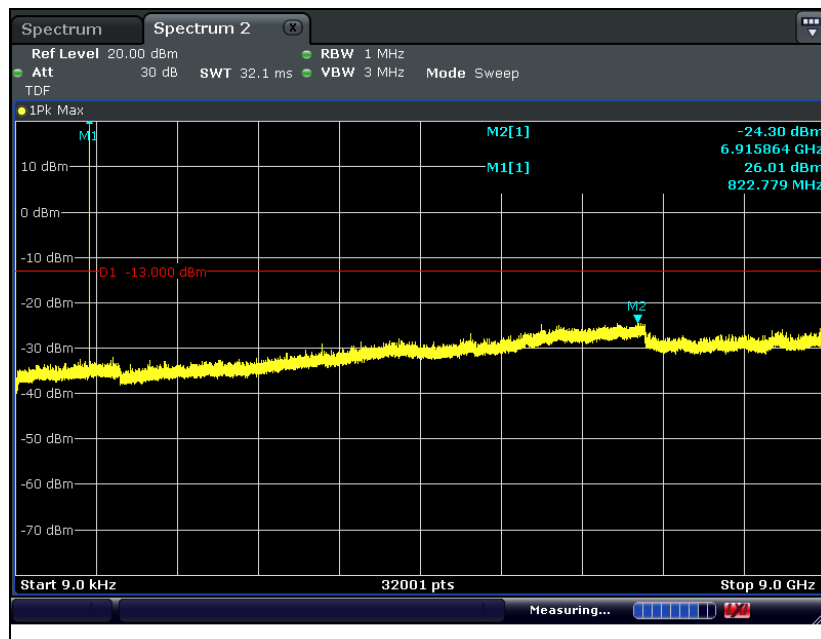
Ambient temperature : (23 ± 1) °C  
Relative humidity : 47 % R.H.

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

Low Channel



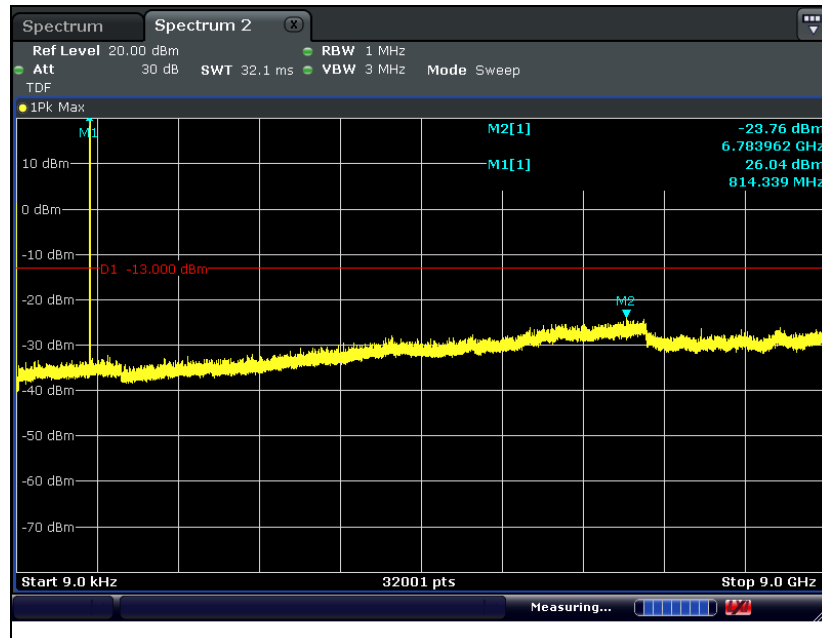
High Channel



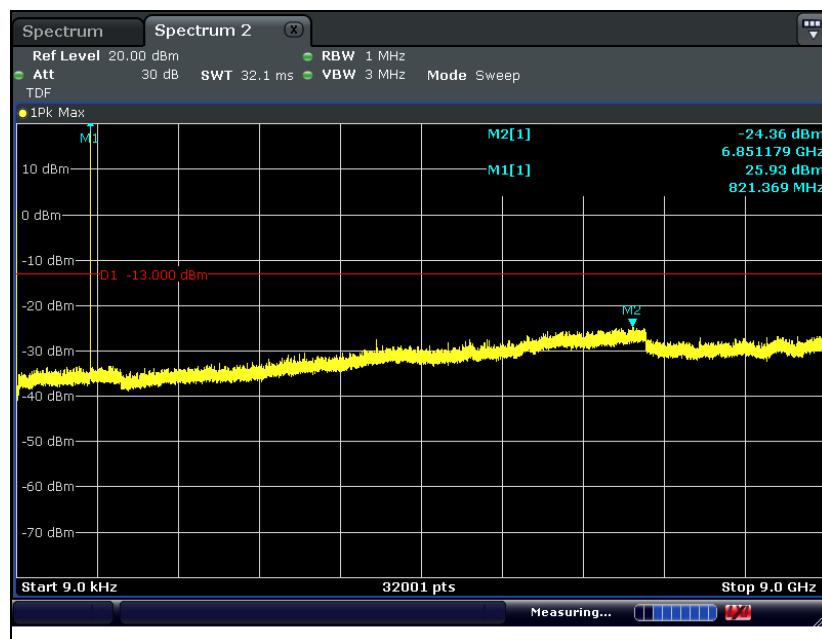
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## LTE band 26 (3 MHz - QPSK)

### Low Channel



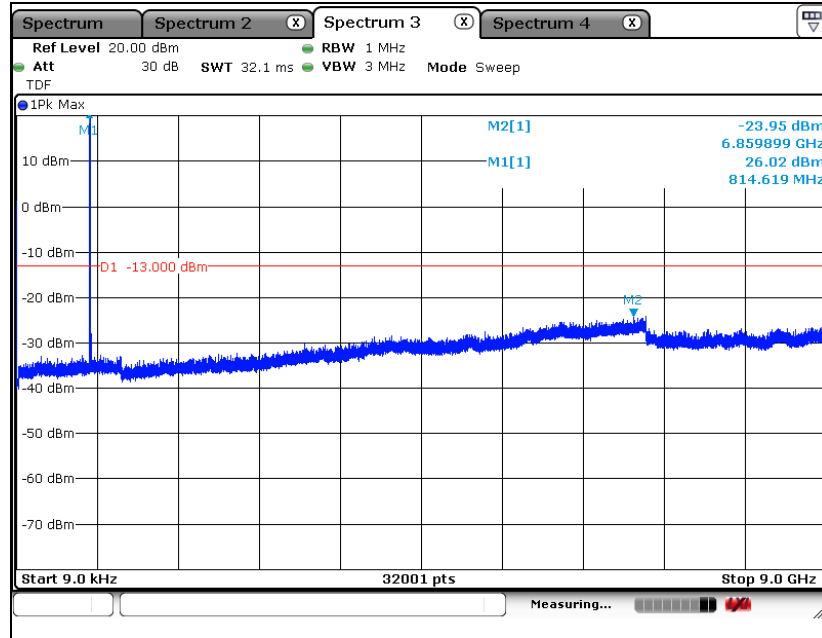
### High Channel



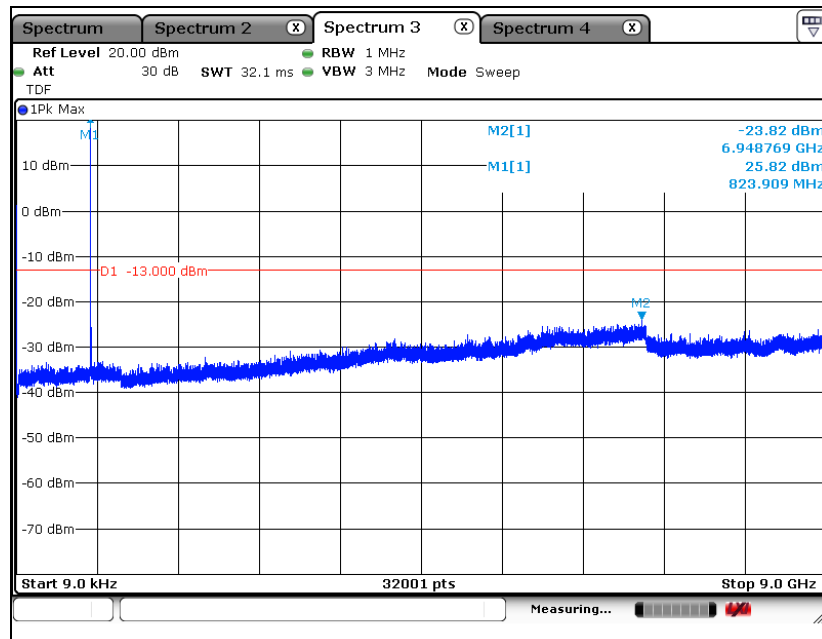
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## LTE band 26 (5 MHz - QPSK)

### Low Channel



### High Channel

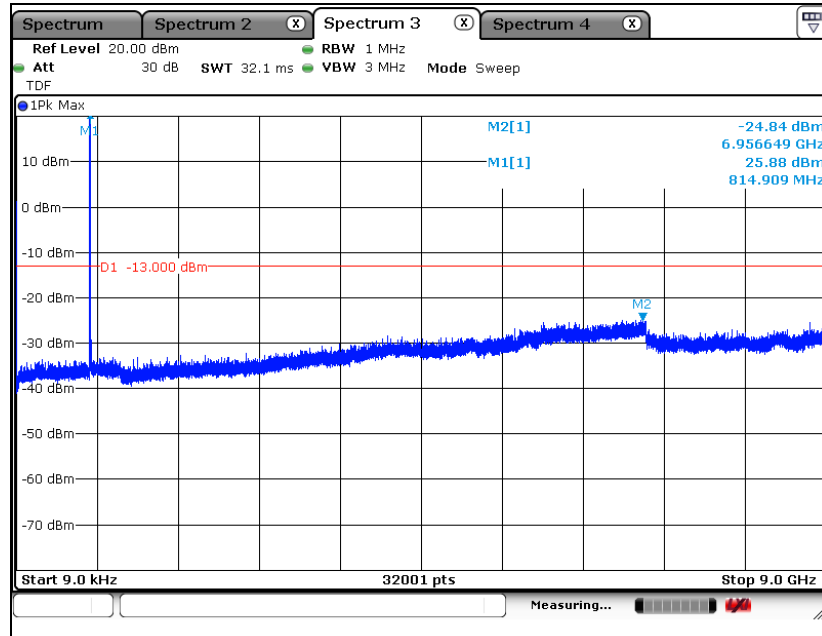


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## LTE band 26 (10 MHz - QPSK)

Middle Channel



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RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

## 6. Band Edge

### 6.1. 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<sub>10</sub>(f/6.1) decibels or 50 + 10 Log<sub>10</sub>(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 + 10Log<sub>10</sub>(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.

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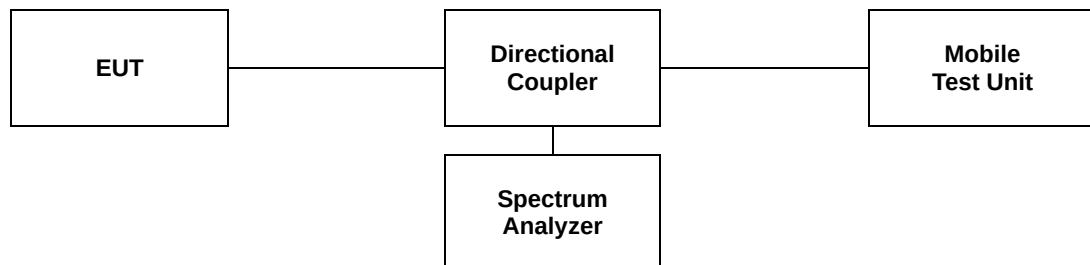
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

## 6.2. Test Procedure

The test follows section 6.0 of FCC KDB Publication 971168 D01 v03r01.

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



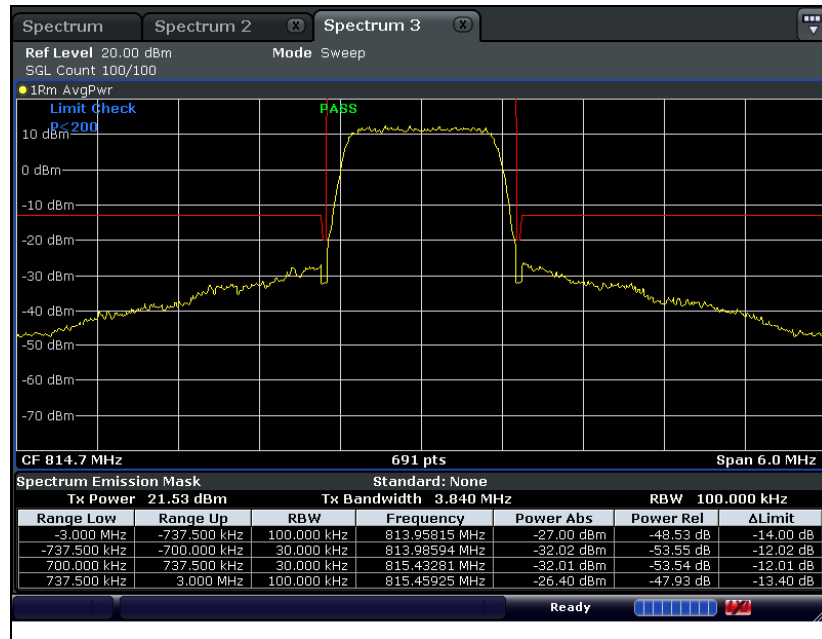
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## 6.3. Test Results

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

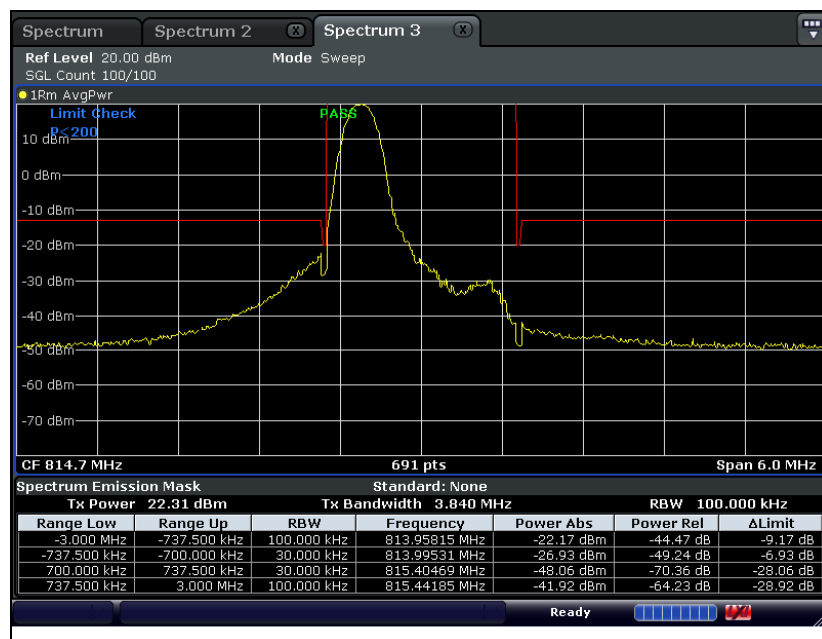
### LTE band 26 (1.4 MHz - QPSK\_RB 6)

Low Channel



### LTE band 26 (1.4 MHz - QPSK\_RB 1)

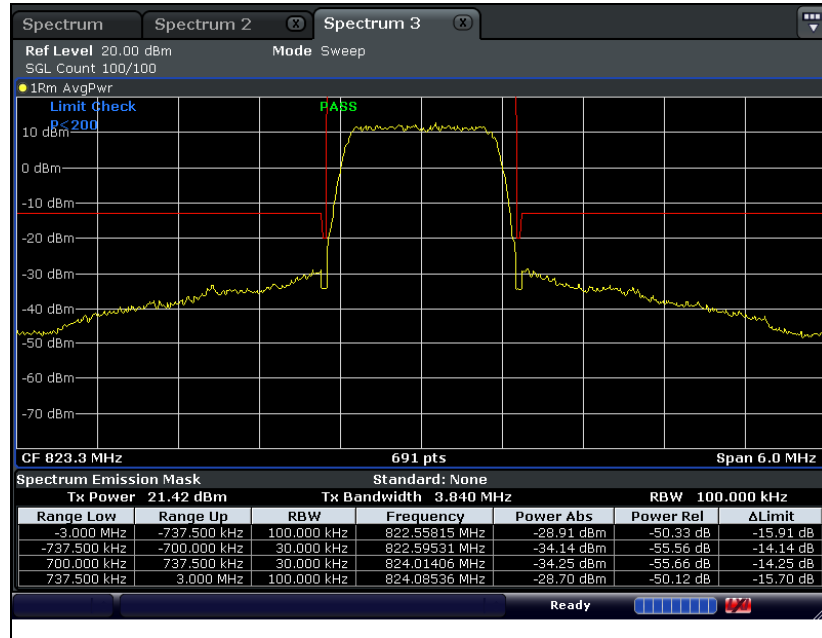
Low Channel



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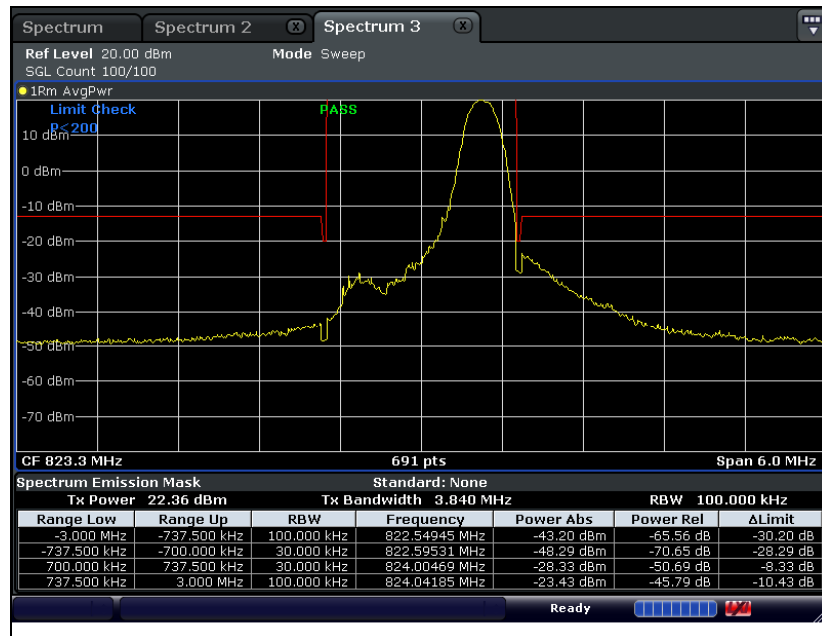
## LTE band 26 (1.4 MHz - QPSK\_RB 6)

High Channel



## LTE band 26 (1.4 MHz - QPSK\_RB 1)

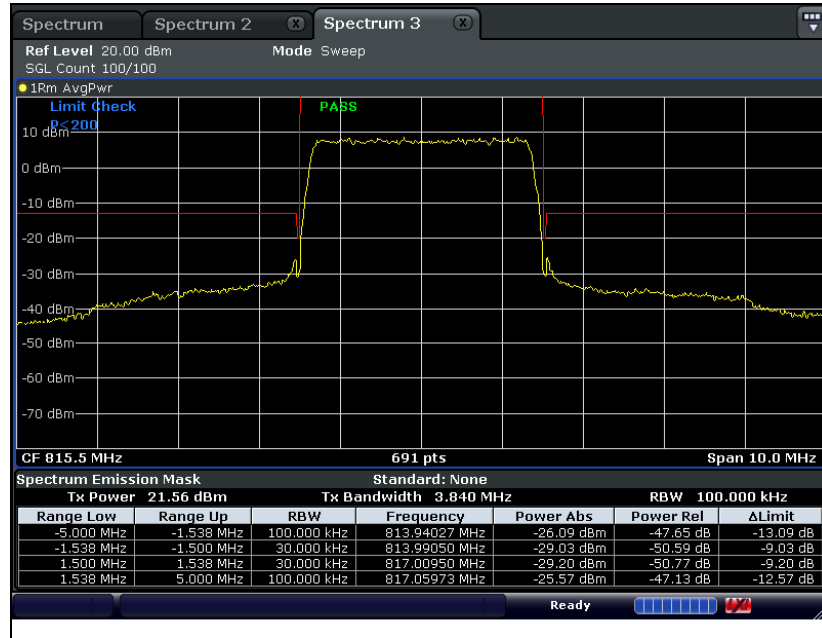
High Channel



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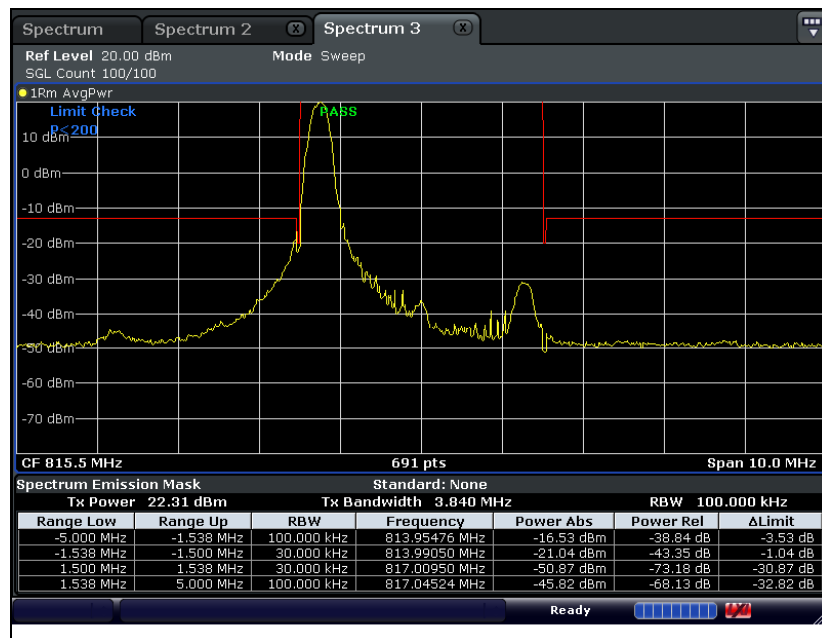
## LTE band 26 (3 MHz - QPSK\_RB 15)

Low Channel



## LTE band 26 (3 MHz - QPSK\_RB 1)

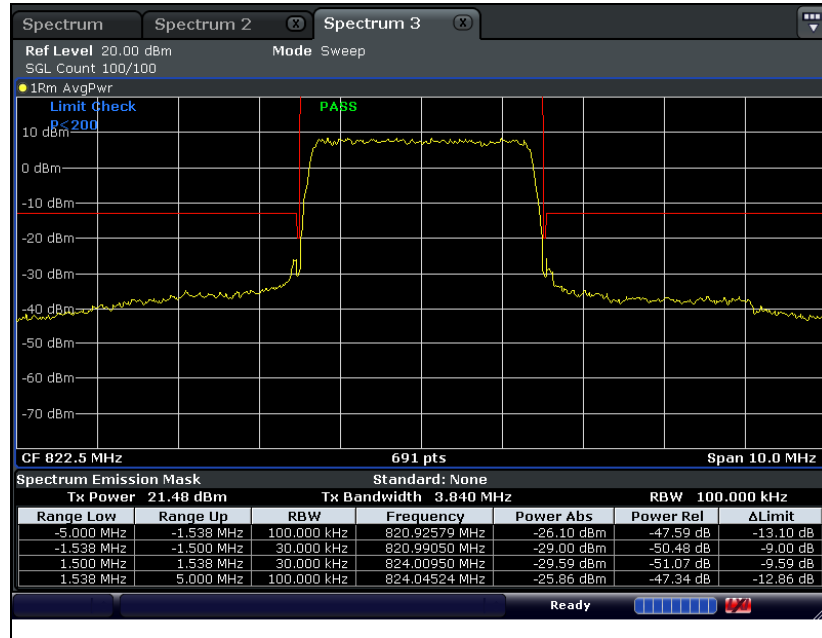
Low Channel



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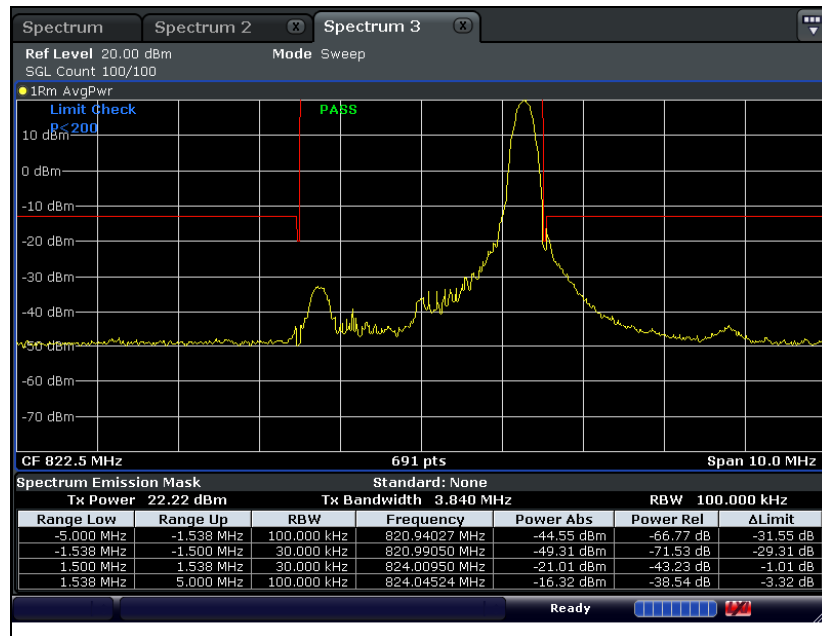
## LTE band 26 (3 MHz - QPSK\_RB 15)

High Channel



## LTE band 26 (3 MHz - QPSK\_RB 1)

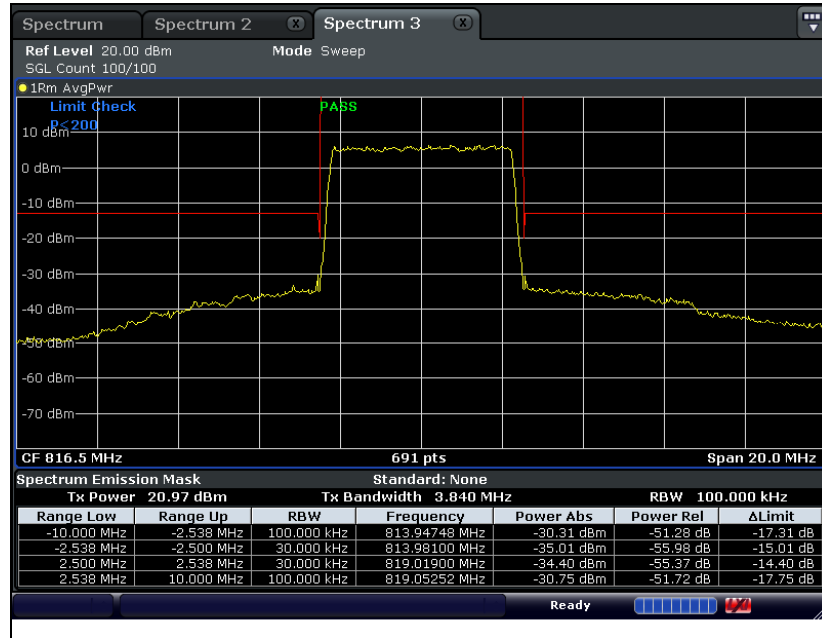
High Channel



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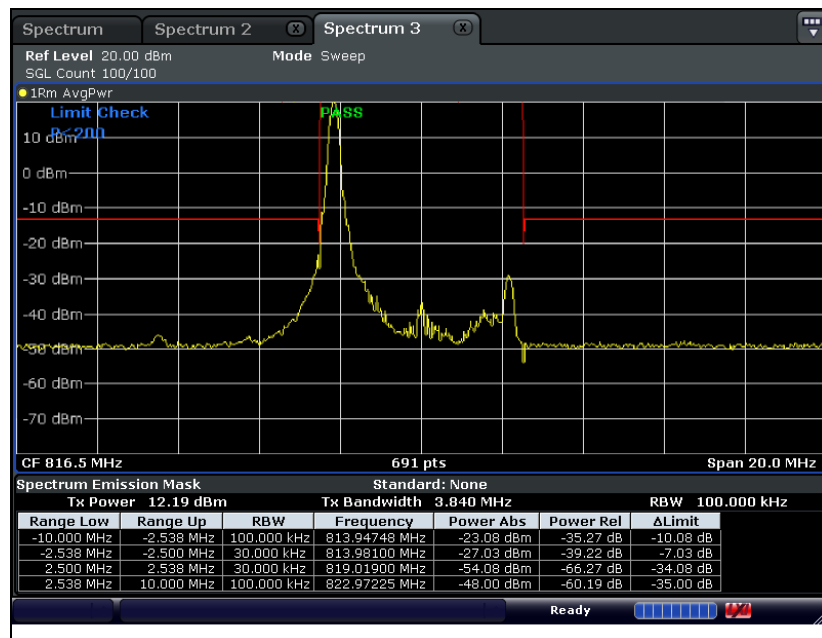
## LTE band 26 (5 MHz - QPSK\_RB 25)

Low Channel



## LTE band 26 (5 MHz - QPSK\_RB 1)

Low Channel

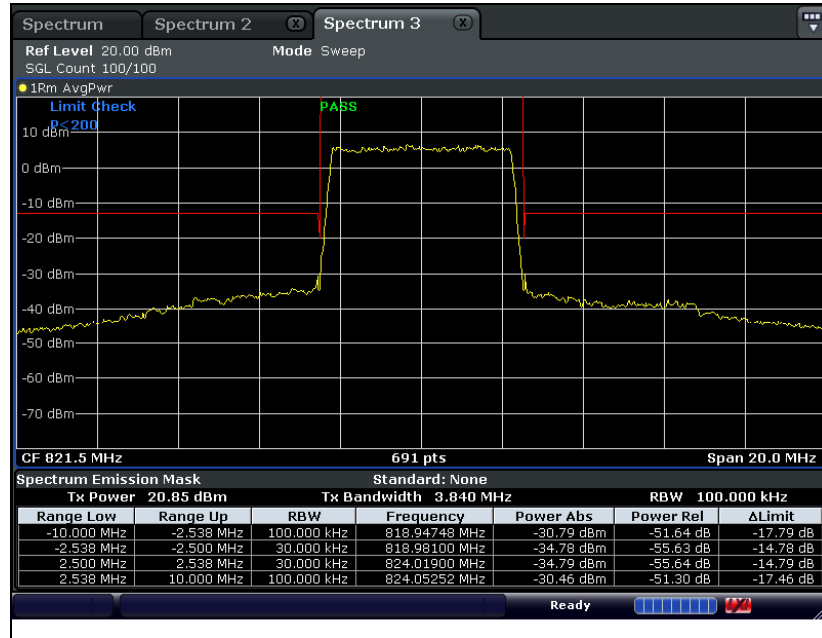


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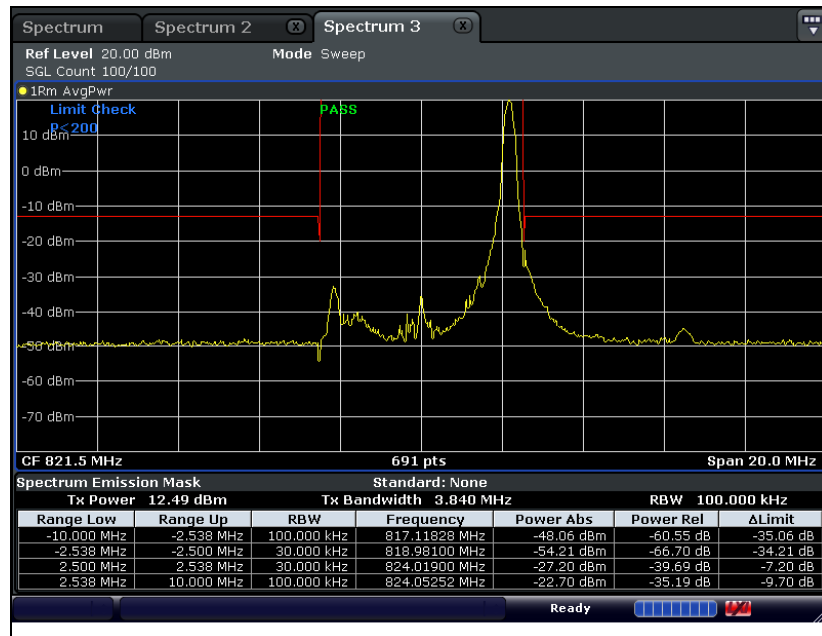
## LTE band 26 (5 MHz - QPSK\_RB 25)

High Channel



## LTE band 26 (5 MHz - QPSK\_RB 1)

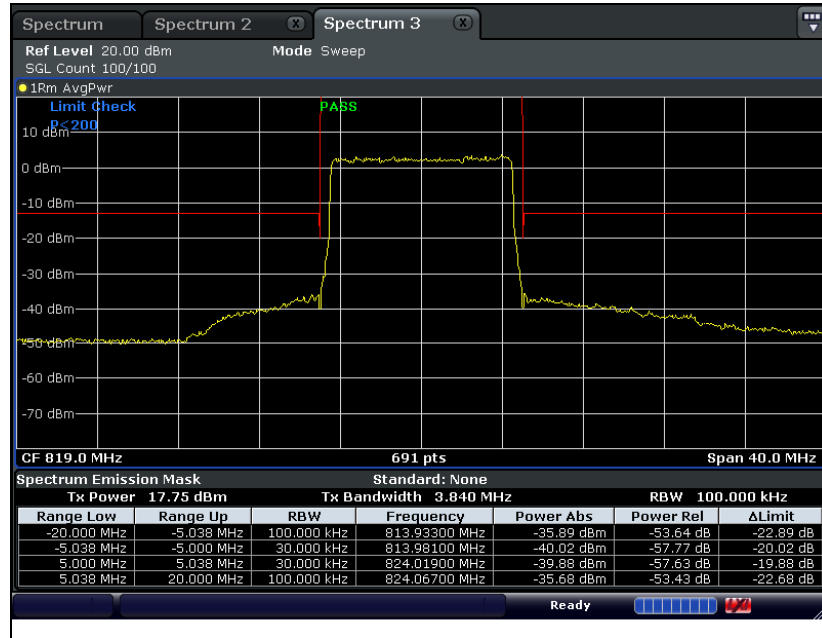
High Channel



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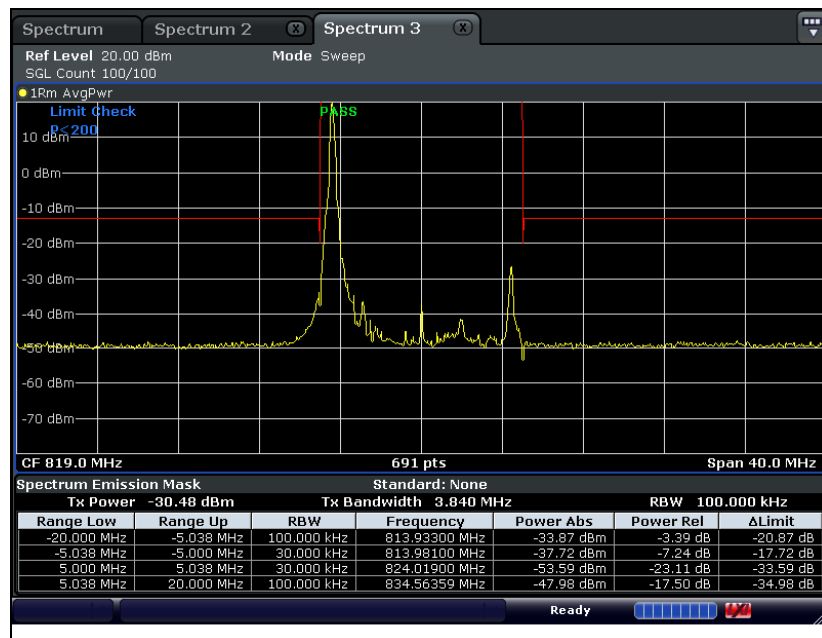
## LTE band 26 (10 MHz - QPSK\_RB 50)

Middle Channel



## LTE band 26 (10 MHz - QPSK\_RB 1 Low)

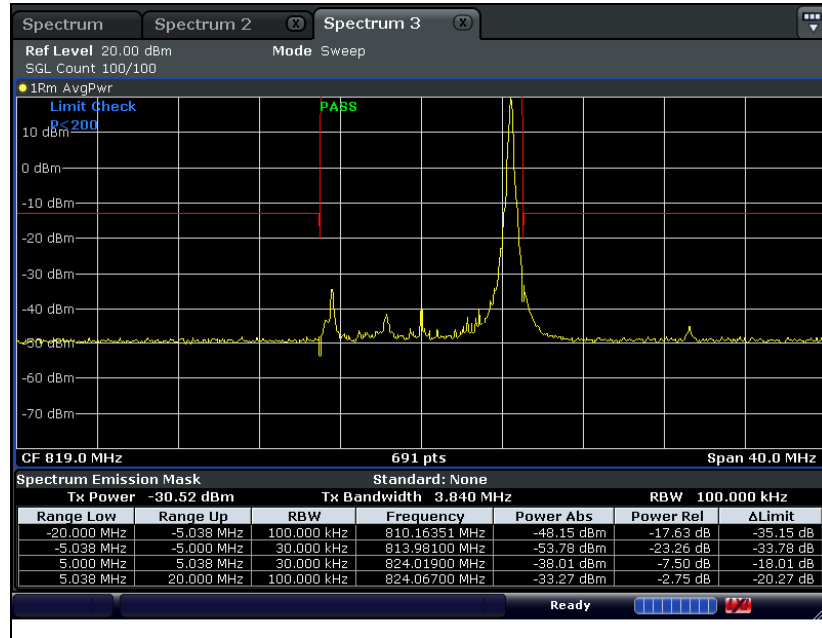
Middle Channel



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## LTE band 26 (10 MHz - QPSK\_RB 1 High)

Middle Channel



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## 7. Frequency Stability

### 7.1. Limit

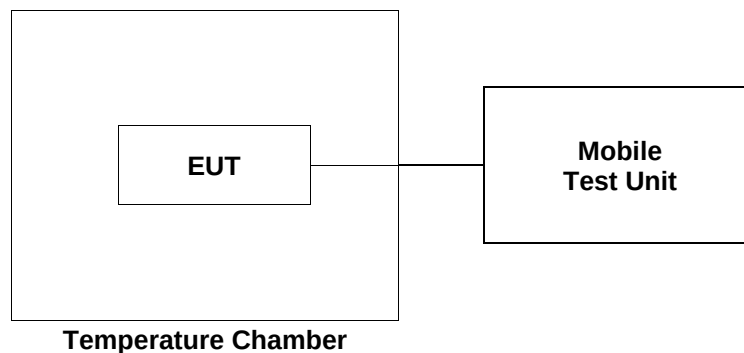
- § 2.1055 (a), § 2.1055 (d) & following:

- §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.

### 7.2. 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.



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### 7.3. Test Results

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

| Reference Frequency: 814.7 MHz          |                                   |                                    |          |
|-----------------------------------------|-----------------------------------|------------------------------------|----------|
| Frequency Stability versus Temperature  |                                   |                                    |          |
| Environment Temperature (°C)            | Power Supplied (V <sub>dc</sub> ) | Frequency Measure with Time Elapse |          |
|                                         |                                   | Frequency Error (Hz)               | ppm      |
| 50                                      | 12.0                              | 2                                  | 0.002 5  |
| 40                                      |                                   | 4                                  | 0.004 9  |
| 30                                      |                                   | -1                                 | -0.001 2 |
| 23                                      |                                   | -1                                 | -0.001 2 |
| 10                                      |                                   | 3                                  | 0.003 7  |
| 0                                       |                                   | 2                                  | 0.002 5  |
| -10                                     |                                   | -2                                 | -0.002 5 |
| -20                                     |                                   | 1                                  | 0.001 2  |
| -30                                     |                                   | 3                                  | 0.003 7  |
| Frequency Stability versus Power Supply |                                   |                                    |          |
| Environment Temperature (°C)            | Power Supplied (V <sub>dc</sub> ) | Frequency Measure with Time Elapse |          |
|                                         |                                   | Frequency Error (Hz)               | ppm      |
| 23                                      | 13.8                              | 1                                  | 0.001 2  |
|                                         | 10.2                              | -3                                 | -0.003 7 |

### - End of the Test Report -

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