

# FCC Test Report

|              |          |
|--------------|----------|
| Product Name | 5G CPE   |
| Model No.    | FWAR     |
| FCC ID.      | NKR-LAA2 |

|           |  |
|-----------|--|
| Applicant | Wistron NeWeb Corporation                                    |
| Address   | 20 Park Avenue II, Hsinchu Science Park, Hsinchu 308, Taiwan |

|                 |                        |
|-----------------|------------------------|
| Date of Receipt | Nov. 16, 2020          |
| Issued Date     | Dec. 09, 2020          |
| Report No.      | 20B0401R-E3032110108-A |
| Report Version  | V1.0                   |



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

This report must not be used to claim product endorsement by TAF or any agency of the government.

The test report shall not be reproduced without the written approval of DEKRA Testing and Certification Co., Ltd.

Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

# Test Report

Issued Date: Dec. 09, 2020


Report No.: 20B0401R-E3032110108-A



|                           |  |
|---------------------------|--|
| Product Name              | 5G CPE   |
| Applicant                 | Wistron NeWeb Corporation                                    |
| Address                   | 20 Park Avenue II, Hsinchu Science Park, Hsinchu 308, Taiwan |
| Manufacturer              | Wistron NeWeb Corporation                                    |
| Model No.                 | FWAR   |
| FCC ID.                   | NKR-LAA2   |
| EUT Adapter Rated Voltage | AC 100-240V / 50-60Hz  |
| EUT Adapter Test Voltage  | AC 120V / 60Hz   |
| Trade Name                | WNC  |
| Applicable Standard       | FCC 47 CFR Part 96   |
| Test Result               | Complied   |

Documented By : Jinn Chen  
( Senior Adm. Specialist / Jinn Chen )

Tested By : Paul Jiang  
( Engineer / Paul Jiang )

Approved By :   
( Director / Vincent Lin )

## Revision History

| Report No.             | Version | Description             | Issued Date |
|------------------------|---------|-------------------------|-------------|
| 20B0401R-E3032110108-A | V1.0    | Initial issue of report | 2020-12-09  |

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**Attachment 1: EUT Test Photographs**

## 1. GENERAL INFORMATION

### 1.1. EUT Description

|                   |   |
|-------------------|---|
| Product Name      | 5G CPE                                  |
| Model No.         | FWAR                                    |
| Trade Name        | WNC                                     |
| IMEI No.          | 355806710006100                         |
| FCC ID            | NKR-LAA2                                |
| Modulation        | LTE Band 48 : QPSK, 16-QAM, 64-QAM      |
| TX Frequency      | LTE Band 48 : 3550MHz~3700MHz           |
| Rx Frequency      | LTE Band 48 : 3550MHz~3700MHz           |
| Bandwidth         | LTE Band 48 : 5MHz, 10MHz, 15MHz, 20MHz |
| HW Version        | 0.3.3                                   |
| SW Version        | 0.16.06.1dbg                            |
| Antenna Type      | Monopole antenna with 4.19dBi gain      |
| Antenna Connector | i-pex(MHF)                              |

| Accessories Information                 |   |
|---|---|
| Power Adapter (1)<br>(White/Black/Gray) | MFR: Delta, M/N: ADP-120VH D<br>Input: AC 100-240V~2.5A, 50-60Hz<br>Output: 20V, 6A<br>Cable Out: Non-Shielded, 3.0m<br>Power Cord: Non-Shielded, 1.8m    |
| Power Adapter (2)<br>(White/Black/Gray) | MFR: Delta, M/N: ADP-65JH HB<br>Input: AC 100-240V~2.5A, 50-60Hz<br>Output: 19V, 3.42A<br>Cable Out: Non-Shielded, 3.0m<br>Power Cord: Non-Shielded, 1.8m |
| Power Adapter (3)<br>(White/Black/Gray) | MFR: Delta, M/N: ADH-90AR B<br>Input: AC 100-240V~2.0A, 50-60Hz<br>Output: 56V, 1.61A<br>Power Cord: Non-Shielded, 1.8m                                   |

| Antenna Information |              |                |             |                            |                     |
|---------------------|--------------|----------------|-------------|----------------------------|---------------------|
| No                  | Manufacturer | Model No.      | Part No     | Antenna Type               | Peak Gain           |
| 1                   | WNC          | 95XKAC15.GDSVZ | LTE1(ANT_1) | Monopole                   | 4.19dBi for Band 48 |
| 2                   | WNC          | 95XKAC15.GDSVZ | LTE2(ANT_3) | Monopole<br>(RX functions) | 2.89dBi for Band 48 |
| 3                   | WNC          | 95XKAC15.GDTVZ | LTE3(ANT_4) | Monopole<br>(RX functions) | 3.18dBi for Band 48 |
| 4                   | WNC          | 95XKAC15.GDRVZ | LTE4(ANT_2) | Monopole<br>(RX functions) | 3.10dBi for Band 48 |

**Note:**

This report is prepared for Class II permissive change. The difference compared with original report no.: RF200605C31, RF200605C31A is housing and software. The software changes as following:

- 1) Add LTE band 4, band 12, band 14, band 29 and close band 13 by software.
- 2) Close 5G FR2 band n261 by software.

According to above conditions, Radiated Spurious Emissions (RSE) worst-case need to be performed and all data were verified to meet the requirements, and other test data refer to original report.

## 1.2. Mode of Operation

The EUT provide all functions described as above. The EUT is tested with maximum rated TX power via the Base Station simulator.

DEKRA has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

| Test Mode           |
|---------------------|
| Mode 1: LTE Band 48 |

Note:

1. WWAN module ANT\_1 support TX/RX functions and support 2UL CA PCC functions.
2. WWAN module ANT\_3 and ANT\_4 support RX functions.
3. WWAN module ANT\_2 2UL CA SCC functions and RX functions.
4. The adapter mode and the PoE mode pre-scanning radiation has determined by the adapter mode is the worst case.
5. This report is prepared for Class II permissive change. The difference compared with original report no.: RF200605C31, RF200605C31A is housing and software. The software changes as following:
  - 1) Add LTE band 4, band 12, band 14, band 29 and close band 13 by software.
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 According to above conditions, Radiated Spurious Emissions (RSE) worst-case need to be performed and all data were verified to meet the requirements, and other test data refer to original report.

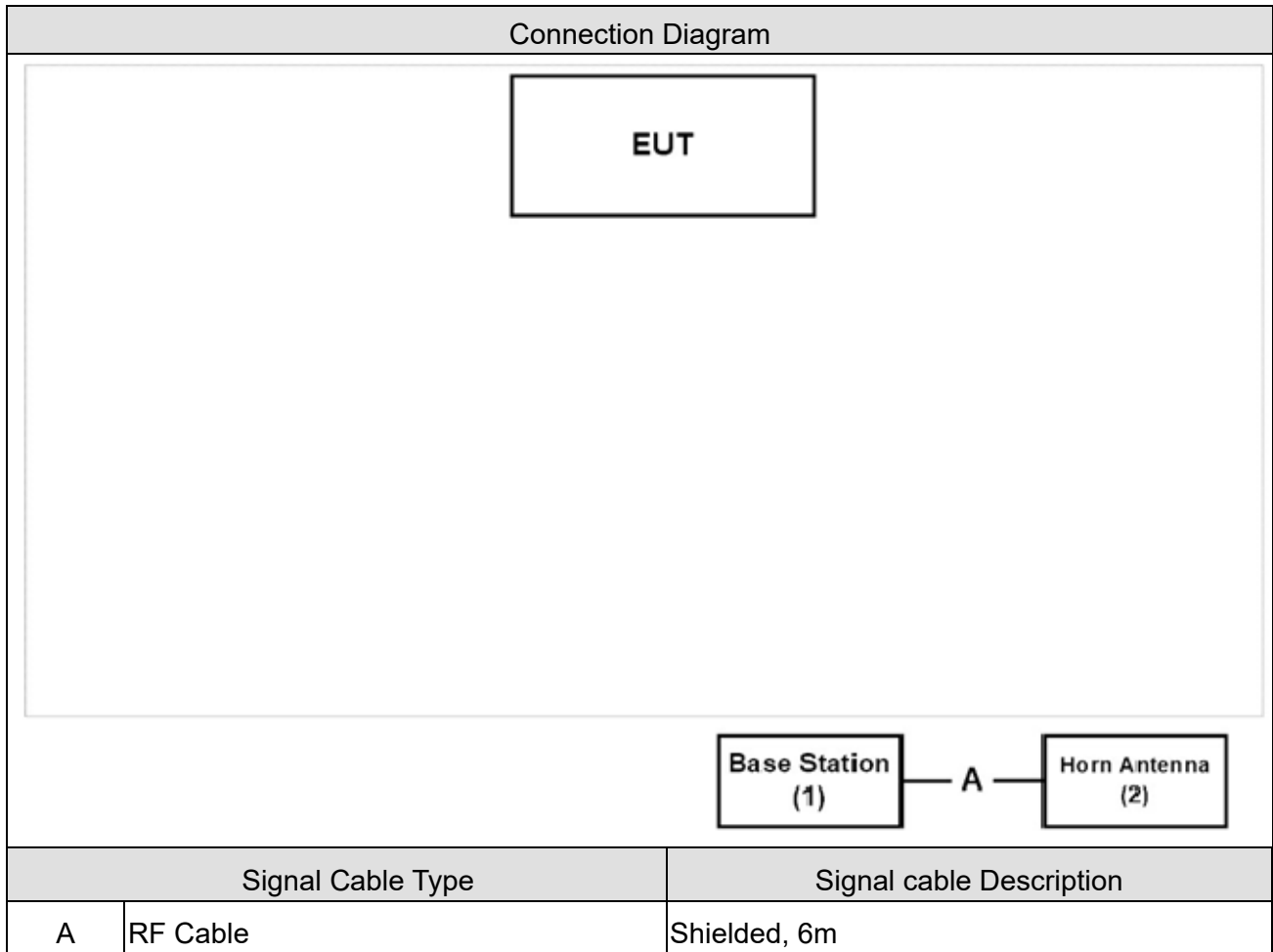
## 1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

| Product        | Manufacturer | Model No.  | Serial No. | FCC ID | Power Cord        |
|----------------|--------------|------------|------------|--------|-------------------|
| 1 Base Station | R&S          | CMW500     | 106071     | DoC    | Non- Shielded, 2m |
| 2 Horn Antenna | Schwarzbeck  | BBHA 9120D | 1640       | DoC    | --                |



### 1.4. Configuration of Tested System



### 1.5. EUT Setup Procedures

- (1) Setup the EUT and simulators as shown on 1.4
- (2) Turn on the power of all equipment.
- (3) The EUT was set to communicate with the Base Station.
- (4) Repeat the above procedure.

### 1.6. Comments and Remarks

The product specification and testing instructions for the EUT declared in the report are provided by the manufacturer who will take all responsibilities for the accuracy

## 1.7. Test Facility

Ambient conditions in the laboratory:

| Items                      | Required (IEC 68-1) | Actual   |
|----------------------------|---------------------|----------|
| Temperature (°C)           | 15-35               | 20-35    |
| Humidity (%RH)             | 25-75               | 50-70    |
| Barometric pressure (mbar) | 860-1060            | 950-1000 |

**USA : FCC Registration Number: TW3023**

**Canada : IC Registration Number: 4075A**

Site Description: Accredited by TAF  
Accredited Number: 3023

Test Laboratory: DEKRA Testing and Certification Co., Ltd  
Address: No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451,  
Taiwan, R.O.C.  
Phone number: 886-2-8601-3788  
Fax number: 886-2-8601-3789  
Email address: [info.tw@dekra.com](mailto:info.tw@dekra.com)  
Website: <http://www.dekra.com.tw>

## 2. Technical Test

### 2.1. Summary of test result

| FCC Standard | Test Item                                     | Result |
|--------------|---|--------|
| 2.1046       | Conducted Output Power                        | Note   |
| 96.41(b)     |   |        |
| 2.1049       | Occupied Bandwidth                            | Note   |
| 96.41(e)     |   |        |
| 2.1051       | Spurious Emission at Antenna Terminals        | Note   |
| 96.41(e)     |   |        |
| 2.1051       | Conducted Emission                            | Note   |
| 96.41(e)     |   |        |
| 2.1053       | Field Strength of Spurious Radiation          | Pass   |
| 96.41(e)     |   |        |
| 2.1055       | Frequency Stability for Temperature & Voltage | Note   |
| 96.47        | End user device additional requirements       | Note   |
| 96.41(g)     | Peak to Average Ratio                         | Note   |

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- 1) Add LTE band 4, band 12, band 14, band 29 and close band 13 by software.
- 2) Close 5G FR2 band n261 by software.

According to above conditions, Radiated Spurious Emissions (RSE) worst-case need to be performed and all data were verified to meet the requirements, and other test data refer to original report.

## 2.2. List of test Equipment

| Equipment         | Manufacturer | Model No.    | Serial No. | Cal. Date  |
|-------------------|--------------|--------------|------------|------------|
| EMI Test Receiver | R&S          | ESR7         | 101602     | 2019.12.16 |
| Spectrum Analyzer | R&S          | FSV40        | 101148     | 2020.03.16 |
| Bi-Log Antenna    | SCHWARZBECK  | VULB9168     | 9168-953   | 2020.01.03 |
| Horn Antenna      | ETS-Lindgren | 3117         | 203800     | 2019.12.12 |
| Horn Antenna      | Com-Power    | AH-840       | 101087     | 2020.06.08 |
| Pre-Amplifier     | EMCI         | EMC001330    | 980316     | 2020.06.23 |
| Pre-Amplifier     | EMCI         | EMC051835SE  | 980311     | 2020.06.23 |
| Pre-Amplifier     | EMCI         | EMC184045SE  | 980314     | 2020.06.10 |
| Coaxial Cable     | SUHNER       | SUCOFLEX 106 | RF002      | 2020.07.03 |
| Mircoflex Cable   | HUBER SUHNER | SUCOFLEX 102 | MY3381/2   | 2020.06.10 |

Note:

1. All equipment are calibrated every one year.
2. Test Software version: DEKRA Testing System V1.2

## 2.3. Measurement Uncertainty

### Conducted Emission

The measurement uncertainty of confidence of 95% is evaluated as  $\pm 1.52$  dB

### Radiated Emission (Below 1GHz)

The measurement uncertainty of confidence of 95% is evaluated as  $\pm 3.44$  dB .

### Radiated Emission (Above 1GHz)

The measurement uncertainty of confidence of 95% is evaluated as  $\pm 4.08$  dB

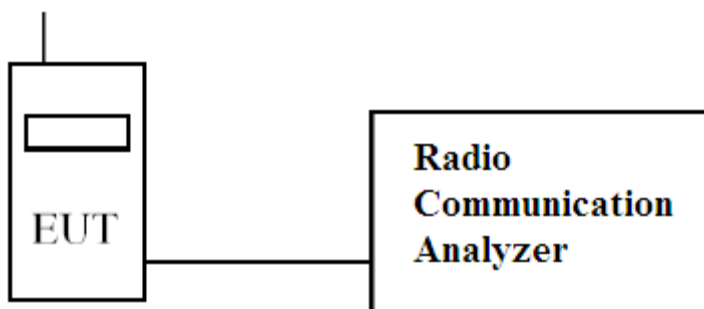
### 3. Conducted Output Power Measurement

#### 3.1. Test Specification

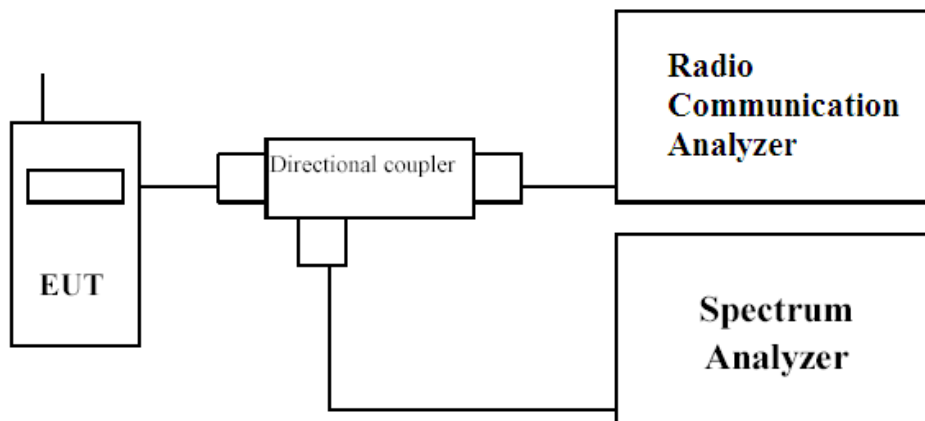
According to FCC Part 2.1046, 96.41(b)

#### 3.2. Test Setup

Conducted Power



Channel Power



### 3.3. Limits

FCC Part 96

| Type     | Device                 | Maximum EIRP<br>(dBm/10 MHz) | Maximum PSD<br>(dBm/MHz) |
|----------|------------------------|------------------------------|--------------------------|
| <b>X</b> | <b>End User Device</b> | <b>23</b>                    | <b>n/a</b>               |
|          | <b>Category A CBSD</b> | <b>30</b>                    | <b>20</b>                |
|          | <b>Category B CBSD</b> | <b>47</b>                    | <b>37</b>                |

### 3.4. Test Procedure

Conducted Power:

The EUT is tested with maximum rated TX power via the Base Station simulator, and the output power was measured at the antenna terminals of the EUT.

Channel Power:

1. Channel power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW  $\geq$  3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points  $\geq$  2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
8. The integration bandwidth was set to 10MHz.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

### **3.5. Test Result of Maximum Output Power**

N/A

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According to above conditions, Radiated Spurious Emissions (RSE) worst-case need to be performed and all data were verified to meet the requirements, and other test data refer to original report.

### **3.6. Maximum Conducted Power and ERP/EIRP Power**

N/A

**Note:**

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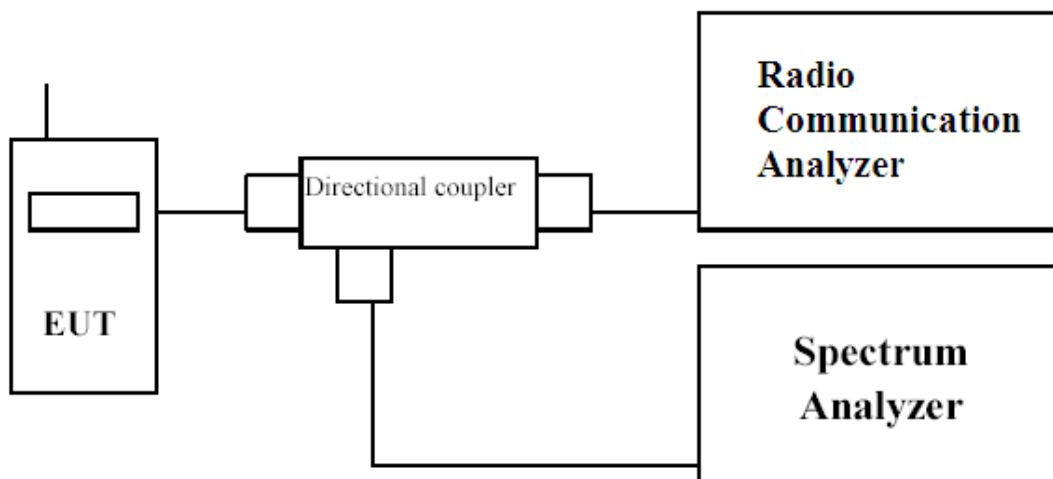


## 4. Occupied Bandwidth

### 4.1. Test Secification

According to FCC Part 2.1049, 96.41

### 4.2. Test Setup



### 4.3. Test Procedure

The EUT is tested with maximum rated TX power via the Base Station simulator, and the occupied bandwidth was measured at the antenna terminals of the EUT.

The Resolution BW of the analyzer is set to 1 %~5% of the emission bandwidth. The EUT's occupied bandwidth is measured as the width of the signal between two points, one below the carrier center frequency and one above the carrier frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

The plots below show the resultant display from the Spectrum Analyser.

#### 4.4. Test Result of Occupied Bandwidth

N/A

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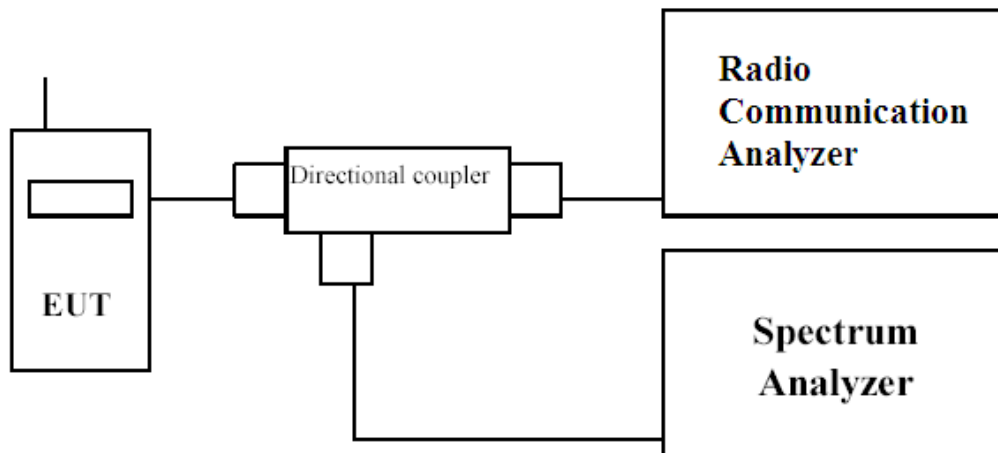
According to above conditions, Radiated Spurious Emissions (RSE) worst-case need to be performed and all data were verified to meet the requirements, and other test data refer to original report.

## 5. Spurious Emission At Antenna Terminals (+/-1MHz)

### 5.1. Test Specification

According to Part 2.1051, 96.41

### 5.2. Setup



### 5.3. Limits

- (1) Within 0 MHz to 10 MHz above and below the assigned channel  $\leq -13$  dBm/MHz.
- (2) Greater than 10 MHz above and below the assigned channel  $\leq -25$  dBm/MHz.
- (3) Any emission below 3530 MHz and above 3720 MHz  $\leq -40$  dBm/MHz.

### 5.4. Test Procedure

In accordance with Part 96.41 at least 1% of the emission bandwidth was used for the resolution and video bandwidths up to 1MHz away from the Block Edge. At greater than 1MHz, the resolution and video bandwidth were increased to 1MHz/3MHz.

The reference power and path losses of all channels used for testing in each frequency block were measured.

---

## 5.5. Test Result of Spurious Emission At Antenna Terminals (+/-1MHz)

N/A

Note:

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According to above conditions, Radiated Spurious Emissions (RSE) worst-case need to be performed and all data were verified to meet the requirements, and other test data refer to original report.

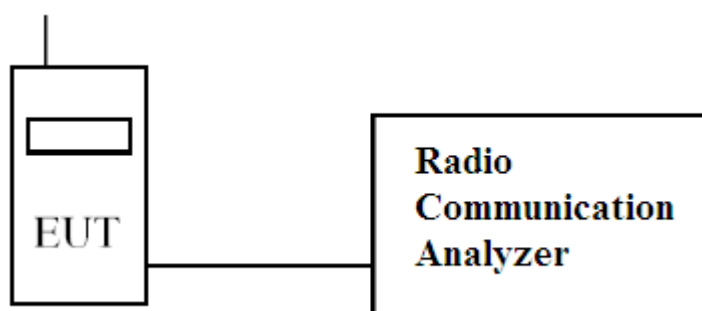
## 6. Spurious Emission

### 6.1. Test Specification

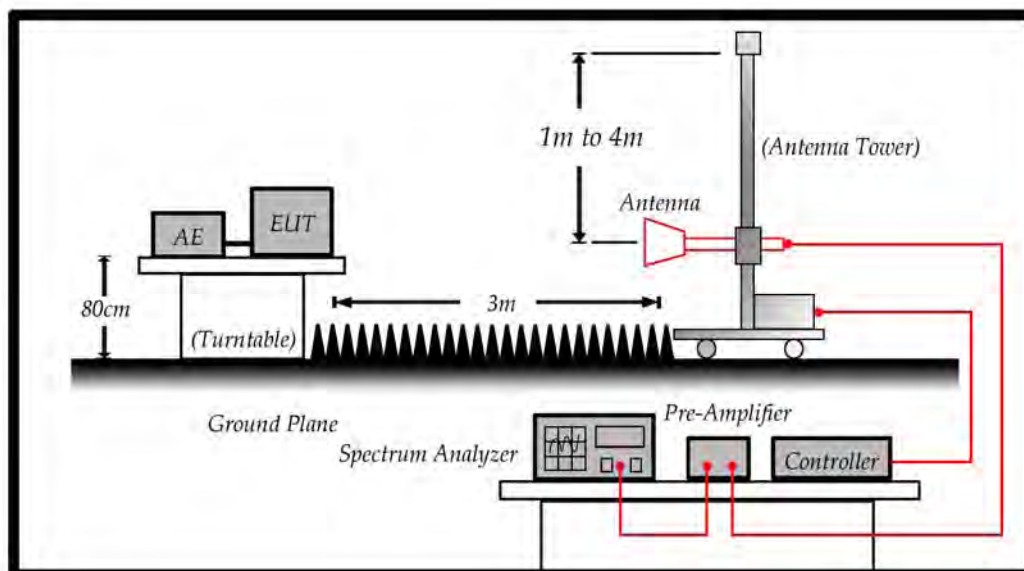
According to Part 2.1051, 96.41

### 6.2. Test Setup

#### 6.2.1 Spurious emissions at antenna terminals.



#### 6.2.2 Field strength of spurious radiation.



Note: The Worst case Mode is QPSK Mode for Radiated spurious emissions.

### 6.3. Limits

|       |         |
|-------|---------|
| Limit | <-40dBm |
|-------|---------|

43 + 10Log(P) down on the carrier where P is the power in Watts.

### 6.4. Test Procedure

In accordance with Part 2.1051, 96.41, the spurious emissions from the antenna terminal were measured. The transmitter output power was attenuated using a combination of filters and attenuators and the frequency spectrum investigated from 30MHz to 40GHz. The EUT was set to transmit on full power. The EUT was tested on Low, middle and High channels for both power levels. The resolution and video bandwidth was set to 1MHz/3MHz in accordance with Part 2.1051, 96.41. The spectrum analyzer detector was set to Max Hold. In addition, measurements were made up to the 10<sup>th</sup> harmonic of the fundamental. The device was then replaced with a substitution antenna, which input signal was adjusted until the received level matched that of the previously detected emission.

- (1) The EUT is tested with maximum rated TX power via the Base Station simulator.
- (2) The EUT is tested in three orthogonal planes, The worst case was showing in this report.

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to TIA/EIA 603-E on radiated measurement.

## 6.5. Test Result of Spurious Emission

|                |                              |
|----------------|------------------------------|
| Product        | 5G CPE                       |
| Test Mode      | Spurious Emission (Radiated) |
| Date of Test   | 2020/11/19                   |
| Test Condition | LTE Band 48                  |

### 20M\_Ch 56640\_QPSK\_Band48

| Antenna Polarity | Frequency (MHz) | Emission Level (dBm) | Limit (dBm) | Margin (dB) | SG Level (dBm) | Antenna Gain (dBi) | Cable Loss (dB) |
|------------------|-----------------|----------------------|-------------|-------------|----------------|--------------------|-----------------|
| H                | 7380.000        | -44.13               | -40         | -4.13       | -48.87         | 11.33              | 6.60            |
| V                | 7380.000        | -43.35               | -40         | -3.35       | -48.09         | 11.33              | 6.60            |

Note:

1. Emission Level = SG (Signal Generator) Level + Antenna Gain - Cable Loss.
2. Sweep the whole frequency band through the range from 30MHz to the 10th harmonic of the carrier
3. The spurious emissions within 30-1000MHz were found more than 20dB below the permissible value is not required to be report.
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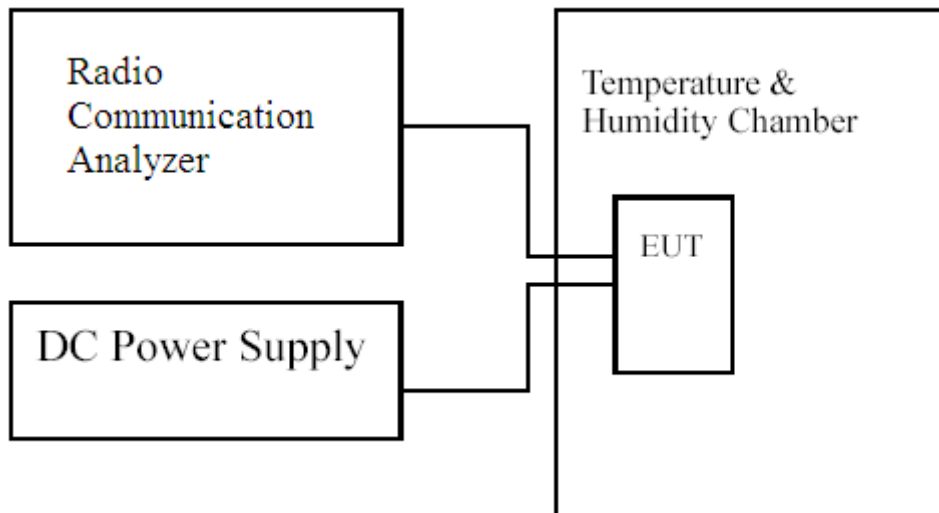
According to above conditions, Radiated Spurious Emissions (RSE) worst-case need to be performed and all data were verified to meet the requirements, and other test data refer to original report.

## 7. Frequency Stability Under Temperature & Voltage Variations

### 7.1. Test Specification

According to Part 2.1055

### 7.2. Test Setup



### 7.3. Limits

|       |          |
|-------|----------|
| Limit | <±2.5ppm |
|-------|----------|

### 7.4. Test Procedure

The frequency stability of transmitter is measured by:

- Temperature: The temperature is varied from -30 °C to 50 °C in 10 °C increment using a standard temperature & Humidity chamber.
- Primary Supply Voltage: The primary supply voltage is varied 85% to 115% of the nominal value for non hand-carried equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating endpoint which shall be specified by the manufacturer.

The EUT was connected via the base station simulator. Universal Radio Communication Tester, was used to measure The Frequency Error. The maximum result of measurements was recorded.



## 7.5. Test Result of Frequency Stability Under Temperature & Voltage Variations

N/A

Note:

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- 1) Add LTE band 4, band 12, band 14, band 29 and close band 13 by software.
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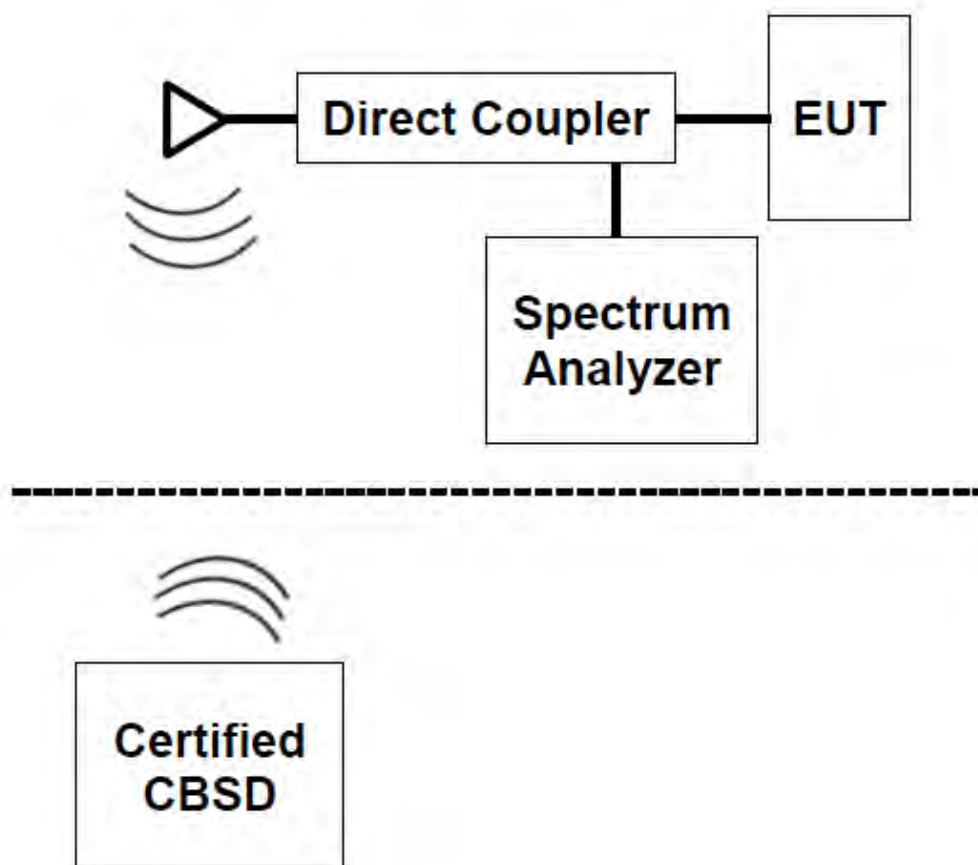
According to above conditions, Radiated Spurious Emissions (RSE) worst-case need to be performed and all data were verified to meet the requirements, and other test data refer to original report.

## 8. End User Device Additional Requirements

### 8.1. Test Specification

According to Part 96.47

### 8.2. Test Setup



### 8.3. Limits

End User Devices may operate only if they can positively receive and decode an authorization signal transmitted by a CBSD, including the frequencies and power limits for their operation. An End User Device must discontinue operations, change frequencies, or change its operational power level within 10 seconds of receiving instructions from its associated CBSD.

## 8.4. Test Procedure

### 1. Run#1:

- a. Setup WINNF.PT.C.HBT.1 with 3615MHz – 3635MHz and power level at 13 dBm/MHz.
- b. Enable AP service from Ruckus Cloud management.
- c. Check EUT Tx frequency and power.
- d. Disable AP service from Ruckus Cloud management and check EUT stop transmission within 10s.

### 2. Run#2:

- a. Setup WINNF.PT.C.HBT.1 with 3660MHz – 3680MHz and power level at 8 dBm/MHz.
- b. Enable AP service from Ruckus Cloud management.
- c. Check EUT Tx frequency and power.
- d. Disable AP service from Ruckus Cloud management and check EUT stop transmission within 10s.

### Test Notes

The EUT is an End User Device.

## 8.5. Test Result of End User Device Additional Requirements

N/A

Note:

This report is prepared for Class II permissive change. The difference compared with original report no.: RF200605C31, RF200605C31A is housing and software. The software changes as following:

- 1) Add LTE band 4, band 12, band 14, band 29 and close band 13 by software.
- 2) Close 5G FR2 band n261 by software.

According to above conditions, Radiated Spurious Emissions (RSE) worst-case need to be performed and all data were verified to meet the requirements, and other test data refer to original report.

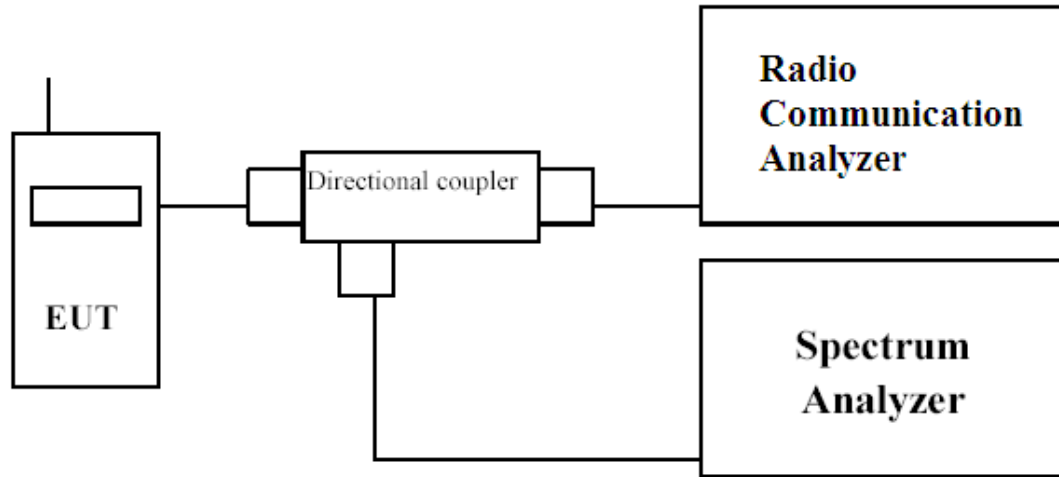
For End User Device Additional Requirements according to Part 96.47, the mechanism is identical with software change.

## 9. Peak to Average Ratio

### 9.1. Test Specification

According to Part 96.41

### 9.2. Test Setup



### 9.3. Limits

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB. The PAPR measurements should be made using either an instrument with complementary cumulative distribution function (CCDF) capabilities to determine that PAPR will not exceed 13 dB for more than 0.1 percent of the time or other Commission approved procedure.

### 9.4. Test Procedure

- a) Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;
- b) Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth;
- c) Set the number of counts to a value that stabilizes the measured CCDF curve;
- d) Set the measurement interval as follows:
  - 1) for continuous transmissions, set to 1 ms,
  - 2) for burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.
- e) Record the maximum PAPR level associated with a probability of 0.1%.

## 9.5. Test Result of Peak to Average Ratio

N/A

Note:

This report is prepared for Class II permissive change. The difference compared with original report no.: RF200605C31, RF200605C31A is housing and software. The software changes as following:

- 1) Add LTE band 4, band 12, band 14, band 29 and close band 13 by software.
- 2) Close 5G FR2 band n261 by software.

According to above conditions, Radiated Spurious Emissions (RSE) worst-case need to be performed and all data were verified to meet the requirements, and other test data refer to original report.