



# **FCC Test Report**

## **FCC Part 24E & 27 F&L**

Product Name : TKG-1MU  
Model No. : TKG-1MU  
FCC ID : BXTTKG1MU

Applicant : Kaga Electronics Co.,Ltd.  
Address : 20 Kandamatsunagacho,Chiyoda-ku  
Tokyo 101-8628,Japan

Date of Receipt : Aug. 13, 2018  
Test Date : Aug. 14, 2018~ Sep. 05, 2018  
Issued Date : Sep. 21, 2018  
Report No. : 1882083R-HP-US-P07V01  
Report Version : V1.1

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 of the equipment and evaluated measurement uncertainty herein.

This report must not be used to claim product endorsement by A2LA or any agency of the government.

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# Test Report Certification

Issued Date : Sep. 21, 2018

Report No. :1882083R-HP-US-P07V01



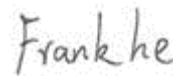
Product Name : TKG-1MU  
Applicant : Kaga Electronics Co.,Ltd.  
Address : 20 Kandamatsunagacho,Chiyoda-ku  
Tokyo 101-8628,Japan  
Manufacturer : eSky wireless Inc  
Address : 22-303,#328 xinghu street ,suzhou ,China  
Model No. : TKG-1MU  
FCC ID : BXTTKG1MU  
EUT Voltage : DC 9-16V  
Test Voltage : AC 120V/60Hz  
Brand Name : Kaga  
Applicable Standard : FCC CFR Title 47 Part 2,  
FCC Part 24 Subpart E  
FCC Part 27 Subpart L&F  
TIA/EIA 603-D  
KDB971168  
ANSI 63.26: 2015  
Test Result : Complied  
Performed Location : DEKRA Testing and Certification (Suzhou) Co., Ltd.  
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FCC Designation Number: CN1199

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(Engineering Supervisor: Jack Zhang)

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**History of This Test Report**

| REPORT NO.            | VERSION | DESCRIPTION               | ISSUED DATE   |
|-----------------------|---------|---------------------------|---------------|
| 1882083R-HP-US-P07V01 | V1.0    | Initial Issued Report     | Sep. 14, 2018 |
| 1882083R-HP-US-P07V01 | V1.1    | Page 13, Add channel list | Sep. 21, 2018 |
|                       |         |                           |               |
|                       |         |                           |               |

## 1. General Information

### 1.1. EUT Description

|                    |                                                                     |
|--------------------|---------------------------------------------------------------------|
| Product Name       | TKG-1MU                                                             |
| Model No.          | TKG-1MU                                                             |
| EUT Voltage        | DC 9-16V                                                            |
| <b>4G</b>          |                                                                     |
| Support Band       | LTE Band 2/4/12                                                     |
| Uplink             | Band 2: 1850-1910MHz<br>Band 4: 1710~1755MHz<br>Band 12: 699~716MHz |
| Downlink           | Band 2: 1930-1990MHz<br>Band 4: 2110~2155MHz<br>Band 12: 729~746MHz |
| Type of modulation | QPSK, 16QAM                                                         |
| Antenna Type       | Dipole                                                              |
| Antenna Gain       | Band 2: 3.13dBi<br>Band 4: 3.52dBi<br>Band 12: 2.23dBi              |

## 1.2. Mode of Operation

We have 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:

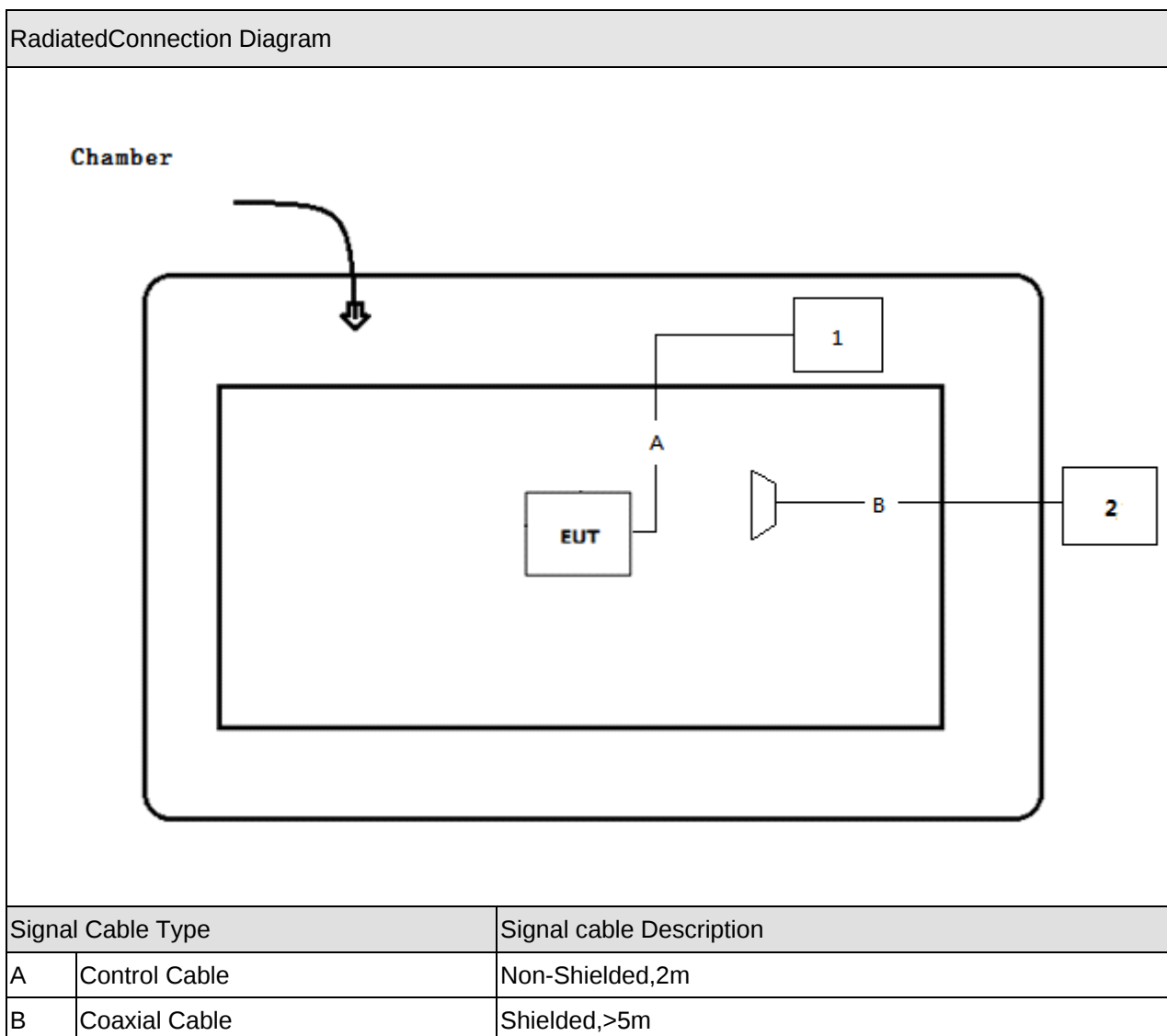
| Test Mode                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mode 1 :LTE Band 2 Link                                                                                                                                                                                                                                                                                               |
| Mode 2 :LTE Band 4 Link                                                                                                                                                                                                                                                                                               |
| Mode 3 : LTE Band 12 Link                                                                                                                                                                                                                                                                                             |
| Note<br>1: Regards to the frequency band operation: the lowest, middle and highest frequency of channel were selected to perform the test, then shown on this report. For the LTE band, we also evaluate the each channel of bandwidth, RB offset and modulation, we will choose the worst case shown on this report. |

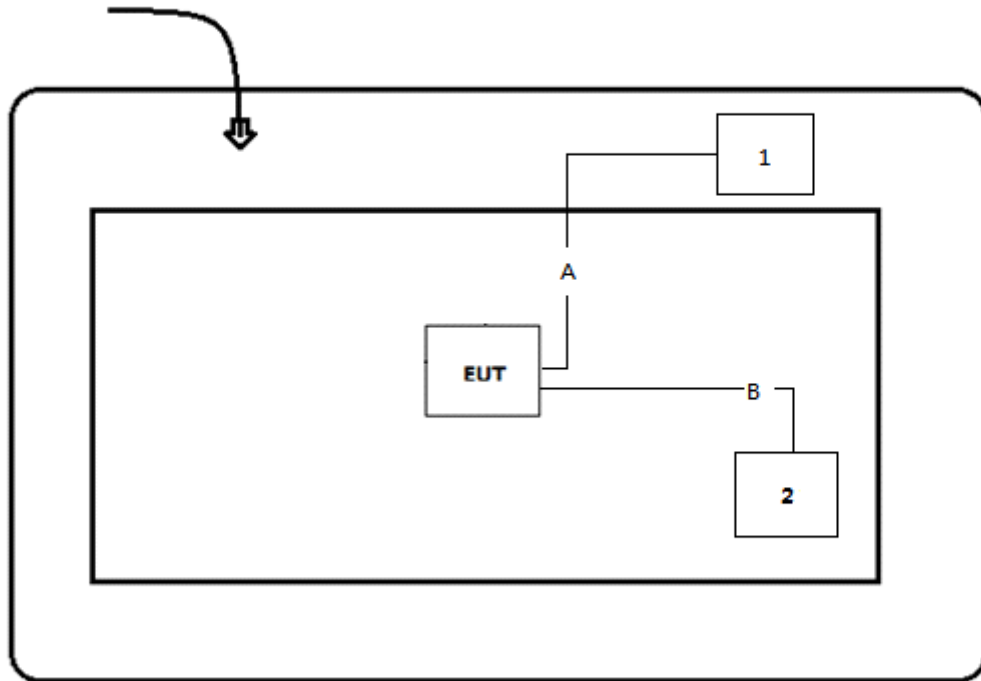
### 1.3. Tested System Details

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. | Power Cord        |
|------------------------------|--------------|--------------|------------|-------------------|
| 1 DC Power Supply            | IDRC         | CD-035-020PR | 977272     | non-shielded 1.8m |
| 2 Radio Communication Tester | Anritsu      | MT8820C      | 6201181503 | non-shielded 1.8m |

### 1.4. Configuration of Tested System



**Conducted Connection Diagram****Chamber**

| Signal Cable Type |               | Signal cable Description |
|-------------------|---------------|--------------------------|
| A                 | Control Cable | Non-Shielded,2m          |
| B                 | Coaxial Cable | Shielded,>5m             |

**1.5. EUT Exercise Software**

|   |                                                            |
|---|------------------------------------------------------------|
| 1 | Setup the EUT and simulators as shown on above.            |
| 2 | Turn on the power of all equipment.                        |
| 3 | EUT Communicate with MT8820C, then select channel to test. |

## 2. Summary Technical Test

### 2.1. Limit and Test Result

| LTE Band 2                                                 |                       |           |        |
|------------------------------------------------------------|-----------------------|-----------|--------|
| FCC Part 24 Subpart E                                      |                       |           |        |
| Industry Canada RSS-133, Issue 6, Industry Canada RSS-GEN  |                       |           |        |
| Test Item                                                  | FCC Reference section | FCC Limit | Result |
| Maximum Output Power                                       | §2.1033               | < 2 Watts | Pass   |
|                                                            | §2.1046               |           |        |
|                                                            | §24.232               |           |        |
| Equivalent Isotropic Radiated Power                        | §24.232               | < 2 Watts | Pass   |
| Peak-to-average power ratio                                | §24.232               | < 13dB    | Pass   |
| Occupied Bandwidth                                         | §2.1049               | N/A       | Pass   |
| Conducted Band Edge Emissions                              | §27.238               | <-13dBm   | Pass   |
| Spurious Radiation                                         | §2.1053               | <-13dBm   | Pass   |
|                                                            | §24.238               |           |        |
| Frequency Stability Under Temperature & Voltage Variations | §2.1055<br>§24.235    | < 2.5 ppm | Pass   |

| LTE Band 4                                                 |                       |           |        |
|------------------------------------------------------------|-----------------------|-----------|--------|
| FCC Part 27 Subpart L                                      |                       |           |        |
| Industry Canada RSS-139, Issue 3 , Industry Canada RSS-GEN |                       |           |        |
| Test Item                                                  | FCC Reference section | FCC Limit | Result |
| Maximum Output Power                                       | §2.1033               | <1 Watts  | Pass   |
|                                                            | §2.1046               |           |        |
|                                                            | §27.50                |           |        |
| Equivalent Isotropic Radiated Power                        | §27.50                | <1 Watts  | Pass   |
| Peak-to-average power ratio                                | §27.50                | < 13dB    | Pass   |
| Occupied Bandwidth                                         | §2.1049               | N/A       | Pass   |
| Conducted Band Edge Emissions                              | §27.53                | <-13dBm   | Pass   |
| Spurious Radiation                                         | §2.1053               | <-13dBm   | Pass   |
|                                                            | §27.53                |           |        |
| Frequency Stability Under Temperature & Voltage Variations | §2.1055               | <2.5 ppm  | Pass   |
|                                                            | §27.54                |           |        |

| LTE Band 12                                                |                       |           |        |
|------------------------------------------------------------|-----------------------|-----------|--------|
| FCC Part 27 Subpart F                                      |                       |           |        |
| Industry Canada RSS-130, Issue 1, Industry Canada RSS-GEN  |                       |           |        |
| Test Item                                                  | FCC Reference section | FCC Limit | Result |
| Maximum Output Power                                       | §2.1033               | <3 Watts  | Pass   |
|                                                            | §2.1046               |           |        |
|                                                            | §27.50                |           |        |
| Equivalent Isotropic Radiated Power                        | §27.50                | <3 Watts  | Pass   |
| Occupied Bandwidth                                         | §2.1049               | N/A       | Pass   |
| Conducted Band Edge Emissions                              | §27.53                | <-13dBm   | Pass   |
| Spurious Radiation                                         | §2.1053               | <-13dBm   | Pass   |
|                                                            | §27.53                |           |        |
| Frequency Stability Under Temperature & Voltage Variations | §2.1055<br>§27.54     | < 2.5 ppm | Pass   |

## 2.2. Channel list

### LTE Band 2

| BW<br>[MHz] | RB<br>Offset | Low<br>Ch. / Freq. | Mid<br>Ch. / Freq. | High<br>Ch. / Freq. |
|-------------|--------------|--------------------|--------------------|---------------------|
| 20          | Channel      | 18700              | 18900              | 19100               |
| 20          | Frequency    | 1860               | 1880               | 1900                |
| 15          | Channel      | 18675              | 18900              | 19125               |
| 15          | Frequency    | 1857.5             | 1880               | 1902.5              |
| 10          | Channel      | 18650              | 18900              | 19150               |
| 10          | Frequency    | 1855               | 1880               | 1905                |
| 5           | Channel      | 18625              | 18900              | 19175               |
| 5           | Frequency    | 1852.5             | 1880               | 1907.5              |

### LTE Band 4

| BW<br>[MHz] | RB<br>Offset | Low<br>Ch. / Freq. | Mid<br>Ch. / Freq. | High<br>Ch. / Freq. |
|-------------|--------------|--------------------|--------------------|---------------------|
| 20          | Channel      | 20050              | 20175              | 20300               |
| 20          | Frequency    | 1720               | 1732.5             | 1745                |
| 15          | Channel      | 20025              | 20175              | 20325               |
| 15          | Frequency    | 1717.5             | 1732.5             | 1747.5              |
| 10          | Channel      | 20000              | 20175              | 20350               |
| 10          | Frequency    | 1715               | 1732.5             | 1750                |
| 5           | Channel      | 19975              | 20175              | 20375               |
| 5           | Frequency    | 1712.5             | 1732.5             | 1752.5              |

### LTE Band 12

| BW<br>[MHz] | RB<br>Offset | Low<br>Ch. / Freq. | Mid<br>Ch. / Freq. | High<br>Ch. / Freq. |
|-------------|--------------|--------------------|--------------------|---------------------|
| 10          | Channel      | 23060              | 23095              | 23130               |
| 10          | Frequency    | 704                | 707.5              | 711                 |
| 5           | Channel      | 23035              | 23095              | 23155               |
| 5           | Frequency    | 701.5              | 707.5              | 713.5               |

### 2.3. Test Environment

| Items                      | Required (IEC 68-1) | Actual   |
|----------------------------|---------------------|----------|
| Temperature (°C)           | 15-35               | 23       |
| Humidity (%RH)             | 25-75               | 52       |
| Barometric pressure (mbar) | 860-1060            | 950-1000 |

### 2.4. Measurement Uncertainty

| Items                                                      | Uncertainty |
|------------------------------------------------------------|-------------|
| Maximum Output Power                                       | ±1.2 dB     |
| Equivalent Isotropic Radiated Power                        | ±3.2 dB     |
| Occupied Bandwidth                                         | ±10 Hz      |
| Conducted Band Edge Emissions                              | ±1.2 dB     |
| Field Strength of Spurious Radiation                       | ±3.2 dB     |
| Frequency Stability Under Temperature & Voltage Variations | ±10 Hz      |

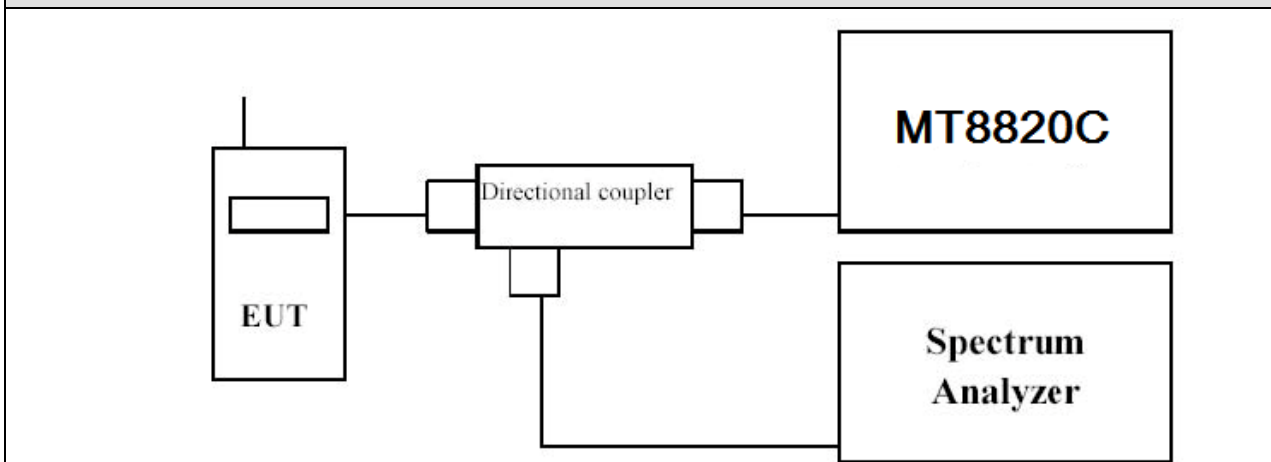
### 3. Maximum Output Power and Effective Isotropic Radiated Power Measurement

#### 3.1. Test Equipment

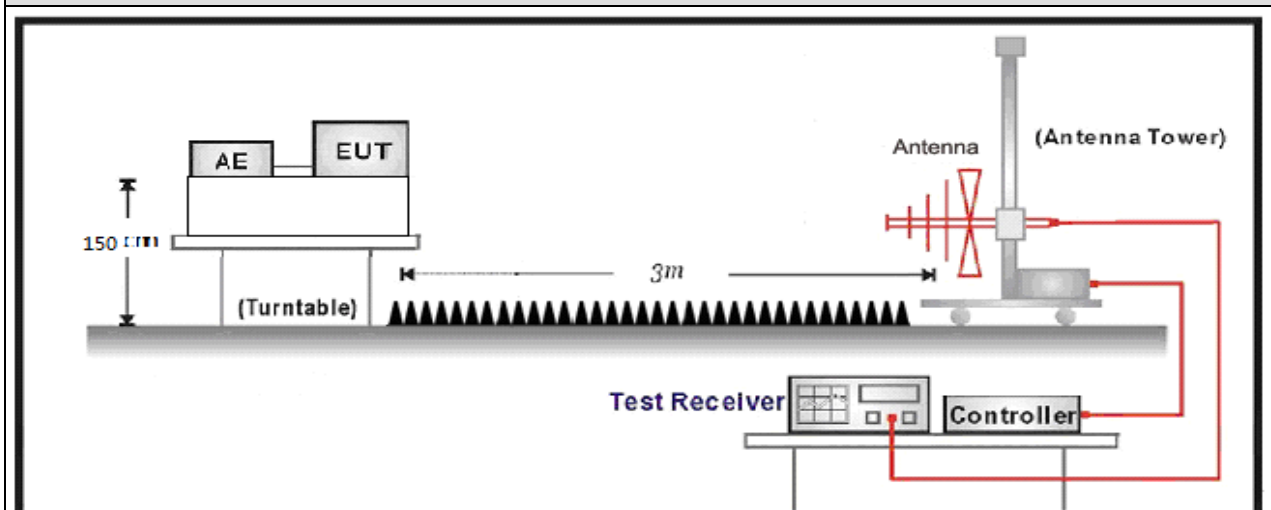
| Maximum Output Power and Effective Isotropic Radiated Power Measurement / AC-5 |              |            |             |                |
|--------------------------------------------------------------------------------|--------------|------------|-------------|----------------|
| Instrument                                                                     | Manufacturer | Type No.   | Serial No   | Cali. Due Date |
| PSA Series Spectrum Analyzer                                                   | Agilent      | E4440A     | MY49420184  | 2019.02.04     |
| Radio Communication Tester                                                     | Anritsu      | MT8820C    | 6201181503  | 2018.09.16     |
| Dual Directional Coupler                                                       | Agilent      | 778D       | 20160       | 2019.02.04     |
| 10dB Coaxial Coupler                                                           | Agilent      | 87300C     | MY44300299  | 2019.03.28     |
| PSG Analog Signal Generator                                                    | Agilent      | E8257D     | MY44321116  | 2019.02.04     |
| Preamplifier                                                                   | QuieTek      | AP-025C    | CHM-0503006 | 2019.04.11     |
| Preamplifier                                                                   | Miteq        | NSP1800-25 | 1364185     | 2019.05.03     |
| Bilog Antenna                                                                  | Teseq GmbH   | CBL6112D   | 27612       | 2019.01.23     |
| Half Wave Tuned Dipole Antenna                                                 | COM-POWER    | AD-100     | 40137       | 2019.02.26     |
| Broad-Band Horn Antenna                                                        | Schwarzbeck  | BBHA9120D  | 737         | 2019.03.06     |
| DRG Horn                                                                       | ETS-Lindgren | 3117       | 00167055    | 2019.07.23     |
| Temperature/Humidity Meter                                                     | Zhicheng     | ZC1-2      | AC5-TH      | 2019.01.05     |

### 3.2. Test Setup

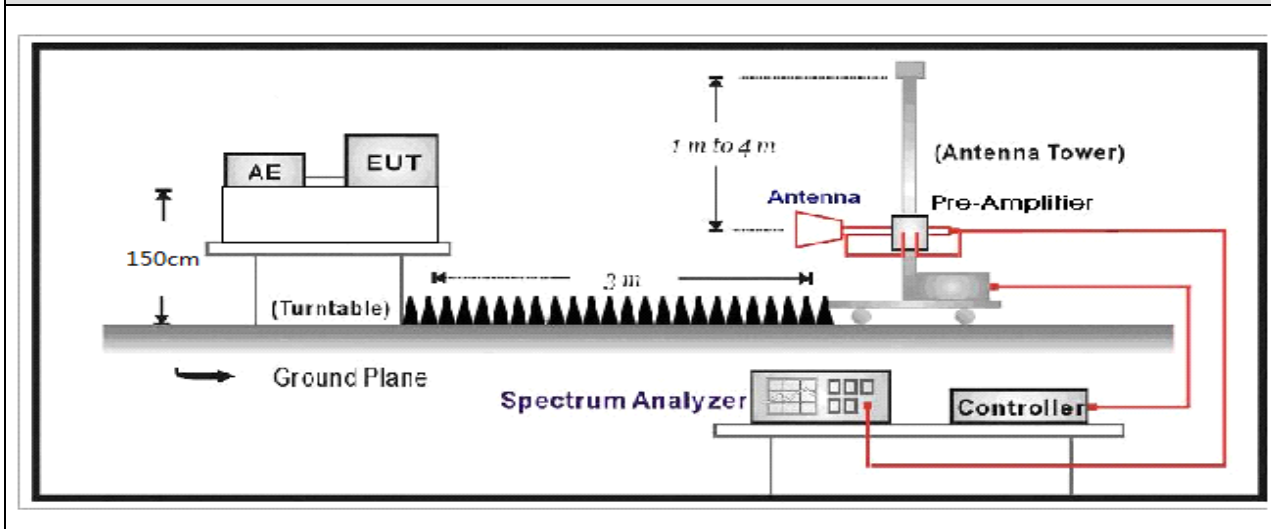
#### Conducted Power Measurement:



#### Radiated Power Measurement (Below 1G):



#### Radiated Power Measurement (Above 1G):



### 3.3. Test Procedure

| Test Method for conducted power                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>a) The RF output of the transmitter was connected to base station simulator.</li> <li>b) The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.<br/>The path loss was compensated to the results for each measurement.</li> <li>c) Set EUT at maximum average power by base station simulator.</li> <li>d) Measure lowest, middle, and highest channels for each bandwidth and different modulation.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Test For Effective Isotropic Radiated Power Measurement:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <ul style="list-style-type: none"> <li>a) The EUT was placed on a turntable with 1.5 meter height in a fully anechoic chamber.</li> <li>b) The EUT was set at 3 meters from the receiving antenna, which was mounted on the antenna tower</li> <li>c) LTE operating modes: use channel power function to test</li> <li>d) The table was rotated 360 degrees to determine the position of the highest radiated power.</li> <li>e) The height of the receiving antenna is adjusted to look for the maximum EIRP.</li> <li>f) The maximum EIRP shall be record.</li> <li>g) A dipole antenna was substituted in place of the EUT and was driven by a signal generator.</li> <li>h) The conducted power at the terminal of the dipole antenna is measured.</li> <li>i) Repeat step c) to step h) to get the maximum EIRP of the substitution antenna.</li> <li>j) <math>EIRP = P_s + E_t - E_s + G_s = P_s + R_t - R_s + G_s</math>.</li> <li>k) <math>P_s</math> (dBm) : Input power to substitution antenna</li> <li>l) <math>G_s</math> (dBi or dBd) : Substitution antenna Gain.</li> <li>m) <math>E_t = R_t + AF</math></li> <li>n) <math>E_s = R_s + AF</math></li> <li>o) <math>AF</math> (dB/m) : Receive antenna factor</li> <li>p) <math>R_t</math> : The highest received signal in spectrum analyzer for EUT.</li> <li>q) <math>R_s</math> : The highest received signal in spectrum analyzer for substitution antenna.</li> </ul> |

### **3.4. Test Result**

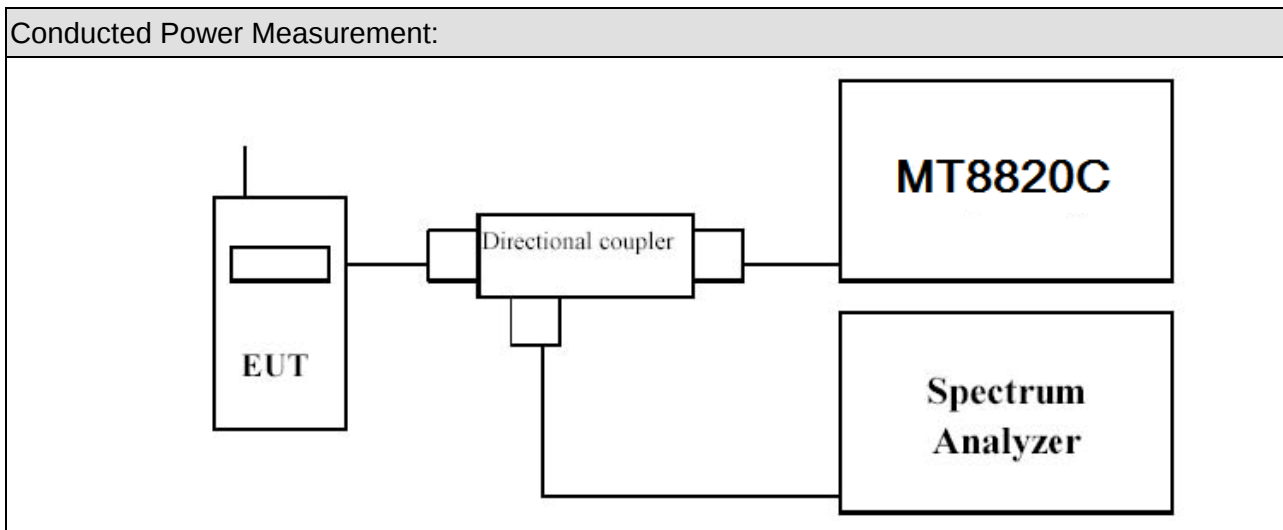
**Note: Appendix 1**

## 4. Occupied Bandwidth

### 4.1. Test Equipment

| Occupied Bandwidth / TR-8    |              |          |            |                |
|------------------------------|--------------|----------|------------|----------------|
| Instrument                   | Manufacturer | Type No. | Serial No  | Cali. Due Date |
| PSA Series Spectrum Analyzer | Agilent      | E4440A   | MY49420184 | 2019.02.04     |
| Radio Communication Tester   | Anritsu      | MT8820C  | 6201181503 | 2018.09.16     |
| Dual Directional Coupler     | Agilent      | 778D     | 20160      | 2019.02.04     |
| 10dB Coaxial Coupler         | Agilent      | 87300C   | MY44300299 | 2019.03.28     |
| Temperature/Humidity Meter   | Zhicheng     | ZC1-2    | AC6-TH     | 2019.01.05     |

### 4.2. Test Setup



### 4.3. Test Procedure

| Test Method for conducted test                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.</li> <li>2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.</li> <li>3. The 99% occupied bandwidth and 26 dB bandwidth of the middle channel for the highest RF powers were measured.</li> </ol> |

#### 4.4. Test Result

**Note: Appendix 1**

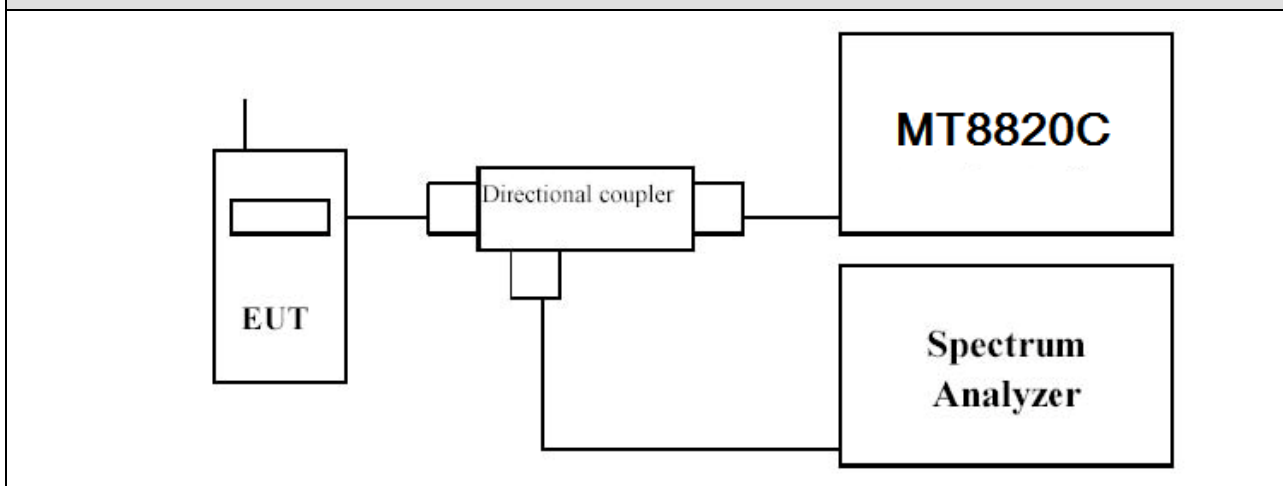
| Mode  | Bandwidth (MHz) |
|-------|-----------------|
| LTE2  | 5               |
|       | 10              |
|       | 15              |
|       | 20              |
| LTE4  | 5               |
|       | 10              |
|       | 15              |
|       | 20              |
| LTE12 | 5               |
|       | 10              |

## 5. Conducted Band Edge

### 5.1. Test Equipment

| Conducted Band Edge / TR-8   |              |          |            |                |
|------------------------------|--------------|----------|------------|----------------|
| Instrument                   | Manufacturer | Type No. | Serial No  | Cali. Due Date |
| PSA Series Spectrum Analyzer | Agilent      | E4440A   | MY49420184 | 2019.02.04     |
| Radio Communication Tester   | Anritsu      | MT8820C  | 6201181503 | 2018.09.16     |
| Dual Directional Coupler     | Agilent      | 778D     | 20160      | 2019.02.04     |
| 10dB Coaxial Coupler         | Agilent      | 87300C   | MY44300299 | 2019.03.28     |
| Temperature/Humidity Meter   | Zhicheng     | ZC1-2    | AC6-TH     | 2019.01.05     |

#### Conducted Power Measurement:



### 5.2. Test Procedure

| Test Method for conducted test                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>1. The EUT was connected to spectrum analyzer and System Simulator via power divider.</li> <li>2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.</li> <li>3. The conducted spurious emission for the whole frequency range was taken.</li> </ol> |

### **5.3. Test Result**

**Note: Appendix 1**

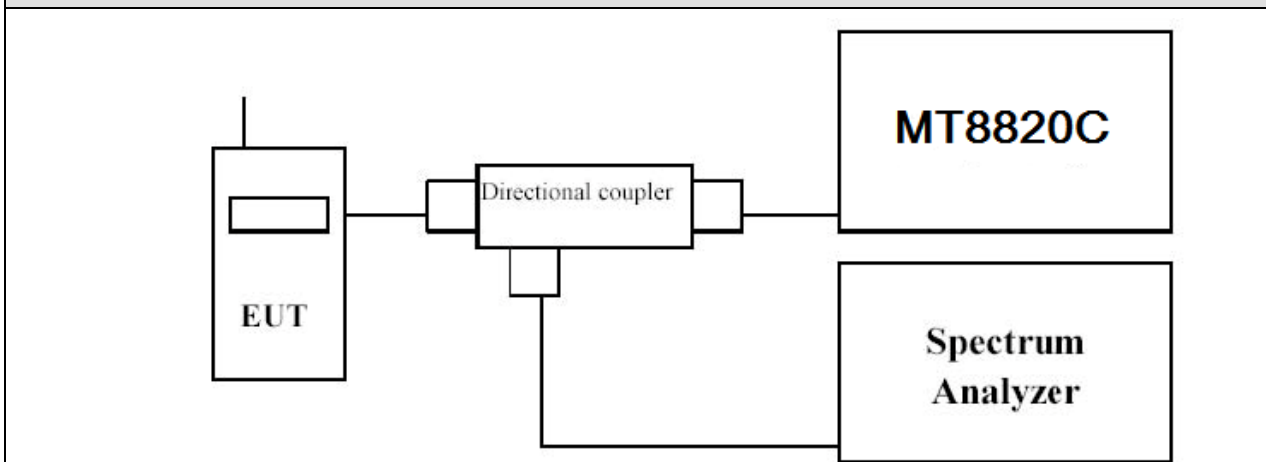
## 6. Spurious Emission

### 6.1. Test Equipment

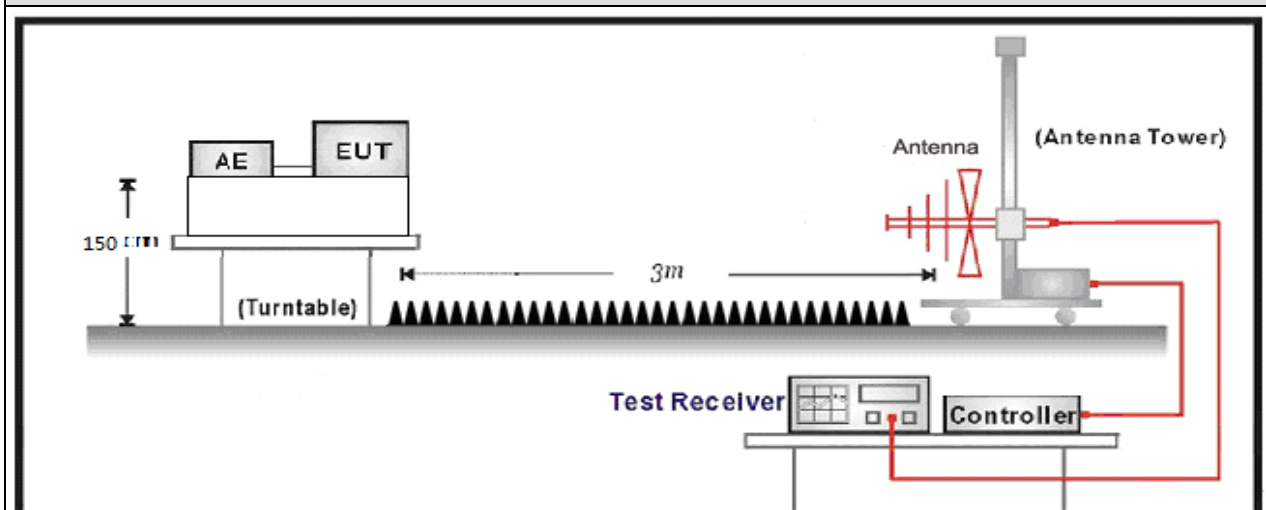
| Spurious Emission / AC-5       |              |            |             |                |
|--------------------------------|--------------|------------|-------------|----------------|
| Instrument                     | Manufacturer | Type No.   | Serial No   | Cali. Due Date |
| PSA Series Spectrum Analyzer   | Agilent      | E4440A     | MY49420184  | 2019.02.04     |
| Radio Communication Tester     | Anritsu      | MT8820C    | 6201181503  | 2018.09.16     |
| Dual Directional Coupler       | Agilent      | 778D       | 20160       | 2019.02.04     |
| 10dB Coaxial Coupler           | Agilent      | 87300C     | MY44300299  | 2019.03.28     |
| PSG Analog Signal Generator    | Agilent      | E8257D     | MY44321116  | 2019.02.04     |
| Preamplifier                   | QuieTek      | AP-025C    | CHM-0503006 | 2019.04.11     |
| Preamplifier                   | Miteq        | NSP1800-25 | 1364185     | 2019.05.03     |
| Bilog Antenna                  | Teseq GmbH   | CBL6112D   | 27612       | 2019.01.23     |
| Half Wave Tuned Dipole Antenna | COM-POWER    | AD-100     | 40137       | 2019.02.26     |
| Broad-Band Horn Antenna        | Schwarzbeck  | BBHA9120D  | 737         | 2019.03.06     |
| DRG Horn                       | ETS-Lindgren | 3117       | 00167055    | 2019.07.23     |
| Temperature/Humidity Meter     | Zhicheng     | ZC1-2      | AC5-TH      | 2019.01.05     |

## 6.2. Test Setup

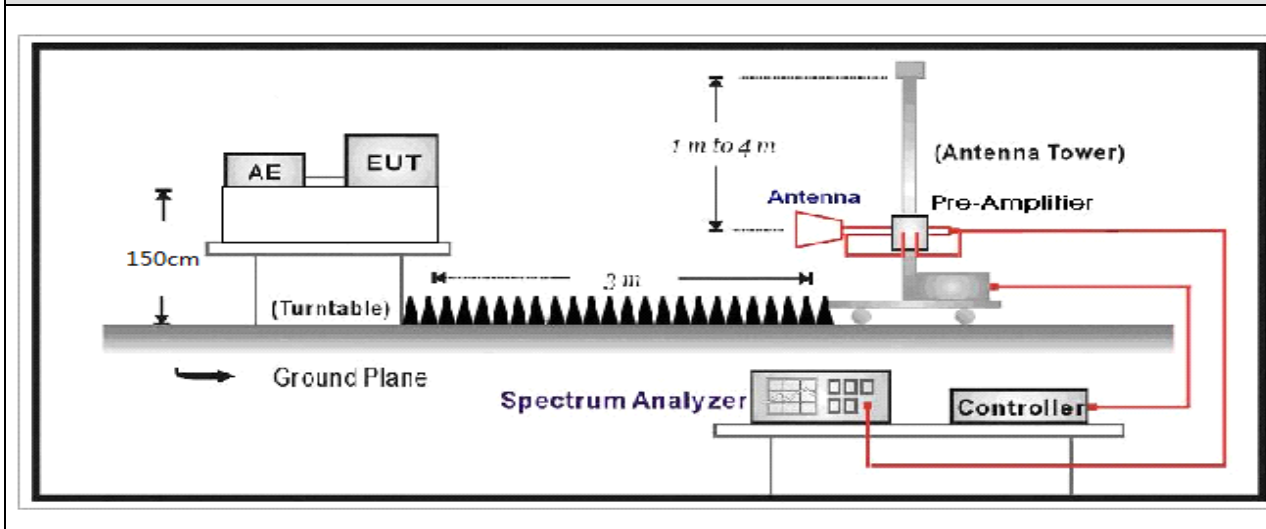
### Conducted Power Measurement:



### Radiated Power Measurement (Below 1G):



### Radiated Power Measurement (Above 1G):



### 6.3. Test Procedure

#### Test Method for conducted power

- a) The RF output of the transmitter was connected to base station simulator.
- b) The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.  
The path loss was compensated to the results for each measurement.
- c) Set EUT at maximum average power by base station simulator.
- d) Measure lowest, middle, and highest channels for each bandwidth and different modulation.

#### Test For Effective Isotropic Radiated Power Measurement:

- a) The EUT was placed on a turntable with 1.5 meter height in a fully anechoic chamber.
- b) The EUT was set at 3 meters from the receiving antenna, which was mounted on the antenna tower
- c) LTE operating modes: use channel power function to test
- d) The table was rotated 360 degrees to determine the position of the highest radiated power.
- e) The height of the receiving antenna is adjusted to look for the maximum EIRP.
- f) The maximum EIRP shall be record.
- g) A dipole antenna was substituted in place of the EUT and was driven by a signal generator.
- h) The conducted power at the terminal of the dipole antenna is measured.
- i) Repeat step c) to step h) to get the maximum EIRP of the substitution antenna.
- j)  $EIRP = P_s + E_t - E_s + G_s = P_s + R_t - R_s + G_s$ .
- k)  $P_s$  (dBm) : Input power to substitution antenna
- l)  $G_s$  (dBi or dBd) : Substitution antenna Gain.
- m)  $E_t = R_t + AF$
- n)  $E_s = R_s + AF$
- o)  $AF$  (dB/m) : Receive antenna factor
- p)  $R_t$  : The highest received signal in spectrum analyzer for EUT.
- q)  $R_s$  : The highest received signal in spectrum analyzer for substitution antenna.

#### 6.4. Test Result

|              |                                         |           |     |
|--------------|-----------------------------------------|-----------|-----|
| Product      | TKG-1MU                                 |           |     |
| Test Item    | Radiated Spurious Emission              |           |     |
| Test Mode    | Mode 1: LTE Band 2 Link QPSK/16QAM 5MHz |           |     |
| Date of Test | 2018/08/20                              | Test Site | AC5 |

| Frequency<br>(MHz)                                                                                                                           | SA<br>Reading<br>(dBm) | Ant.Pol.<br>(H/V) | SG<br>Reading<br>(dBm) | Cable<br>Loss<br>(dB) | Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Over<br>Limit<br>(dB) |
|----------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-------------------|------------------------|-----------------------|---------------|---------------|----------------|-----------------------|
| <b>Low Channel 18625 (1852.5MHz) BW5MHz 1RB0</b>                                                                                             |                        |                   |                        |                       |               |               |                |                       |
| 3705.00                                                                                                                                      | -59.487                | V                 | -55.449                | 4.76                  | 12.73         | -47.479       | -13.00         | -34.479               |
| 5557.50                                                                                                                                      | -66.551                | V                 | -58.261                | 4.81                  | 13.20         | -49.871       | -13.00         | -36.871               |
| 3705.00                                                                                                                                      | -51.467                | H                 | -47.711                | 4.83                  | 12.73         | -39.811       | -13.00         | -26.811               |
| 5557.50                                                                                                                                      | -66.048                | H                 | -57.927                | 4.87                  | 13.18         | -49.617       | -13.00         | -36.617               |
| Note 1: We have evaluated all bandwidth and channels by modulation of QPSK and 16QAM, shown in the report are worst data.                    |                        |                   |                        |                       |               |               |                |                       |
| Note 2: We also evaluate frequency range 30MHz-1GHz, but the test trace is same as the ambient noise, therefor no data appear in the report. |                        |                   |                        |                       |               |               |                |                       |

|              |                                         |           |      |
|--------------|-----------------------------------------|-----------|------|
| Product      | TKG-1MU                                 |           |      |
| Test Item    | Radiated Spurious Emission              |           |      |
| Test Mode    | Mode 2: LTE Band 4 Link QPSK/16QAM 5MHz |           |      |
| Date of Test | 2018/08/20                              | Test Site | AC-5 |

| Frequency<br>(MHz)                                                                                                                           | SA<br>Reading<br>(dBm) | Ant.Pol.<br>(H/V) | SG<br>Reading<br>(dBm) | Cable<br>Loss<br>(dB) | Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Over<br>Limit<br>(dB) |
|----------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-------------------|------------------------|-----------------------|---------------|---------------|----------------|-----------------------|
| <b>Mid Channel 19975 (1732.50MHz) BW5MHz 1RB0</b>                                                                                            |                        |                   |                        |                       |               |               |                |                       |
| 3465.00                                                                                                                                      | -60.254                | V                 | -56.481                | 4.78                  | 12.81         | -48.451       | -13.00         | -35.451               |
| 5197.50                                                                                                                                      | -61.841                | V                 | -54.114                | 4.79                  | 12.83         | -46.074       | -13.00         | -33.074               |
| 3465.00                                                                                                                                      | -59.754                | H                 | -56.300                | 4.80                  | 12.84         | -48.260       | -13.00         | -35.260               |
| 5197.50                                                                                                                                      | -62.213                | H                 | -54.697                | 4.80                  | 12.82         | -46.677       | -13.00         | -33.677               |
| Note 1: We have evaluated all bandwidth and channels by modulation of QPSK and 16QAM, shown in the report are worst data.                    |                        |                   |                        |                       |               |               |                |                       |
| Note 2: We also evaluate frequency range 30MHz-1GHz, but the test trace is same as the ambient noise, therefor no data appear in the report. |                        |                   |                        |                       |               |               |                |                       |

|              |                                           |           |      |
|--------------|-------------------------------------------|-----------|------|
| Product      | TKG-1MU                                   |           |      |
| Test Item    | Radiated Spurious Emission                |           |      |
| Test Mode    | Mode 3: LTE Band 12 Link QPSK/16QAM 15MHz |           |      |
| Date of Test | 2018/08/20                                | Test Site | AC-5 |

| Frequency<br>(MHz) | SA<br>Reading<br>(dBm) | Ant.Pol.<br>(H/V) | SG<br>Reading<br>(dBm) | Cable<br>Loss<br>(dB) | Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Over<br>Limit<br>(dB) |
|--------------------|------------------------|-------------------|------------------------|-----------------------|---------------|---------------|----------------|-----------------------|
|--------------------|------------------------|-------------------|------------------------|-----------------------|---------------|---------------|----------------|-----------------------|

**Low Channel 23035 (701.50MHz) BW5MHz 1RB0**

|          |         |   |         |      |       |         |        |         |
|----------|---------|---|---------|------|-------|---------|--------|---------|
| 1425.000 | -58.180 | V | -63.922 | 2.69 | 12.67 | -53.942 | -13.00 | -40.942 |
| 2105.000 | -58.791 | V | -58.681 | 3.26 | 11.27 | -50.671 | -13.00 | -37.671 |
| 1425.000 | -54.595 | H | -60.123 | 2.69 | 12.67 | -50.143 | -13.00 | -37.143 |
| 2105.000 | -55.175 | H | -54.994 | 3.26 | 11.27 | -46.984 | -13.00 | -33.984 |

Note 1: We have evaluated all bandwidth and channels by modulation of QPSK and 16QAM, shown in the report are worst data.

Note 2: We also evaluate frequency range 30MHz-1GHz, but the test trace is same as the ambient noise, therefor no data appear in the report.

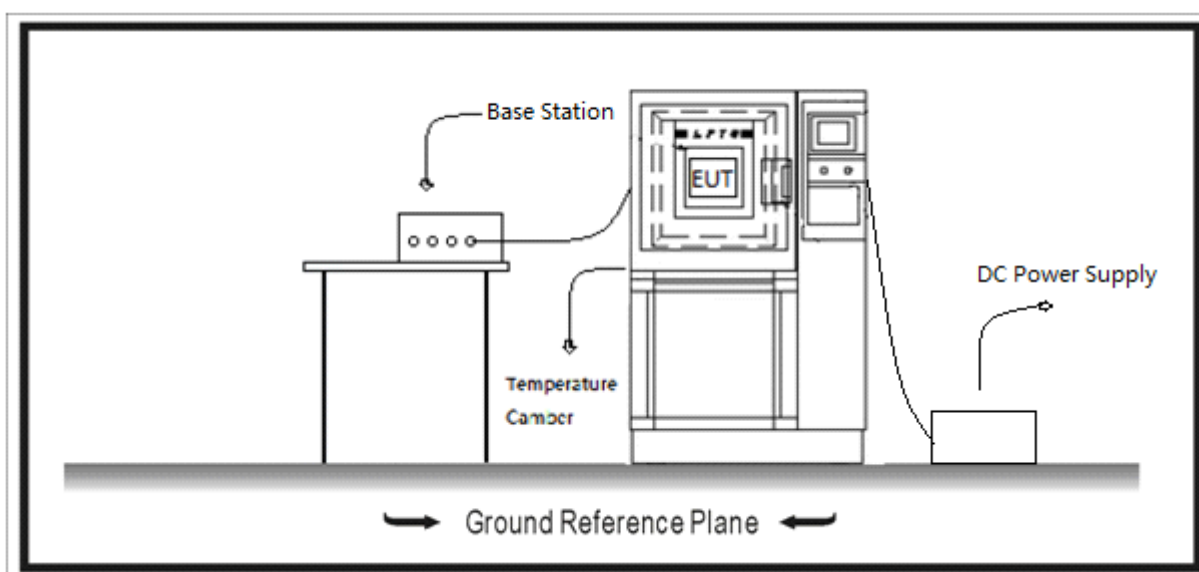
## 7. Frequency Stability Under Temperature & Voltage Variations

### 7.1. Test Equipment

| Frequency Stability Under Temperature & Voltage Variations/TR-7 |              |              |              |                |
|-----------------------------------------------------------------|--------------|--------------|--------------|----------------|
| Instrument                                                      | Manufacturer | Type No.     | Serial No    | Cali. Due Date |
| PSA Series Spectrum Analyzer                                    | Agilent      | E4440A       | MY49420184   | 2019.02.04     |
| Radio Communication Tester                                      | Anritsu      | MT8820C      | 6201181503   | 2018.09.16     |
| Dual Directional Coupler                                        | Agilent      | 778D         | 20160        | 2019.02.04     |
| 10dB Coaxial Coupler                                            | Agilent      | 87300C       | MY44300299   | 2019.03.28     |
| DC Power Supply                                                 | IDRC         | CD-035-020PR | 977272       | 2018.09.16     |
| Temperature & Humidity Chamber                                  | Gaoyu        | TH-1P-B      | WIT-05121302 | 2019.01.04     |
| Temperature/Humidity Meter                                      | Zhicheng     | ZC1-2        | AC6-TH       | 2019.01.05     |

### 7.2. Test Setup

For Conducted Measurement



### 7.3. Test Procedure

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Frequency Stability Under Temperature Variations:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20 operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -30 . After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10 increased per stage until the highest temperature of +50 reached. |
| <b>Frequency Stability Under Voltage Variations:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Set chamber temperature to 20 . Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.<br>Reduce the input voltage to specify extreme voltage variation ( $\pm 15\%$ ) and endpoint, record the maximum frequency change.                                                                                                                                                                                                                                                             |

#### **7.4. Test Result**

**Note: Appendix 1**

\_\_\_\_\_ The End \_\_\_\_\_