

# TEST REPORT

**FCC ID: 2AM8I-LINBLE**

**Product: Industrial 4g router**

**Model No.: T260S**

**Additional Model No.: T270, T270S, T280, T290, T300, T310, T320, T330, T350,  
T360, D500, D510, D520, D530, D550, D560, D570, D580, M350, M390, M400,  
M410, M420, M430, M450, M460, M470**

**Trade Mark: Linble**

**Report No.: TCT170731E024**

**Issued Date: Sep. 08, 2017**

Issued for:

**Shenzhen Libtor Technology Co., Ltd**

**Room 608, Building A, Hongshengyuan Industrial Zone, No.339 Bulong  
Road, Bantian Street Office, Longgang District, Shenzhen, Guangdong,  
China**

Issued By:

**Shenzhen Tongce Testing Lab.**

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**Appendix A: Photographs of Test Setup**

**Appendix B: Photographs of EUT**

**Test Data: Refer to Appendix For Band 2, Appendix For Band 4,**

**Appendix For Band 5**

## 1. Test Certification

|                              |                                                                                                                                                                   |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product:</b>              | Industrial 4g router                                                                                                                                              |
| <b>Model No.:</b>            | T260S                                                                                                                                                             |
| <b>Additional Model:</b>     | T270, T270S, T280, T290, T300, T310, T320, T330, T350, T360, D500, D510, D520, D530, D550, D560, D570, D580, M350, M390, M400, M410, M420, M430, M450, M460, M470 |
| <b>Trade Mark:</b>           | Linble                                                                                                                                                            |
| <b>Applicant:</b>            | Shenzhen Libtor Technology Co., Ltd                                                                                                                               |
| <b>Address:</b>              | Room 608, Building A, Hongshengyuan Industrial Zone, No.339 Bulong Road, Bantian Street Office, Longgang District, Shenzhen, Guangdong, China                     |
| <b>Manufacturer:</b>         | Shenzhen Libtor Technology Co., Ltd                                                                                                                               |
| <b>Address:</b>              | Room 608, Building A, Hongshengyuan Industrial Zone, No.339 Bulong Road, Bantian Street Office, Longgang District, Shenzhen, Guangdong, China                     |
| <b>Date of Test:</b>         | Aug. 01, 2017 – Sep. 07, 2017                                                                                                                                     |
| <b>Applicable Standards:</b> | FCC CFR Title 47 Part 2<br>FCC CFR Title 47 Part24<br>FCC CFR Title 47 Part27                                                                                     |

The above equipment has been tested by Shenzhen Tongce Testing Lab. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:



Garen

Date:

Sep. 07, 2017

Reviewed By:



Joe Zhou

Date:

Sep. 08, 2017

Approved By:



Tomsin

Date:

Sep. 08, 2017

## 2. Test Result Summary

| Requirement                                   | CFR 47 Section                                      | Result |
|-----------------------------------------------|-----------------------------------------------------|--------|
| Conducted Output Power                        | §2.1046; §24.232(c);<br>§27.50(h);                  | PASS   |
| Peak-to-Average Ratio                         | §24.232(d);                                         | PASS   |
| Effective Radiated Power                      | §2.1046; §27.50(d)(4);                              | PASS   |
| Equivalent Isotropic Radiated Power           | §2.1046; §27.50(d);                                 | PASS   |
| Occupied Bandwidth                            | §2.1049; §24.238(b);<br>§27.53(h)(3); §27.53(m)(6); | PASS   |
| Band Edge                                     | §2.1051; §27.53(g);<br>§27.53(g); §24.238(a);       | PASS   |
| Conducted Spurious Emission                   | §2.1051;<br>§27.53(h); §24.238(a);                  | PASS   |
| Field Strength of Spurious Radiation          | §2.1053; §27.53(g) ;<br>§27.53(h); §24.238(a);      | PASS   |
| Frequency Stability for Temperature & Voltage | §2.1055; §27.54; §24.235;                           | PASS   |

**Note:**

1. PASS: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.

### 3. EUT Description

|                                         |                                                                                                                                                                   |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product:</b>                         | Industrial 4g router                                                                                                                                              |
| <b>Model No.:</b>                       | T260S                                                                                                                                                             |
| <b>Additional Model No.:</b>            | T270, T270S, T280, T290, T300, T310, T320, T330, T350, T360, D500, D510, D520, D530, D550, D560, D570, D580, M350, M390, M400, M410, M420, M430, M450, M460, M470 |
| <b>Trade Mark:</b>                      | Linble                                                                                                                                                            |
| <b>Hardware Version:</b>                | T260S_V16                                                                                                                                                         |
| <b>Software Version:</b>                | 2.2.1.3                                                                                                                                                           |
| <b>Tx Frequency:</b>                    | LTE Band 2: 1850 MHz ~ 1910 MHz<br>LTE Band 4: 1710 MHz ~ 1755 MHz<br>LTE Band 5: 824 MHz ~ 849 MHz                                                               |
| <b>Rx Frequency:</b>                    | LTE Band 2: 1930 MHz ~ 1990 MHz<br>LTE Band 4: 2110 MHz ~ 2155 MHz<br>LTE Band 5: 869 MHz ~ 894 MHz                                                               |
| <b>Bandwidth:</b>                       | LTE Band 2: 5MHz /10MHz /15MHz / 20MHz<br>LTE Band 4: 5MHz /10MHz /15MHz<br>LTE Band 5: 5MHz /10MHz                                                               |
| <b>Maximum Output Power to Antenna:</b> | LTE Band 2: 24.97dBm<br>LTE Band 4: 24.23dBm<br>LTE Band 5: 25.67dBm                                                                                              |
| <b>99% Occupied Bandwidth:</b>          | LTE Band 2: 17M9W7D<br>LTE Band 4: 13M4G7D<br>LTE Band 5: 8M96G7D                                                                                                 |
| <b>Type of Modulation:</b>              | QPSK / 16QAM                                                                                                                                                      |
| <b>Antenna Type:</b>                    | RP-SMA Antenna (Internal spiral + hole)                                                                                                                           |
| <b>Antenna Gain:</b>                    | LTE band 2: 2.0dBi<br>LTE band 4: 2.5dBi<br>LTE band 5: 2.1dBi                                                                                                    |
| <b>Power Supply:</b>                    | Adapter Information:<br>MODEL: YCZX-1258<br>INPUT: 100-240V~50/60Hz, 0.5A<br>OUTPUT: 12V, 1.0A                                                                    |
| <b>Remark:</b>                          | All models above are identical in interior structure, electrical circuits and components, and just model names are different for the marketing requirement.       |

## Emission Designator

| LTE Band 2 | QPSK                         |                 | 16QAM                        |                 |
|------------|------------------------------|-----------------|------------------------------|-----------------|
| BW(MHz)    | Emission Designator (99%OBW) | Maximum EIRP(W) | Emission Designator (99%OBW) | Maximum EIRP(W) |
| 5          | 4M48G7D                      | 0.3266          | 4M48W7D                      | 0.3199          |
| 10         | 8M95G7D                      | 0.4864          | 8M94W7D                      | 0.3681          |
| 15         | 13M41G7D                     | 0.4467          | 13M41W7D                     | 0.3656          |
| 20         | 17M90G7D                     | 0.4977          | 17M91W7D                     | 0.3664          |
| LTE Band 4 | QPSK                         |                 | 16QAM                        |                 |
| BW(MHz)    | Emission Designator (99%OBW) | Maximum EIRP(W) | Emission Designator (99%OBW) | Maximum EIRP(W) |
| 5          | 4M48G7D                      | 0.4710          | 4M48W7D                      | 0.3864          |
| 10         | 8M96G7D                      | 0.4508          | 8M96W7D                      | 0.3750          |
| 15         | 13M42G7D                     | 0.4256          | 13M42W7D                     | 0.3597          |
| LTE Band 5 | QPSK                         |                 | 16QAM                        |                 |
| BW(MHz)    | Emission Designator (99%OBW) | Maximum EIRP(W) | Emission Designator (99%OBW) | Maximum EIRP(W) |
| 5          | 4M48G7D                      | 0.5984          | 4M48W7D                      | 0.3673          |
| 10         | 8M96G7D                      | 0.5702          | 8M94W7D                      | 0.3945          |

## 4. Genera Information

### 4.1. Test environment and mode

**Operating Environment:**

|                       |           |
|-----------------------|-----------|
| Temperature:          | 24.0 °C   |
| Humidity:             | 54 % RH   |
| Atmospheric Pressure: | 1010 mbar |

**Test Mode:**

|                 |                                                         |
|-----------------|---------------------------------------------------------|
| Operation mode: | Keep the EUT in continuous transmitting with modulation |
|-----------------|---------------------------------------------------------|

The sample was placed 0.8m above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

## Description Operation Frequency

| LTE Band 2(5MHz)  |                 | LTE Band 2(10MHz) |                 |
|-------------------|-----------------|-------------------|-----------------|
| Channel           | Frequency (MHz) | Channel           | Frequency (MHz) |
| 18625             | 1852.5          | 18650             | 1855.0          |
| 18626             | 1852.6          | 18651             | 1855.1          |
| ....              | ....            | ....              | ....            |
| 18899             | 1879.9          | 18899             | 1879.9          |
| 18900             | 1880.0          | 18900             | 1880.0          |
| 18901             | 1880.1          | 18901             | 1880.1          |
| ...               | ...             | ...               | ...             |
| 19174             | 1907.4          | 19149             | 1904.9          |
| 19175             | 1907.5          | 19150             | 1905.0          |
| LTE Band 2(15MHz) |                 | LTE Band 2(20MHz) |                 |
| Channel           | Frequency (MHz) | Channel           | Frequency (MHz) |
| 18675             | 1857.5          | 18700             | 1860.0          |
| 18676             | 1857.6          | 18701             | 1860.1          |
| ....              | ....            | ....              | ....            |
| 18899             | 1879.9          | 18899             | 1879.9          |
| 18900             | 1880.0          | 18900             | 1880.0          |
| 18901             | 1880.1          | 18901             | 1880.1          |
| ...               | ...             | ...               | ...             |
| 19124             | 1902.4          | 19099             | 1899.9          |
| 19125             | 1902.5          | 19100             | 1900.0          |

| LTE Band 4(5MHz)  |                 | LTE Band 4(10MHz) |                 |
|-------------------|-----------------|-------------------|-----------------|
| Channel           | Frequency (MHz) | Channel           | Frequency (MHz) |
| 19975             | 1712.50         | 20000             | 1715.00         |
| 19976             | 1712.60         | 20001             | 1715.10         |
| ...               | ...             | ...               | ...             |
| 20174             | 1732.40         | 20174             | 1732.40         |
| 20175             | 1732.50         | 20175             | 1732.50         |
| 20176             | 1732.60         | 20176             | 1732.60         |
| ...               | ...             | ...               | ...             |
| 20374             | 1752.40         | 20349             | 1749.90         |
| 20375             | 1752.50         | 20350             | 1750.00         |
| LTE Band 4(15MHz) |                 | LTE Band 4(20MHz) |                 |
| Channel           | Frequency (MHz) | Channel           | Frequency (MHz) |
| 20025             | 1717.50         | 20050             | 1720.00         |
| 20026             | 1717.60         | 20051             | 1720.10         |
| ...               | ...             | ...               | ...             |
| 20174             | 1732.40         | 20174             | 1732.40         |
| 20175             | 1732.50         | 20175             | 1732.50         |
| 20176             | 1732.60         | 20176             | 1732.60         |
| ...               | ...             | ...               | ...             |
| 20324             | 1747.40         | 20299             | 1744.90         |
| 20325             | 1747.50         | 20300             | 1745.00         |

| LTE Band 5(5MHz) |                 | LTE Band 5(10MHz) |                 |
|------------------|-----------------|-------------------|-----------------|
| Channel          | Frequency (MHz) | Channel           | Frequency (MHz) |
| 19975            | 1712.50         | 20000             | 1715.00         |
| 19976            | 1712.60         | 20001             | 1715.10         |
| ...              | ...             | ...               | ...             |
| 20174            | 1732.40         | 20174             | 1732.40         |
| 20175            | 1732.50         | 20175             | 1732.50         |
| 20176            | 1732.60         | 20176             | 1732.60         |
| ...              | ...             | ...               | ...             |
| 20374            | 1752.40         | 20349             | 1749.90         |
| 20375            | 1752.50         | 20350             | 1750.00         |

## 4.2. Test Mode

All modes and data rates and positions were investigated.

Test modes are chosen to be reported as the worst case configuration below:

| Test Mode  |                                             |                                              |
|------------|---------------------------------------------|----------------------------------------------|
| Band       | Radiated TCs                                | Conducted TCs                                |
| LTE Band 2 | QPSK Link<br>(5MHz / 10MHz / 15MHz / 20MHz) | 16QAM Link<br>(5MHz / 10MHz / 15MHz / 20MHz) |
| LTE Band 4 | QPSK Link<br>(5MHz / 10MHz / 15MHz)         | 16QAM Link<br>(5MHz / 10MHz / 15MHz / )      |
| LTE Band 5 | QPSK Link<br>(5MHz / 10MHz)                 | 16QAM Link<br>(5MHz / 10MHz)                 |

Antenna port conducted and radiated test items were performed according to KDB 971168 D02 Power Meas. License Digital Systems v02r02 with maximum output power. Radiated measurements were performed with rotating EUT in different three orthogonal test planes to find the maximum emission.

| Test Items             | Band | Bandwidth (MHz) |   |   |    |    |    | Modulation |       | RB # |      |      | Test Channel |   |   |
|------------------------|------|-----------------|---|---|----|----|----|------------|-------|------|------|------|--------------|---|---|
|                        |      | 1.4             | 3 | 5 | 10 | 15 | 20 | QPSK       | 16QAM | 1    | Half | Full | L            | M | H |
| Max. Output Power      | 2    | v               | v | v | v  | v  | v  | v          | v     | v    | v    | v    | v            | v | v |
|                        | 4    | v               | v | v | v  | v  | v  | v          | v     | v    | v    | v    | v            | v | v |
|                        | 5    | v               | v | v | v  | v  | v  | v          | v     | v    | v    | v    | v            | v | v |
| Peak-to-Average Ratio  | 2    | v               | v | v | v  | v  | v  | v          | v     | v    | v    | v    | v            | v | v |
|                        | 4    | v               | v | v | v  | v  | v  | v          | v     | v    | v    | v    | v            | v | v |
|                        | 5    | v               | v | v | v  | v  | v  | v          | v     | v    | v    | v    | v            | v | v |
| 26dB and 99% Bandwidth | 2    | v               | v | v | v  | v  | v  | v          | v     |      |      | v    | v            | v | v |
|                        | 4    | v               | v | v | v  | v  | v  | v          | v     |      |      | v    | v            | v | v |
|                        | 5    | v               | v | v | v  | v  | v  | v          | v     | v    | v    | v    | v            | v | v |

| Test Items                        | Band                                                                                                                               | Bandwidth (MHz) |   |   |    |    |    | Modulation |       | RB # |      |      | Test Channel |   |   |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------|---|---|----|----|----|------------|-------|------|------|------|--------------|---|---|
|                                   |                                                                                                                                    | 1.4             | 3 | 5 | 10 | 15 | 20 | QPSK       | 16QAM | 1    | Half | Full | L            | M | H |
| Conducted<br>Band Edge            | 2                                                                                                                                  | v               | v | v | v  | v  | v  | v          | v     | v    |      | v    | v            |   | v |
|                                   | 4                                                                                                                                  | v               | v | v | v  | v  | v  | v          | v     | v    |      | v    | v            |   | v |
|                                   | 5                                                                                                                                  | v               | v | v | v  | v  | v  | v          | v     | v    |      | v    | v            |   | v |
| Conducted<br>Spurious<br>Emission | 2                                                                                                                                  | v               | v | v | v  | v  | v  | v          | v     | v    |      |      | v            | v | v |
|                                   | 4                                                                                                                                  | v               | v | v | v  | v  | v  | v          | v     | v    |      |      | v            | v | v |
|                                   | 5                                                                                                                                  | v               | v | v | v  | v  | v  | v          | v     | v    |      |      | v            | v | v |
| Frequency<br>Stability            | 2                                                                                                                                  |                 |   |   | v  |    |    | v          | v     |      |      | v    |              | v |   |
|                                   | 4                                                                                                                                  |                 |   |   | v  |    |    | v          | v     |      |      | v    |              | v |   |
|                                   | 5                                                                                                                                  |                 |   |   | v  |    |    | v          | v     |      |      | v    |              | v |   |
| E.R.P./ E.I.R.P.                  | 2                                                                                                                                  | v               | v | v | v  | v  | v  | v          | v     | v    | v    | v    | v            | v | v |
|                                   | 4                                                                                                                                  | v               | v | v | v  | v  | v  | v          | v     | v    | v    | v    | v            | v | v |
|                                   | 5                                                                                                                                  | v               | v | v | v  | v  | v  | v          | v     | v    | v    | v    | v            | v | v |
| Radiated<br>Spurious<br>Emission  | 2                                                                                                                                  | v               |   |   |    |    |    | v          | v     | v    |      |      | v            | v | v |
|                                   | 4                                                                                                                                  | v               |   |   |    |    |    | v          | v     | v    |      |      | v            | v | v |
|                                   | 5                                                                                                                                  | v               |   |   |    |    |    | v          | v     | v    |      |      | v            | v | v |
| Note                              | 1. The mark "v" means that this configuration is chosen for testing<br>2. The mark "-" means that this bandwidth is not supported. |                 |   |   |    |    |    |            |       |      |      |      |              |   |   |

## 4.3. Description of Support Units

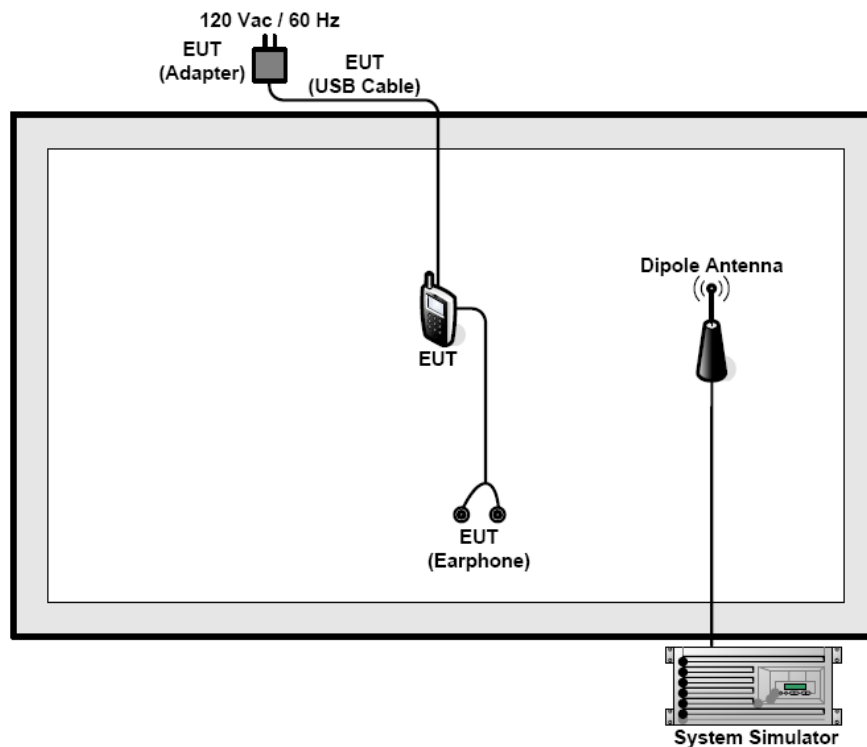
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| Equipment | Model No. | Serial No. | FCC ID | Trade Name |
|-----------|-----------|------------|--------|------------|
|           |           |            |        |            |

### Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

#### 4.4. Configuration of Tested System



#### 4.5. Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between RF conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level will be exactly the RF output level. The spectrum analyzer offset is derived from RF cable loss and attenuator factor.  
*Offset = RF cable loss + attenuator factor.*

## 5. Facilities and Accreditations

### 5.1. Facilities

The test facility is recognized, certified, or accredited by the following organizations:

- FCC - Registration No.: 645098

#### **Shenzhen Tongce Testing Lab.**

The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A-1

The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

### 5.2. Location

Shenzhen Tongce Testing Lab

Address: 1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District, Shenzhen, Guangdong, China

TEL: +86-755-27673339

### 5.3. Measurement Uncertainty

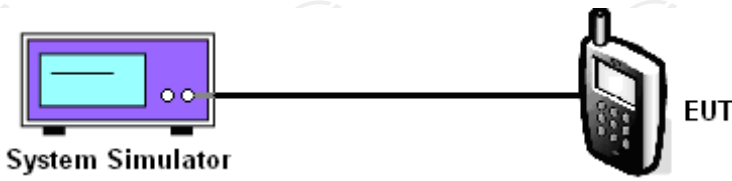
The reported uncertainty of measurement  $y \pm U$ , where expended uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95 %.

| No. | Item                          | MU                        |
|-----|-------------------------------|---------------------------|
| 1   | Conducted Emission            | $\pm 2.56\text{dB}$       |
| 2   | RF power, conducted           | $\pm 0.12\text{dB}$       |
| 3   | Spurious emissions, conducted | $\pm 0.11\text{dB}$       |
| 4   | All emissions, radiated(<1G)  | $\pm 3.92\text{dB}$       |
| 5   | All emissions, radiated(>1G)  | $\pm 4.28\text{dB}$       |
| 6   | Temperature                   | $\pm 0.1^{\circ}\text{C}$ |
| 7   | Humidity                      | $\pm 1.0\%$               |

## 6. Test Results and Measurement Data

### 6.1. Conducted Output Power Measurement

#### 6.1.1. Test Specification

|                          |                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Test Requirement:</b> | FCC part 27.50(c), FCC part 27.50(d) and FCC part 27.50(h), FCC part 24.232(c),                                                                                                                                                                                                                                                                               |
| <b>Test Method:</b>      | FCC part 2.1046                                                                                                                                                                                                                                                                                                                                               |
| <b>Limits:</b>           | LTE Band 2: 2W<br>LTE Band 4: 1W                                                                                                                                                                                                                                                                                                                              |
| <b>Test Setup:</b>       |  <p>The diagram illustrates the test setup. On the left is a 'System Simulator' represented by a purple box with a screen and two ports. A black cable connects one of its ports to the 'EUT' (Equipment Under Test), which is depicted as a mobile phone on the right.</p> |
| <b>Test Procedure:</b>   | <ol style="list-style-type: none"> <li>1. The transmitter output port was connected to the system simulator.</li> <li>2. Set EUT at maximum power through system simulator.</li> <li>3. Select lowest, middle, highest channels for each band and different modulation.</li> <li>4. Measure and record the power level from the system simulator.</li> </ol>  |
| <b>Test Result:</b>      | PASS                                                                                                                                                                                                                                                                                                                                                          |

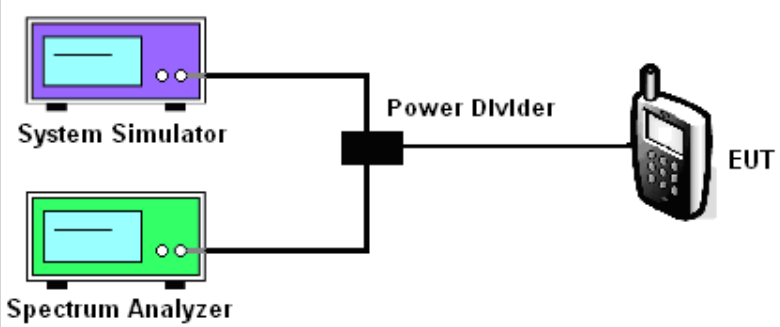
#### 6.1.2. Test Instruments

| Equipment                           | Manufacturer | Model  | Serial Number | Calibration Due |
|-------------------------------------|--------------|--------|---------------|-----------------|
| Wideband Radio Communication Tester | R&S          | CMW500 | 114220        | Jun. 12, 2018   |
| RF cable (9kHz-40GHz)               | TCT          | RE-05  | N/A           | Oct. 13, 2017   |
| Antenna Connector                   | TCT          | RFC-02 | N/A           | Oct. 13, 2017   |

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

## 6.2. Peak to Average Ratio

### 6.2.1. Test Specification

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Test Requirement:</b> | FCC part 24.232(d)                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Test Method:</b>      | FCC KDB 971168 v02r02                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Limit:</b>            | The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Test Setup:</b>       |  <p>The diagram illustrates the test setup. A System Simulator (represented by a purple box) and a Spectrum Analyzer (represented by a green box) are connected to a central Power Divider (represented by a black box). The Power Divider is then connected to the EUT (Equipment Under Test, represented by a mobile phone icon).</p>                                      |
| <b>Test Procedure:</b>   | <ol style="list-style-type: none"> <li>1. The testing follows FCC KDB 971168 v02r02 Section 5.7.1.</li> <li>2. The EUT was connected to spectrum analyzer and system simulator via a power divider.</li> <li>3. Set EUT to transmit at maximum output power.</li> <li>4. Set the CCDF (Complementary Cumulative Distribution Function) option of the spectrum analyzer.</li> </ol> <p>Record the maximum PAPR level associated with a probability of 0.1%.</p> |
| <b>Test Result:</b>      | PASS                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

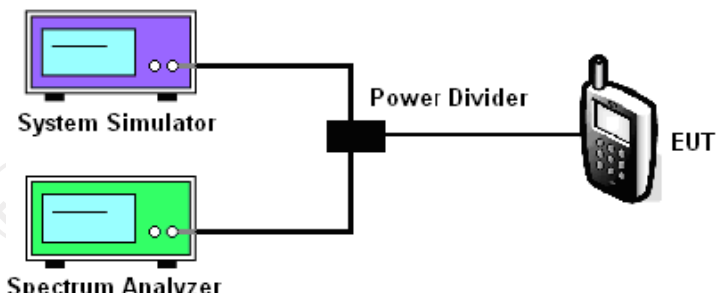
### 6.2.2. Test Instruments

| Equipment                           | Manufacturer | Model  | Serial Number | Calibration Due |
|-------------------------------------|--------------|--------|---------------|-----------------|
| Wideband Radio Communication Tester | R&S          | CMW500 | 114220        | Jun. 12, 2018   |
| Spectrum Analyzer                   | Agilent      | N9020A | MY49100060    | Oct. 13, 2017   |
| RF cable (9kHz-40GHz)               | TCT          | RE-05  | N/A           | Oct. 13, 2017   |
| Antenna Connector                   | TCT          | RFC-02 | N/A           | Oct. 13, 2017   |

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

### 6.3. 99% Occupied Bandwidth and 26dB Bandwidth Measurement

#### 6.3.1. Test Specification

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Test Requirement:</b> | FCC part 27.53(h)(3) and FCC part 27.53(m)(6),<br>FCC part 24.238(b)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Test Method:</b>      | FCC part 2.1049                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Limit:</b>            | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Test Setup:</b>       |  <p>The diagram illustrates the test setup. A System Simulator (represented by a purple box) and a Spectrum Analyzer (represented by a green box) are connected to a Power Divider (represented by a black box). The Power Divider is then connected to the EUT (Equipment Under Test, represented by a mobile phone icon). The Spectrum Analyzer is also connected to the Power Divider.</p>                                                                                                                                                         |
| <b>Test Procedure:</b>   | <ol style="list-style-type: none"> <li>1. The testing follows FCC KDB 971168 v02r02 Section 4.2.</li> <li>2. The EUT was connected to the spectrum analyzer and system simulator via a power divider.</li> <li>3. The RF output of the 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>4. The 99% occupied bandwidth were measured, set RBW= 1% of OBW, VBW= 3*RBW, sample detector, trace maximum hold.</li> <li>5. The 26dB bandwidth were measured, set RBW= 1% of EBW, VBW= 3*RBW, peak detector, trace maximum hold.</li> </ol> |
| <b>Test Result:</b>      | PASS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

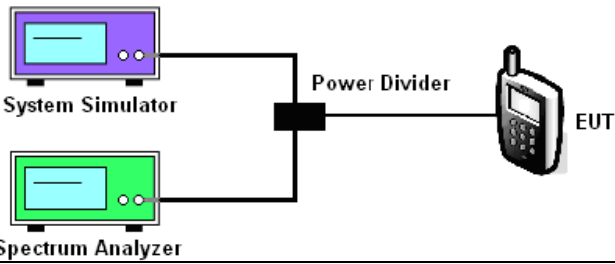
#### 6.3.2. Test Instruments

| Equipment                           | Manufacturer | Model  | Serial Number | Calibration Due |
|-------------------------------------|--------------|--------|---------------|-----------------|
| Wideband Radio Communication Tester | R&S          | CMW500 | 114220        | Jun. 12, 2018   |
| Spectrum Analyzer                   | Agilent      | N9020A | MY49100060    | Oct. 13, 2017   |
| RF cable (9kHz-40GHz)               | TCT          | RE-05  | N/A           | Oct. 13, 2017   |
| Antenna Connector                   | TCT          | RFC-02 | N/A           | Oct. 13, 2017   |

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

## 6.4. Band Edge and Conducted Spurious Emission Measurement

### 6.4.1. Test Specification

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Test Requirement:</b> | FCC part 27.53(h), FCC part 27.53(g) ,<br>FCC part 27.53(m)(4), FCC part 24.238(a)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Test Method:</b>      | FCC part2.1051                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Limit:</b>            | -13dBm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Test Setup:</b>       |  <p>The diagram shows a System Simulator (purple box) and a Spectrum Analyzer (green box) connected to a Power Divider (black box). The Power Divider is connected to the EUT (Equipment Under Test, represented by a mobile phone icon).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Test Procedure:</b>   | <ol style="list-style-type: none"> <li>1. The testing follows FCC KDB 971168 v02r02 Section 6.0.</li> <li>2. The EUT was connected to the spectrum analyzer and system simulator via a power divider.</li> <li>3. The RF output of EUT was connected to the spectrum analyzer by an RF cable and attenuator. The path loss was compensated to the results for each measurement.</li> <li>4. The band edges of low and high channels for the highest RF powers were measured.</li> <li>5. The conducted spurious emission for the whole frequency range was taken.</li> <li>6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.</li> <li>7. The limit line is derived from <math>43 + 10\log(P)</math> dB below the transmitter power<br/> <math>P(\text{Watts}) = P(\text{W}) - [43 + 10\log(P)] (\text{dB}) = [30 + 10\log(P)] (\text{dBm}) - [43 + 10\log(P)] (\text{dB}) = -13\text{dBm}</math>.<br/> For Band 17, the limit line is derived from <math>55 + 10\log(P)</math> dB below the transmitter power</li> </ol> |
| <b>Test Result:</b>      | PASS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

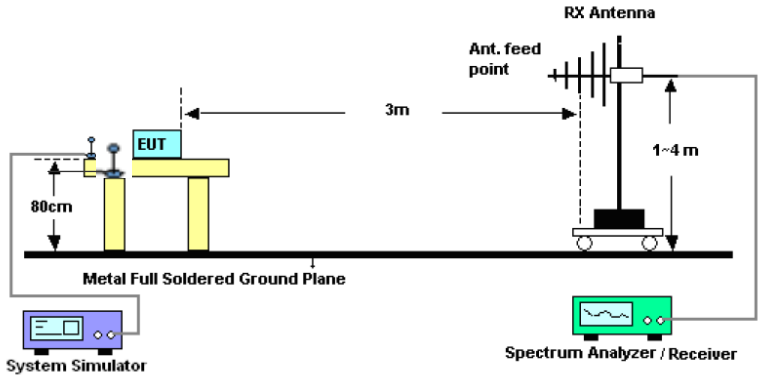
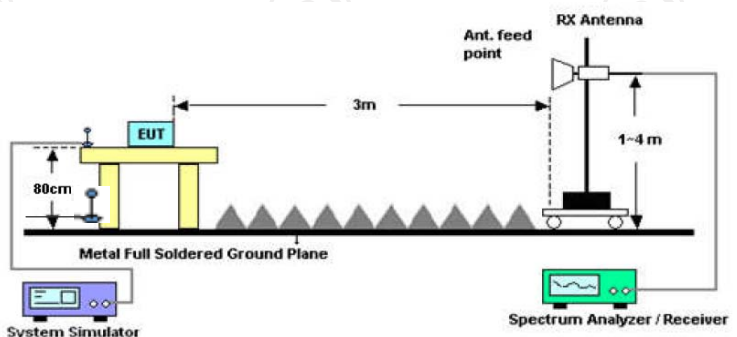
**6.4.2. Test Instruments**

| Equipment                           | Manufacturer | Model  | Serial Number | Calibration Due |
|-------------------------------------|--------------|--------|---------------|-----------------|
| Wideband Radio Communication Tester | R&S          | CMW500 | 114220        | Jun. 12, 2018   |
| Spectrum Analyzer                   | Agilent      | N9020A | MY49100060    | Oct. 13, 2017   |
| RF cable (9kHz-40GHz)               | TCT          | RE-05  | N/A           | Oct. 13, 2017   |
| Antenna Connector                   | TCT          | RFC-02 | N/A           | Oct. 13, 2017   |

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

## 6.5. Field Strength of Spurious Radiation Measurement

### 6.5.1. Test Specification

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Test Requirement:</b> | FCC part 27.53(g) ,FCC part 27.53(h),<br>FCC part 27.53(m)(4), FCC part 24.238(b)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Test Method:</b>      | FCC part 2.1053                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Limit:</b>            | 30MHz~20GHz -13dBm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Test setup:</b>       | <p>From 30MHz to 1GHz</p>  <p>Above 1GHz</p>                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Test Procedure:</b>   | <ol style="list-style-type: none"> <li>1. The testing follows FCC KDB 971168 v02r02 Section 5.8 and ANSI / TIA-603-D-2010Section 2.2.12.</li> <li>2. The EUT was placed on a rotatable wooden table 0.8 meters above the ground.</li> <li>3. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.</li> <li>4. The table was rotated 360 degrees to determine the position of the highest spurious emission.</li> <li>5. The height of the receiving antenna is varied between one meter and four meters to search for the maximum spurious emission for both horizontal and vertical polarizations.</li> </ol> |

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                      | <p>6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking record of maximum spurious emission.</p> <p>7. A horn antenna was substituted in place of the EUT and was driven by a signal generator.</p> <p>8. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.</p> <p>9. Taking the record of output power at antenna port.</p> <p>10. Repeat step 7 to step 8 for another polarization.</p> <p>11. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain</p> <p>12. ERP (dBm) = EIRP - 2.15</p> <p>13. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.</p> <p>14. The limit line is derived from <math>43 + 10\log(P)</math> dB below the transmitter power P(Watts)</p> $= P(W) - [43 + 10\log(P)] \text{ (dB)}$ $= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)}$ $= -13\text{dBm}.$ <p>For Band 17, the limit line is derived from <math>55 + 10\log(P)</math> dB below the transmitter power</p> |
| <b>Test results:</b> | <b>PASS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

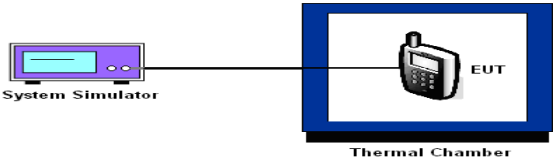
## 6.5.2. Test Instruments

| Radiated Emission Test Site (966) |                    |            |               |                 |
|-----------------------------------|--------------------|------------|---------------|-----------------|
| Name of Equipment                 | Manufacturer       | Model      | Serial Number | Calibration Due |
| System simulator                  | R&S                | CMU200     | 111382        | Oct. 13, 2017   |
| Spectrum Analyzer                 | ROHDE&SCHW ARZ     | R&S        | FSQ           | Oct. 13, 2017   |
| Signal Generator                  | HP                 | 83623B     | 3614A00396    | Oct. 13, 2017   |
| Broadband Antenna                 | Schwarzbeck        | VULB9163   | 340           | Oct. 13, 2017   |
| Horn Antenna                      | Schwarzbeck        | BBHA 9120D | 631           | Oct. 13, 2017   |
| Broadband Antenna                 | Schwarzbeck        | VULB9163   | 412           | Oct. 13, 2017   |
| Horn Antenna                      | Schwarzbeck        | BBHA 9120D | 1201          | Mar. 05, 2018   |
| Horn Antenna                      | Schwarzbeck        | BBH 9170   | 582           | Jun. 07, 2018   |
| Dipole Antenna                    | TCT                | TCT-RF     | N/A           | Oct. 13, 2017   |
| Coax cable (9kHz-1GHz)            | TCT                | RE-low-01  | N/A           | Oct. 13, 2017   |
| Coax cable (9kHz-40GHz)           | TCT                | RE-high-02 | N/A           | Oct. 13, 2017   |
| Coax cable (9kHz-1GHz)            | TCT                | RE-low-03  | N/A           | Oct. 13, 2017   |
| Coax cable (9kHz-40GHz)           | TCT                | RE-High-04 | N/A           | Oct. 13, 2017   |
| Antenna Mast                      | Keleto             | CC-A-4M    | N/A           | N/A             |
| EMI Test Software                 | Shurple Technology | EZ-EMC     | N/A           | N/A             |

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

## 6.6. Frequency Stability Measurement

### 6.6.1. Test Specification

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Test Requirement:</b> | FCC part 27.54, FCC part 24.235                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Test Method:</b>      | FCC Part 2.1055                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Limit:</b>            | $\pm 2.5$ ppm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Test Setup:</b>       |  <p>The diagram illustrates the test setup. On the left, a 'System Simulator' is connected via a cable to an 'EUT' (Equipment Under Test) which is placed inside a 'Thermal Chamber'.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Test Procedure:</b>   | <p><b>Test Procedures for Temperature Variation</b></p> <ol style="list-style-type: none"> <li>1. The testing follows FCC KDB 971168 v02r02 Section 9.0.</li> <li>2. The EUT was set up in the thermal chamber and connected with the system simulator.</li> <li>3. With power OFF, the temperature was decreased to <math>-30^{\circ}\text{C}</math> and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.</li> <li>4. With power OFF, the temperature was raised in <math>10^{\circ}\text{C}</math> steps up to <math>50^{\circ}\text{C}</math>. The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.</li> </ol> <p><b>Test Procedures for Voltage Variation</b></p> <ol style="list-style-type: none"> <li>1. The testing follows FCC KDB 971168 v02r02 Section 9.0.</li> <li>2. The EUT was placed in a temperature chamber at <math>25 \pm 5^{\circ}\text{C}</math> and connected with the system simulator.</li> <li>3. The power supply voltage to the EUT was varied from BEP to 115% of the nominal value measured at the input to the EUT.</li> <li>4. The variation in frequency was measured for the worst case.</li> </ol> |
| <b>Test Result:</b>      | PASS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

**6.6.2. Test Instruments**

| Equipment                                   | Manufacturer | Model             | Serial Number | Calibration Due |
|---------------------------------------------|--------------|-------------------|---------------|-----------------|
| Wideband Radio Communication Tester         | R&S          | CMW500            | 114220        | Jun. 12, 2018   |
| Programable tempratuce and humidity chamber | JQ           | JQ-2000           | N/A           | Oct. 13, 2017   |
| DC power supply                             | Kingrang     | KR3005K<br>30V/5A | N/A           | Oct. 13, 2017   |
| RF cable<br>(9kHz-40GHz)                    | TCT          | RE-04             | N/A           | Oct. 13, 2017   |
| Antenna Connector                           | TCT          | RFC-03            | N/A           | Oct. 13, 2017   |

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

## Appendix A: Photographs of Test Setup

Refer to the test report No. TCT170731E023

## Appendix B: Photographs of EUT

Refer to the test report No. TCT170731E018

**\*\*\*\*\*END OF REPORT\*\*\*\*\***