# EMC TEST REPORT

| | |
|---|---|
| **Applicant** | ZTECorporation |
| **FCC ID** | SRQ-WF821 |
| **Product** | LTE router |
| **Brand** | ZTE |
| **Model** | WF821/WF821+ |
| **Report No.** | RXA1701-0006EMC |
| **Issue Date** | March 6, 2017 |

TA Technology (Shanghai) Co., Ltd.tested the above equipment in accordance with the requirements in **FCC Code CFR47 Part15B (2015)/ ANSI C63.4 (2014)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

*Wei Liu*

*Guangchang Fan*

*Performed by: Wei Liu/ Manager*          *Approved by: Guangchang Fan/ Director*

# TA Technology (Shanghai) Co., Ltd.

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# Summary of measurement results

| Number | Test Case | Clause in FCC Rules | Conclusion |
|--------|-----------|---------------------|------------|
| 1 | Radiated Emission | 15.109, ANSI C63.4-2014 | PASS |
| 2 | Conducted Emission | 15.107, ANSI C63.4-2014 | PASS |
| Test Date: February 16, 2017 ~ March 1, 2017 | | | |

# 1   Test Laboratory

## 1.1   Notes of the Test Report

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## 1.2   Test facility

**CNAS (accreditation number:L2264)**

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

**FCC (recognition number is 428261)**

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

**IC (recognition number is 8510A)**

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

**VCCI (recognition number is**C-4595, T-2154, R-4113, G-766**)**

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

**A2LA (Certificate Number: 3857.01)**

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

## 1.3   Testing Location

| | |
|---|---|
| Company: | TA Technology (Shanghai) Co., Ltd. |
| Address: | No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China |
| City: | Shanghai |
| Post code: | 201201 |
| Country: | P. R. China |
| Contact: | Xu Kai |
| Telephone: | +86-021-50791141/2/3 |
| Fax: | +86-021-50791141/2/3-8000 |
| Website: | http://www.ta-shanghai.com |
| E-mail: | xukai@ta-shanghai.com |

# 2  General Description of Equipment under Test

## 2.1  Client Information

| | |
|---|---|
| **Applicant** | ZTE Corporation |
| **Applicant address** | ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen<br>Guangdong<br>P.R.China |
| **Manufacturer** | ZTE Corporation |
| **Manufacturer address** | ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen<br>Guangdong<br>P.R.China |

## 2.2   General information

| EUT Description | |
|---|---|
| Device Type: | Portable Device |
| Product Name: | LTE router |
| Model Number: | WF821/WF821+ |
| HW Version: | v3.3 |
| SW Version: | OLO_PER_WF821+V1.0.0B03 |
| Product SN: | 6611016350400055 |
| Antenna Type: | Internal Antenna |
| Used Host Product: | PCManufacturer: lenovo<br>Model:Thinkpad T540p(SN : SL10E37685) |
| Test Mode: | Transfer Data Mode |
| EUT Accessory | |
| Adapter 1 | Manufacturer: AQUILSTAR PRECISION INDUSTRIAL(SHENZHEN)CO., LTD<br>Model:   ASSA65A-120100 |
| Adapter 2 | Manufacturer: TRANSIN<br>Model:TS-A012-120010A8H |
| Cable | Model : UTP CAT5E |
| Remark: 1. Theinformation of the EUT is declared by the manufacturer.Please refer to the specifications or user manual for details.<br>　　　　2. There is more than one adapter, each one should be applied throughout the compliance test respectively, however, only the worst case (Adapter 1) will be recorded in this report. | |

## 2.3  Applied Standards

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**Test standards**
**FCC Code CFR47 Part15B(2016)**
**ANSI C63.4 (2014)**

# 3   Test Case Results

## 3.1   Radiated Emission

**Ambient condition**

| Temperature | Relative humidity | Pressure |
|---|---|---|
| 24°C~26°C | 45%~50% | 102.5kPa |

**Methods of Measurement**

The EUT is placed on a non-metallic table 0.8m above the horizontal metal reference ground plane. The distance between EUT and receive antenna should be 3 meters.During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.4-2014.Sweep the whole frequency band through the range from30MHzto the 5th harmonic of the carrier.During the test, the height of receive antenna shall be moved from 1 to4meters, and the antenna shall be performed under horizontal and vertical polarization. The turn table shall be rotated from 0 to 360 degrees fordetecting the maximum of radiated signal level.

The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing.During the test, the EUT is worked at maximum output power.

Set the spectrum analyzer in the following:

Below 1GHz:

RBW=100 kHz / VBW=300 kHz / Sweep=AUTO

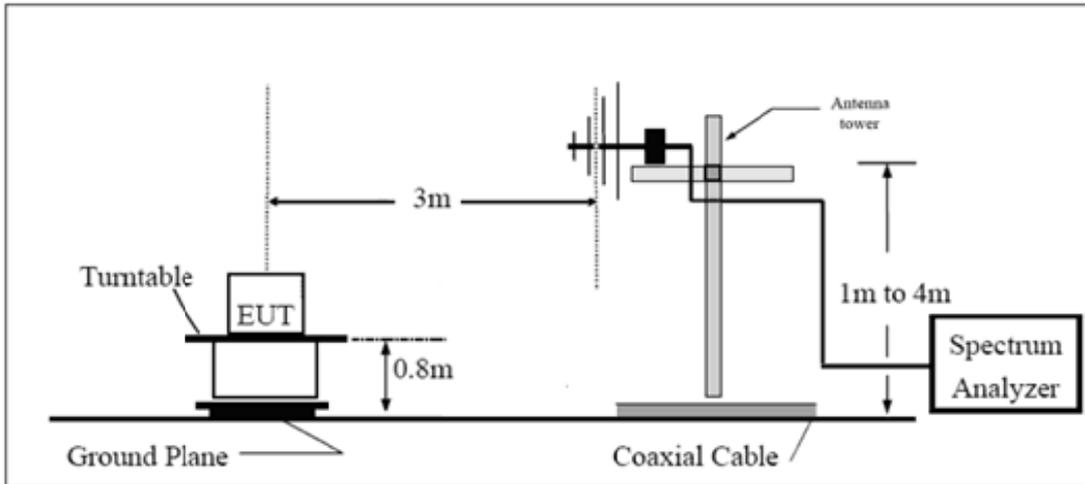Above 1GHz:

(a)   PEAK: RBW=1MHz VBW=3MHz/ Sweep=AUTO

(b)   AVERAGE: RBW=1MHz / VBW=3MHz / Sweep=AUTO

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded.

During the test, EUT is connected to a laptop via a USB cable in the case of Transfer Data mode. The EUT is used as the peripheral equipment of the PC.The data is transferred from EUT to PC; PC is connected to server via a long LAN cable.

**Test Setup**

**Below 1GHz**



**Above 1GHz**
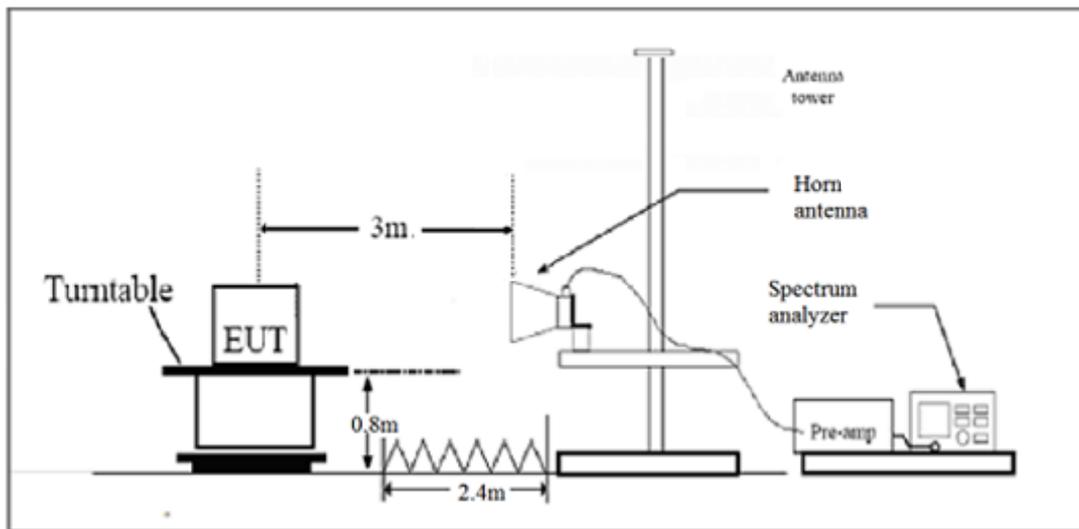


Note: Area side:2.4mX3.6m

Antenna Tower meets ANSI C63.4 requirements for measurements above 1 GHz by keeping the antenna aimed at the EUT during the antenna's ascent/ descent along the antenna mast.

**Limits**

| Frequency (MHz) | Field Strength (dBμV/m) | Detector |
|---|---|---|
| 30 -88 | 40.0 | Quasi-peak |
| 88-216 | 43.5 | Quasi-peak |
| 216 – 960 | 46.0 | Quasi-peak |
| 960-1000 | 54.0 | Quasi-peak |
| 1000-5th harmonic of the highest frequency or 40GHz,which is lower | 54<br>74 | Average<br>Peak |

**Measurement Uncertainty**

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k$ = 1.96. U=3.92 dB.

**Test Results**

The following graphs display the maximum values of horizontal and vertical by software.
For above 1GHz, Blue trace uses the peak detection, Green trace uses the average detection.

RE 30M-1GHz QP
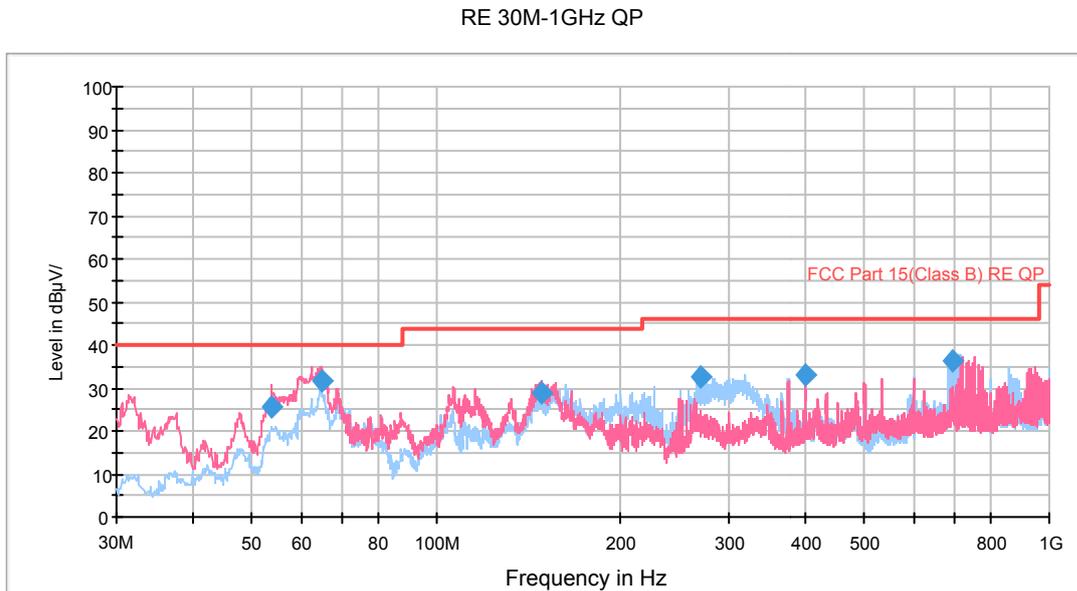


Radiated Emission from 30MHz to 1GHz

| Frequency (MHz) | Quasi-Peak (dBuV/m) | Reading value (dBuV/m) | Height (cm) | Polarization | Azimuth (deg) | Correct Factor (dB) | Margin (dB) | Limit (dBuV/m) |
|---|---|---|---|---|---|---|---|---|
| 53.830588 | 25.8 | 46.6 | 104.0 | V | 91.0 | -20.8 | 14.2 | 40.0 |
| 64.795806 | 31.7 | 55.4 | 101.0 | V | 182.0 | -23.7 | 8.3 | 40.0 |
| 148.127256 | 28.9 | 58.3 | 105.0 | V | 325.0 | -29.4 | 14.6 | 43.5 |
| 269.636750 | 32.4 | 56.7 | 104.0 | H | 218.0 | -24.3 | 13.6 | 46.0 |
| 400.013750 | 33.1 | 53.9 | 104.0 | V | 22.0 | -20.8 | 12.9 | 46.0 |
| 696.329000 | 36.1 | 51.2 | 101.0 | H | 12.0 | -15.1 | 9.9 | 46.0 |

**Remark: 1. Quasi-Peak = Reading value + Correction factor**

         **2. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)**

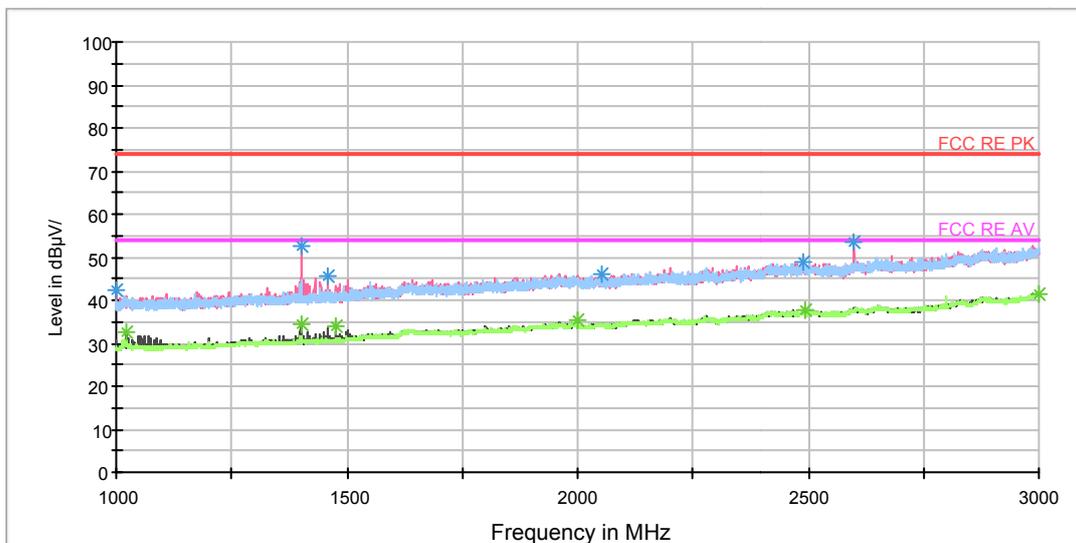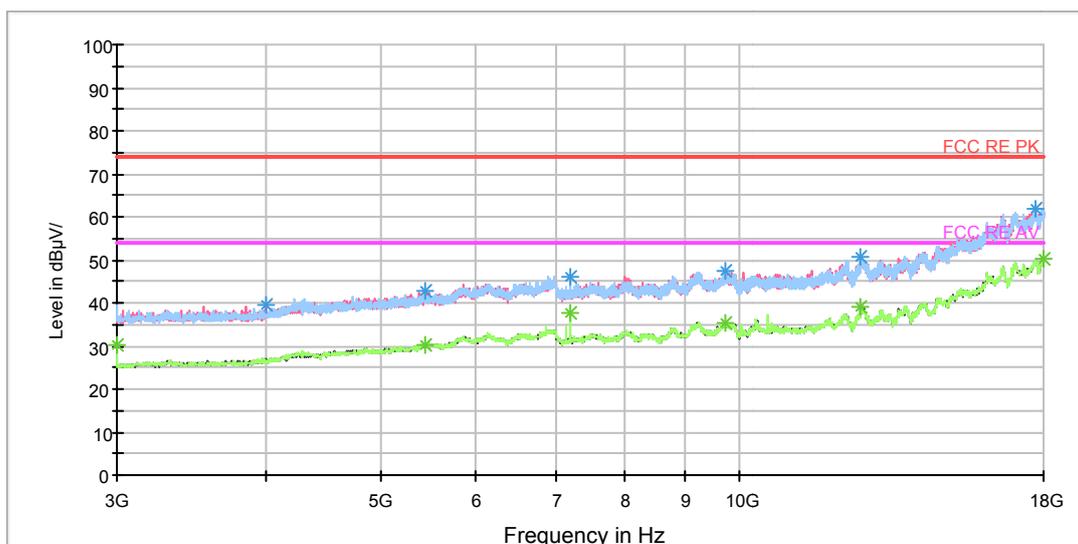         **3. Margin = Limit –Quasi-Peak**

RE 1G-3GHz PK+AV



Radiated Emission from 1GHz to 3GHz

| Frequency (MHz) | Peak (dBuV/m) | Reading value (dBuV/m) | Height (cm) | Polarization | Azimuth (deg) | Correct Factor (dB) | Margin (dB) | Limit (dBuV/m) |
|---|---|---|---|---|---|---|---|---|
| 1000.250000 | 42.1 | 51.3 | 105.0 | V | 188.0 | -9.2 | 31.9 | 74 |
| 1400.250000 | 52.4 | 59.5 | 105.0 | V | 188.0 | -7.1 | 21.6 | 74 |
| 1460.000000 | 45.4 | 52.3 | 105.0 | V | 109.0 | -6.9 | 28.6 | 74 |
| 2052.250000 | 46.2 | 49.4 | 105.0 | V | 341.0 | -3.2 | 27.8 | 74 |
| 2488.000000 | 48.6 | 48.4 | 105.0 | H | 10.0 | 0.2 | 25.4 | 74 |
| 2600.250000 | 53.5 | 53.1 | 105.0 | V | 176.0 | 0.4 | 20.5 | 74 |

| Frequency (MHz) | Average (dBuV/m) | Reading value (dBuV/m) | Height (cm) | Polarization | Azimuth (deg) | Correct Factor (dB) | Margin (dB) | Limit (dBuV/m) |
|---|---|---|---|---|---|---|---|---|
| 1020.500000 | 32.4 | 41.5 | 105.0 | V | 85.0 | -9.1 | 21.6 | 54 |
| 1400.000000 | 34.5 | 41.6 | 105.0 | V | 170.0 | -7.1 | 19.5 | 54 |
| 1474.750000 | 34.0 | 40.6 | 105.0 | V | 127.0 | -6.6 | 20.0 | 54 |
| 2000.250000 | 35.1 | 38.5 | 105.0 | V | 0.0 | -3.4 | 18.9 | 54 |
| 2492.250000 | 37.6 | 37.3 | 105.0 | V | 341.0 | 0.3 | 16.4 | 54 |
| 2999.750000 | 41.4 | 39.1 | 105.0 | V | 359.0 | 2.3 | 12.6 | 54 |

RE 3-18GHz PK+AV



Radiated Emission from 3GHz to 18GHz

| Frequency (MHz) | Peak (dBuV/m) | Reading value (dBuV/m) | Height (cm) | Polarization | Azimuth (deg) | Correct Factor (dB) | Margin (dB) | Limit (dBuV/m) |
|---|---|---|---|---|---|---|---|---|
| 4005.000000 | 39.7 | 40.8 | 105.0 | V | 228.0 | -1.1 | 34.3 | 74 |
| 5450.625000 | 42.7 | 39.9 | 105.0 | V | 0.0 | 2.8 | 31.3 | 74 |
| 7198.125000 | 46.0 | 39.6 | 105.0 | H | 223.0 | 6.4 | 28.0 | 74 |
| 9735.000000 | 47.3 | 37.4 | 105.0 | H | 0.0 | 9.9 | 26.7 | 74 |
| 12646.875000 | 50.8 | 36.5 | 105.0 | H | 86.0 | 14.3 | 23.2 | 74 |
| 17745.000000 | 61.8 | 37.7 | 105.0 | H | 41.0 | 24.1 | 12.2 | 74 |

| Frequency (MHz) | Average (dBuV/m) | Reading value (dBuV/m) | Height (cm) | Polarization | Azimuth (deg) | Correct Factor (dB) | Margin (dB) | Limit (dBuV/m) |
|---|---|---|---|---|---|---|---|---|
| 3000.000000 | 30.4 | 33.6 | 105.0 | H | 0.0 | -3.2 | 23.6 | 54 |
| 5439.375000 | 30.3 | 27.4 | 105.0 | H | 63.0 | 2.9 | 23.7 | 54 |
| 7198.125000 | 37.8 | 31.4 | 105.0 | H | 223.0 | 6.4 | 16.2 | 54 |
| 9740.625000 | 35.5 | 25.5 | 105.0 | V | 297.0 | 10.0 | 18.5 | 54 |
| 12639.375000 | 38.9 | 24.4 | 105.0 | V | 0.0 | 14.5 | 15.1 | 54 |
| 18000.000000 | 50.2 | 24.7 | 105.0 | V | 228.0 | 25.5 | 3.8 | 54 |

## 3.2  Conducted Emission

**Ambient condition**

| Temperature | Relative humidity | Pressure |
|-------------|-------------------|----------|
| 24°C ~26°C  | 50%~55%           | 102.5kPa |

**Methods of Measurement**

The EUT is placed on a non-metallic table of 80cm height above the horizontal metal reference ground plane. During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.4-2014. Connect the AC power line of the EUT to the L.I.S.N. Use EMI receiver to detect the average and Quasi-peak value. RBW is set to 9 kHz, VBW is set to 30kHz. The measurement result should include both L line and N line.

During the test, EUT is connected to a laptop via a USB cable in the case of Transfer Data mode. The EUT is used as the peripheral equipment of the PC.The data is transferred from EUT to PC; PC is connected to server via a long LAN cable.

**Test Setup**
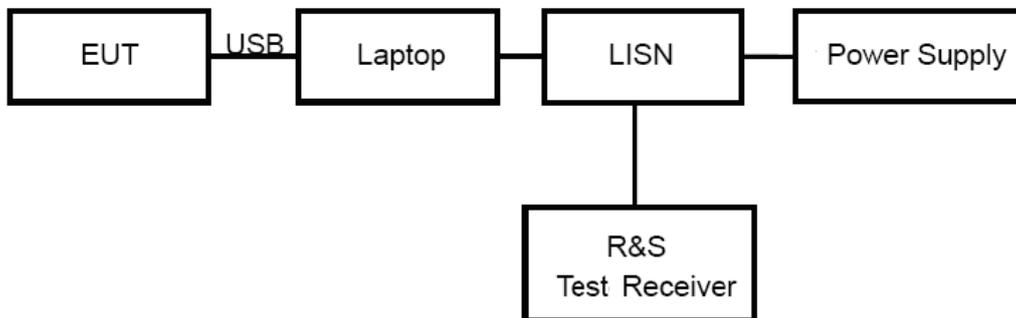


Note: Power Supply is AC Power source and it is used to change the voltage 120V/60Hz.

**Limits**

| Frequency | Conducted Limits(dBµV) | |
|-----------|-------------|----------|
| **(MHz)** | Quasi-peak | Average |
| 0.15 - 0.5 | 66 to 56 * | 56 to 46 * |
| 0.5 - 5 | 56 | 46 |
| 5 - 30 | 60 | 50 |
| *: Decreases with the logarithm of the frequency. | | |

**Measurement Uncertainty**

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k$ = 1.96. U=2.69 dB.

**Test Results**

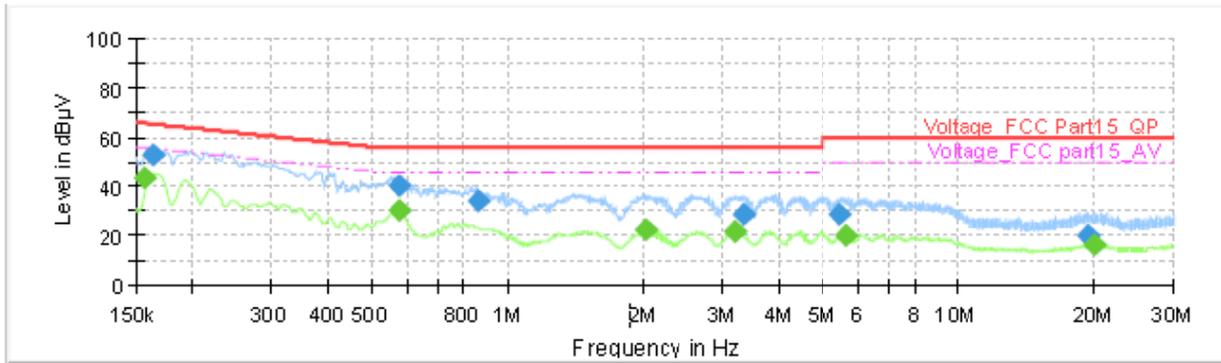Following plots, Blue trace uses the peak detection; Green trace uses the average detection.
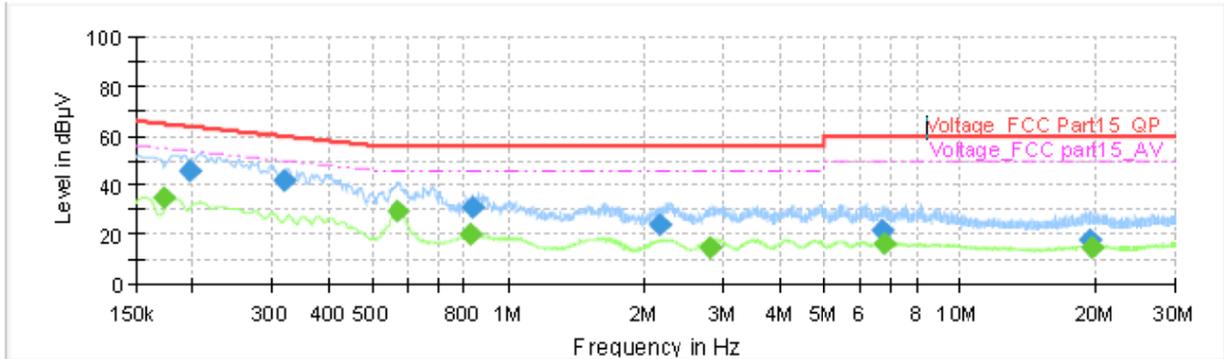


## Final_Result

| Frequency (MHz) | QuasiPeak (dBμV) | Average (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Filter | Corr. (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 0.172500 | --- | 35.14 | 54.84 | 19.70 | 1000.0 | 9.000 | L1 | ON | 19.2 |
| 0.197250 | 45.99 | --- | 63.73 | 17.73 | 1000.0 | 9.000 | L1 | ON | 19.2 |
| 0.318750 | 41.55 | --- | 59.74 | 18.19 | 1000.0 | 9.000 | L1 | ON | 19.2 |
| 0.568500 | --- | 29.63 | 46.00 | 16.37 | 1000.0 | 9.000 | L1 | ON | 19.3 |
| 0.822750 | --- | 20.52 | 46.00 | 25.48 | 1000.0 | 9.000 | L1 | ON | 19.2 |
| 0.834000 | 31.14 | --- | 56.00 | 24.86 | 1000.0 | 9.000 | L1 | ON | 19.2 |
| 2.163750 | 23.77 | --- | 56.00 | 32.23 | 1000.0 | 9.000 | L1 | ON | 19.1 |
| 2.816250 | --- | 14.52 | 46.00 | 31.48 | 1000.0 | 9.000 | L1 | ON | 19.0 |
| 6.744750 | 21.70 | --- | 60.00 | 38.30 | 1000.0 | 9.000 | L1 | ON | 19.1 |
| 6.803250 | --- | 16.47 | 50.00 | 33.53 | 1000.0 | 9.000 | L1 | ON | 19.1 |
| 19.293000 | 18.17 | --- | 60.00 | 41.83 | 1000.0 | 9.000 | L1 | ON | 19.6 |
| 19.590000 | --- | 15.09 | 50.00 | 34.91 | 1000.0 | 9.000 | L1 | ON | 19.7 |

L line

Conducted Emission from 150 KHz to 30MHz

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# Final_Result

| Frequency (MHz) | QuasiPeak (dBμV) | Average (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Filter | Corr. (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 0.156750 | --- | 43.61 | 55.63 | 12.03 | 1000.0 | 9.000 | N | ON | 19.1 |
| 0.163500 | 52.84 | --- | 65.28 | 12.44 | 1000.0 | 9.000 | N | ON | 19.1 |
| 0.573000 | 40.20 | --- | 56.00 | 15.80 | 1000.0 | 9.000 | N | ON | 19.3 |
| 0.577500 | --- | 30.05 | 46.00 | 15.95 | 1000.0 | 9.000 | N | ON | 19.3 |
| 0.858750 | 34.19 | --- | 56.00 | 21.81 | 1000.0 | 9.000 | N | ON | 19.2 |
| 2.017500 | --- | 22.63 | 46.00 | 23.37 | 1000.0 | 9.000 | N | ON | 19.1 |
| 3.178500 | --- | 21.35 | 46.00 | 24.65 | 1000.0 | 9.000 | N | ON | 19.1 |
| 3.331500 | 28.92 | --- | 56.00 | 27.08 | 1000.0 | 9.000 | N | ON | 19.1 |
| 5.460000 | 28.93 | --- | 60.00 | 31.07 | 1000.0 | 9.000 | N | ON | 19.1 |
| 5.644500 | --- | 19.95 | 50.00 | 30.05 | 1000.0 | 9.000 | N | ON | 19.1 |
| 19.407750 | 20.09 | --- | 60.00 | 39.91 | 1000.0 | 9.000 | N | ON | 19.5 |
| 20.125500 | --- | 16.03 | 50.00 | 33.97 | 1000.0 | 9.000 | N | ON | 19.5 |

N line
Conducted Emission from 150 KHz to 30MHz

# 4   Main Test Equipment

| Name | Type | Manufacturer | Serial Number | Last Cal. | Cal. Due Date |
|---|---|---|---|---|---|
| EMI Test Receiver | ESCI3 | R&S | 100948 | 2016-06-01 | 2017-05-31 |
| Signal Analyzer | FSV30 | R&S | 100815 | 2016-12-16 | 2017-12-15 |
| Trilog Antenna | VULB 9163 | SCHWARZBECK | 9163-201 | 2014-12-06 | 2017-12-05 |
| Horn Antenna | HF907 | R&S | 100126 | 2014-12-06 | 2017-12-05 |
| Horn Antenna | 3160-09 | ETS-Lindgren | 00102643 | 2015-01-30 | 2018-01-29 |
| EMI Test Receiver | ESCS30 | R&S | 100138 | 2016-12-16 | 2017-12-15 |
| LISN | ENV216 | R&S | 101171 | 2016-12-16 | 2019-12-15 |
| Bore Sight Antenna mast | 2171B | ETS | 00058752 | NA | NA |

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# ANNEX A：The EUT Appearance and Test Configuration

## A.1 EUT Appearance
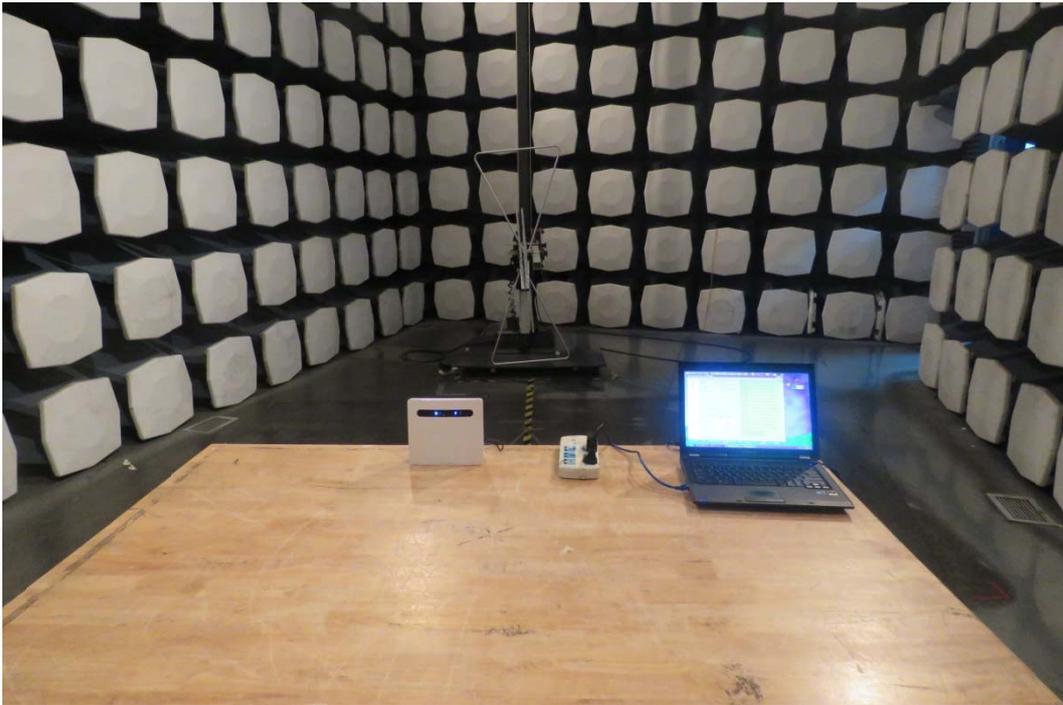


Front Side



Back Side

a: EUT

Adapter 1



Adapter 2

b: Adapter

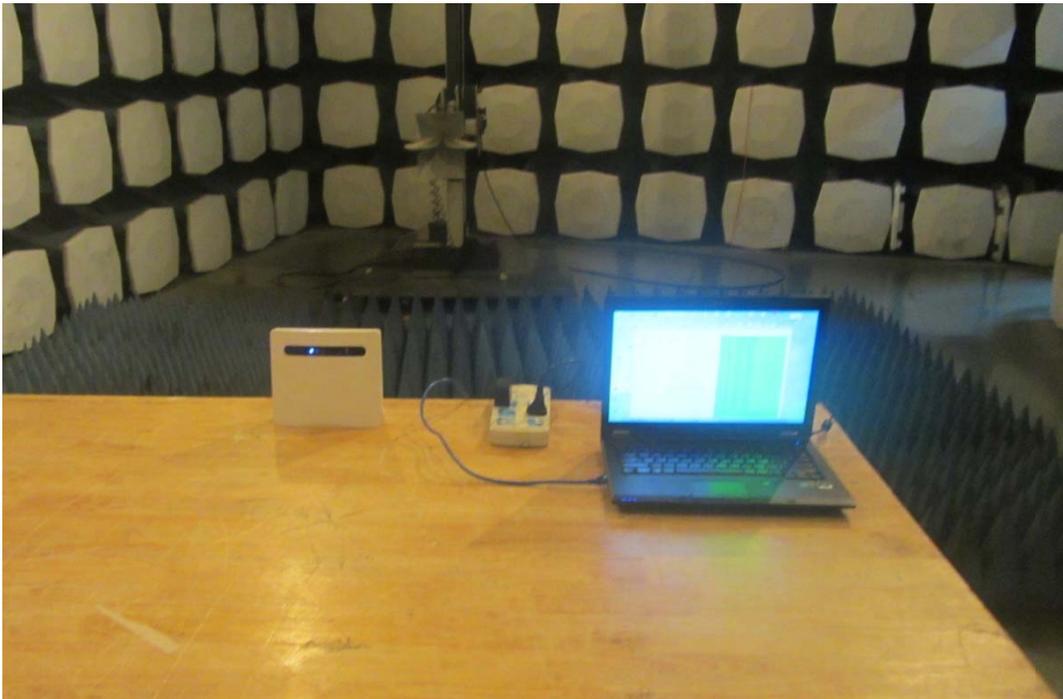c: Cable
**Picture 1EUT**

## A.2 Test Setup



a: Below 1GHz



b: Above 1GHz

**Picture 2Radiated Emission Test Setup**

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**Picture 3 Conducted Emission Test Setup**

## A.3 Host Product

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