

# FCC TEST REPORT

**Product Name:** Mobile Phone  
**Trade Mark:** BLU  
**Model No.:** VIVO ONE PLUS 2019  
**Report Number:** 180814012RFM-1  
**Test Standards:** FCC 47 CFR Part 22 Subpart H  
FCC 47 CFR Part 2  
**FCC ID:** YHLBLUVOONEPS19  
**Test Result:** PASS  
**Date of Issue:** October 15, 2018

Prepared for:

**BLU Products, Inc.**  
**10814 NW 33rd St #100 Doral, FL33172**

Prepared by:

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Date: October 15, 2018



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## Version

| Version No. | Date             | Description |
|-------------|------------------|-------------|
| V1.0        | October 15, 2018 | Original    |



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## 1. GENERAL INFORMATION

### 1.1 CLIENT INFORMATION

|                                 |                                     |
|---------------------------------|-------------------------------------|
| <b>Applicant:</b>               | BLU Products, Inc.                  |
| <b>Address of Applicant:</b>    | 10814 NW 33rd St#100 Doral, FL33172 |
| <b>Manufacturer:</b>            | BLU Products, Inc.                  |
| <b>Address of Manufacturer:</b> | 10814 NW 33rd St#100 Doral, FL33172 |

### 1.2 EUT INFORMATION

#### 1.2.1 General Description of EUT

|                               |                                       |                                                      |                      |
|-------------------------------|---------------------------------------|------------------------------------------------------|----------------------|
| <b>Product Name:</b>          | Mobile Phone                          |                                                      |                      |
| <b>Model No.:</b>             | VIVO ONE PLUS 2019                    |                                                      |                      |
| <b>Add. Model No.:</b>        | N/A                                   |                                                      |                      |
| <b>Trade Mark:</b>            | BLU                                   |                                                      |                      |
| <b>DUT Stage:</b>             | Identical Prototype                   |                                                      |                      |
| <b>EUT Supports Function:</b> | <b>GSM Bands:</b>                     | GSM850/1900                                          |                      |
|                               | <b>UTRA Bands:</b>                    | Band II/ Band IV/ Band V                             |                      |
|                               | <b>E-UTRA Bands:</b>                  | FDD Band 2/ Band 4/ Band 5/ Band 7/ Band 12/ Band 17 |                      |
|                               | <b>2.4 GHz ISM Band:</b>              | IEEE 802.11b/g/n                                     |                      |
|                               |                                       | Bluetooth V4.0                                       |                      |
|                               | <b>RNSS Bands:</b>                    | 1559 MHz to 1610 MHz                                 | 1559 MHz to 1610 MHz |
| <b>Sample Received Date:</b>  | August 15, 2018                       |                                                      |                      |
| <b>Sample Tested Date:</b>    | August 15, 2018 to September 12, 2018 |                                                      |                      |

## 1.2.2 Description of Accessories

| Adapter     |                          |
|-------------|--------------------------|
| Trade Mark: | BLU                      |
| Model No.:  | US-ZC-1500               |
| Input:      | 100-240 V~50/60 Hz 0.3 A |
| Output:     | 5.0 V $\equiv$ 1.5 A     |
| AC Cable:   | N/A                      |
| DC Cable:   | N/A                      |

| Battery         |                                  |
|-----------------|----------------------------------|
| Trade Mark:     | BLU                              |
| Model No.:      | C876444300L                      |
| Battery Type:   | Lithium-ion Rechargeable Battery |
| Rated Voltage:  | 3.8 Vdc                          |
| Rated Capacity: | 3000 mAh                         |

| Cable        |                          |
|--------------|--------------------------|
| Description: | USB Micro-B Plug Cable   |
| Cable Type:  | Shielded without ferrite |
| Length:      | 1 Meter                  |

| Earphone     |                            |
|--------------|----------------------------|
| Description: | 3.5 mm AUX                 |
| Cable Type:  | Unshielded without ferrite |
| Length:      | 1.2 Meter                  |

### 1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

|                                  |                                            |                            |                 |
|----------------------------------|--------------------------------------------|----------------------------|-----------------|
| <b>Support Networks:</b>         | GSM, GPRS, EDGE, WCDMA, HSDPA, HSUPA, LTE  |                            |                 |
| <b>Type of Modulation:</b>       | GSM/GPRS:                                  |                            | GMSK            |
|                                  | EDGE:                                      |                            | GMSK, 8PSK      |
|                                  | HSDPA:                                     |                            | QPSK            |
|                                  | HSUPA:                                     |                            | QPSK            |
|                                  | LTE Band 5:                                |                            | QPSK, 16QAM     |
| <b>Frequency Range:</b>          | GSM/GPRS/EDGE 850:                         |                            | 824.2-848.8 MHz |
|                                  | WCDMA Band V:                              |                            | 826.4-846.6 MHz |
|                                  | LTE Band 5 (Channel Bandwidth: 1.4 MHz):   |                            | 824.7-848.3 MHz |
|                                  | LTE Band 5 (Channel Bandwidth: 3 MHz):     |                            | 825.5-847.5MHz  |
|                                  | LTE Band 5 (Channel Bandwidth: 5 MHz):     |                            | 826.5-846.5 MHz |
|                                  | LTE Band 5 (Channel Bandwidth: 10 MHz):    |                            | 829-844 MHz     |
| <b>Max RF Output Power:</b>      | GSM/GPRS 850:                              |                            | 31.99dBm        |
|                                  | EDGE 850:                                  |                            | 27.12dBm        |
|                                  | WCDMA Band V:                              |                            | 21.96dBm        |
|                                  | LTE Band 5 (Channel Bandwidth: 1.4 MHz):   |                            | 22.10dBm        |
|                                  | LTE Band 5 (Channel Bandwidth: 3 MHz):     |                            | 22.04dBm        |
|                                  | LTE Band 5 (Channel Bandwidth: 5 MHz):     |                            | 21.97dBm        |
|                                  | LTE Band 5 (Channel Bandwidth: 10 MHz):    |                            | 22.12dBm        |
| <b>Type of Emission:</b>         | GSM/GPRS 850:                              |                            | 246KGXW         |
|                                  | EDGE 850:                                  |                            | 244KG7W         |
|                                  | WCDMA Band V:                              |                            | 4M21F9W         |
|                                  | LTE Band 5 QPSK                            | Channel Bandwidth: 1.4 MHz | 1M10G7D         |
|                                  |                                            | Channel Bandwidth: 3 MHz   | 2M70G7D         |
|                                  |                                            | Channel Bandwidth: 5 MHz   | 4M55G7D         |
|                                  |                                            | Channel Bandwidth: 10 MHz  | 9M03G7D         |
|                                  | LTE Band 5 16QAM                           | Channel Bandwidth: 1.4 MHz | 1M10W7D         |
|                                  |                                            | Channel Bandwidth: 3 MHz   | 2M70W7D         |
|                                  |                                            | Channel Bandwidth: 5 MHz   | 4M53W7D         |
|                                  |                                            | Channel Bandwidth: 10 MHz  | 9M03W7D         |
| <b>IEMI:</b>                     | Radiation: 351812051133984, 35181051133985 |                            |                 |
|                                  | Conducted: 351812051133976, 35181051133977 |                            |                 |
| <b>Antenna Type:</b>             | FPCB Antenna                               |                            |                 |
| <b>Antenna Gain:</b>             | GSM 850/WCDMA Band IV:                     |                            | 1.82 dBi        |
|                                  | LTE Band 5:                                |                            | 1.89 dBi        |
| <b>GPRS/EDGE Class:</b>          | Class 12                                   |                            |                 |
| <b>Normal Test Voltage:</b>      | 3.8 Vdc                                    |                            |                 |
| <b>Extreme Test Voltage:</b>     | 3.5 to 4.35Vdc                             |                            |                 |
| <b>Extreme Test Temperature:</b> | -30 °C to +50 °C                           |                            |                 |

### 1.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

#### 1) Support Equipment

| Description | Manufacturer | Model No. | Serial Number | Supplied by |
|-------------|--------------|-----------|---------------|-------------|
| --          | --           | --        | --            | --          |

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## 2) Support Cable

| Cable No. | Description   | Connector | Length     | Supplied by |
|-----------|---------------|-----------|------------|-------------|
| 1         | Antenna Cable | SMA       | 0.30 Meter | UnionTrust  |

## 1.5 TEST LOCATION

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## 1.6 TEST FACILITY

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

**CNAS-Lab Code: L9069**

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC/EN 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

**IC-Registration No.: 21600-1**

The 3m Semi-anechoic chamber of Shenzhen UnionTrust Quality and Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 21600-1.

**A2LA-Lab Certificate No.: 4312.01**

Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

**FCC Accredited Lab.**

Designation Number: CN1194

Test Firm Registration Number: 259480

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## 1.7 DEVIATION FROM STANDARDS

None.

## 1.8 ABNORMALITIES FROM STANDARD CONDITIONS

None.

## 1.9 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

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## 1.10 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .

| No. | Item                            | Measurement Uncertainty |
|-----|---------------------------------|-------------------------|
| 1   | Conducted emission 9KHz-150KHz  | $\pm 3.8$ dB            |
| 2   | Conducted emission 150KHz-30MHz | $\pm 3.4$ dB            |
| 3   | Radiated emission 9KHz-30MHz    | $\pm 4.9$ dB            |
| 4   | Radiated emission 30MHz-1GHz    | $\pm 4.7$ dB            |
| 5   | Radiated emission 1GHz-18GHz    | $\pm 5.1$ dB            |
| 6   | Radiated emission 18GHz-26GHz   | $\pm 5.2$ dB            |
| 7   | Radiated emission 26GHz-40GHz   | $\pm 5.2$ dB            |

## 2. TEST SUMMARY

| FCC 47 CFR Part 22 Subpart H Test Cases |                                                       |                                            |        |
|-----------------------------------------|-------------------------------------------------------|--------------------------------------------|--------|
| Test Item                               | Test Requirement                                      | Test Method                                | Result |
| Effective Radiated Power (ERP)          | FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 22.913(a) | ANSI/TIA-603-E-2016 & KDB 971168 D01v03r01 | PASS   |
| Conducted Output Power                  | FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 22.913(a) | ANSI/TIA-603-E-2016 & KDB 971168 D01v03r01 | PASS   |
| Peak-to-average ratio                   | FCC 47 CFR Part 22.913(a)                             | ANSI/TIA-603-E-2016 & KDB 971168 D01v03r01 | PASS   |
| 99%&26dB Bandwidth                      | FCC 47 CFR Part 2.1049(h)                             | ANSI/TIA-603-E-2016 & KDB 971168 D01v03r01 | PASS   |
| Band Edge at antenna terminals          | FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 22.917(a)    | ANSI/TIA-603-E-2016 & KDB 971168 D01v03r01 | PASS   |
| Spurious emissions at antenna terminals | FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 22.917(a)(b) | ANSI/TIA-603-E-2016 & KDB 971168 D01v03r01 | PASS   |
| Field strength of spurious radiation    | FCC 47 CFR Part 2.1053 & FCC 47 CFR Part 22.917(a)(b) | ANSI/TIA-603-E-2016 & KDB 971168 D01v03r01 | PASS   |
| Frequency stability                     | FCC 47 CFR Part 2.1055 & FCC 47 CFR Part 22.355       | ANSI/TIA-603-E-2016 & KDB 971168 D01v03r01 | PASS   |

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### 3. EQUIPMENT LIST

| Radiated Emission Test Equipment List |                                   |              |           |                            |                         |                             |
|---------------------------------------|-----------------------------------|--------------|-----------|----------------------------|-------------------------|-----------------------------|
| Used                                  | Equipment                         | Manufacturer | Model No. | Serial Number              | Cal. date (mm dd, yyyy) | Cal. Due date (mm dd, yyyy) |
| <input checked="" type="checkbox"/>   | 3M Chamber & Accessory Equipment  | ETS-LINDGREN | 3M        | N/A                        | Dec. 20, 2015           | Dec. 19, 2018               |
| <input checked="" type="checkbox"/>   | Receiver                          | R&S          | ESIB26    | 100114                     | Dec. 10, 2017           | Dec. 10, 2018               |
| <input checked="" type="checkbox"/>   | Broadband Antenna                 | ETS-LINDGREN | 3142E     | 00201566                   | Dec. 17, 2017           | Dec. 17, 2018               |
| <input checked="" type="checkbox"/>   | Preamplifier                      | HP           | 8447F     | 2805A02960                 | Dec. 10, 2017           | Dec. 10, 2018               |
| <input checked="" type="checkbox"/>   | Broadband Antenna (Pre-amplifier) | ETS-LINDGREN | 3142E-PA  | 00201891                   | May 19, 2018            | May 19, 2019                |
| <input checked="" type="checkbox"/>   | Horn Antenna                      | ETS-LINDGREN | 3117      | 00164202                   | Dec. 17, 2017           | Dec. 17, 2018               |
| <input checked="" type="checkbox"/>   | Horn Antenna (Pre-amplifier)      | ETS-LINDGREN | 3117-PA   | 00201874                   | May 22, 2018            | May 22, 2019                |
| <input checked="" type="checkbox"/>   | Multi device Controller           | ETS-LINDGREN | 7006-001  | 00160105                   | N/A                     | N/A                         |
| <input checked="" type="checkbox"/>   | Test Software                     | Audix        | e3        | Software Version: 9.160323 |                         |                             |

| 2/3/4G RF Test Equipment List       |                                      |              |                      |                        |                            |                             |
|-------------------------------------|--------------------------------------|--------------|----------------------|------------------------|----------------------------|-----------------------------|
| Used                                | Equipment                            | Manufacturer | Model No.            | Serial Number          | Cal. date (mm dd, yyyy)    | Cal. Due date (mm dd, yyyy) |
| <input checked="" type="checkbox"/> | Receiver                             | R&S          | ESR7                 | 1316.3003K07-101181-K3 | Dec. 10, 2017              | Dec. 10, 2018               |
| <input checked="" type="checkbox"/> | EXA Spectrum Analyzer                | KEYSIGHT     | N9010A               | MY51440197             | Dec.10, 2017               | Dec. 10, 2018               |
| <input checked="" type="checkbox"/> | Wideband Radio Communication Tester  | R&S          | CMW500               | 116254                 | June 07, 2018              | June 07, 2019               |
| <input type="checkbox"/>            | Universal Radio Communication Tester | R&S          | CMU200               | 114713                 | Dec. 10, 2017              | Dec. 10, 2018               |
| <input checked="" type="checkbox"/> | DC Source                            | KIKUSUI      | PWR400L              | LK003024               | Sep. 14, 2017              | Sep. 13, 2018               |
| <input type="checkbox"/>            | Temp & Humidity chamber              | Espec        | GL(U)04KA(W)         | 16921H201P3            | Sep. 14, 2017              | Sep. 13, 2018               |
| <input checked="" type="checkbox"/> | Temp & Humidity chamber              | Votisch      | VT4002               | 58566133290020         | June 05, 2018              | June 05, 2019               |
| <input type="checkbox"/>            | Test Software                        | ECIT         | AutomationTestSystem |                        | Software Version: 2.170530 |                             |

## 4. TEST CONFIGURATION

### 4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

#### 4.1.1 Normal or Extreme Test Conditions

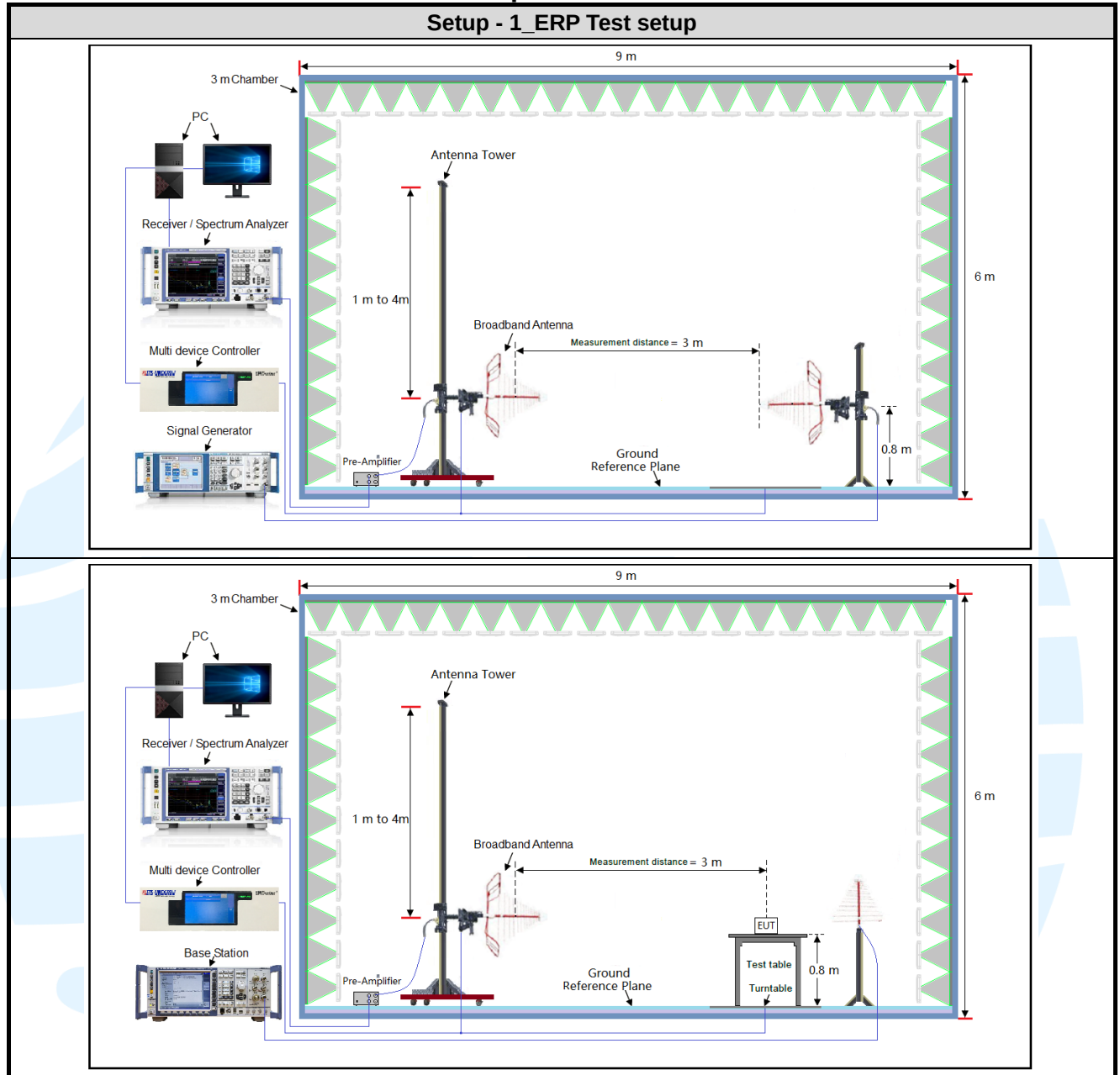
| Test Environment | Selected Values During Tests |             |                       |
|------------------|------------------------------|-------------|-----------------------|
| Test Condition   | Ambient                      |             |                       |
|                  | Temperature (°C)             | Voltage (V) | Relative Humidity (%) |
| TN/VN            | +15 to +35                   | 3.8         | 20 to 75              |
| TL/VL            | -30                          | 3.5         | 20 to 75              |
| TH/VL            | +50                          | 3.5         | 20 to 75              |
| TL/VH            | -30                          | 4.35        | 20 to 75              |
| TH/VH            | +50                          | 4.35        | 20 to 75              |

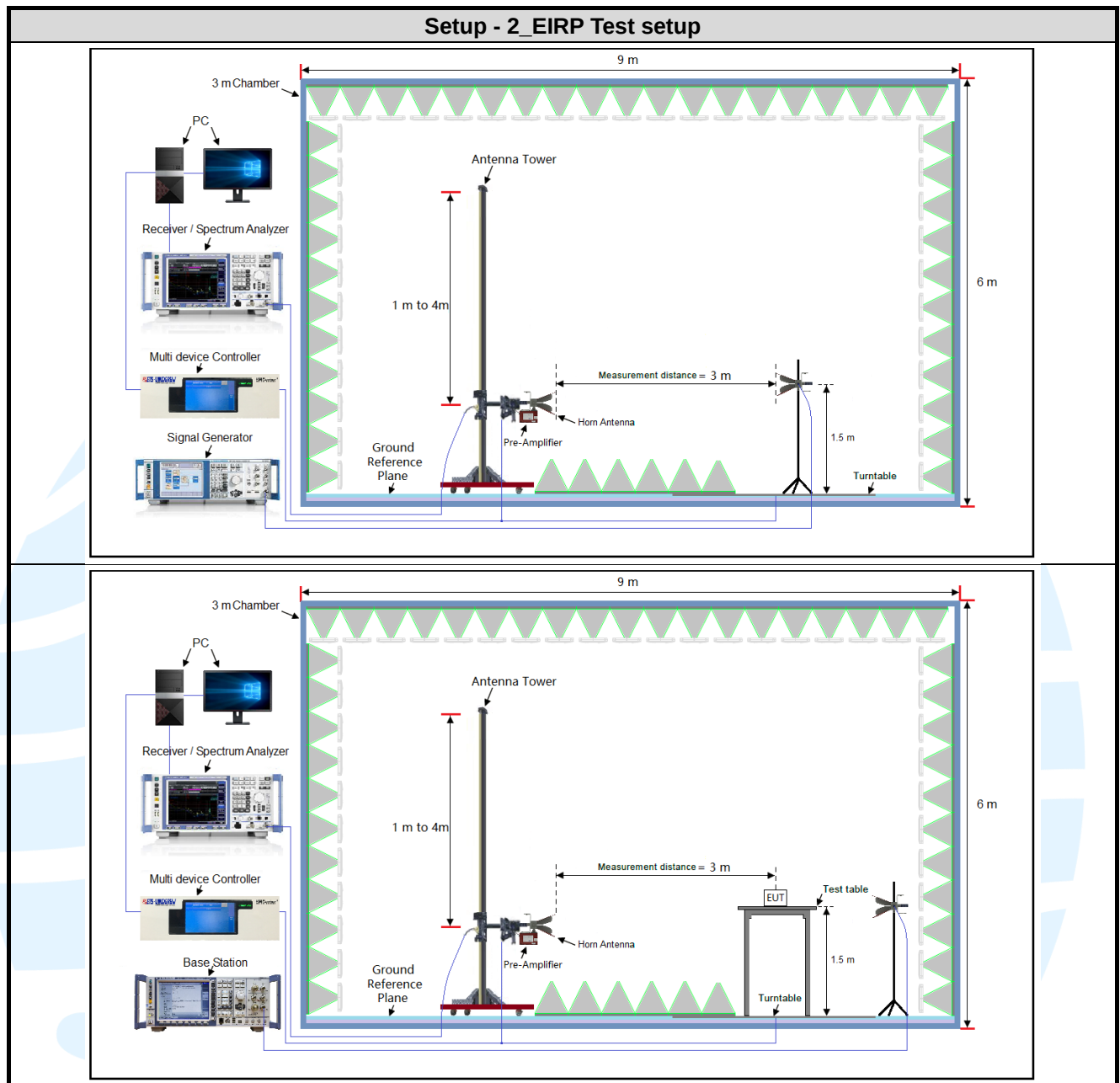
**Remark:**

- 1) The EUT just work in such extreme temperature of -30 °C to +50 °C and the extreme voltage of 3.5 V to 4.35 V, so here the EUT is tested in the temperature of -30 °C to +50 °C and the voltage of 3.5 V to 4.35 V.
- 2) VN: Normal Voltage; TN: Normal Temperature;  
TL: Low Extreme Test Temperature; TH: High Extreme Test Temperature;  
VL: Low Extreme Test Voltage; VH: High Extreme Test Voltage.

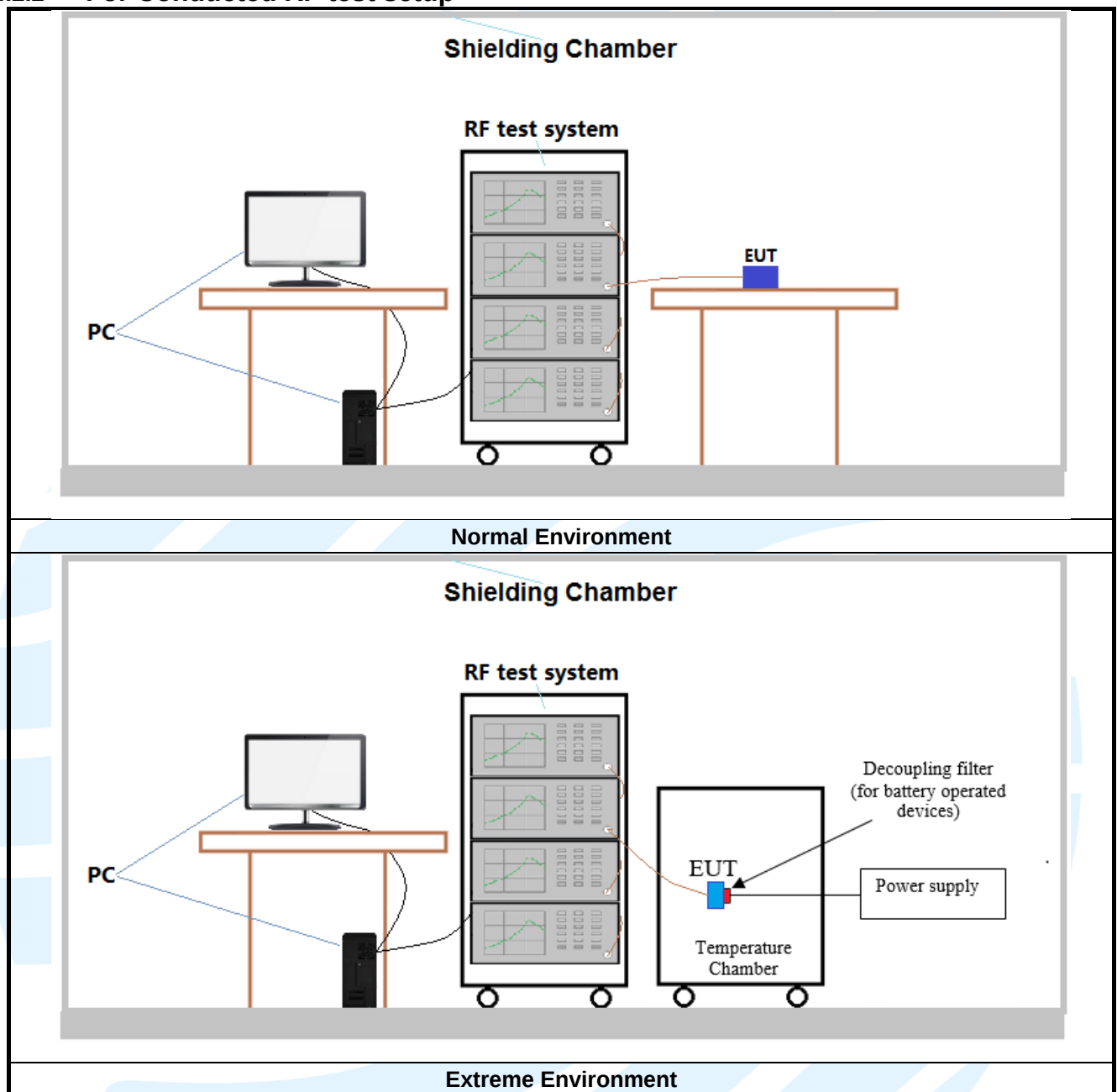
## 4.2 TEST SETUP

### 4.2.1 For Radiated Emissions test setup





#### 4.2.2 For Conducted RF test setup



### 4.3 TEST CHANNELS

| Band                 | Tx/Rx Frequency           | RF Channel   |              |              |
|----------------------|---------------------------|--------------|--------------|--------------|
|                      |                           | Low(L)       | Middle(M)    | High(H)      |
| GSM/GPRS/<br>EDGE850 | Tx<br>(824 MHz ~ 849 MHz) | Channel 128  | Channel 190  | Channel 251  |
|                      |                           | 824.2 MHz    | 836.6 MHz    | 848.8 MHz    |
| WCDMA band V         | Tx<br>(824 MHz ~ 849 MHz) | Channel 4132 | Channel 4182 | Channel 4233 |
|                      |                           | 826.4 MHz    | 836.4 MHz    | 846.6 MHz    |

| Band                         | Test Frequency ID | Bandwidth (MHz) | Number [UL] | Frequency of Uplink (MHz) |
|------------------------------|-------------------|-----------------|-------------|---------------------------|
| LTE band 5<br>TX:824~849 MHz | Low Range         | 1.4             | 20407       | 824.7                     |
|                              |                   | 3               | 20415       | 825.5                     |
|                              |                   | 5               | 20425       | 826.5                     |
|                              |                   | 10              | 20450       | 829                       |
|                              | Middle Range      | 1.4/3/5/10      | 20525       | 836.5                     |
|                              | High Range        | 1.4             | 20643       | 848.3                     |
|                              |                   | 3               | 20635       | 847.5                     |
|                              |                   | 5               | 20625       | 846.5                     |
|                              |                   | 10              | 20600       | 844                       |

### 4.4 SYSTEM TEST CONFIGURATION

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. It was powered by a 3.8V battery. Only the worst case data were recorded in this test report.

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, X/Y/Z axis, and antenna ports.

The worst case was found when positioned as the table below.

| Band         | Mode | Antenna Port | Worst-case axis positioning |
|--------------|------|--------------|-----------------------------|
| GSM 850      | 1TX  | Chain 0      | Y axis                      |
| EDGE 850     | 1TX  | Chain 0      | Y axis                      |
| WCDMA Band V | 1TX  | Chain 0      | Y axis                      |
| LTE Band 5   | 1TX  | Chain 0      | Y axis                      |

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000MHz. The resolution is 1 MHz or greater for frequencies above 1000MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

## 4.5 PRE-SCAN

Pre-scan under all rate at lowest middle and highest channel, find the transmitter power as below:

SIM 1 Card Conducted transmitter power measurement result.

| GSM 850 Maximum Average Power (dBm) |           |              |           |
|-------------------------------------|-----------|--------------|-----------|
| Channel                             | 128       | 190          | 251       |
| Frequency(MHz)                      | 824.2 MHz | 836.6 MHz    | 848.8 MHz |
| GSM (GMSK, 1Tx-slot)                | 31.98     | <b>31.99</b> | 31.97     |
| GPRS (GMSK, 1Tx-slot)               | 31.98     | 31.96        | 31.97     |
| GPRS (GMSK, 2Tx-slot)               | 31.17     | 31.19        | 31.19     |
| GPRS (GMSK, 3Tx-slot)               | 29.34     | 29.36        | 29.38     |
| GPRS (GMSK, 4Tx-slot)               | 28.19     | 28.28        | 28.23     |
| EDGE (8PSK, 1Tx-slot)               | 27.12     | 26.74        | 27.02     |
| EDGE (8PSK, 2Tx-slot)               | 25.71     | 25.82        | 25.68     |
| EDGE (8PSK, 3Tx-slot)               | 23.26     | 23.38        | 23.16     |
| EDGE (8PSK, 4Tx-slot)               | 21.92     | 22.23        | 22.25     |

| WCDMA Band V Maximum Average Power (dBm) |           |              |           |
|------------------------------------------|-----------|--------------|-----------|
| Channel                                  | 4132      | 4182         | 4233      |
| Frequency(MHz)                           | 826.4 MHz | 836.4 MHz    | 846.6 MHz |
| RMC 12.2K                                | 21.90     | <b>21.96</b> | 21.92     |
| HSDPA Subtest-1                          | 20.93     | 20.91        | 20.99     |
| HSDPA Subtest-2                          | 20.91     | 20.90        | 20.95     |
| HSDPA Subtest-3                          | 20.46     | 20.38        | 20.53     |
| HSDPA Subtest-4                          | 20.38     | 20.41        | 20.45     |
| HSUPA Subtest-1                          | 20.61     | 20.62        | 20.59     |
| HSUPA Subtest-2                          | 18.65     | 18.65        | 18.62     |
| HSUPA Subtest-3                          | 19.05     | 19.01        | 19.06     |
| HSUPA Subtest-4                          | 18.47     | 18.46        | 18.45     |
| HSUPA Subtest-5                          | 20.22     | 20.26        | 20.22     |
| DC-HSDPA Subtest-1                       | 20.91     | 20.84        | 20.94     |
| DC-HSDPA Subtest-2                       | 20.85     | 20.82        | 20.93     |
| DC-HSDPA Subtest-3                       | 20.45     | 20.36        | 20.45     |
| DC-HSDPA Subtest-4                       | 20.31     | 20.33        | 20.39     |
| HSPA+                                    | --        | --           | --        |

| LTE Band 5 Maximum Average Power (dBm) |      |        |              |       |              |                           |        |              |       |       |
|----------------------------------------|------|--------|--------------|-------|--------------|---------------------------|--------|--------------|-------|-------|
| Modulation                             | RB   |        | Test Channel |       |              | RB                        |        | Test Channel |       |       |
|                                        | Size | Offset | Low          | Mid   | High         | Size                      | Offset | Low          | Mid   | High  |
| Channel Bandwidth: 1.4 MHz             |      |        |              |       |              | Channel Bandwidth: 3 MHz  |        |              |       |       |
| QPSK                                   | 1    | 0      | 21.95        | 21.62 | 21.76        | 1                         | 0      | 21.91        | 21.70 | 21.73 |
|                                        | 1    | 2      | 21.92        | 21.86 | 21.68        | 1                         | 7      | <b>22.04</b> | 21.89 | 21.72 |
|                                        | 1    | 5      | 21.80        | 21.88 | 21.65        | 1                         | 14     | 21.85        | 21.72 | 21.65 |
|                                        | 3    | 0      | 22.06        | 21.78 | <b>22.10</b> | 8                         | 0      | 21.07        | 20.82 | 21.20 |
|                                        | 3    | 1      | 21.96        | 21.85 | 21.94        | 8                         | 3      | 20.93        | 20.82 | 20.84 |
|                                        | 3    | 3      | 21.84        | 22.01 | 21.68        | 8                         | 7      | 20.81        | 21.15 | 20.74 |
| 16QAM                                  | 6    | 0      | 20.99        | 20.85 | 20.81        | 15                        | 0      | 20.90        | 20.84 | 20.92 |
|                                        | 1    | 0      | 21.34        | 20.87 | 20.96        | 1                         | 0      | 21.35        | 20.82 | 20.78 |
|                                        | 1    | 2      | 21.33        | 20.68 | 20.88        | 1                         | 7      | 21.23        | 20.78 | 20.88 |
|                                        | 1    | 5      | 21.07        | 20.92 | 20.73        | 1                         | 14     | 21.11        | 20.83 | 20.68 |
|                                        | 3    | 0      | 21.04        | 20.83 | 21.20        | 8                         | 0      | 20.15        | 19.70 | 20.20 |
|                                        | 3    | 1      | 21.06        | 20.77 | 20.89        | 8                         | 3      | 19.98        | 19.74 | 19.87 |
| QPSK                                   | 3    | 3      | 20.75        | 21.09 | 20.71        | 8                         | 7      | 19.88        | 20.09 | 19.72 |
|                                        | 6    | 0      | 19.88        | 19.85 | 20.02        | 15                        | 0      | 19.82        | 20.01 | 19.89 |
| Channel Bandwidth: 5 MHz               |      |        |              |       |              | Channel Bandwidth: 10 MHz |        |              |       |       |
| QPSK                                   | 1    | 0      | 21.89        | 21.66 | 21.66        | 1                         | 0      | 21.97        | 21.80 | 21.85 |
|                                        | 1    | 12     | <b>21.97</b> | 21.91 | 21.79        | 1                         | 24     | <b>22.12</b> | 21.92 | 21.85 |
|                                        | 1    | 24     | 21.78        | 21.83 | 21.56        | 1                         | 49     | 21.88        | 21.91 | 21.68 |
|                                        | 12   | 0      | 21.14        | 20.90 | 21.09        | 25                        | 0      | 21.24        | 20.93 | 21.21 |
|                                        | 12   | 6      | 21.01        | 20.89 | 20.80        | 25                        | 12     | 21.06        | 20.91 | 20.97 |
|                                        | 12   | 13     | 20.78        | 21.07 | 20.61        | 25                        | 25     | 20.87        | 21.16 | 20.77 |
| 16QAM                                  | 25   | 0      | 20.95        | 20.94 | 20.82        | 50                        | 0      | 21.03        | 21.01 | 20.94 |
|                                        | 1    | 0      | 21.33        | 20.89 | 20.93        | 1                         | 0      | 21.38        | 20.95 | 20.96 |
|                                        | 1    | 12     | 21.36        | 20.71 | 20.82        | 1                         | 24     | 21.38        | 20.88 | 21.00 |
|                                        | 1    | 24     | 21.14        | 20.97 | 20.62        | 1                         | 49     | 21.23        | 20.97 | 20.75 |
|                                        | 12   | 0      | 20.13        | 19.70 | 20.14        | 25                        | 0      | 20.19        | 19.84 | 20.27 |
|                                        | 12   | 6      | 19.92        | 19.77 | 20.01        | 25                        | 12     | 20.11        | 19.94 | 20.03 |
| 16QAM                                  | 12   | 13     | 19.88        | 19.98 | 19.81        | 25                        | 25     | 19.91        | 20.14 | 19.91 |
|                                        | 25   | 0      | 19.92        | 19.96 | 19.91        | 50                        | 0      | 20.01        | 20.02 | 20.02 |

Pre-scan all bandwidth and RB, find worse case mode are chosen to the report, the worse mode applicability and tested channel detail as below:

| Band                  | Radiated                                                                                       | Conducted                                                                                     |
|-----------------------|------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| GSM/GPRS/<br>EDGE 850 | 1) GSM (GMSK, 1Tx-slot) Link<br>2) GPRS (GMSK, 1Tx-slot) Link<br>3) EDGE (8PSK, 1Tx-slot) Link | 1) GSM (GMSK,1Tx-slot) Link<br>2) GPRS (GMSK, 1Tx-slot) Link<br>3) EDGE (8PSK, 1Tx-slot) Link |
| WCDMA Band V          | RMC 12.2Kbps Link                                                                              | RMC 12.2Kbps Link                                                                             |

LTE worse case mode applicability and tested channel detail as below:

| Item                                                                                                                                                                                                                  | Channel Bandwidth(MHz)              |                                     |                                     |                                     |    |    | Modulation                          |                                     |                          | RB #                                |                                     |                                     | Test                                |                                     |                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|----|----|-------------------------------------|-------------------------------------|--------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
|                                                                                                                                                                                                                       | 1.4                                 | 3                                   | 5                                   | 10                                  | 15 | 20 | QPSK                                | 16QAM                               | 64QAM                    | 1                                   | Half                                | Full                                | L                                   | M                                   | H                                   |
| <b>LTE Band 5</b>                                                                                                                                                                                                     |                                     |                                     |                                     |                                     |    |    |                                     |                                     |                          |                                     |                                     |                                     |                                     |                                     |                                     |
| Effective Radiated Power                                                                                                                                                                                              | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | -- | -- | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Conducted output power                                                                                                                                                                                                | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | -- | -- | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 99%&26dB Bandwidth                                                                                                                                                                                                    | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | -- | -- | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Band Edge at antenna terminals                                                                                                                                                                                        | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | -- | -- | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Spurious emissions at antenna terminals                                                                                                                                                                               | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | -- | -- | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Field strength of spurious radiation                                                                                                                                                                                  | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | -- | -- | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Frequency stability                                                                                                                                                                                                   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | -- | -- | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Remark:<br>The mark " <input checked="" type="checkbox"/> " means is chosen for testing;<br>The mark " <input type="checkbox"/> " means is not chosen for testing;<br>The mark "--" means is not supported bandwidth. |                                     |                                     |                                     |                                     |    |    |                                     |                                     |                          |                                     |                                     |                                     |                                     |                                     |                                     |

## 5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION

### 5.1 REFERENCE DOCUMENTS FOR TESTING

| No. | Identity                     | Document Title                                                                      |
|-----|------------------------------|-------------------------------------------------------------------------------------|
| 1   | FCC 47 CFR Part 2 Subpart J  | Frequency allocations and radio treaty matters; general rules and regulations       |
| 2   | FCC 47 CFR Part 22 Subpart H | Cellular Radiotelephone Service                                                     |
| 3   | ANSI/TIA-603-E-2016          | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards |
| 4   | KDB 971168 D01               | KDB 971168 D01 Power Meas License Digital Systems v03r01                            |

### 5.2 EFFECTIVE RADIATED POWER (ERP)

**Test Requirement:** FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 22.913(a)

**Test Method:** KDB 971168 D01v03r01& ANSI/TIA-603-E-2016

**Limit:**

The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

**Test Procedure:**

Test procedure as below:

- The EUT was powered ON and placed on a 0.8/1.5m high table at a 3 meter semi/fully Anechoic Chamber. The antenna of the transmitter was extended to its maximum length. Modulation mode and the measuring receiver shall be tuned to the frequency of the transmitter under test.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.
- Steps 1) to 3) were performed with the EUT and the receive antenna in both vertical and horizontal polarization.
- The transmitter was then removed and replaced with another antenna. The center of the antenna was approximately at the same location as the center of the transmitter.
- A signal at the disturbance was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 3) is obtained for this set of conditions.
- The output power into the substitution antenna was then measured.
- Steps 6) and 7) were repeated with both antennas polarized.
- Calculate power in dBm by the following formula:

$$ERP(dBm) = P_g(dBm) - \text{cable loss (dB)} + \text{antenna gain (dBd)}$$

$$EIRP(dBm) = P_g(dBm) - \text{cable loss (dB)} + \text{antenna gain (dBi)}$$

$$EIRP = ERP + 2.15dB$$

where:

$P_g$  is the generator output power into the substitution antenna.

- Test the EUT in the lowest channel, the middle channel the Highest channel
- The radiation measurements are performed in X, Y, Z axis positioning for EUT operation mode, and found the Y axis positioning which it is worse case.
- Repeat above procedures until all frequencies measured was complete.

**Receiver Setup:**

| Frequency  | Detector | RBW    | VBW    | Remark |
|------------|----------|--------|--------|--------|
| 30MHz-1GHz | Peak     | 100kHz | 300kHz | Peak   |
| Above 1GHz | Peak     | 1MHz   | 3MHz   | Peak   |

**Test Setup:** Refer to section 4.2.1 for details.

**Instruments Used:** Refer to section 3 for details

**Test Mode:** Link mode

**Test Results:** Pass

**Test Data:** See table below

| Maximum ERP (dBm) |                 |                  |                       |                |        |
|-------------------|-----------------|------------------|-----------------------|----------------|--------|
| Channel           | GSM<br>1Tx-slot | EDGE<br>1Tx-slot | WCDMA<br>RMC 12.2Kbps | Limit<br>(dBm) | Result |
| Lowest            | 31.65           | 26.79            | 21.57                 | 38.45          | Pass   |
| Middle            | 31.66           | 26.41            | 21.63                 | 38.45          | Pass   |
| Highest           | 31.64           | 26.69            | 21.59                 | 38.45          | Pass   |

| LTE Band 5 Maximum ERP (dBm) |       |       |       |                |        |
|------------------------------|-------|-------|-------|----------------|--------|
| Channel                      | QPSK  | 16QAM | 64QAM | Limit<br>(dBm) | Result |
| Channel Bandwidth: 1.4MHz    |       |       |       |                |        |
| Lowest                       | 21.80 | 21.08 | N/A   | 38.45          | Pass   |
| Middle                       | 21.62 | 20.83 | N/A   | 38.45          | Pass   |
| Highest                      | 21.84 | 20.94 | N/A   | 38.45          | Pass   |
| Channel Bandwidth: 3MHz      |       |       |       |                |        |
| Lowest                       | 21.78 | 21.09 | N/A   | 38.45          | Pass   |
| Middle                       | 21.63 | 20.57 | N/A   | 38.45          | Pass   |
| Highest                      | 21.47 | 20.62 | N/A   | 38.45          | Pass   |
| Channel Bandwidth: 5MHz      |       |       |       |                |        |
| Lowest                       | 21.71 | 21.10 | N/A   | 38.45          | Pass   |
| Middle                       | 21.65 | 20.71 | N/A   | 38.45          | Pass   |
| Highest                      | 21.53 | 20.67 | N/A   | 38.45          | Pass   |
| Channel Bandwidth: 10MHz     |       |       |       |                |        |
| Lowest                       | 21.86 | 21.12 | N/A   | 38.45          | Pass   |
| Middle                       | 21.66 | 20.69 | N/A   | 38.45          | Pass   |
| Highest                      | 21.59 | 20.74 | N/A   | 38.45          | Pass   |

### 5.3 CONDUCTED OUTPUT POWER

**Test Requirement:** FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 22.913(a)

**Test Method:** ANSI/TIA-603-E-2016 & KDB 971168 D01v03r01

**Limit:**

The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

**Test Procedure:**

The EUT was set up for the maximum power with GSM, GPRS, EDGE, WCDMA, CDMA2000, and LTE link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

**Test Setup:** Refer to section 4.2.2 for details.

**Instruments Used:** Refer to section 3 for details

**Test Mode:** Link mode

**Test Results:** Pass

**Test Data:** The full result refer to section 4.5 for details.

## 5.4 PEAK-TO-AVERAGE RATIO

**Test Requirement:** FCC 47 CFR Part 22.913(a)

**Test Method:** KDB 971168 D01v03r01

**Limit:** In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB

**Test Procedure:**

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer.

- Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth
- Set the number of counts to a value that stabilizes the measured CCDF curve
- Record the maximum PAPR level associated with a probability of 0.1 %

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

**Test Setup:** Refer to section 4.2.2 for details.

**Instruments Used:** Refer to section 3 for details

**Test Mode:** Link mode

**Test Results:** Pass

**Test Data:** See table below

| Peak-to-average ratio (dB) |                 |                  |                  |                |        |
|----------------------------|-----------------|------------------|------------------|----------------|--------|
| Channel                    | GSM<br>1Tx-slot | GPRS<br>1Tx-slot | EDGE<br>1Tx-slot | Limit<br>(dBm) | Result |
| Lowest                     | 0.27            | 0.17             | 2.88             | 13             | Pass   |
| Middle                     | 0.27            | 0.17             | 2.93             | 13             | Pass   |
| Highest                    | 0.27            | 0.17             | 2.97             | 13             | Pass   |

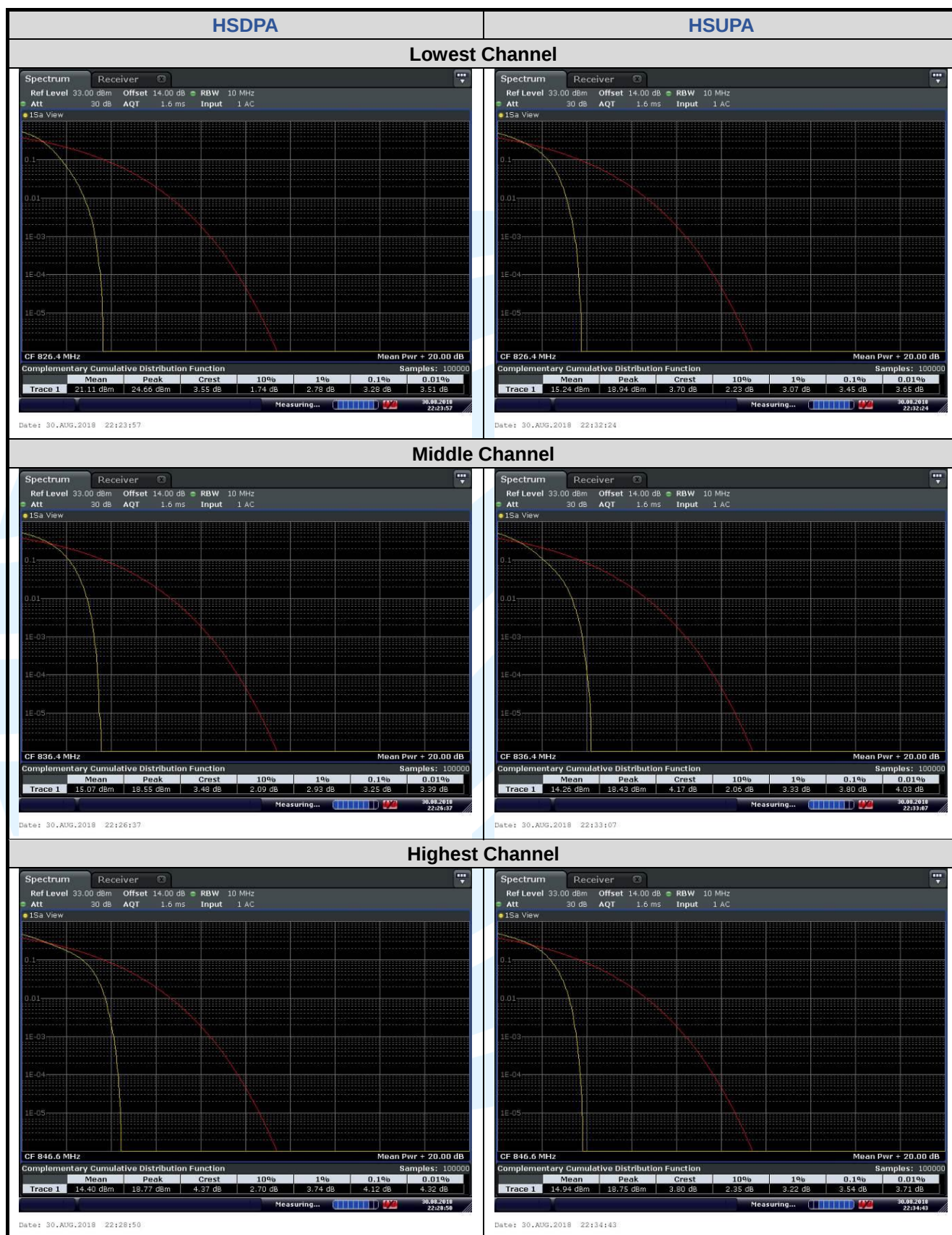
| Channel | WCDMA<br>RMC 12.2Kbps | HSDPA | HSUPA | Limit<br>(dBm) | Result |
|---------|-----------------------|-------|-------|----------------|--------|
| Lowest  | 2.99                  | 3.28  | 3.45  | 13             | Pass   |
| Middle  | 2.96                  | 3.25  | 3.80  | 13             | Pass   |
| Highest | 3.16                  | 4.12  | 3.54  | 13             | Pass   |

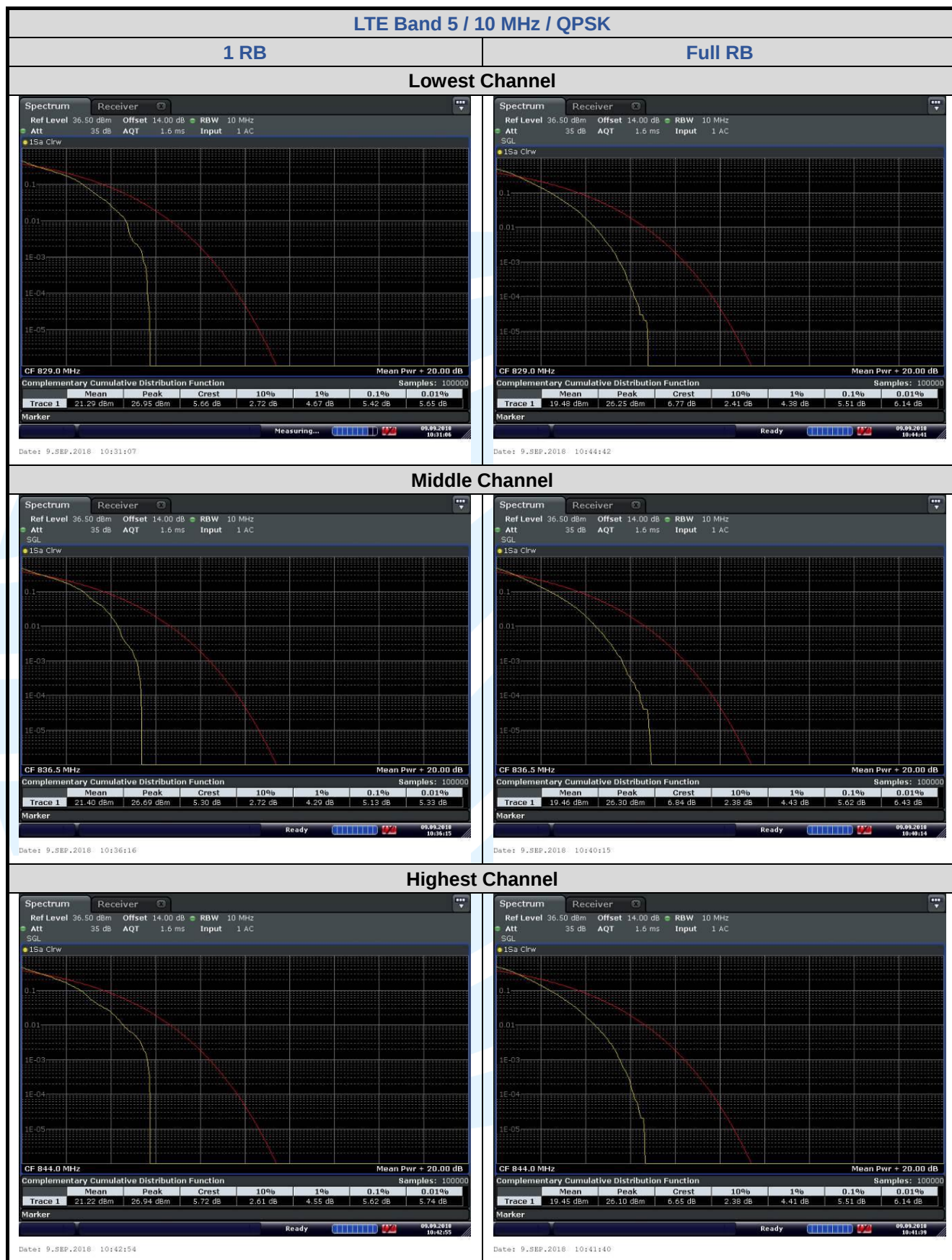
| LTE Band 5 Peak-to-average ratio (dB) |                     |                           |       |       |               |        |
|---------------------------------------|---------------------|---------------------------|-------|-------|---------------|--------|
| Channel                               | RB<br>Configuration | Channel Bandwidth: 10 MHz |       |       | Limit<br>(dB) | Result |
|                                       |                     | QPSK                      | 16QAM | 64QAM |               |        |
| Lowest                                | 1 RB                | 5.42                      | 6.81  | N/A   | 13            | Pass   |
|                                       | Full RB             | 5.51                      | 6.43  | N/A   | 13            | Pass   |
| Middle                                | 1 RB                | 5.13                      | 5.88  | N/A   | 13            | Pass   |
|                                       | Full RB             | 5.62                      | 6.35  | N/A   | 13            | Pass   |
| Highest                               | 1 RB                | 5.62                      | 6.09  | N/A   | 13            | Pass   |
|                                       | Full RB             | 5.51                      | 6.35  | N/A   | 13            | Pass   |

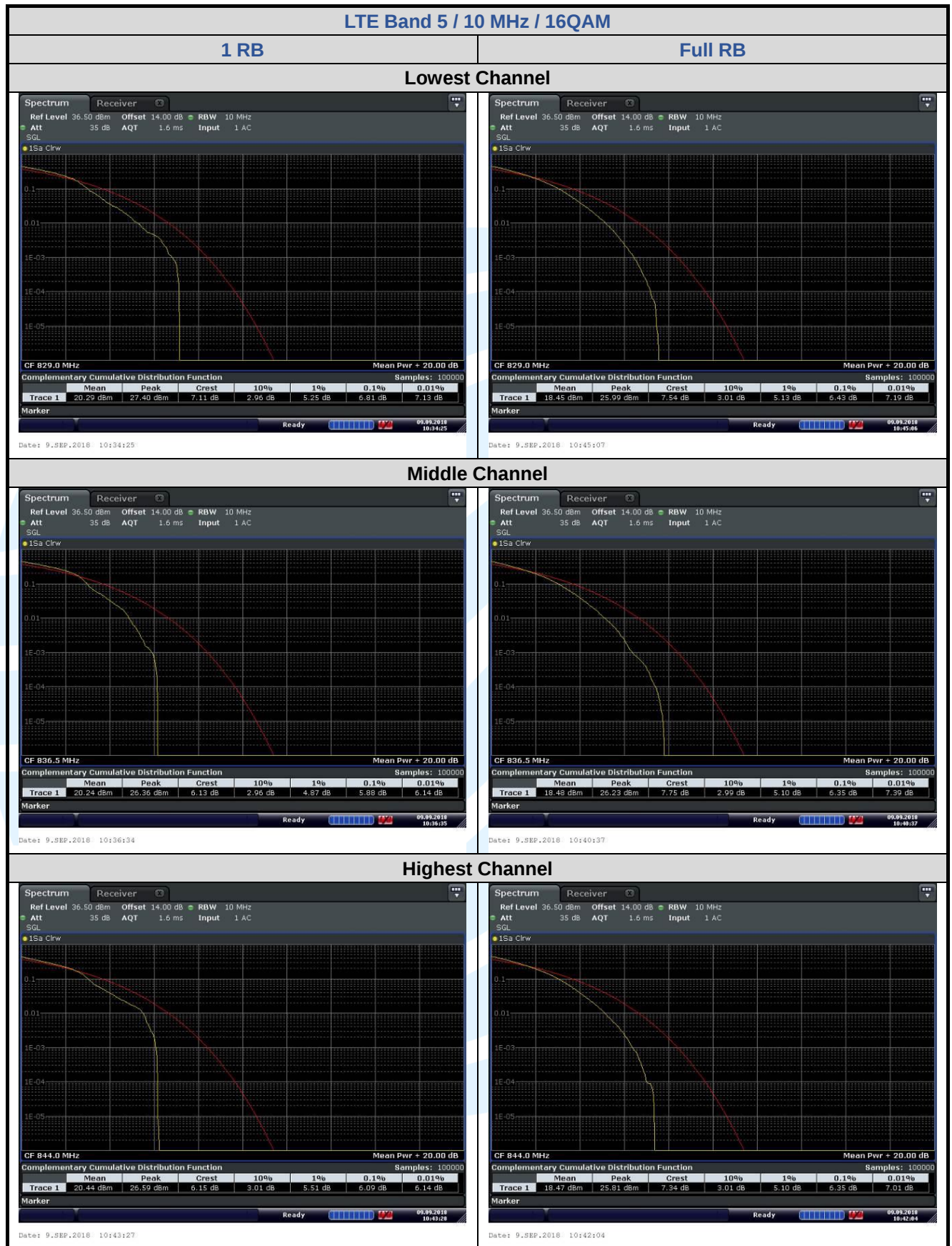
The test plot as follows:











## 5.5 99%&26DB BANDWIDTH

**Test Requirement:** FCC 47 CFR Part 2.1049(h) & FCC 47 CFR Part 22.917(b)

**Test Method:** ANSI/TIA-603-E-2016 & KDB 971168 D01v03r01

**Limit:** No Limit

**Test Procedure:**

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the low, middle and high channel in each band. The 99% and -26dB bandwidths was also measured and recorded.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

**Test Setup:** Refer to section 4.2.2 for details.

**Instruments Used:** Refer to section 3 for details

**Test Mode:** Link mode

**Test Results:** Pass

**Test Data:** See table below

| 99% & 26 dB Bandwidth |         |                 |                |              |
|-----------------------|---------|-----------------|----------------|--------------|
| Test Mode             | Channel | Frequency (MHz) | 26 dB BW (kHz) | 99% BW (kHz) |
| GSM 1Tx-slot          | 128     | 824.2           | 317.1          | 244.31       |
|                       | 190     | 836.6           | 312.1          | 243.26       |
|                       | 251     | 848.8           | 311.7          | 246.31       |
| GPRS 1Tx-slot         | 128     | 824.2           | 317.4          | 246.39       |
|                       | 190     | 836.6           | 317.7          | 243.12       |
|                       | 251     | 848.8           | 317.8          | 243.36       |
| EDGE 1Tx-slot         | 128     | 824.2           | 296.8          | 242.17       |
|                       | 190     | 836.6           | 306.5          | 238.44       |
|                       | 251     | 848.8           | 315.5          | 244.41       |

| 99% & 26 dB Bandwidth |         |                 |                |              |
|-----------------------|---------|-----------------|----------------|--------------|
| Test Mode             | Channel | Frequency (MHz) | 26 dB BW (MHz) | 99% BW (MHz) |
| WCDMA RMC 12.2Kbps    | 4132    | 826.4           | 4.726          | 4.1701       |
|                       | 4182    | 836.4           | 4.716          | 4.1780       |
|                       | 4233    | 846.6           | 4.712          | 4.1768       |
| HSDPA                 | 4132    | 826.4           | 4.856          | 4.1931       |
|                       | 4182    | 836.4           | 5.107          | 4.2066       |
|                       | 4233    | 846.6           | 5.118          | 4.2042       |
| HSUPA                 | 4132    | 826.4           | 4.979          | 4.1866       |
|                       | 4182    | 836.4           | 4.742          | 4.1931       |
|                       | 4233    | 846.6           | 5.470          | 4.1930       |

| LTE Band 5                 |                  |        |                |       |       |              |        |       |
|----------------------------|------------------|--------|----------------|-------|-------|--------------|--------|-------|
| Channel                    | RB Configuration |        | 26 dB BW (MHz) |       |       | 99% BW (MHz) |        |       |
|                            | Size             | Offset | QPSK           | 16QAM | 64QAM | QPSK         | 16QAM  | 64QAM |
| Channel Bandwidth: 1.4 MHz |                  |        |                |       |       |              |        |       |
| Lowest                     | 6                | 0      | 1.277          | 2.285 | N/A   | 1.1002       | 1.1000 | N/A   |
| Middle                     | 6                | 0      | 1.280          | 1.287 | N/A   | 1.0951       | 1.0935 | N/A   |
| Highest                    | 6                | 0      | 1.309          | 1.296 | N/A   | 1.1023       | 1.1033 | N/A   |
| Channel Bandwidth: 3 MHz   |                  |        |                |       |       |              |        |       |
| Lowest                     | 15               | 0      | 2.931          | 2.928 | N/A   | 2.7001       | 2.6962 | N/A   |
| Middle                     | 15               | 0      | 2.937          | 2.913 | N/A   | 2.6982       | 2.6959 | N/A   |
| Highest                    | 15               | 0      | 2.939          | 2.924 | N/A   | 2.7044       | 2.6953 | N/A   |
| Channel Bandwidth: 5 MHz   |                  |        |                |       |       |              |        |       |
| Lowest                     | 25               | 0      | 5.099          | 5.098 | N/A   | 4.5123       | 4.5140 | N/A   |
| Middle                     | 25               | 0      | 5.155          | 5.192 | N/A   | 4.5464       | 4.5199 | N/A   |
| Highest                    | 25               | 0      | 5.226          | 5.130 | N/A   | 4.5325       | 4.5252 | N/A   |
| Channel Bandwidth: 10 MHz  |                  |        |                |       |       |              |        |       |
| Lowest                     | 50               | 0      | 10.02          | 9.925 | N/A   | 8.9964       | 8.9963 | N/A   |
| Middle                     | 50               | 0      | 9.979          | 10.14 | N/A   | 9.0295       | 9.0287 | N/A   |
| Highest                    | 50               | 0      | 10.57          | 9.778 | N/A   | 8.9932       | 8.9848 | N/A   |

The test plot as follows:

