



## MEASUREMENT REPORT

**FCC ID** : XBG-BA1GMNRCH8  
**APPLICANT** : AVALUE TECHNOLOGY INCORPORATION  
**Application Type** : Certification  
**Product** : Intercom  
**Model Name** : Monarch 8  
**Model Number** : BUTTERFLYMX.M8.1  
**Trade Mark** :   
**FCC Classification** : PCS Licensed Transmitter (PCB)  
**FCC Rule Part(s)** : Part2, Part22 Subpart H, Part24 Subpart E, Part27  
**Test Procedure(s)** : ANSI/TIA-603-E-2016  
**Received Date** : September 13, 2022  
**Test Date** : September 23 ~ November 18, 2022

**Tested By** :   
( Wen Lee )  
**Reviewed By** :   
( Paddy Chen )  
**Approved By** :   
( Chenz Ker )



The test results only relate to the tested sample.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Taiwan) Co., Ltd.

## Revision History

| Report No.     | Version | Description     | Issue Date | Note |
|----------------|---------|-----------------|------------|------|
| 2209TWI301-U17 | 1.0     | Original Report | 2022-12-15 |      |

Note: This case is a copy report, the original report number is 2209TWI301-U8 (FCC ID: XBG-BA1GMNRCH12). Model No.: Monarch 8 and Model No.: Monarch 12 which the RF & PCB layout are the same, only the panel size and antenna position are different. Therefore, the conducted Power 、Conducted emissions& radiated have to test and other test data can refer report number 2209TWI301-U8.

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## §2.1033 General Information

|                                 |                                                                                                                                  |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| <b>Applicant</b>                | AVALUE TECHNOLOGY INCORPORATION                                                                                                  |
| <b>Applicant Address</b>        | 7F, 228, Lian-cheng Road, Zhonghe Dist., New Taipei City 235, Taiwan                                                             |
| <b>Manufacturer</b>             | ButterflyMX, inc.                                                                                                                |
| <b>Manufacturer Address</b>     | 44 West 28th Street, 4th Floor New York, NY 10001                                                                                |
| <b>Test Site</b>                | MRT Technology (Taiwan) Co., Ltd                                                                                                 |
| <b>Test Site Address</b>        | No. 38, Fuxing Second Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C)                                                       |
| <b>MRT FCC Registration No.</b> | 291082                                                                                                                           |
| <b>FCC Rule Part(s)</b>         | Part 22H, Part 24E, Part27                                                                                                       |
| <b>Test Device Serial No.</b>   | #1-2 <input type="checkbox"/> Production <input checked="" type="checkbox"/> Pre-Production <input type="checkbox"/> Engineering |

### Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Fuxing Rd., Taoyuan, Taiwan ( R.O.C )

- MRT facility is a FCC registered (Reg. No. 291082) test facility with the site description report on file and is designated by the FCC as an Accredited Test Firm.
- MRT facility is an IC registered (MRT Reg. No. 21723) test laboratory with the site description on file at Industry Canada.
- MRT Lab is accredited to ISO 17025 by the Taiwan Accreditation Foundation (TAF Cert. No. 3261) in EMC, Telecommunications and Radio testing for FCC (Designation Number: TW3261), Industry Taiwan, EU and TELEC Rules.

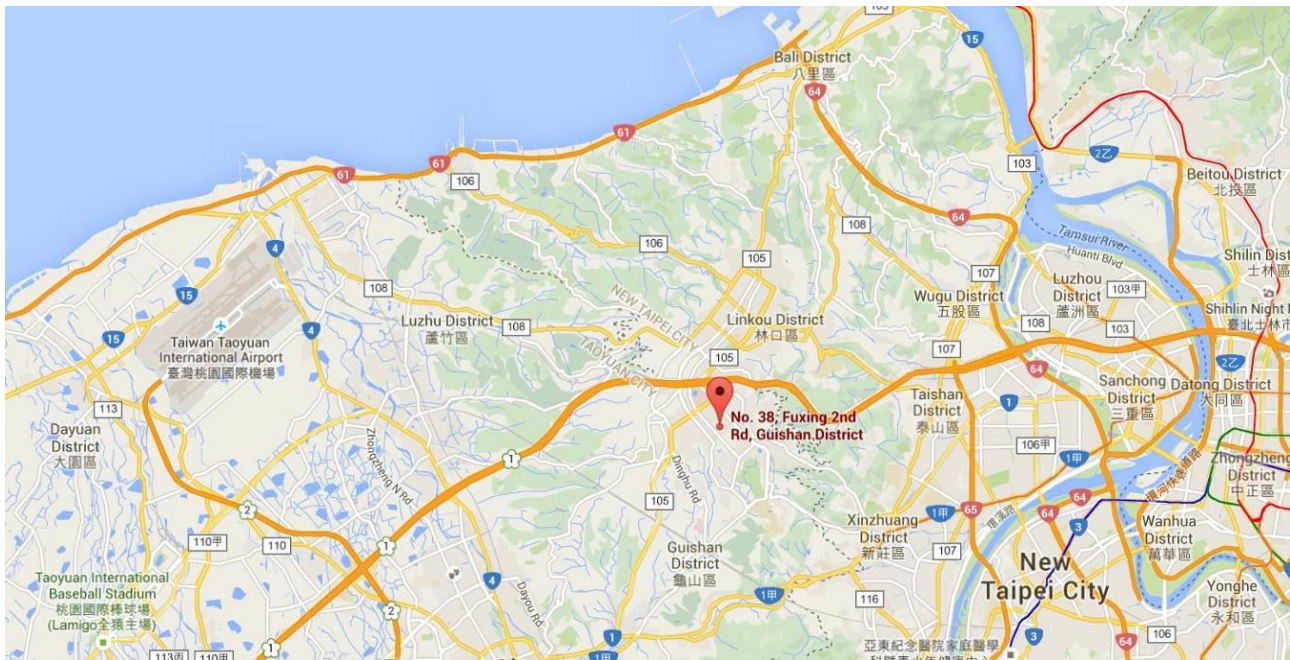
## 1. INTRODUCTION

### 1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

### 1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taoyuan City. These measurement tests were conducted at the MRT Technology (Taiwan) Co., Ltd. Facility located at No.38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 33377, Taiwan (R.O.C).



## 2. PRODUCT INFORMATION

### 2.1. Feature of Equipment under Test

|                       |                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Name          | Intercom                                                                                                                                                                                                                                                                                                                                                                                                         |
| Trade Mark            |                                                                                                                                                                                                                                                                                                                                 |
| Model Name            | Monarch 8                                                                                                                                                                                                                                                                                                                                                                                                        |
| Model Number          | BUTTERFLYMX.M8.1                                                                                                                                                                                                                                                                                                                                                                                                 |
| Supports Radios Spec. | <b>WPAN:</b><br>Bluetooth Dual Mode: V5.0<br>RFID: 125kHz & 13.56MHz<br><b>WLAN:</b><br>2.4G: 802.11b/g/n-20/n-40<br>5G: 802.11a/n-20/ac-20/n-40/ac-40/ac-80, Band 1,4<br><b>WWAN:</b><br>4G: Band 2,4,5,7,12,13,25,26,38,41                                                                                                                                                                                     |
| 4G Operation Band (s) | Band 2, 4, 5, 7, 12, 13, 25, 26, 38, 41                                                                                                                                                                                                                                                                                                                                                                          |
| Frequency Range       | Band2: 1850MHz–1910MHz (LTE Band 2 is covered by Band 25)<br>Band4: 1710MHz–1755MHz<br>Band5: 824MHz–849MHz (LTE Band 5 is covered by Band 26)<br>Band7: 2500MHz–2570MHz<br>Band12: 699MHz–716MHz<br>Band13: 777MHz–787MHz<br>Band25: 1850MHz–1915MHz (Covered B2)<br>Band26: 814MHz–849MHz (Covered B5)<br>Band38: 2570MHz–2620MHz (LTE Band 38 is covered by Band 41)<br>Band41: 2496MHz–2690MHz (Covered B38) |
| Accessory             |                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Power Adapter         | Brand Name: EDAC<br>Model: EA10731F-240<br>Input: AC 100-240V~0.2A, 50-60Hz<br>Output: DC 24.0V-2.08A                                                                                                                                                                                                                                                                                                            |

## 2.2. Equipment Description

|                    |                                                                                                                                                                                          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Antenna Type       | FPCB                                                                                                                                                                                     |
| Antenna M/N        | YFCA002FA                                                                                                                                                                                |
| Antenna Gain       | Band 2: 2.46dBi, Band 4: 2.50dBi, Band 5: -3.00dBi, Band 7: 2.10dBi,<br>Band 12: -4.52dBi, Band 13: -4.52dBi, Band 25: 2.46dBi, Band 26: -3.00dBi,<br>Band 38: 2.80dBi, Band 41: 2.80dBi |
| Type of Modulation | QPSK, 16QAM                                                                                                                                                                              |

Note:

1. The test report has showed the worst test mode.

## 2.3. Device Capabilities

This device contains the following capabilities:

LTE Band 2, 4, 5, 7, 12, 13, 25, 26, 38, 41.

## 2.4. Test Configuration

The **Intercom** was tested per the guidance of ANSI/TIA-603-E-2016 and KDB 971168 D01v02r02. See section 3.0 of this report for a description of the radiated and antenna port conducted emissions tests.

## 2.5. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

### 3. DESCRIPTION OF TEST

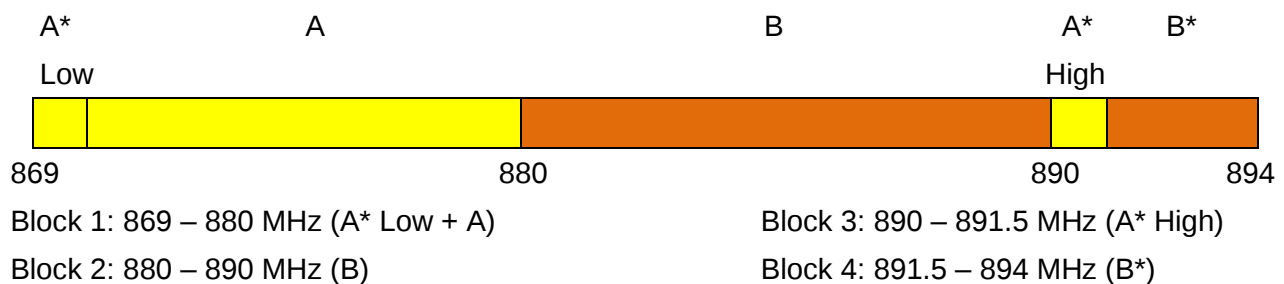
#### 3.1. Evaluation Procedure

The measurement procedures described in the “Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards” (ANSI/TIA-603-E-2016) and “Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems” (KDB 971168) were used in the measurement of the **Intercom**

Deviation from measurement procedure.....None

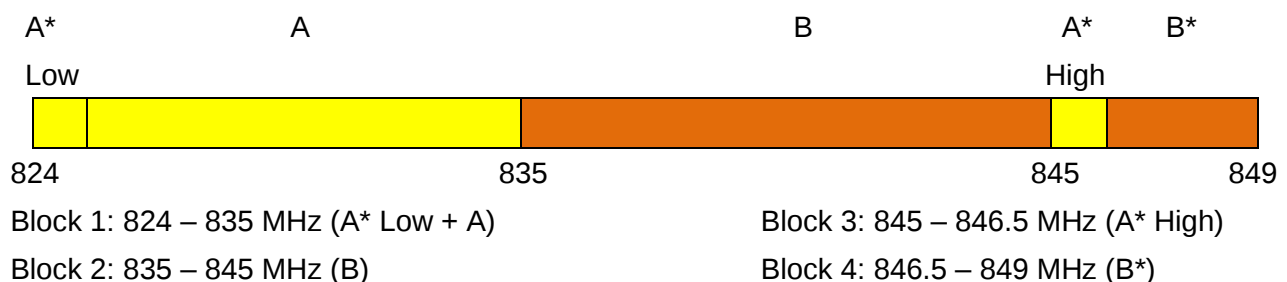
#### 3.2. Cellular – Base Frequency Blocks

##### §22.905



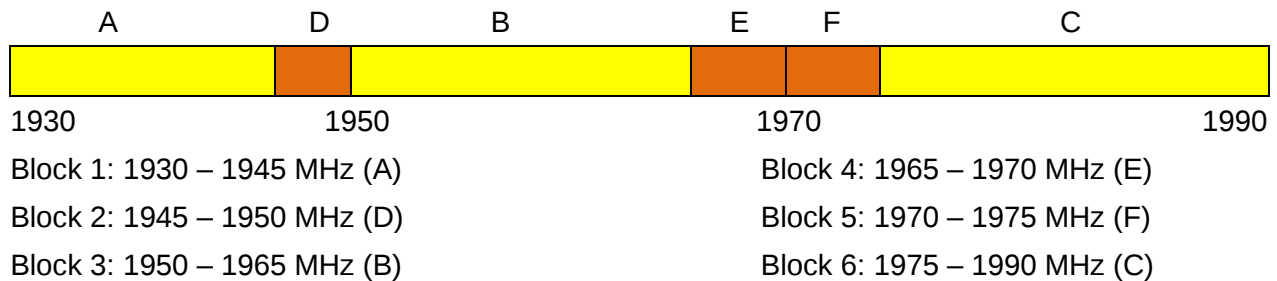
#### 3.3. Cellular – Mobile Frequency Blocks

##### §22.905



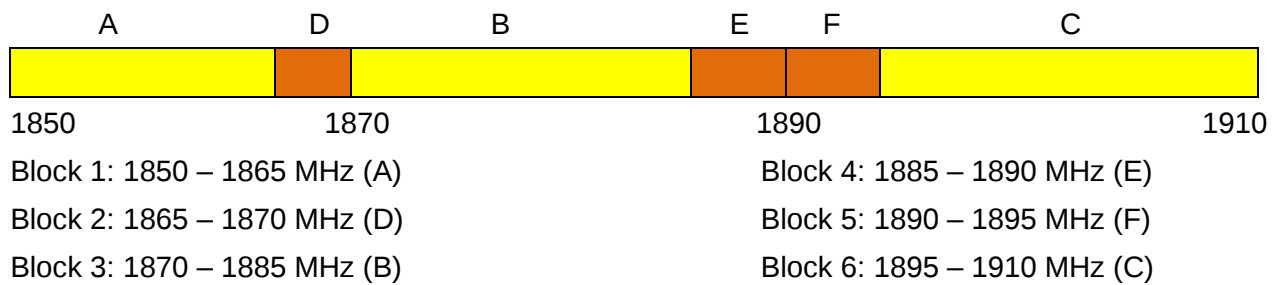
### 3.4. PCS – Base Frequency Blocks

#### §24.229



### 3.5. PCS – Mobile Frequency Blocks

#### §24.229



### 3.6. Occupied Bandwidth

#### §2.1049

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. The spectrum analyzers' "occupied bandwidth" measurement function was used to record the occupied bandwidth in accordance with KDB 971168.

### 3.7. Spurious and Harmonic Emissions at Antenna Terminal

#### §2.1051 §22.917(a) §24.238(a)

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10<sup>th</sup> harmonic. On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for Part 22. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

### 3.8. Power and Radiated Spurious Emissions

#### §2.1053 §22.913(a.2) §22.917(a) §24.232(c) §24.238(a)

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurement and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. A MF Model 210SS turntable is used for radiated measurement. It is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. A 80cm high PVC support structure is placed on top of the turntable.

The equipment under test was transmitting while connected to its integral antenna and is placed on a wooden turntable 80cm above the ground plane and 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer. Radiated power levels are also investigated with the receive antenna horizontally and vertically polarized. The maximized power level is recorded using the spectrum analyzer “Channel Power” function with the integration band set to the emissions’ occupied bandwidth, a RMS detector, RBW = 100kHz, VBW = 300kHz, and a 1 second sweep time over a minimum of 10 sweeps, per the guidelines of KDB 971168.

Per the guidance of ANSI/TIA-603-E-2016, a half-wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

$$P_d \text{ [dBm]} = P_g \text{ [dBm]} - \text{cable loss [dB]} + \text{antenna gain [dBd/dBi]}$$

Where,  $P_d$  is the dipole equivalent power,  $P_g$  is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to  $P_g \text{ [dBm]} - \text{cable loss [dB]}$ .

The calculated  $P_d$  levels are then compared to the absolute spurious emission limit of -13dBm which is equivalent to the required minimum attenuation of  $43 + 10 \cdot \log_{10}(\text{Power [Watts]})$  specified in 22.917(a).

### 3.9. Peak-Average Ratio

#### §24.232(d)

A peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

For pulsed signals, the spectrum analyzer is set to use an internal “RF Burst” trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the “on time” of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power. For continuous signals, the trigger is set to “free run” in the CCDF measurement mode.

### 3.10. Frequency Stability / Temperature Variation

#### §2.1055 §22.355 §22.863 §22.905 §24.229 §24.235

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-E-2016. The frequency stability of the transmitter is measured by:

- a.) Temperature: The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.
- b.) Primary Supply Voltage: The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

Specification – For Part 22, the frequency stability of the transmitter shall be maintained within  $\pm 0.00025\%$  ( $\pm 2.5$  ppm) of the center frequency.

Time Period and Procedure:

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a “standby” condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

## 4. TEST EQUIPMENT CALIBRATION DATE

### Conducted Emissions – SR2

| Instrument         | Manufacturer | Type No.                    | Asset No.   | Cali. Interval | Cali. Due Date |
|--------------------|--------------|-----------------------------|-------------|----------------|----------------|
| Two-Line V-Network | R&S          | ENV216                      | MRTTWA00019 | 1 year         | 2023/3/7       |
| Cable              | Rosnol       | N1C50-RG400-B<br>1C50-500CM | MRTTWE00013 | 1 year         | 2023/6/21      |
| EMI Test Receiver  | R&S          | ESR3                        | MRTTWA00009 | 1 year         | 2023/3/9       |

### Radiated Emissions – AC1

| Instrument               | Manufacturer | Type No.                  | Asset No.   | Cali. Interval | Cali. Due Date |
|--------------------------|--------------|---------------------------|-------------|----------------|----------------|
| Broadband TRILOG Antenna | SCHWARZBECK  | VULB 9162                 | MRTTWA00001 | 1 year         | 2022/12/30     |
| EMI Test Receiver        | R&S          | ESR3                      | MRTTWA00009 | 1 year         | 2023/3/9       |
| Active Loop Antenna      | Schwarzbeck  | FMZB 1519B                | MRTTWA00002 | 1 year         | 2023/5/24      |
| Broadband Horn antenna   | SCHWARZBECK  | BBHA 9120D                | MRTTWA00003 | 1 year         | 2023/3/30      |
| Breitband Hornantenna    | Schwarzbeck  | BBHA 9170                 | MRTTWA00004 | 1 year         | 2023/3/29      |
| Broadband Amplifier      | Schwarzbeck  | BBV 9721                  | MRTTWA00006 | 1 year         | 2023/3/30      |
| Broadband Preamplifier   | SCHWARZBECK  | BBV 9718                  | MRTTWA00005 | 1 year         | 2023/3/30      |
| Cable                    | HUBERSUHNER  | SF106                     | MRTTWE00010 | 1 year         | 2023/6/14      |
| Cable                    | Rosnol       | K1K50-UP0264-<br>K1K50-4M | MRTTWE00012 | 1 year         | 2023/6/19      |

### Conducted Test Equipment –SR5

| Instrument                             | Manufacturer | Type No. | Asset No.   | Cali. Interval | Cali. Due Date |
|----------------------------------------|--------------|----------|-------------|----------------|----------------|
| EXA Signal Analyzer                    | KEYSIGHT     | N9010A   | MRTTWA00012 | 1 year         | 2023/10/5      |
| EXA Signal Analyzer                    | KEYSIGHT     | N9010B   | MRTTWA00074 | 1 year         | 2023/7/19      |
| USB Wideband Power Sensor              | KEYSIGHT     | U2021XA  | MRTTWA00015 | 1 year         | 2023/3/16      |
| Wideband Radio Communication<br>Taster | R&S          | CMW 500  | MRTTWA00084 | 1 year         | 2023/10/18     |

### Test Software

| Software | Version   | Function          |
|----------|-----------|-------------------|
| e3       | 9.160520a | EMI Test Software |
| EMI      | V3        | EMI Test Software |

## 5. SAMPLE CALCULATIONS

### **GSM Emission Designator**

Emission Designator = 250KGXW

GSM BW = 250 kHz

G = Phase Modulation

X = Cases not otherwise covered

W = Combination (Audio/Data)

### **EGPRS Emission Designator**

Emission Designator = 250KG7W

GSM BW = 250 kHz

G = Phase Modulation

7 = Quantized/Digital Info

W = Combination (Audio/Data)

### **WCDMA / CDMA Emission Designator**

Emission Designator = 1M25F9W

WCDMA BW = 1.25 MHz

F = Frequency Modulation

9 = Composite Digital Info

W = Combination (Audio/Data)

### **LTE Emission Designator**

Emission Designator = QPSK 5M00G7D / 16QAM 5M00W7D

LTE BW = 1.4/3/5/10/15/20 MHz

QPSK G = Phase Modulation /

16QAM W= in a combination of two or more of the following modes: amplitude, angle, pulse

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

### **Spurious Radiated Emission**

Example: Spurious emission at 1688.10 MHz

The receive spectrum analyzer reading at 3 meters with the EUT on the turntable was  $-65.0\text{dBm}$ . The gain of the substituted antenna is  $6.5\text{dBi}$ . The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of  $-65.0\text{dBm}$  on the spectrum analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is  $4.5\text{ dB}$  at  $1688.1\text{MHz}$ . So  $2\text{ dB}$  is added to the signal generator reading of  $-25\text{dBm}$  yielding  $-23\text{dBm}$ . The fundamental EIRP was  $24.0\text{dBm}$  so this harmonic was  $24.0\text{dBm} - (-23) = 47\text{dBc}$ .

## 6. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT 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  $k = 2$ .

|                                                                                                             |
|-------------------------------------------------------------------------------------------------------------|
| <b>Radiated Spurious Emission - AC1</b>                                                                     |
| Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): $\pm 3.92\text{dB}$ (Below 30M)      |
| Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): $\pm 4.25\text{dB}$ (30M~1G)         |
| Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): $\pm 4.40\text{dB}$ (1G~18G)         |
| Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): $\pm 4.45\text{dB}$ (18G~40G)        |
| <b>Frequency Error</b>                                                                                      |
| Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): $\pm 78.4\text{Hz}$                  |
| <b>Conducted Power</b>                                                                                      |
| Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): $\pm 0.84\text{dB}$                  |
| <b>Conducted Spurious Emission</b>                                                                          |
| Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): $\pm 2.65\text{ dB}$                 |
| <b>Occupied Bandwidth</b>                                                                                   |
| Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): 3.3%                                 |
| <b>Temp. / Humidity</b>                                                                                     |
| Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): $\pm 0.82^\circ\text{C}$ / $\pm 3\%$ |
| <b>DC Voltage</b>                                                                                           |
| Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): $\pm 0.3\%$                          |

## 7. TEST RESULT

### 7.1. Summary

FCC Classification: PCS Licensed Transmitter (PCB)  
Mode(s): LTE Band 2, 4, 5, 7, 12, 13, 25, 26, 38, 41

| FCC Part Section(s)                                      | Test Description             | Test Limit                                                                                                       | Test Condition | Test Result | Reference   |
|----------------------------------------------------------|------------------------------|------------------------------------------------------------------------------------------------------------------|----------------|-------------|-------------|
| 2.1049                                                   | Occupied bandwidth           | N/A                                                                                                              | Conducted      | Pass        | Section 7.2 |
| 2.1051<br>22.917(a)<br>24.238(a)<br>27.53(c)<br>27.52(h) | Conducted Spurious Emissions | > 43 + 10log <sub>10</sub> (P[Watts])<br>for all out-of-band emissions<br>(Band 2, 4, 5, 12, 13, 17, 25, 26, 66) |                | Pass        | Section 7.3 |
| 27.53(m)                                                 |                              | > 55 + 10log <sub>10</sub> (P[Watts])<br>for all out-of-band emissions<br>(Band 7, 38, 41)                       |                |             |             |
| 27.53(a)                                                 |                              | > 70 + 10log <sub>10</sub> (P[Watts])<br>for all out-of-band emissions<br>(Band 30)                              |                |             |             |
| 2.1051<br>22.917(a)<br>24.238(a)<br>27.53(c)<br>27.52(h) | Band Edge                    | > 43 + 10log <sub>10</sub> (P[Watts])<br>for all out-of-band emissions                                           |                | Pass        | Section 7.4 |
| 27.53(m)                                                 |                              | 27.53(m)(4)<br>(Band 7, 38, 41)                                                                                  |                |             |             |
| 27.53(a)                                                 |                              | 27.53(a)(4) (Band 30)                                                                                            |                |             |             |
| 2.1046                                                   | Conducted Output Power       | N/A                                                                                                              |                | Pass        | Section 7.5 |
| 22.913(a)                                                |                              | < 7 Watts max. ERP<br>(Band 5, 26)                                                                               |                |             |             |
| 24.232(c)<br>27.50(h)                                    |                              | < 2 Watts max. EIRP<br>(Band 2, 7, 25, 38, 41)                                                                   |                |             |             |
| 27.50(b)                                                 |                              | < 3 Watts max. ERP<br>(Band 12,13)                                                                               |                |             |             |
| 27.50(d)                                                 |                              | < 1 Watts max. EIRP<br>(Band 4, 66)                                                                              |                |             |             |
| 27.50(a)                                                 |                              | < 0.25 Watts max. EIRP<br>(Band 30)                                                                              |                |             |             |

|                                                          |                                                                                                              |                                |                                                                                                  |           |      |             |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|--------------------------------|--------------------------------------------------------------------------------------------------|-----------|------|-------------|
| 2.1053<br>22.917(a)<br>24.238(a)<br>27.53(c)<br>27.53(h) | RSS-GEN 6.6,<br>RSS-130 4.6,<br>RSS-132 5.4,<br>RSS-133 6.5,<br>RSS-139 6.6                                  | Radiated Spurious<br>Emissions | > 43 + log <sub>10</sub> (P[Watts])<br>for all out-of-band<br>emissions<br>(Band 2,4,5,12,13,17) | Radiated  | Pass | Section 7.5 |
| 27.53(m)                                                 | RSS-199 4.5                                                                                                  |                                | > 55 + 10log <sub>10</sub> (P[Watts])<br>for all out-of-band<br>emissions<br>(Band 7, 38, 41)    |           |      |             |
| 27.53(a)                                                 | RSS-195 5.6                                                                                                  |                                | > 70 + 10log <sub>10</sub> (P[Watts])<br>for all out-of-band<br>emissions<br>(Band 30)           |           |      |             |
| 24.232(d)<br>27.50(B)                                    | RSS-GEN 6.12,<br>RSS-130 4.4,<br>RSS-132 5.4,<br>RSS-133 6.4,<br>RSS-139 6.5,<br>RSS-199 4.4,<br>RSS-199 5.5 | Peak-Average<br>Ratio          | <13dB                                                                                            | Conducted | Pass | Section 7.6 |
| 2.1055<br>22.355                                         | RSS-GEN 8.11,<br>RSS-130 4.3,<br>RSS-132 5.3,                                                                | Frequency Stability            | < 2.5 ppm                                                                                        |           | Pass | Section 7.7 |
| 2.1055<br>24.235<br>27.54                                | RSS-133 6.3,<br>RSS-139 6.4,<br>RSS-199 4.3<br>RSS-199 5.4                                                   |                                | Within Authorized Band                                                                           |           |      |             |

**Notes:**

- 1) Determining compliance is based on the test results met the regulation limits or requirements declared by clients, and the test results don't take into account the value of measurement uncertainty.
- 2) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.

## 7.2. Occupied Bandwidth

### 7.2.1. Test Limit

N/A

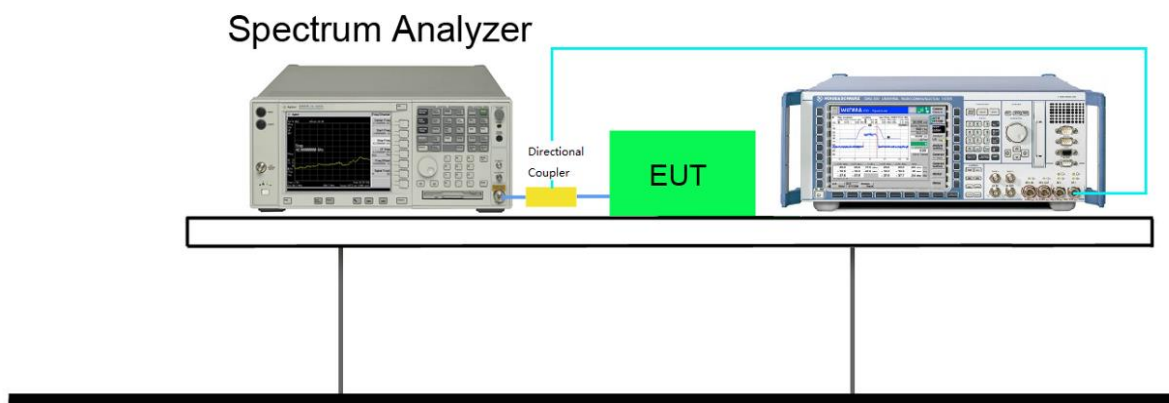
### 7.2.2. Test Procedure used

KDB 971168 D01v02r02 – Section 4.2 & ANSI/TIA-603-E-2016

### 7.2.3. Test Setting

1. The spectrum analyzer center frequency is set to the nominal EUT channel center frequency.  
The span range for the spectrum analyzer shall be between two and five times the anticipated OBW.
2. The nominal resolution bandwidth (RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW. (RBW = approximately 1% of the emission bandwidth).
3. Set the detection mode to peak, and the trace mode to max hold.
4. Use the 99 % power bandwidth function of the spectrum analyzer (if available) and report the measured bandwidth.

### 7.2.4. Test Setup



### **7.2.5. Test Result**

Note: Please refer to the original report as 2209TWI301-U8.

## 7.3. Conducted Spurious Emissions

### 7.3.1. Test Limit

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10\log_{10}(P)$  dB for Band 2,4,5,12,13,17, 25, 26, 66/  $55+10\log_{10}(P)$  dB for Band7, 38, 41/  $70+10\log_{10}(P)$  dB for Band30.

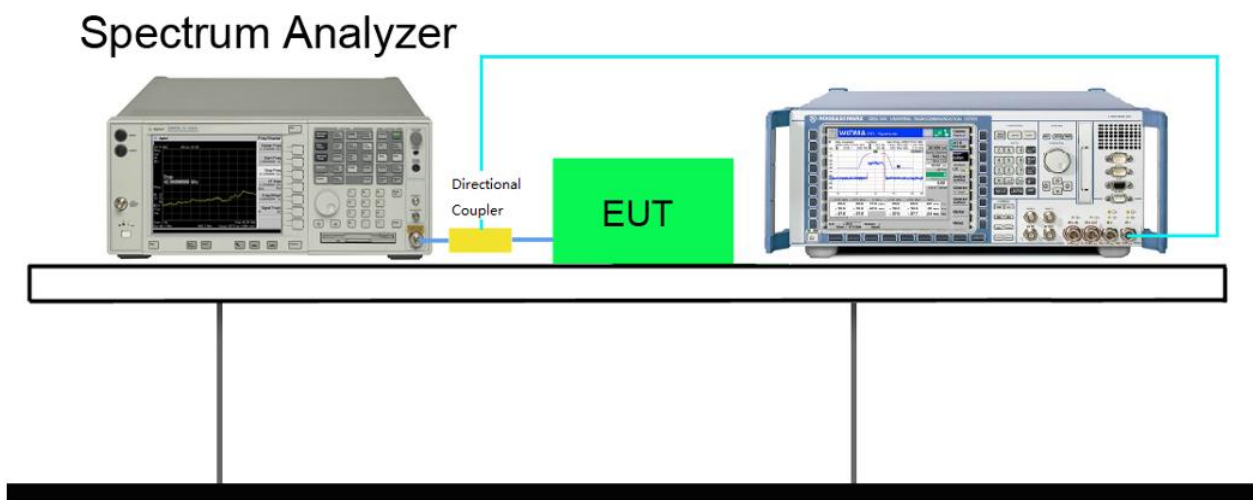
### 7.3.2. Test Procedure Used

KDB 971168 D01v02r02 – Section 6.0 & ANSI/TIA-603-E-2016

### 7.3.3. Test Setting

Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz is at or below 1GHz and 1MHz is above 1GHz, If any, up to 10<sup>th</sup> harmonic.

### 7.3.4. Test Setup



### **7.3.5. Test Result**

Note: Please refer to the original report as 2209TWI301-U8.

## 7.4. Band Edge at Antenna Terminal

### 7.4.1. Test Limit

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10\log(P)$  dB for Band 2,4,5,12,13,17/ the attenuation factor shall be not less than  $40 + 10 \log (P)$  dB on all frequencies between the channel edge and 5 megahertz from the channel edge,  $43 + 10 \log (P)$  dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and  $55 + 10 \log (P)$  dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that  $43 + 10 \log (P)$  dB on all frequencies between 2490.5 MHz and 2496 MHz and  $55 + 10 \log (P)$  dB at or below 2490.5 MHz for Band7.

For LTE Band 13:

On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than  $65 + 10 \log (P)$  dB in a 6.25 kHz band segment, for mobile and portable stations.

For LTE Band 30 27.53(a.4):

For mobile and portable stations operating in the 2305-2315 MHz and 2350-2360 MHz bands:

- (i) By a factor of not less than:  $43 + 10 \log (P)$  dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than  $55 + 10 \log (P)$  dB on all frequencies between 2320 and 2324 MHz and on all frequencies between 2341 and 2345 MHz, not less than  $61 + 10 \log (P)$  dB on all frequencies between 2324 and 2328 MHz and on all frequencies between 2337 and 2341 MHz, and not less than  $67 + 10 \log (P)$  dB on all frequencies between 2328 and 2337 MHz;
- (ii) By a factor of not less than  $43 + 10 \log (P)$  dB on all frequencies between 2300 and 2305 MHz,  $55 + 10 \log (P)$  dB on all frequencies between 2296 and 2300 MHz,  $61 + 10 \log (P)$  dB on all frequencies between 2292 and 2296 MHz,  $67 + 10 \log (P)$  dB on all frequencies between 2288 and 2292 MHz, and  $70 + 10 \log (P)$  dB below 2288 MHz;
- (iii) By a factor of not less than  $43 + 10 \log (P)$  dB on all frequencies between 2360 and 2365 MHz, and not less than  $70 + 10 \log (P)$  dB above 2365 MHz.

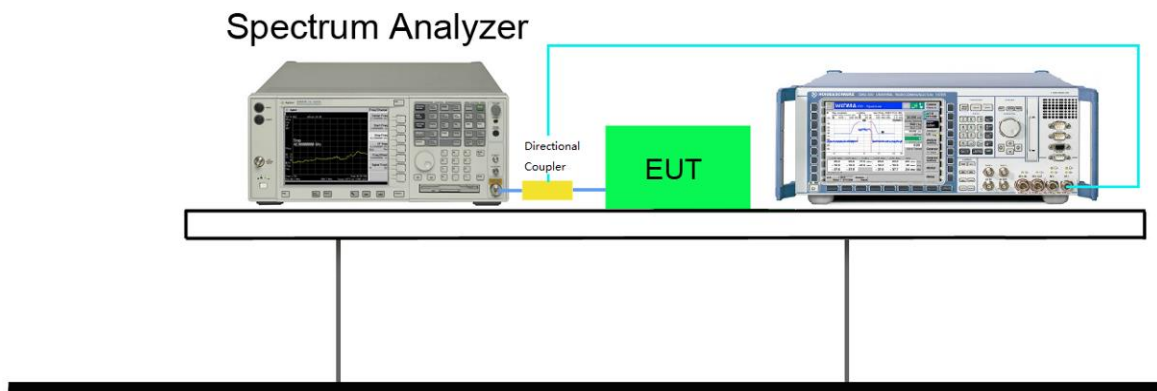
#### 7.4.2. Test Procedure Used

KDB 971168 D01v02r02 – Section 6.0 & ANSI/TIA-603-E-2016

#### 7.4.3. Test Setting

In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

#### 7.4.4. Test Setup



#### **7.4.5. Test Result**

Note: Please refer to the original report as 2209TWI301-U8.

## 7.5. Power and Radiated Spurious Emissions

### 7.5.1 Test Limit

#### **Radiated Power**

For FCC Part 22.913(a)(2):

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

For FCC Part 24.232(c)/27.50(h):

The EIRP of mobile transmitters and auxiliary test transmitters must not exceed 2 Watts.

For FCC Part 27.50(a):

The EIRP of mobile transmitters and auxiliary test transmitters must not exceed 0.25 Watts.

For FCC Part 27.50(b):

The ERP of mobile transmitters and auxiliary test transmitters must not exceed 3 Watts.

For FCC Part 27.50(d):

The ERP of mobile transmitters and auxiliary test transmitters must not exceed 1 Watts.

#### **Radiated Spurious Emissions**

For FCC Part 22.917(a)/24.238(a)/27.53(c)/27.53(f)/27.53(h):

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10\log_{10}(P)$  dB.

For FCC Part 27.53(m):

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $55 + 10\log_{10}(P)$  dB.

For FCC Part 27.53(a):

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $70 + 10\log_{10}(P)$  dB.

### 7.5.2 Test Procedure Used

KDB 971168 D01v02r02 - Section 7.0 & ANSI/TIA-603-E-2016

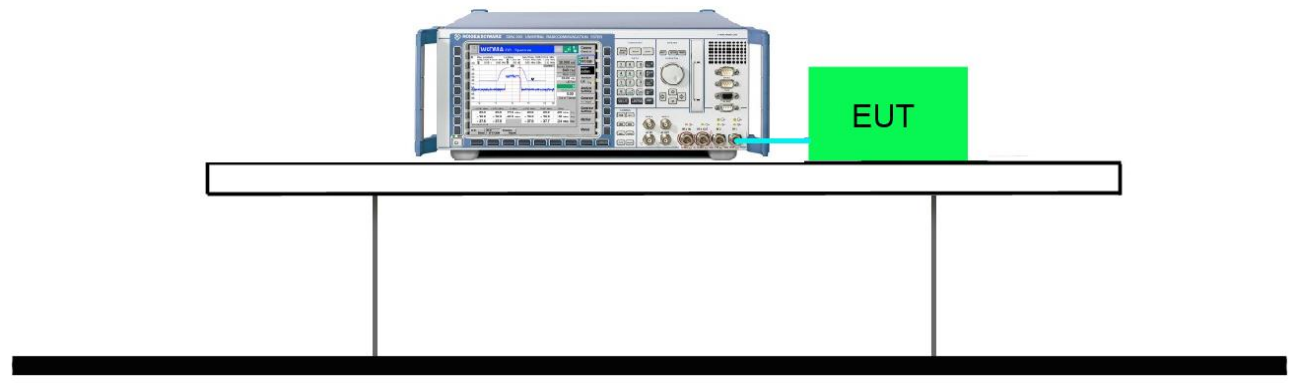
### 7.5.3 Test Setting

1. The EUT shall be placed at the specified height on a support, and in the position closest to normal use as declared by provider.
2. The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter
3. The output of the test antenna shall be connected to the measuring receiver.
4. The transmitter shall be switched on and the measuring receiver shall be tuned to the frequency of the transmitter under test.
5. The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
6. The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
7. The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
8. The maximum signal level detected by the measuring receiver shall be noted.
9. The transmitter shall be replaced by a substitution antenna.
10. The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
11. The substitution antenna shall be connected to a calibrated signal generator.
12. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
13. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.

14. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
15. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.
16. The measure of the effective radiated power is the larger of the two levels recorded at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.
17. Test site anechoic chamber refer to ANSI C63.4: 2014.

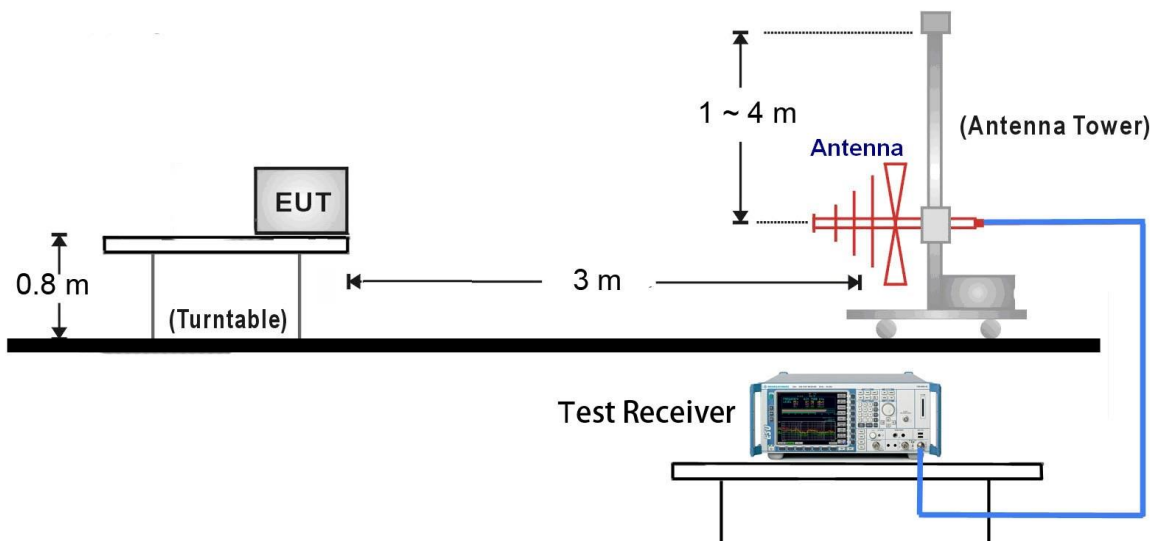
## 7.5.4 Test Setup

### Conducted Power

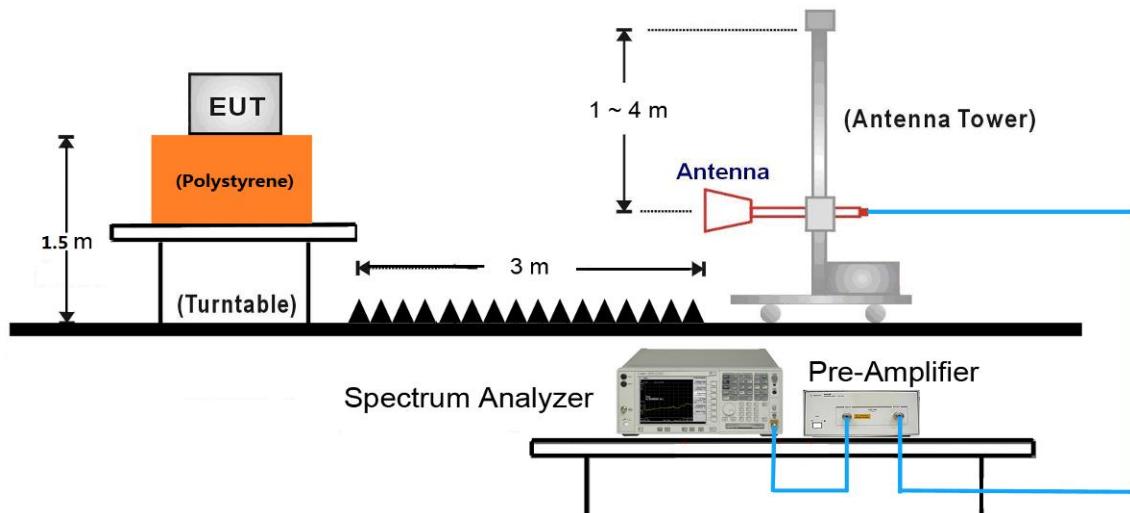


### Radiated Power & Radiated Spurious Emissions

#### 30MHz ~ 1GHz Test Setup:



#### 1GHz ~ 10GHz Test Setup:



## 7.5.5 Test Result

### Conducted Power

#### Monarch 8

| LTE Band4  |           |        | Maximum Conducted Output Power (Channel / Frequency (MHz)) |        |        |        |        |        |        |        |        |       |        |       |        |        |        |       |        |       |
|------------|-----------|--------|------------------------------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|-------|--------|-------|--------|--------|--------|-------|--------|-------|
| Modulation | Bandwidth |        | 1.4MHz                                                     |        |        | 3MHz   |        |        | 5MHz   |        |        | 10MHz |        |       | 15MHz  |        |        | 20MHz |        |       |
|            | RB        | RB     | 19957                                                      | 20175  | 20393  | 19965  | 20175  | 20385  | 19975  | 20175  | 20375  | 20000 | 20175  | 20350 | 20025  | 20175  | 20325  | 20050 | 20175  | 20300 |
|            | No.       | Offset | 1710.7                                                     | 1732.5 | 1754.3 | 1711.5 | 1732.5 | 1753.5 | 1712.5 | 1732.5 | 1752.5 | 1715  | 1732.5 | 1750  | 1717.5 | 1732.5 | 1747.5 | 1720  | 1732.5 | 1745  |
| QPSK       | 1         | #0     | 22.63                                                      | 22.86  | 22.30  | 22.48  | 22.54  | 22.45  | 22.65  | 22.48  | 22.21  | 22.58 | 22.57  | 22.58 | 22.39  | 22.60  | 22.53  | 21.97 | 21.94  | 22.80 |
|            | 1         | #Mid   | 22.51                                                      | 22.95  | 22.28  | 22.40  | 22.69  | 22.42  | 22.41  | 22.61  | 22.38  | 22.73 | 22.99  | 22.49 | 22.66  | 22.91  | 22.62  | 22.63 | 23.05  | 22.95 |
|            | 1         | #High  | 22.56                                                      | 22.86  | 22.24  | 22.45  | 22.64  | 22.48  | 22.51  | 22.53  | 22.47  | 22.04 | 22.31  | 22.41 | 22.24  | 22.41  | 22.50  | 22.81 | 22.99  | 22.66 |
|            | 50%       | #0     | 22.45                                                      | 22.73  | 22.35  | 21.72  | 21.59  | 21.17  | 21.66  | 21.61  | 21.30  | 21.71 | 21.64  | 21.30 | 21.69  | 21.67  | 21.37  | 21.66 | 21.73  | 21.56 |
|            | 50%       | #Mid   | 22.53                                                      | 22.61  | 22.52  | 21.58  | 21.65  | 21.08  | 21.64  | 21.57  | 21.32  | 21.53 | 21.64  | 21.30 | 21.82  | 21.73  | 21.36  | 21.75 | 21.74  | 21.51 |
|            | 50%       | #High  | 22.56                                                      | 22.71  | 22.36  | 21.71  | 21.60  | 21.25  | 21.59  | 21.58  | 21.36  | 21.52 | 21.69  | 21.32 | 21.83  | 21.58  | 21.32  | 21.91 | 21.69  | 21.35 |
|            | 100%      | #0     | 21.35                                                      | 21.57  | 21.21  | 21.55  | 21.62  | 21.18  | 21.48  | 21.51  | 21.29  | 21.58 | 21.66  | 21.38 | 21.64  | 21.60  | 21.32  | 21.73 | 21.53  | 21.51 |
| 16QAM      | 1         | #0     | 21.89                                                      | 21.86  | 21.08  | 21.46  | 21.81  | 21.88  | 21.35  | 21.34  | 21.63  | 22.08 | 21.57  | 22.04 | 21.52  | 21.88  | 21.93  | 21.35 | 21.21  | 21.28 |
|            | 1         | #Mid   | 22.07                                                      | 21.90  | 21.24  | 21.41  | 21.83  | 21.94  | 21.38  | 21.40  | 21.78  | 22.14 | 22.16  | 22.01 | 21.91  | 22.02  | 21.85  | 22.09 | 21.72  | 21.76 |
|            | 1         | #High  | 21.90                                                      | 21.43  | 21.12  | 21.52  | 21.93  | 22.01  | 21.24  | 21.35  | 21.74  | 21.70 | 21.30  | 22.01 | 21.90  | 21.21  | 22.08  | 22.26 | 21.40  | 21.08 |
|            | 50%       | #0     | 21.53                                                      | 21.59  | 21.22  | 20.85  | 20.94  | 20.44  | 20.67  | 20.75  | 20.35  | 20.64 | 20.79  | 20.41 | 20.70  | 20.74  | 20.47  | 20.87 | 20.91  | 20.69 |
|            | 50%       | #Mid   | 21.41                                                      | 21.94  | 21.64  | 20.62  | 20.78  | 20.37  | 20.55  | 20.74  | 20.62  | 20.71 | 20.88  | 20.45 | 20.76  | 20.75  | 20.54  | 20.99 | 20.87  | 20.62 |
|            | 50%       | #High  | 21.60                                                      | 21.62  | 21.31  | 20.56  | 20.95  | 20.61  | 20.70  | 20.65  | 20.38  | 20.65 | 20.77  | 20.64 | 20.94  | 20.61  | 20.59  | 20.96 | 20.66  | 20.64 |
|            | 100%      | #0     | 20.58                                                      | 20.62  | 20.39  | 20.93  | 20.72  | 20.48  | 20.80  | 20.65  | 20.37  | 20.63 | 20.66  | 20.48 | 20.82  | 20.73  | 20.45  | 20.91 | 20.66  | 20.55 |

| LTE Band7  |           |        | Maximum Conducted Output Power (Channel / Frequency (MHz)) |       |        |       |       |       |        |       |        |       |       |       |
|------------|-----------|--------|------------------------------------------------------------|-------|--------|-------|-------|-------|--------|-------|--------|-------|-------|-------|
| Modulation | Bandwidth |        | 5MHz                                                       |       |        | 10MHz |       |       | 15MHz  |       |        | 20MHz |       |       |
|            | RB        | RB     | 20775                                                      | 21100 | 21425  | 20800 | 21100 | 21400 | 20825  | 21100 | 21375  | 20850 | 21100 | 21350 |
|            | No.       | Offset | 2502.5                                                     | 2535  | 2567.5 | 2505  | 2535  | 2565  | 2507.5 | 2535  | 2562.5 | 2510  | 2535  | 2560  |
| QPSK       | 1         | #0     | 22.84                                                      | 22.99 | 23.28  | 23.09 | 22.89 | 23.17 | 23.03  | 23.10 | 23.13  | 22.99 | 22.96 | 23.28 |
|            | 1         | #Mid   | 22.84                                                      | 23.01 | 23.16  | 23.07 | 23.11 | 23.56 | 22.83  | 23.18 | 23.16  | 23.13 | 23.28 | 23.60 |
|            | 1         | #High  | 22.83                                                      | 22.94 | 22.51  | 22.84 | 23.00 | 22.32 | 23.12  | 23.21 | 22.44  | 22.73 | 23.01 | 22.35 |
|            | 50%       | #0     | 22.04                                                      | 22.11 | 22.21  | 22.03 | 22.02 | 22.20 | 21.99  | 22.21 | 22.08  | 22.06 | 22.21 | 22.08 |
|            | 50%       | #Mid   | 21.98                                                      | 22.10 | 22.15  | 21.92 | 22.07 | 22.08 | 21.88  | 22.11 | 22.17  | 21.87 | 22.13 | 22.09 |
|            | 50%       | #High  | 21.91                                                      | 22.08 | 22.22  | 21.98 | 22.11 | 22.23 | 21.91  | 22.17 | 22.26  | 21.96 | 22.19 | 22.33 |
|            | 100%      | #0     | 21.91                                                      | 22.06 | 22.09  | 22.08 | 22.03 | 22.15 | 21.95  | 22.19 | 22.03  | 21.96 | 22.19 | 22.06 |
| 16QAM      | 1         | #0     | 21.46                                                      | 21.40 | 21.51  | 22.06 | 21.95 | 22.08 | 22.50  | 22.32 | 22.17  | 22.81 | 22.06 | 22.53 |
|            | 1         | #Mid   | 21.46                                                      | 21.75 | 21.45  | 22.70 | 22.66 | 22.39 | 22.15  | 22.55 | 22.32  | 22.68 | 22.82 | 23.11 |
|            | 1         | #High  | 21.34                                                      | 21.77 | 21.80  | 21.80 | 22.19 | 21.85 | 22.34  | 22.52 | 22.04  | 22.58 | 22.74 | 21.85 |
|            | 50%       | #0     | 20.88                                                      | 20.97 | 21.10  | 21.02 | 21.05 | 21.24 | 21.02  | 21.17 | 20.96  | 21.11 | 21.24 | 21.10 |
|            | 50%       | #Mid   | 20.86                                                      | 20.99 | 21.11  | 20.85 | 21.11 | 21.08 | 20.82  | 21.13 | 21.04  | 20.95 | 21.24 | 21.13 |
|            | 50%       | #High  | 20.83                                                      | 21.04 | 20.90  | 20.96 | 20.88 | 21.41 | 20.85  | 21.05 | 21.28  | 21.09 | 21.13 | 21.24 |
|            | 100%      | #0     | 21.06                                                      | 21.21 | 21.22  | 21.08 | 21.11 | 21.13 | 21.04  | 21.11 | 21.01  | 21.04 | 21.21 | 21.09 |

| LTE Band12 |           |        | Maximum Conducted Output Power (Channel / Frequency (MHz)) |       |       |       |       |       |       |       |       |       |       |       |
|------------|-----------|--------|------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Modulation | Bandwidth |        | 1.4MHz                                                     |       |       | 3MHz  |       |       | 5MHz  |       |       | 10MHz |       |       |
|            | RB        | RB     | 23017                                                      | 23095 | 23173 | 23025 | 23095 | 23165 | 23035 | 23095 | 23155 | 23060 | 23095 | 23130 |
|            | No.       | Offset | 699.7                                                      | 707.5 | 715.3 | 700.5 | 707.5 | 714.5 | 701.5 | 707.5 | 713.5 | 704   | 707.5 | 711   |
| QPSK       | 1         | #0     | 23.71                                                      | 23.89 | 23.87 | 23.73 | 23.82 | 23.59 | 23.80 | 23.76 | 23.51 | 24.08 | 24.05 | 23.94 |
|            | 1         | #Mid   | 24.09                                                      | 24.17 | 24.01 | 23.75 | 23.96 | 23.65 | 23.95 | 23.63 | 23.76 | 23.95 | 24.01 | 23.93 |
|            | 1         | #High  | 23.84                                                      | 23.77 | 23.91 | 23.77 | 23.59 | 23.59 | 23.92 | 23.45 | 23.44 | 23.61 | 23.48 | 23.48 |
|            | 50%       | #0     | 23.94                                                      | 23.84 | 23.54 | 22.83 | 22.80 | 22.69 | 22.72 | 22.74 | 22.64 | 22.81 | 22.86 | 22.86 |
|            | 50%       | #Mid   | 23.98                                                      | 23.94 | 23.63 | 22.86 | 22.72 | 22.64 | 23.06 | 22.73 | 22.66 | 22.81 | 22.76 | 22.80 |
|            | 50%       | #High  | 24.01                                                      | 23.93 | 23.64 | 22.95 | 22.77 | 22.65 | 22.87 | 22.67 | 22.51 | 22.87 | 22.71 | 22.72 |
|            | 100%      | #0     | 22.95                                                      | 22.89 | 22.66 | 22.88 | 22.66 | 22.67 | 22.80 | 22.69 | 22.63 | 22.80 | 22.74 | 22.81 |
| 16QAM      | 1         | #0     | 23.39                                                      | 22.80 | 22.88 | 22.84 | 23.32 | 22.90 | 22.57 | 23.18 | 22.52 | 22.78 | 23.35 | 22.56 |
|            | 1         | #Mid   | 23.64                                                      | 22.74 | 23.17 | 22.88 | 23.31 | 22.84 | 22.77 | 23.20 | 22.81 | 23.25 | 23.87 | 22.54 |
|            | 1         | #High  | 23.49                                                      | 22.64 | 22.38 | 22.90 | 23.13 | 22.42 | 22.99 | 22.89 | 22.61 | 22.66 | 23.40 | 22.30 |
|            | 50%       | #0     | 23.02                                                      | 22.84 | 22.65 | 21.86 | 22.10 | 21.61 | 21.60 | 21.64 | 21.71 | 21.84 | 22.02 | 21.85 |
|            | 50%       | #Mid   | 23.12                                                      | 22.96 | 22.87 | 21.88 | 21.78 | 21.37 | 21.85 | 21.57 | 21.66 | 21.69 | 21.66 | 21.92 |
|            | 50%       | #High  | 23.29                                                      | 22.74 | 22.49 | 21.82 | 21.98 | 21.56 | 21.84 | 21.58 | 21.53 | 21.91 | 21.84 | 21.69 |
|            | 100%      | #0     | 21.86                                                      | 21.93 | 21.75 | 21.85 | 21.60 | 21.70 | 21.75 | 21.71 | 21.47 | 21.94 | 21.65 | 21.76 |

| LTE Band13 |           |        | Maximum Conducted Output Power (Channel / Frequency (MHz)) |       |       |       |       |    |
|------------|-----------|--------|------------------------------------------------------------|-------|-------|-------|-------|----|
| Modulation | Bandwidth |        | 5MHz                                                       |       |       | 10MHz |       |    |
|            | RB        | RB     | 23205                                                      | 23230 | 23255 | --    | 23230 | -- |
|            | No.       | Offset | 779.5                                                      | 782   | 784.5 | --    | 782   | -- |
| QPSK       | 1         | #0     | 23.84                                                      | 23.58 | 23.54 | --    | 23.91 | -- |
|            | 1         | #Mid   | 23.90                                                      | 23.97 | 23.61 | --    | 24.04 | -- |
|            | 1         | #High  | 23.69                                                      | 23.79 | 23.94 | --    | 23.87 | -- |
|            | 50%       | #0     | 22.87                                                      | 22.76 | 22.75 | --    | 23.15 | -- |
|            | 50%       | #Mid   | 22.87                                                      | 22.89 | 22.77 | --    | 22.76 | -- |
|            | 50%       | #High  | 22.88                                                      | 22.75 | 22.75 | --    | 23.10 | -- |
|            | 100%      | #0     | 22.78                                                      | 22.76 | 22.68 | --    | 23.11 | -- |
| 16QAM      | 1         | #0     | 22.94                                                      | 22.72 | 23.07 | --    | 22.74 | -- |
|            | 1         | #Mid   | 22.97                                                      | 22.81 | 23.07 | --    | 22.99 | -- |
|            | 1         | #High  | 22.95                                                      | 22.90 | 23.06 | --    | 22.77 | -- |
|            | 50%       | #0     | 21.85                                                      | 21.89 | 21.71 | --    | 21.83 | -- |
|            | 50%       | #Mid   | 21.81                                                      | 21.69 | 21.43 | --    | 21.83 | -- |
|            | 50%       | #High  | 21.81                                                      | 21.73 | 21.67 | --    | 21.64 | -- |
|            | 100%      | #0     | 21.84                                                      | 21.69 | 21.58 | --    | 21.66 | -- |

| LTE Band25 |           |        | Maximum Conducted Output Power (Channel / Frequency (MHz)) |        |        |        |        |        |        |        |        |       |        |       |        |        |        |       |        |       |
|------------|-----------|--------|------------------------------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|-------|--------|-------|--------|--------|--------|-------|--------|-------|
| Modulation | Bandwidth |        | 1.4MHz                                                     |        |        | 3MHz   |        |        | 5MHz   |        |        | 10MHz |        |       | 15MHz  |        |        | 20MHz |        |       |
|            | RB        | RB     | 26047                                                      | 26365  | 26683  | 26055  | 26365  | 26675  | 26065  | 26365  | 26665  | 26090 | 26365  | 26640 | 26115  | 26365  | 26615  | 26140 | 26365  | 26590 |
|            | No.       | Offset | 1850.7                                                     | 1882.5 | 1914.3 | 1851.5 | 1882.5 | 1913.5 | 1852.5 | 1882.5 | 1912.5 | 1855  | 1882.5 | 1910  | 1857.5 | 1882.5 | 1907.5 | 1860  | 1882.5 | 1905  |
| QPSK       | 1         | #0     | 22.94                                                      | 23.94  | 20.84  | 23.43  | 23.74  | 22.60  | 23.29  | 23.64  | 23.33  | 23.64 | 23.75  | 22.78 | 23.34  | 23.10  | 22.31  | 23.38 | 23.00  | 23.33 |
|            | 1         | #Mid   | 23.17                                                      | 24.01  | 20.45  | 23.44  | 23.76  | 21.15  | 23.21  | 23.65  | 21.88  | 23.56 | 23.77  | 23.60 | 23.60  | 24.07  | 23.37  | 24.01 | 24.05  | 23.45 |
|            | 1         | #High  | 23.01                                                      | 23.97  | 20.16  | 23.50  | 23.56  | 20.10  | 23.23  | 23.72  | 19.99  | 23.76 | 23.78  | 19.51 | 23.54  | 23.71  | 19.18  | 23.03 | 23.59  | 19.40 |
|            | 50%       | #0     | 23.01                                                      | 23.86  | 20.92  | 22.35  | 22.67  | 21.71  | 22.26  | 22.73  | 22.69  | 22.39 | 22.77  | 22.81 | 22.53  | 22.85  | 22.77  | 22.68 | 22.83  | 22.98 |
|            | 50%       | #Mid   | 23.16                                                      | 23.65  | 21.42  | 22.37  | 22.75  | 21.56  | 22.27  | 22.60  | 22.50  | 22.53 | 22.72  | 22.61 | 22.62  | 22.77  | 22.72  | 22.72 | 22.87  | 22.73 |
|            | 50%       | #High  | 23.07                                                      | 23.92  | 20.40  | 22.39  | 22.62  | 20.56  | 22.39  | 22.77  | 21.03  | 22.56 | 22.72  | 22.04 | 22.72  | 22.81  | 22.31  | 22.66 | 22.77  | 22.52 |
|            | 100%      | #0     | 22.08                                                      | 22.81  | 20.82  | 22.38  | 22.67  | 21.13  | 22.37  | 22.66  | 22.22  | 22.43 | 22.74  | 22.61 | 22.64  | 22.88  | 22.74  | 22.69 | 22.84  | 22.73 |
| 16QAM      | 1         | #0     | 22.54                                                      | 23.05  | 20.99  | 22.72  | 23.04  | 21.79  | 22.06  | 22.42  | 22.32  | 22.79 | 23.08  | 22.08 | 22.66  | 23.03  | 22.36  | 23.25 | 22.53  | 22.51 |
|            | 1         | #Mid   | 22.63                                                      | 23.13  | 20.47  | 22.69  | 22.88  | 20.38  | 22.20  | 22.44  | 21.61  | 23.54 | 23.44  | 22.90 | 23.01  | 23.15  | 23.00  | 23.77 | 23.72  | 22.68 |
|            | 1         | #High  | 22.46                                                      | 22.99  | 20.11  | 22.71  | 22.97  | 19.51  | 22.02  | 22.38  | 19.57  | 22.98 | 23.06  | 18.94 | 22.96  | 22.93  | 19.25  | 22.67 | 23.20  | 18.69 |
|            | 50%       | #0     | 22.31                                                      | 22.94  | 20.39  | 21.63  | 21.92  | 21.11  | 21.33  | 21.64  | 21.60  | 21.52 | 21.78  | 21.96 | 21.63  | 21.89  | 21.85  | 21.68 | 21.80  | 21.94 |
|            | 50%       | #Mid   | 22.53                                                      | 23.05  | 20.80  | 21.63  | 21.80  | 20.77  | 21.34  | 21.60  | 21.52  | 21.62 | 21.85  | 21.68 | 21.65  | 21.71  | 21.73  | 21.86 | 21.83  | 21.85 |
|            | 50%       | #High  | 22.34                                                      | 22.88  | 19.99  | 21.65  | 21.96  | 19.95  | 21.48  | 21.51  | 20.44  | 21.71 | 21.70  | 21.38 | 21.64  | 21.65  | 21.65  | 21.78 | 21.62  | 21.72 |
|            | 100%      | #0     | 21.21                                                      | 21.89  | 20.16  | 21.44  | 21.58  | 20.51  | 21.46  | 21.87  | 21.53  | 21.44 | 21.58  | 21.58 | 21.69  | 21.79  | 21.69  | 21.73 | 21.91  | 21.93 |

Note: Band25 Covered Band2.

| LTE Band26 |           |        | Maximum Conducted Output Power (Channel / Frequency (MHz)) |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|------------|-----------|--------|------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Modulation | Bandwidth |        | 1.4MHz                                                     |       |       | 3MHz  |       |       | 5MHz  |       |       | 10MHz |       |       | 15MHz |       |       |
|            | RB        | RB     | 26797                                                      | 26915 | 27033 | 26805 | 26915 | 27025 | 26815 | 26915 | 27015 | 26840 | 26915 | 27015 | 26865 | 26915 | 26965 |
|            | No.       | Offset | 824.7                                                      | 836.5 | 848.3 | 825.5 | 836.5 | 847.5 | 826.5 | 836.5 | 846.5 | 829   | 836.5 | 844   | 831.5 | 836.5 | 841.5 |
| QPSK       | 1         | #0     | 23.94                                                      | 23.66 | 23.61 | 23.61 | 23.40 | 23.35 | 23.50 | 23.15 | 23.25 | 23.60 | 23.29 | 23.10 | 23.75 | 23.29 | 23.31 |
|            | 1         | #Mid   | 23.87                                                      | 23.51 | 23.84 | 23.51 | 23.62 | 23.65 | 23.47 | 23.23 | 23.36 | 23.64 | 23.64 | 23.23 | 23.57 | 23.32 | 23.44 |
|            | 1         | #High  | 23.66                                                      | 23.31 | 23.67 | 23.43 | 23.47 | 23.53 | 23.51 | 23.21 | 23.26 | 23.22 | 23.27 | 23.29 | 23.25 | 23.45 | 23.27 |
|            | 50%       | #0     | 23.71                                                      | 23.44 | 23.46 | 22.71 | 22.38 | 22.42 | 22.61 | 22.39 | 22.47 | 22.59 | 22.41 | 22.27 | 22.55 | 22.42 | 22.37 |
|            | 50%       | #Mid   | 24.09                                                      | 23.50 | 23.38 | 22.53 | 22.44 | 22.28 | 22.60 | 22.35 | 22.37 | 22.53 | 22.36 | 22.30 | 22.46 | 22.48 | 22.44 |
|            | 50%       | #High  | 23.91                                                      | 23.26 | 23.31 | 22.50 | 22.40 | 22.38 | 22.61 | 22.42 | 22.40 | 22.51 | 22.42 | 22.24 | 22.42 | 22.41 | 22.36 |
|            | 100%      | #0     | 22.80                                                      | 22.46 | 22.43 | 22.77 | 22.49 | 22.35 | 22.71 | 22.35 | 22.35 | 22.44 | 22.34 | 22.16 | 22.39 | 22.45 | 22.45 |
| 16QAM      | 1         | #0     | 23.64                                                      | 22.29 | 22.73 | 23.85 | 22.82 | 22.21 | 22.42 | 22.58 | 22.29 | 22.66 | 23.18 | 22.79 | 22.97 | 22.10 | 22.43 |
|            | 1         | #Mid   | 23.44                                                      | 22.52 | 22.83 | 23.99 | 23.08 | 21.98 | 22.64 | 22.74 | 22.53 | 22.95 | 23.65 | 23.54 | 23.08 | 22.31 | 22.54 |
|            | 1         | #High  | 23.50                                                      | 22.36 | 22.87 | 23.51 | 23.01 | 22.07 | 22.65 | 22.58 | 22.44 | 22.36 | 23.21 | 22.78 | 23.04 | 22.13 | 22.40 |
|            | 50%       | #0     | 22.90                                                      | 22.37 | 22.52 | 22.61 | 21.23 | 21.13 | 21.49 | 21.25 | 21.38 | 21.76 | 21.22 | 21.31 | 21.54 | 21.30 | 21.39 |
|            | 50%       | #Mid   | 23.14                                                      | 22.68 | 22.77 | 21.64 | 21.53 | 21.23 | 21.58 | 21.26 | 21.47 | 21.62 | 21.40 | 21.38 | 21.58 | 21.46 | 21.52 |
|            | 50%       | #High  | 22.57                                                      | 22.46 | 22.31 | 22.57 | 21.27 | 21.09 | 21.63 | 21.28 | 21.25 | 21.31 | 21.43 | 21.09 | 21.61 | 21.40 | 21.40 |
|            | 100%      | #0     | 21.73                                                      | 21.60 | 21.50 | 22.77 | 21.31 | 21.31 | 21.67 | 21.30 | 21.36 | 21.45 | 21.33 | 21.21 | 21.50 | 21.45 | 21.34 |

Note: Band26 Covered Band5.

| LTE Band41 |           |        | Maximum Conducted Output Power (Channel / Frequency (MHz)) |       |        |       |       |       |        |       |        |       |       |       |
|------------|-----------|--------|------------------------------------------------------------|-------|--------|-------|-------|-------|--------|-------|--------|-------|-------|-------|
| Modulation | Bandwidth |        | 5MHz                                                       |       |        | 10MHz |       |       | 15MHz  |       |        | 20MHz |       |       |
|            | RB        | RB     | 39675                                                      | 40620 | 41565  | 39700 | 40620 | 41540 | 39725  | 40620 | 41515  | 39750 | 40620 | 41490 |
|            | No.       | Offset | 2498.5                                                     | 2593  | 2687.5 | 2501  | 2593  | 2685  | 2503.5 | 2593  | 2682.5 | 2506  | 2593  | 2680  |
| QPSK       | 1         | #0     | 22.60                                                      | 22.55 | 23.05  | 22.67 | 22.88 | 22.98 | 22.44  | 22.84 | 23.18  | 22.60 | 22.46 | 22.82 |
|            | 1         | #Mid   | 22.49                                                      | 22.68 | 23.22  | 22.66 | 22.72 | 23.13 | 22.57  | 23.01 | 23.25  | 22.53 | 22.75 | 22.90 |
|            | 1         | #High  | 22.54                                                      | 22.56 | 23.10  | 22.97 | 22.82 | 23.12 | 22.81  | 22.68 | 23.11  | 22.33 | 22.43 | 22.77 |
|            | 50%       | #0     | 21.64                                                      | 21.79 | 22.09  | 21.64 | 21.76 | 22.21 | 21.51  | 21.89 | 22.11  | 21.58 | 21.80 | 22.17 |
|            | 50%       | #Mid   | 21.59                                                      | 21.72 | 22.05  | 21.58 | 21.73 | 22.10 | 21.51  | 21.65 | 22.14  | 21.75 | 21.82 | 22.08 |
|            | 50%       | #High  | 21.66                                                      | 21.84 | 22.01  | 21.77 | 21.79 | 22.10 | 21.74  | 21.86 | 22.09  | 21.89 | 21.81 | 22.22 |
|            | 100%      | #0     | 21.68                                                      | 21.74 | 22.21  | 21.70 | 21.72 | 22.32 | 21.53  | 21.87 | 22.11  | 21.59 | 21.71 | 22.11 |
| 16QAM      | 1         | #0     | 21.61                                                      | 21.61 | 22.17  | 21.72 | 21.74 | 22.42 | 21.27  | 21.99 | 22.09  | 21.79 | 22.12 | 21.85 |
|            | 1         | #Mid   | 21.74                                                      | 21.79 | 22.32  | 21.94 | 21.98 | 22.79 | 21.89  | 21.77 | 22.11  | 22.33 | 22.08 | 22.08 |
|            | 1         | #High  | 21.55                                                      | 21.70 | 22.30  | 21.95 | 21.77 | 22.39 | 21.84  | 21.78 | 21.92  | 22.14 | 21.80 | 21.97 |
|            | 50%       | #0     | 20.47                                                      | 20.58 | 21.09  | 20.61 | 20.77 | 21.43 | 20.51  | 20.75 | 20.93  | 20.73 | 20.79 | 21.26 |
|            | 50%       | #Mid   | 20.70                                                      | 20.78 | 21.14  | 20.55 | 20.85 | 21.10 | 20.60  | 20.77 | 20.99  | 20.84 | 20.71 | 21.17 |
|            | 50%       | #High  | 20.60                                                      | 20.64 | 21.06  | 20.83 | 20.71 | 21.38 | 20.68  | 20.73 | 21.17  | 20.86 | 20.81 | 21.25 |
|            | 100%      | #0     | 20.73                                                      | 20.81 | 20.91  | 20.73 | 20.67 | 21.20 | 20.69  | 20.88 | 21.17  | 20.76 | 20.82 | 21.24 |

Note: Band41 Covered Band38.

### Maximum Conducted Power and ERP/EIRP Power

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter.

The relevant equation for determining the maximum ERP or EIRP from the measured RF output power is given in Equation (1) as follows

$$\text{ERP or EIRP} = P_{\text{Meas}} + G_T$$

where

ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively.

(expressed in the same units as  $P_{\text{Meas}}$ , e.g., dBm or dBW)

$P_{\text{Meas}}$  measured transmitter output power or PSD, in dBm or dBW

$G_T$  gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

$$\text{ERP} = \text{EIRP} - 2.15$$

### Monarch 8

| LTE Band  | BW   | Modulation | Conducted Peak Power (dBm) | Conducted Peak Power (W) | Antenna Gain (dBi) | Maximum EIRP (W) | EIRP Limit (W) |
|-----------|------|------------|----------------------------|--------------------------|--------------------|------------------|----------------|
| LTE Band4 | 1.4M | QPSK       | 22.95                      | 0.197                    | 2.50               | 0.351            | 1              |
|           |      | 16QAM      | 22.07                      | 0.161                    | 2.50               | 0.286            | 1              |
|           | 3M   | QPSK       | 22.69                      | 0.186                    | 2.50               | 0.330            | 1              |
|           |      | 16QAM      | 22.01                      | 0.159                    | 2.50               | 0.282            | 1              |
|           | 5M   | QPSK       | 22.65                      | 0.184                    | 2.50               | 0.327            | 1              |
|           |      | 16QAM      | 21.78                      | 0.151                    | 2.50               | 0.268            | 1              |
|           | 10M  | QPSK       | 22.99                      | 0.199                    | 2.50               | 0.354            | 1              |
|           |      | 16QAM      | 22.16                      | 0.164                    | 2.50               | 0.292            | 1              |
|           | 15M  | QPSK       | 22.91                      | 0.195                    | 2.50               | 0.348            | 1              |
|           |      | 16QAM      | 22.08                      | 0.161                    | 2.50               | 0.287            | 1              |
|           | 20M  | QPSK       | 23.05                      | 0.202                    | 2.50               | 0.359            | 1              |
|           |      | 16QAM      | 22.26                      | 0.168                    | 2.50               | 0.299            | 1              |

| LTE Band  | BW  | Modulation | Conducted Peak Power (dBm) | Conducted Peak Power (W) | Antenna Gain (dBi) | Maximum EIRP (W) | EIRP Limit (W) |
|-----------|-----|------------|----------------------------|--------------------------|--------------------|------------------|----------------|
| LTE Band7 | 5M  | QPSK       | 23.28                      | 0.213                    | 2.10               | 0.345            | 2              |
|           |     | 16QAM      | 21.80                      | 0.151                    | 2.10               | 0.245            | 2              |
|           | 10M | QPSK       | 23.56                      | 0.227                    | 2.10               | 0.368            | 2              |
|           |     | 16QAM      | 22.70                      | 0.186                    | 2.10               | 0.302            | 2              |
|           | 15M | QPSK       | 23.21                      | 0.209                    | 2.10               | 0.340            | 2              |
|           |     | 16QAM      | 22.55                      | 0.180                    | 2.10               | 0.292            | 2              |
|           | 20M | QPSK       | 23.60                      | 0.229                    | 2.10               | 0.372            | 2              |
|           |     | 16QAM      | 23.11                      | 0.205                    | 2.10               | 0.332            | 2              |

| LTE Band   | BW   | Modulation | Conducted Peak Power (dBm) | Conducted Peak Power (W) | Antenna Gain (dBi) | Maximum ERP (W) | ERP Limit (W) |
|------------|------|------------|----------------------------|--------------------------|--------------------|-----------------|---------------|
| LTE Band12 | 1.4M | QPSK       | 24.17                      | 0.261                    | -4.52              | 0.056           | 3             |
|            |      | 16QAM      | 23.64                      | 0.231                    | -4.52              | 0.050           | 3             |
|            | 3M   | QPSK       | 23.96                      | 0.249                    | -4.52              | 0.054           | 3             |
|            |      | 16QAM      | 23.32                      | 0.215                    | -4.52              | 0.046           | 3             |
|            | 5M   | QPSK       | 23.95                      | 0.248                    | -4.52              | 0.053           | 3             |
|            |      | 16QAM      | 23.20                      | 0.209                    | -4.52              | 0.045           | 3             |
|            | 10M  | QPSK       | 24.08                      | 0.256                    | -4.52              | 0.055           | 3             |
|            |      | 16QAM      | 23.87                      | 0.244                    | -4.52              | 0.052           | 3             |

| LTE Band   | BW  | Modulation | Conducted Peak Power (dBm) | Conducted Peak Power (W) | Antenna Gain (dBi) | Maximum ERP (W) | ERP Limit (W) |
|------------|-----|------------|----------------------------|--------------------------|--------------------|-----------------|---------------|
| LTE Band13 | 5M  | QPSK       | 23.97                      | 0.249                    | -4.52              | 0.054           | 3             |
|            |     | 16QAM      | 23.07                      | 0.203                    | -4.52              | 0.044           | 3             |
|            | 10M | QPSK       | 24.04                      | 0.254                    | -4.52              | 0.055           | 3             |
|            |     | 16QAM      | 22.99                      | 0.199                    | -4.52              | 0.043           | 3             |

| LTE Band   | BW   | Modulation | Conducted Peak Power (dBm) | Conducted Peak Power (W) | Antenna Gain (dBi) | Maximum EIRP (W) | EIRP Limit (W) |
|------------|------|------------|----------------------------|--------------------------|--------------------|------------------|----------------|
| LTE Band25 | 1.4M | QPSK       | 24.01                      | 0.252                    | 2.46               | 0.444            | 2              |
|            |      | 16QAM      | 23.13                      | 0.206                    | 2.46               | 0.362            | 2              |
|            | 3M   | QPSK       | 23.76                      | 0.238                    | 2.46               | 0.419            | 2              |
|            |      | 16QAM      | 23.04                      | 0.201                    | 2.46               | 0.355            | 2              |
|            | 5M   | QPSK       | 23.72                      | 0.236                    | 2.46               | 0.415            | 2              |
|            |      | 16QAM      | 22.44                      | 0.175                    | 2.46               | 0.309            | 2              |
|            | 10M  | QPSK       | 23.78                      | 0.239                    | 2.46               | 0.421            | 2              |
|            |      | 16QAM      | 23.54                      | 0.226                    | 2.46               | 0.398            | 2              |
|            | 15M  | QPSK       | 24.07                      | 0.255                    | 2.46               | 0.450            | 2              |
|            |      | 16QAM      | 23.15                      | 0.207                    | 2.46               | 0.364            | 2              |
|            | 20M  | QPSK       | 24.05                      | 0.254                    | 2.46               | 0.448            | 2              |
|            |      | 16QAM      | 23.77                      | 0.238                    | 2.46               | 0.420            | 2              |

Note: Band25 Covered Band2.

| LTE Band               | BW   | Modulation | Conducted Peak Power (dBm) | Conducted Peak Power (W) | Antenna Gain (dBi) | Maximum ERP (W) | ERP Limit (W) |
|------------------------|------|------------|----------------------------|--------------------------|--------------------|-----------------|---------------|
| LTE Band26<br>(Part22) | 1.4M | QPSK       | 24.09                      | 0.256                    | -3.00              | 0.078           | 2             |
|                        |      | 16QAM      | 23.64                      | 0.231                    | -3.00              | 0.071           | 2             |
|                        | 3M   | QPSK       | 23.65                      | 0.232                    | -3.00              | 0.071           | 2             |
|                        |      | 16QAM      | 23.99                      | 0.251                    | -3.00              | 0.077           | 2             |
|                        | 5M   | QPSK       | 23.51                      | 0.224                    | -3.00              | 0.069           | 2             |
|                        |      | 16QAM      | 22.74                      | 0.188                    | -3.00              | 0.057           | 2             |
|                        | 10M  | QPSK       | 23.64                      | 0.231                    | -3.00              | 0.071           | 2             |
|                        |      | 16QAM      | 23.65                      | 0.232                    | -3.00              | 0.071           | 2             |
|                        | 15M  | QPSK       | 23.75                      | 0.237                    | -3.00              | 0.072           | 2             |
|                        |      | 16QAM      | 23.08                      | 0.203                    | -3.00              | 0.062           | 2             |

Note: Band26 Covered Band5.

| LTE Band   | BW  | Modulation | Conducted Peak Power (dBm) | Conducted Peak Power (W) | Antenna Gain (dBi) | Maximum EIRP (W) | EIRP Limit (W) |
|------------|-----|------------|----------------------------|--------------------------|--------------------|------------------|----------------|
| LTE Band41 | 5M  | QPSK       | 23.22                      | 0.210                    | 2.80               | 0.400            | 2              |
|            |     | 16QAM      | 22.32                      | 0.171                    | 2.80               | 0.325            | 2              |
|            | 10M | QPSK       | 23.13                      | 0.206                    | 2.80               | 0.392            | 2              |
|            |     | 16QAM      | 22.79                      | 0.190                    | 2.80               | 0.362            | 2              |
|            | 15M | QPSK       | 23.25                      | 0.211                    | 2.80               | 0.403            | 2              |
|            |     | 16QAM      | 22.11                      | 0.163                    | 2.80               | 0.310            | 2              |
|            | 20M | QPSK       | 22.90                      | 0.195                    | 2.80               | 0.372            | 2              |
|            |     | 16QAM      | 22.33                      | 0.171                    | 2.80               | 0.326            | 2              |

Note: Band41 Covered Band38.

## Radiated Spurious Emission

### Monarch 8

| LTE Band4                                 |                 |                  |                 |                |                    |             |             |
|-------------------------------------------|-----------------|------------------|-----------------|----------------|--------------------|-------------|-------------|
| Frequency (MHz)                           | Ant. Pol. (H/V) | SG Reading (dBm) | Cable Loss (dB) | Ant Gain (dBi) | EIRP Measure (dBm) | Limit (dBm) | Margin (dB) |
| QPSK, CH20050 / 1720MHz, Bandwidth 20MHz  |                 |                  |                 |                |                    |             |             |
| 3440                                      | H               | -41.56           | 1.34            | 7.54           | -35.36             | -13         | -22.36      |
| 5160                                      | H               | -48.11           | 1.62            | 9.86           | -39.87             | -13         | -26.87      |
| 6880                                      | H               | -52.49           | 1.83            | 11.11          | -43.21             | -13         | -30.21      |
| 3440                                      | V               | -43.59           | 1.34            | 7.54           | -37.39             | -13         | -24.39      |
| 5160                                      | V               | -50.92           | 1.62            | 9.86           | -42.68             | -13         | -29.68      |
| 6880                                      | V               | -55.06           | 1.83            | 11.11          | -45.78             | -13         | -32.78      |
| QPSK, CH20175 /1732.5MHz, Bandwidth 20MHz |                 |                  |                 |                |                    |             |             |
| 3465                                      | H               | -47.34           | 1.34            | 7.65           | -41.02             | -13         | -28.02      |
| 5197.5                                    | H               | -49.05           | 1.68            | 9.88           | -40.85             | -13         | -27.85      |
| 6930                                      | H               | -56.09           | 1.83            | 11.15          | -46.77             | -13         | -33.77      |
| 3465                                      | V               | -44.25           | 1.34            | 7.65           | -37.93             | -13         | -24.93      |
| 5197.5                                    | V               | -50.56           | 1.68            | 9.88           | -42.36             | -13         | -29.36      |
| 6930                                      | V               | -57.72           | 1.83            | 11.15          | -48.40             | -13         | -35.40      |
| QPSK, CH20300 / 1745MHz, Bandwidth 20MHz  |                 |                  |                 |                |                    |             |             |
| 3490                                      | H               | -46.29           | 1.35            | 7.76           | -39.87             | -13         | -26.87      |
| 5235                                      | H               | -49.64           | 1.74            | 9.89           | -41.48             | -13         | -28.48      |
| 6980                                      | H               | -56.44           | 1.76            | 11.19          | -47.01             | -13         | -34.01      |
| 3490                                      | V               | -40.77           | 1.35            | 7.76           | -34.35             | -13         | -21.35      |
| 5235                                      | V               | -48.38           | 1.74            | 9.89           | -40.22             | -13         | -27.22      |
| 6980                                      | V               | -56.22           | 1.76            | 11.19          | -46.79             | -13         | -33.79      |

Note:

1. Spurious emissions within 30-1000MHz & Other harmonic were found more than 20dB below limit line.
2.  $EIRP \text{ or } ERP \text{ (dBm)} = SG \text{ Reading (dBm)} - \text{Cable Loss (dB)} + \text{Substitute Antenna Gain (dBi)}$

| LTE Band7                                |                 |                  |                 |                |                    |             |             |
|------------------------------------------|-----------------|------------------|-----------------|----------------|--------------------|-------------|-------------|
| SG Reading (dBm)                         | Cable Loss (dB) | SG Reading (dBm) | Cable Loss (dB) | Ant Gain (dBi) | EIRP Measure (dBm) | Limit (dBm) | Margin (dB) |
| QPSK, CH20850 / 2510MHz, Bandwidth 20MHz |                 |                  |                 |                |                    |             |             |
| 5020                                     | H               | -47.37           | 1.56            | 9.81           | -39.12             | -25         | -14.12      |
| 7530                                     | H               | -58.42           | 1.82            | 11.73          | -48.51             | -25         | -23.51      |
| 10040                                    | H               | -54.48           | 2.27            | 12.40          | -44.35             | -25         | -19.35      |
| 5020                                     | V               | -46.90           | 1.56            | 9.81           | -38.65             | -25         | -13.65      |
| 7530                                     | V               | -58.75           | 1.82            | 11.73          | -48.84             | -25         | -23.84      |
| 10040                                    | V               | -54.62           | 2.27            | 12.40          | -44.49             | -25         | -19.49      |
| QPSK, CH21100 / 2535MHz, Bandwidth 20MHz |                 |                  |                 |                |                    |             |             |
| 5070                                     | H               | -50.55           | 1.55            | 9.83           | -42.27             | -25         | -17.27      |
| 7605                                     | H               | -57.76           | 1.76            | 11.79          | -47.74             | -25         | -22.74      |
| 10140                                    | H               | -54.75           | 2.39            | 12.40          | -44.74             | -25         | -19.74      |
| 5070                                     | V               | -46.42           | 1.55            | 9.83           | -38.14             | -25         | -13.14      |
| 7605                                     | V               | -58.36           | 1.76            | 11.79          | -48.34             | -25         | -23.34      |
| 10140                                    | V               | -54.85           | 2.39            | 12.40          | -44.84             | -25         | -19.84      |
| QPSK, CH21350 / 2560MHz, Bandwidth 20MHz |                 |                  |                 |                |                    |             |             |
| 5120                                     | H               | -46.42           | 1.60            | 9.85           | -38.17             | -25         | -13.17      |
| 7680                                     | H               | -54.35           | 1.66            | 11.85          | -44.16             | -25         | -19.16      |
| 10240                                    | H               | -53.50           | 1.82            | 12.40          | -42.92             | -25         | -17.92      |
| 5120                                     | V               | -51.61           | 1.60            | 9.85           | -43.36             | -25         | -18.36      |
| 7680                                     | V               | -57.83           | 1.66            | 11.85          | -47.64             | -25         | -22.64      |
| 10240                                    | V               | -56.64           | 1.82            | 12.40          | -46.06             | -25         | -21.06      |

Note:

1. Spurious emissions within 30-1000MHz & Other harmonic were found more than 20dB below limit line.
2.  $EIRP \text{ or } ERP \text{ (dBm)} = SG \text{ Reading (dBm)} - Cable \text{ Loss (dB)} + Substitute \text{ Antenna Gain (dBi)}$

| LTE Band12                                |                 |                  |                 |                |                    |             |             |
|-------------------------------------------|-----------------|------------------|-----------------|----------------|--------------------|-------------|-------------|
| Frequency (MHz)                           | Ant. Pol. (H/V) | SG Reading (dBm) | Cable Loss (dB) | Ant Gain (dBi) | EIRP Measure (dBm) | Limit (dBm) | Margin (dB) |
| QPSK, CH23060 / 704MHz, Bandwidth 10MHz   |                 |                  |                 |                |                    |             |             |
| 1408                                      | H               | -34.35           | 1.01            | 4.76           | -30.61             | -13         | -17.61      |
| 2112                                      | H               | -36.86           | 1.16            | 4.72           | -33.30             | -13         | -20.30      |
| 2816                                      | H               | -54.84           | 1.22            | 6.41           | -49.65             | -13         | -36.65      |
| 1408                                      | V               | -38.45           | 1.01            | 4.76           | -34.71             | -13         | -21.71      |
| 2112                                      | V               | -45.48           | 1.16            | 4.72           | -41.92             | -13         | -28.92      |
| 2816                                      | V               | -47.91           | 1.22            | 6.41           | -42.72             | -13         | -29.72      |
| QPSK, CH23095 / 707.5MHz, Bandwidth 10MHz |                 |                  |                 |                |                    |             |             |
| 1415                                      | H               | -36.82           | 1.01            | 4.82           | -33.01             | -13         | -20.01      |
| 2122.5                                    | H               | -42.25           | 1.16            | 4.75           | -38.66             | -13         | -25.66      |
| 2830                                      | H               | -58.21           | 1.24            | 6.43           | -53.02             | -13         | -40.02      |
| 1415                                      | V               | -37.31           | 1.01            | 4.82           | -33.50             | -13         | -20.50      |
| 2122.5                                    | V               | -45.80           | 1.16            | 4.75           | -42.21             | -13         | -29.21      |
| 2830                                      | V               | -60.84           | 1.24            | 6.43           | -55.65             | -13         | -42.65      |
| QPSK, CH23130 / 711MHz, Bandwidth 10MHz   |                 |                  |                 |                |                    |             |             |
| 1422                                      | H               | -45.96           | 1.01            | 4.88           | -42.09             | -13         | -29.09      |
| 2133                                      | H               | -48.32           | 1.16            | 4.77           | -44.71             | -13         | -31.71      |
| 2844                                      | H               | -64.10           | 1.26            | 6.45           | -58.91             | -13         | -45.91      |
| 1422                                      | V               | -47.99           | 1.01            | 4.88           | -44.12             | -13         | -31.12      |
| 2133                                      | V               | -57.15           | 1.16            | 4.77           | -53.54             | -13         | -40.54      |
| 2844                                      | V               | -67.72           | 1.26            | 6.45           | -62.53             | -13         | -49.53      |

Note:

1. Spurious emissions within 30-1000MHz & Other harmonic were found more than 20dB below limit line.
2.  $EIRP \text{ or } ERP \text{ (dBm)} = SG \text{ Reading (dBm)} - \text{Cable Loss (dB)} + \text{Substitute Antenna Gain (dBi)}$

| LTE Band13                               |                 |                  |                 |                |                    |             |             |
|------------------------------------------|-----------------|------------------|-----------------|----------------|--------------------|-------------|-------------|
| Frequency (MHz)                          | Ant. Pol. (H/V) | SG Reading (dBm) | Cable Loss (dB) | Ant Gain (dBi) | EIRP Measure (dBm) | Limit (dBm) | Margin (dB) |
| QPSK, CH23205 / 779.5MHz, Bandwidth 5MHz |                 |                  |                 |                |                    |             |             |
| 1559                                     | H               | -44.78           | 1.04            | 5.41           | -40.41             | -40         | -0.41       |
| 2338.5                                   | H               | -60.32           | 1.15            | 5.28           | -56.19             | -13         | -43.19      |
| 3118                                     | H               | -58.99           | 1.28            | 6.70           | -53.57             | -13         | -40.57      |
| 1559                                     | V               | -47.26           | 1.04            | 5.41           | -42.89             | -40         | -2.89       |
| 2338.5                                   | V               | -59.07           | 1.15            | 5.28           | -54.94             | -13         | -41.94      |
| 3118                                     | V               | -62.72           | 1.28            | 6.70           | -57.30             | -13         | -44.30      |
| QPSK, CH23230 / 782MHz, Bandwidth 5MHz   |                 |                  |                 |                |                    |             |             |
| 1564                                     | H               | -44.92           | 1.04            | 5.39           | -40.57             | -40         | -0.57       |
| 2346                                     | H               | -58.32           | 1.14            | 5.29           | -54.17             | -13         | -41.17      |
| 3128                                     | H               | -57.55           | 1.27            | 6.70           | -52.12             | -13         | -39.12      |
| 1564                                     | V               | -45.96           | 1.04            | 5.39           | -41.61             | -40         | -1.61       |
| 2346                                     | V               | -57.92           | 1.14            | 5.29           | -53.77             | -13         | -40.77      |
| 3128                                     | V               | -56.02           | 1.27            | 6.70           | -50.59             | -13         | -37.59      |
| QPSK, CH23255 / 784.5MHz, Bandwidth 5MHz |                 |                  |                 |                |                    |             |             |
| 1569                                     | H               | -47.25           | 1.05            | 5.38           | -42.92             | -40         | -2.92       |
| 2353.5                                   | H               | -57.39           | 1.14            | 5.31           | -53.22             | -13         | -40.22      |
| 3138                                     | H               | -56.58           | 1.27            | 6.70           | -51.15             | -13         | -38.15      |
| 1569                                     | V               | -47.38           | 1.05            | 5.38           | -43.05             | -40         | -3.05       |
| 2353.5                                   | V               | -61.62           | 1.14            | 5.31           | -57.45             | -13         | -44.45      |
| 3138                                     | V               | -59.14           | 1.27            | 6.70           | -53.71             | -13         | -40.71      |

Note:

1. Spurious emissions within 30-1000MHz & Other harmonic were found more than 20dB below limit line.
2.  $EIRP \text{ or } ERP \text{ (dBm)} = SG \text{ Reading (dBm)} - \text{Cable Loss (dB)} + \text{Substitute Antenna Gain (dBi)}$

| LTE Band25                                |                 |                  |                 |                |                    |             |             |
|-------------------------------------------|-----------------|------------------|-----------------|----------------|--------------------|-------------|-------------|
| Frequency (MHz)                           | Ant. Pol. (H/V) | SG Reading (dBm) | Cable Loss (dB) | Ant Gain (dBi) | EIRP Measure (dBm) | Limit (dBm) | Margin (dB) |
| QPSK, CH26140 / 1860MHz, Bandwidth 20MHz  |                 |                  |                 |                |                    |             |             |
| 3720                                      | H               | -44.22           | 1.38            | 7.89           | -37.71             | -13         | -24.71      |
| 5580                                      | H               | -53.41           | 1.74            | 10.10          | -45.05             | -13         | -32.05      |
| 7440                                      | H               | -52.28           | 1.95            | 11.68          | -42.55             | -13         | -29.55      |
| 3720                                      | V               | -45.94           | 1.38            | 7.89           | -39.43             | -13         | -26.43      |
| 5580                                      | V               | -56.33           | 1.74            | 10.10          | -47.97             | -13         | -34.97      |
| 7440                                      | V               | -53.72           | 1.95            | 11.68          | -43.99             | -13         | -30.99      |
| QPSK, CH26365 /1882.5MHz, Bandwidth 20MHz |                 |                  |                 |                |                    |             |             |
| 3765                                      | H               | -39.40           | 1.36            | 7.94           | -32.82             | -13         | -19.82      |
| 5647.5                                    | H               | -53.55           | 1.79            | 10.10          | -45.24             | -13         | -32.24      |
| 7530                                      | H               | -54.25           | 1.82            | 11.73          | -44.34             | -13         | -31.34      |
| 3765                                      | V               | -40.92           | 1.36            | 7.94           | -34.34             | -13         | -21.34      |
| 5647.5                                    | V               | -57.64           | 1.79            | 10.10          | -49.33             | -13         | -36.33      |
| 7530                                      | V               | -59.97           | 1.82            | 11.73          | -50.06             | -13         | -37.06      |
| QPSK, CH26590 / 1905MHz, Bandwidth 20MHz  |                 |                  |                 |                |                    |             |             |
| 3810                                      | H               | -38.23           | 1.35            | 8.05           | -31.53             | -13         | -18.53      |
| 5715                                      | H               | -47.69           | 1.84            | 10.10          | -39.43             | -13         | -26.43      |
| 7620                                      | H               | -55.78           | 1.71            | 11.80          | -45.69             | -13         | -32.69      |
| 3810                                      | V               | -40.53           | 1.35            | 8.05           | -33.83             | -13         | -20.83      |
| 5715                                      | V               | -47.09           | 1.84            | 10.10          | -38.83             | -13         | -25.83      |
| 7620                                      | V               | -55.84           | 1.71            | 11.80          | -45.75             | -13         | -32.75      |

Note:

1. Band25 Covered Band2.
2. Spurious emissions within 30-1000MHz & Other harmonic were found more than 20dB below limit line.
3.  $EIRP \text{ or } ERP \text{ (dBm)} = SG \text{ Reading (dBm)} - Cable \text{ Loss (dB)} + Substitute \text{ Antenna Gain (dBi)}$

| LTE Band26                                |                 |                  |                 |                |                    |             |             |
|-------------------------------------------|-----------------|------------------|-----------------|----------------|--------------------|-------------|-------------|
| Frequency (MHz)                           | Ant. Pol. (H/V) | SG Reading (dBm) | Cable Loss (dB) | Ant Gain (dBi) | EIRP Measure (dBm) | Limit (dBm) | Margin (dB) |
| QPSK, CH26865 / 831.5MHz, Bandwidth 15MHz |                 |                  |                 |                |                    |             |             |
| 1663                                      | H               | -30.98           | 1.06            | 5.08           | -26.97             | -13         | -13.97      |
| 2494.5                                    | H               | -51.67           | 1.14            | 5.59           | -47.21             | -13         | -34.21      |
| 3326                                      | H               | -43.62           | 1.31            | 7.04           | -37.88             | -13         | -24.88      |
| 1663                                      | V               | -35.17           | 1.06            | 5.08           | -31.16             | -13         | -18.16      |
| 2494.5                                    | V               | -53.16           | 1.14            | 5.59           | -48.70             | -13         | -35.70      |
| 3326                                      | V               | -49.28           | 1.31            | 7.04           | -43.54             | -13         | -30.54      |
| QPSK, CH26915 / 836.5MHz, Bandwidth 15MHz |                 |                  |                 |                |                    |             |             |
| 1673                                      | H               | -31.43           | 1.07            | 5.04           | -27.46             | -13         | -14.46      |
| 2509.5                                    | H               | -51.85           | 1.14            | 5.63           | -47.36             | -13         | -34.36      |
| 3346                                      | H               | -38.25           | 1.32            | 7.13           | -32.44             | -13         | -19.44      |
| 1673                                      | V               | -32.87           | 1.07            | 5.04           | -28.90             | -13         | -15.90      |
| 2509.5                                    | V               | -51.76           | 1.14            | 5.63           | -47.27             | -13         | -34.27      |
| 3346                                      | V               | -47.40           | 1.32            | 7.13           | -41.59             | -13         | -28.59      |
| QPSK, CH26965 / 841.5MHz, Bandwidth 15MHz |                 |                  |                 |                |                    |             |             |
| 1683                                      | H               | -30.65           | 1.08            | 5.01           | -26.72             | -13         | -13.72      |
| 2524.5                                    | H               | -50.53           | 1.14            | 5.67           | -46.00             | -13         | -33.00      |
| 3366                                      | H               | -39.44           | 1.34            | 7.22           | -33.57             | -13         | -20.57      |
| 1683                                      | V               | -29.47           | 1.08            | 5.01           | -25.54             | -13         | -12.54      |
| 2524.5                                    | V               | -52.03           | 1.14            | 5.67           | -47.50             | -13         | -34.50      |
| 3366                                      | V               | -44.55           | 1.34            | 7.22           | -38.68             | -13         | -25.68      |

Note:

1. Band26 Covered Band5.
2. Spurious emissions within 30-1000MHz & Other harmonic were found more than 20dB below limit line.
3.  $EIRP \text{ or } ERP \text{ (dBm)} = SG \text{ Reading (dBm)} - Cable \text{ Loss (dB)} + Substitute \text{ Antenna Gain (dBi)}$

| LTE Band41                               |                 |                  |                 |                |                    |             |             |
|------------------------------------------|-----------------|------------------|-----------------|----------------|--------------------|-------------|-------------|
| Frequency (MHz)                          | Ant. Pol. (H/V) | SG Reading (dBm) | Cable Loss (dB) | Ant Gain (dBi) | EIRP Measure (dBm) | Limit (dBm) | Margin (dB) |
| QPSK, CH39750 / 2506MHz, Bandwidth 20MHz |                 |                  |                 |                |                    |             |             |
| 5012                                     | H               | -51.87           | 1.57            | 9.81           | -43.64             | -25         | -18.64      |
| 7518                                     | H               | -57.69           | 1.88            | 11.72          | -47.85             | -25         | -22.85      |
| 10024                                    | H               | -55.22           | 2.11            | 12.40          | -44.93             | -25         | -19.93      |
| 5012                                     | V               | -48.26           | 1.57            | 9.81           | -40.03             | -25         | -15.03      |
| 7518                                     | V               | -60.59           | 1.88            | 11.72          | -50.75             | -25         | -25.75      |
| 10024                                    | V               | -51.20           | 2.11            | 12.40          | -40.91             | -25         | -15.91      |
| QPSK, CH40620 / 2593MHz, Bandwidth 20MHz |                 |                  |                 |                |                    |             |             |
| 5186                                     | H               | -52.06           | 1.66            | 9.88           | -43.84             | -25         | -18.84      |
| 7779                                     | H               | -59.07           | 1.69            | 11.94          | -48.82             | -25         | -23.82      |
| 10372                                    | H               | -52.02           | 2.24            | 12.40          | -41.86             | -25         | -16.86      |
| 5186                                     | V               | -52.76           | 1.66            | 9.88           | -44.54             | -25         | -19.54      |
| 7779                                     | V               | -58.04           | 1.69            | 11.94          | -47.79             | -25         | -22.79      |
| 10372                                    | V               | -47.57           | 2.24            | 12.40          | -37.41             | -25         | -12.41      |
| QPSK, CH41490 / 2680MHz, Bandwidth 20MHz |                 |                  |                 |                |                    |             |             |
| 5360                                     | H               | -52.79           | 1.65            | 9.99           | -44.45             | -25         | -19.45      |
| 8040                                     | H               | -53.65           | 1.99            | 12.24          | -43.40             | -25         | -18.40      |
| 10720                                    | H               | -41.63           | 2.78            | 12.40          | -32.01             | -25         | -7.01       |
| 5360                                     | V               | -59.32           | 1.65            | 9.99           | -50.98             | -25         | -25.98      |
| 8040                                     | V               | -59.59           | 1.99            | 12.24          | -49.34             | -25         | -24.34      |
| 10720                                    | V               | -43.80           | 2.78            | 12.40          | -34.18             | -25         | -9.18       |

Note:

1. Band41 Covered Band38.
2. Spurious emissions within 30-1000MHz & Other harmonic were found more than 20dB below limit line.
3.  $EIRP \text{ or } ERP \text{ (dBm)} = SG \text{ Reading (dBm)} - Cable \text{ Loss (dB)} + Substitute \text{ Antenna Gain (dBi)}$

## 7.6. Peak-Average Ratio

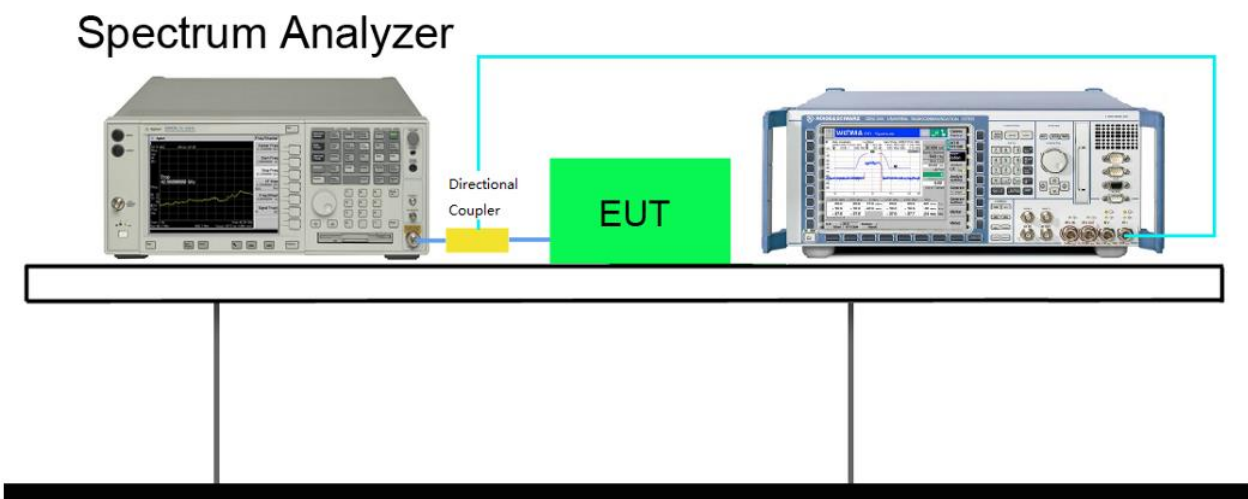
### 7.6.1 Test Limit

The transmitter's peak-to-average power ratio (PAPR) shall not exceed 13 dB for more than 0.1% of the time using a signal corresponding to the highest PAPR during periods of continuous transmission.

### 7.6.2 Test Procedure

KDB 971168 D01v02r02 - Section 5.7 & ANSI/TIA-603-E-2016

### 7.6.3 Test Setup



#### **7.6.4 Test Result**

Note: Please refer to the original report as 2209TWI301-U8.

## 7.7. Frequency Stability Under Temperature & Voltage Variations

### 7.7.1 Test Limit

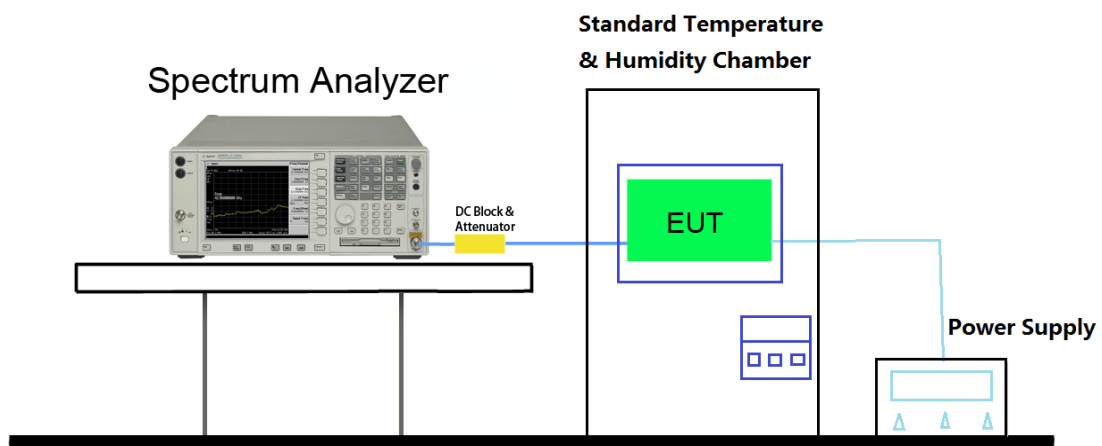
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

|       |                         |
|-------|-------------------------|
| Limit | $< \pm 2.5 \text{ ppm}$ |
|-------|-------------------------|

### 7.7.2 Test Procedure

KDB 971168 D01v02r02 - Section 9.0 & ANSI/TIA-603-E-2016

### 7.7.3 Test Setup



#### 7.7.4 Test Result

Note: Please refer to the original report as 2209TWI301-U8.

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