

## FCC Test Report (PART 24)

**Report No.:** RF160314E01-4

**FCC ID:** G95TCA300

**Test Model:** TCA300COM

**Received Date:** Mar. 14, 2016

**Test Date:** Apr. 18 to 25, 2016

**Issued Date:** May 23, 2016

**Applicant:** Technicolor Connected Home USA LLC

**Address:** 101 West 103rd Street, Indianapolis, IN 46290 United States

**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
Hsin Chu Laboratory

**Lab Address:** E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,  
Taiwan R.O.C.

**Test Location (1):** E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,  
Taiwan R.O.C.

**Test Location (2):** No. 49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin  
Chu Hsien 307, Taiwan R.O.C.



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### Release Control Record

| Issue No.     | Description       | Date Issued  |
|---------------|-------------------|--------------|
| RF160314E01-4 | Original release. | May 23, 2016 |

## 1 Certificate of Conformity

**Product:** Integrated Device

**Brand:** Technicolor

**Test Model:** TCA300COM

**Sample Status:** ENGINEERING SAMPLE

**Applicant:** Technicolor Connected Home USA LLC

**Test Date:** Apr. 18 to 25, 2016

**Standards:** FCC Part 24, Subpart E

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**Prepared by :**  , **Date:** May 23, 2016  
Claire Kuan / Specialist

**Approved by :**  , **Date:** May 23, 2016  
May Chen / Manager

## 2 Summary of Test Results

| Applied Standard: FCC Part 24 & Part 2 |                              |        |                                                                                   |
|----------------------------------------|------------------------------|--------|-----------------------------------------------------------------------------------|
| FCC Clause                             | Test Item                    | Result | Remarks                                                                           |
| 2.1046<br>24.232                       | Output Power                 | PASS   | Meet the requirement of limit.                                                    |
| 2.1046<br>24.232(d)                    | Peak To Average Ratio        | PASS   | Meet the requirement of limit.                                                    |
| 2.1055<br>24.235                       | Frequency Stability          | PASS   | Meet the requirement of limit.                                                    |
| 2.1049<br>24.238(b)                    | Occupied Bandwidth           | PASS   | Meet the requirement of limit.                                                    |
| 24.238(b)                              | Band Edge Measurements       | PASS   | Meet the requirement of limit.                                                    |
| 2.1051<br>24.238                       | Conducted Spurious Emissions | PASS   | Meet the requirement of limit.                                                    |
| 2.1053<br>24.238                       | Radiated Spurious Emissions  | PASS   | Meet the requirement of limit.<br>Minimum passing margin is -19.04dB at 38.93MHz. |

### 2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

| Measurement                    | Frequency     | Expanded Uncertainty (k=2) ( $\pm$ ) |
|--------------------------------|---------------|--------------------------------------|
| Radiated Emissions up to 1 GHz | 30MHz ~ 1GHz  | 5.31 dB                              |
| Radiated Emissions above 1 GHz | 1GHz ~ 6GHz   | 3.40 dB                              |
|                                | 6GHz ~ 18GHz  | 3.73 dB                              |
|                                | 18GHz ~ 40GHz | 4.11 dB                              |

## 2.2 Test Site and Instruments

### For Equivalent Isotropically Radiated Power & Radiated Spurious Emissions test:

| DESCRIPTION & MANUFACTURER              | MODEL NO.                                                               | SERIAL NO.                    | CALIBRATED DATE | CALIBRATED UNTIL |
|-----------------------------------------|-------------------------------------------------------------------------|-------------------------------|-----------------|------------------|
| Test Receiver<br>Agilent                | N9038A                                                                  | MY50010156                    | Aug. 12, 2015   | Aug. 11, 2016    |
| Pre-Amplifier<br>Mini-Circuits          | ZFL-1000VH2<br>B                                                        | AMP-ZFL-07                    | May 08, 2015    | May 07, 2016     |
| Trilog Broadband Antenna<br>SCHWARZBECK | VULB 9168                                                               | 9168-156                      | Jan. 04, 2016   | Jan. 03, 2017    |
| RF Cable                                | 8D                                                                      | 966-3-1<br>966-3-2<br>966-3-3 | Apr. 02, 2016   | Apr. 01, 2017    |
| Horn_Antenna<br>SCHWARZBECK             | BBHA9120-D                                                              | 9120D-406                     | Jan. 20, 2016   | Jan. 19, 2017    |
| Pre-Amplifier<br>Agilent                | 8449B                                                                   | 3008A02465                    | Apr. 05, 2016   | Apr. 04, 2017    |
| RF Cable                                | EMC104-SM-<br>SM-2000<br>EMC104-SM-<br>SM-5000<br>EMC104-SM-<br>SM-5000 | 150317<br>150321<br>150322    | Mar. 30, 2016   | Mar. 29, 2017    |
| Spectrum Analyzer<br>Keysight           | N9030A                                                                  | MY54490520                    | July 26, 2015   | July 25, 2016    |
| Pre-Amplifier<br>EMCI                   | EMC184045                                                               | 980143                        | Jan. 15, 2016   | Jan. 14, 2017    |
| Horn_Antenna<br>SCHWARZBECK             | BBHA 9170                                                               | BBHA9170608                   | Jan. 08, 2016   | Jan. 07, 2017    |
| RF Cable                                | SUCOFLEX<br>102                                                         | 36432/2<br>36441/2            | Jan. 16, 2016   | Jan. 15, 2017    |
| Software                                | ADT_Radiated<br>_V8.7.07                                                | NA                            | NA              | NA               |
| Antenna Tower & Turn Table<br>CT        | MF-7802                                                                 | MF780208406                   | NA              | NA               |
| Boresight Antenna Fixture               | FBA-01                                                                  | FBA-SIP01                     | NA              | NA               |
| Communication Simulator<br>R&S          | CMU200                                                                  | 121040                        | Dec. 25, 2015   | Dec. 24, 2016    |

#### Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in 966 Chamber No. 3.
3. The FCC Site Registration No. is 147459
4. The CANADA Site Registration No. is 20331-1
5. Tested Date: Apr. 18, 2016

**For other test items:**

| DESCRIPTION & MANUFACTURER                            | MODEL NO.                          | SERIAL NO.                            | CALIBRATED DATE | CALIBRATED UNTIL |
|-------------------------------------------------------|------------------------------------|---------------------------------------|-----------------|------------------|
| SPECTRUM ANALYZER R&S                                 | FSP 40                             | 100060                                | May 08, 2015    | May 07, 2016     |
| SPECTRUM ANALYZER R&S                                 | FSV 40                             | 100964                                | June 26, 2015   | June 25, 2016    |
| Spectrum Analyzer Agilent                             | E4446A                             | MY48250253                            | Dec. 22, 2015   | Dec. 21, 2016    |
| Power meter Anritsu                                   | ML2495A                            | 1014008                               | Apr. 28, 2015   | Apr. 27, 2016    |
| Power sensor Anritsu                                  | MA2411B                            | 0917122                               | Apr. 28, 2015   | Apr. 27, 2016    |
| AC Power Source EXTECH Electronics                    | 6205                               | 1440452                               | NA              | NA               |
| Temperature & Humidity Chamber GIANTFORCE             | GTH-150-40-SP-AR                   | MAA0812-008                           | Jan. 15, 2016   | Jan. 14, 2017    |
| DC Power Supply Topward                               | 6603D                              | 795558                                | NA              | NA               |
| ESG Vector signal generator Agilent                   | E4438C                             | MY45094468/0<br>05 506 602<br>UK6 UNJ | Dec. 01, 2015   | Nov. 30, 2016    |
| MSP4TA-18+ MECH SWITCH ABSORPTIVE / SMA Mini-Circuits | MSP4TA-18+                         | 0140                                  | Mar. 19, 2016   | Mar. 18, 2017    |
| FXD ATTEN/SMA/3dB 2W Mini-Circuits                    | BW-S3W2+                           | MN71981                               | Mar. 19, 2016   | Mar. 18, 2017    |
| Software                                              | ADT_RF Test Software V6.6.5.3      | NA                                    | NA              | NA               |
| Band Reject Filter                                    | WRCGV1850/19 10-1830/1930-60 /10SS | 14                                    | June 23, 2015   | June 22, 2016    |
| Communication Simulator R&S                           | CMU200                             | 121040                                | Dec. 25, 2015   | Dec. 24, 2016    |

- NOTE:**
1. The test was performed in Oven room 2.
  2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
  3. Tested Date: Apr. 25, 2016

### 3 General Information

#### 3.1 General Description of EUT

|                     |                                                  |                       |
|---------------------|--------------------------------------------------|-----------------------|
| Product             | Integrated Device                                |                       |
| Brand               | Technicolor                                      |                       |
| Test Model          | TCA300COM                                        |                       |
| IMEI Code           | 35999804                                         |                       |
| HW Version          | FGR                                              |                       |
| Status of EUT       | ENGINEERING SAMPLE                               |                       |
| Power Supply Rating | 12Vdc from power adapter or<br>4Vdc from battery |                       |
| Modulation Type     | WCDMA, HSDPA, HSUPA                              | BPSK                  |
| Operating Frequency | WCDMA                                            | 1852.4MHz ~ 1907.6MHz |
| Max. EIRP Power     | WCDMA                                            | 378.44mW              |
| Emission Designator | WCDMA                                            | 4M17F9W               |
|                     | HSDPA                                            | 4M15F9W               |
|                     | HSUPA                                            | 4M17F9W               |
| Antenna Type        | Please see NOTE                                  |                       |
| Antenna Connector   | Please see NOTE                                  |                       |
| Accessory Device    | Adapter x1<br>Battery x1                         |                       |
| Data Cable Supplied | NA                                               |                       |

Note:

1. There are WLAN, Bluetooth, Zigbee and WWAN(3G) technology used for the EUT.
2. The EUT power needs to be supplied from one power adapter or battery, the information is as below table:

| Adapter    |            |                                                                                           |
|------------|------------|-------------------------------------------------------------------------------------------|
| Brand      | Model      | Spec.                                                                                     |
| XHPSU-TC   | 37469780   | Input: 100-120Vac, 50/60Hz, 0.7A<br>Output: 12V, 1.5A<br>DC output cable (Unshielded, 3m) |
| Battery    |            |                                                                                           |
| Brand      | Model      | Spec.                                                                                     |
| Li-polymer | U46P313.00 | 4V, 2520mAh, 10.08Wh                                                                      |

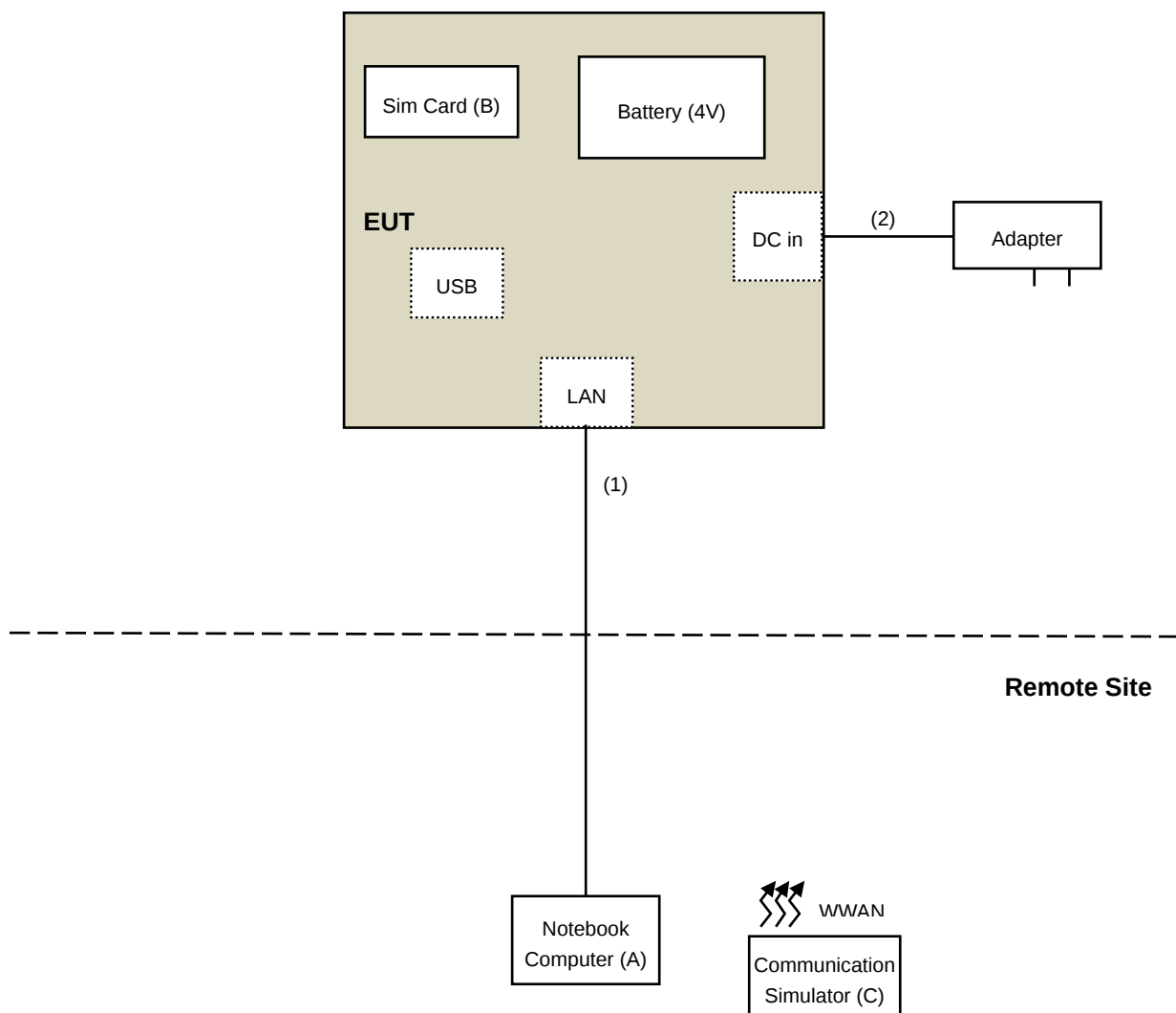
The EUT was pre-tested with Adapter & Battery, the worst case was found in Adapter. Therefore only the test data of the Adapter was recorded in this report.

3. The antennas provided to the EUT, please refer to the following table:

| Antenna NO. | Brand | Antenna Gain(dBi)<br>(Including cable loss) | Frequency range<br>(GHz) | Antenna Type | Connector Type |
|-------------|-------|---------------------------------------------|--------------------------|--------------|----------------|
| Zigbee 1    | INPAQ | 2.84                                        | 2.4~2.4835GHz            | PCB          | i-pex(MHF)     |
| Zigbee 2    | INPAQ | 3.1                                         | 2.4~2.4835GHz            | PCB          | i-pex(MHF)     |
| WiFi 1 & BT | INPAQ | 2.06                                        | 2.4~2.4835GHz            | PCB          | Pogo pin       |
|             |       | 3.13                                        | 5.15~5.25GHz             |              |                |
|             |       | 3.79                                        | 5.25~5.35GHz             |              |                |
|             |       | 3.9                                         | 5.47~5.725GHz            |              |                |
|             |       | 2.39                                        | 5.725~5.85GHz            |              |                |
| WiFi 2      | INPAQ | 0.73                                        | 2.4~2.4835GHz            | PCB          | i-pex(MHF)     |
|             |       | 2.86                                        | 5.15~5.25GHz             |              |                |
|             |       | 3.02                                        | 5.25~5.35GHz             |              |                |
|             |       | 3.33                                        | 5.47~5.725GHz            |              |                |
|             |       | 3.84                                        | 5.725~5.85GHz            |              |                |
| WWAN        | INPAQ | 2.56                                        | 824~849MHz               | PCB          | Pogo pin       |
|             |       | 3.72                                        | 1850~1960MHz             |              |                |

4. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

### 3.2 Configuration of System under Test



### 3.2.1 Description of Support Units

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

| No. | Product                 | Brand | Model No. | Serial No. | FCC ID  | Remark          |
|-----|-------------------------|-------|-----------|------------|---------|-----------------|
| A   | Notebook Computer       | DELL  | E5430     | HYV4VY1    | FCC DoC | Provided by Lab |
| B   | Sim Card                | R&S   | CRT-Z3    | NA         | NA      | Provided by Lab |
| C   | Communication Simulator | R&S   | CMU200    | 121040     | NA      | Provided by Lab |

**NOTE:**

1. All power cords of the above support units are non-shielded (1.8 m).

| No. | Cable | Qty. | Length (m) | Shielded (Yes/ No) | Cores (Number) | Remark             |
|-----|-------|------|------------|--------------------|----------------|--------------------|
| 1   | RJ-45 | 1    | 10         | No                 | 0              | Provided by Lab    |
| 2   | DC    | 1    | 3          | No                 | 0              | Supplied by client |

### 3.3 Test Mode Applicability and Tested Channel Detail

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

The worst case was found when positioned on Y-plane. Following channel(s) was (were) selected for the final test as listed below:

#### WCDMA MODE

| Test Item                    | Available Channel | Tested Channel   | Mode                |
|------------------------------|-------------------|------------------|---------------------|
| EIRP                         | 9262 to 9538      | 9262, 9400, 9538 | WCDMA               |
| Frequency Stability          | 9262 to 9538      | 9400             | WCDMA               |
| Occupied Bandwidth           | 9262 to 9538      | 9262, 9400, 9538 | WCDMA, HSDPA, HSUPA |
| Band Edge                    | 9262 to 9538      | 9262, 9538       | WCDMA, HSDPA, HSUPA |
| Peak To Average Ratio        | 9262 to 9538      | 9262, 9400, 9538 | WCDMA, HSDPA, HSUPA |
| Conducted Emission           | 9262 to 9538      | 9400             | WCDMA               |
| Radiated Emission Below 1GHz | 9262 to 9538      | 9262, 9400, 9538 | WCDMA               |
| Radiated Emission Above 1GHz | 9262 to 9538      | 9262, 9400, 9538 | WCDMA               |

#### Test Condition:

| Test Item                    | Environmental Conditions | Input Power  | Tested By    |
|------------------------------|--------------------------|--------------|--------------|
| EIRP                         | 25deg. C, 63%RH          | 120Vac, 60Hz | Robert Cheng |
| Frequency Stability          | 25deg. C, 63%RH          | 120Vac, 60Hz | Robert Cheng |
| Occupied Bandwidth           | 25deg. C, 63%RH          | 120Vac, 60Hz | Robert Cheng |
| Band Edge                    | 25deg. C, 63%RH          | 120Vac, 60Hz | Robert Cheng |
| Peak To Average Ratio        | 25deg. C, 63%RH          | 120Vac, 60Hz | Robert Cheng |
| Conducted Emission           | 25deg. C, 63%RH          | 120Vac, 60Hz | Robert Cheng |
| Radiated Emission Below 1GHz | 22deg. C, 68%RH          | 120Vac, 60Hz | Tim Ho       |
| Radiated Emission Above 1GHz | 22deg. C, 68%RH          | 120Vac, 60Hz | Tim Ho       |

### 3.4 EUT Operating Conditions

The EUT makes a call to the communication simulator. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency

### 3.5 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**FCC 47 CFR Part 2**

**FCC 47 CFR Part 24**

**KDB 971168 D01 Power Meas License Digital Systems v02r02**

**ANSI/TIA/EIA-603-D 2010**

**NOTE:** All test items have been performed and recorded as per the above standards.

## 4 Test Types and Results

### 4.1 Output Power Measurement

#### 4.1.1 Limits of Output Power Measurement

Mobile / Portable station are limited to 2 watts e.i.r.p.

#### 4.1.2 Test Procedures

##### EIRP / ERP Measurement:

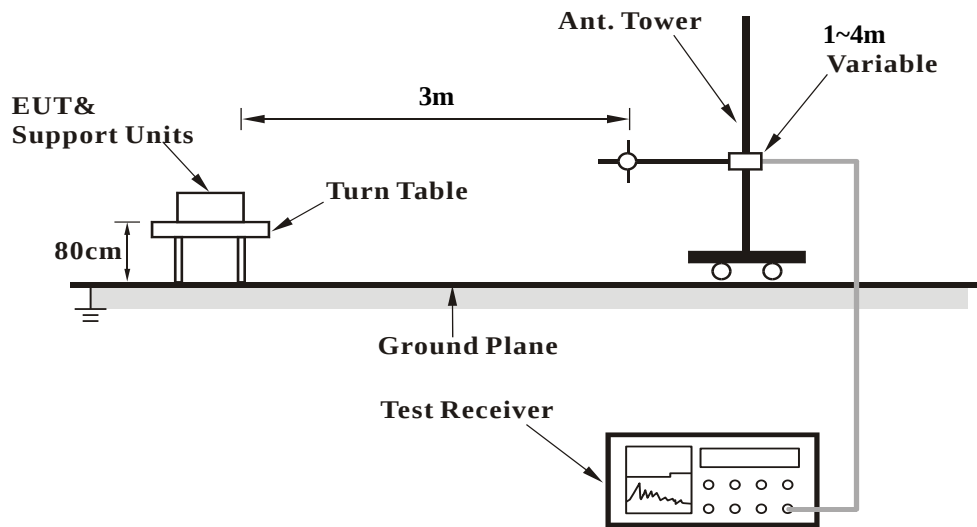
- a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 5MHz for WCDMA mode.
- b. Substitution method is used for EIRP measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- c. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step b. Record the power level of S.G
- d.  $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}$  ERP power can be calculated form EIRP power by subtracting the gain of dipole,  $ERP \text{ power} = EIPR \text{ power} - 2.15dBi$ .

##### Conducted Power Measurement:

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

#### 4.1.3 Test Setup

##### EIRP MEASUREMENT:



For the actual test configuration, please refer to the attached file (Test Setup Photo).

##### CONDUCTED POWER MEASUREMENT:



For the actual test configuration, please refer to the attached file (Test Setup Photo).

#### 4.1.4 Test Results

##### CONDUCTED OUTPUT POWER (dBm)

| Band            | WCDMA II |        |        |
|-----------------|----------|--------|--------|
| Channel         | 9262     | 9400   | 9538   |
| Frequency (MHz) | 1852.4   | 1880.0 | 1907.6 |
| RMC 12.2K       | 22.04    | 21.91  | 22.51  |
| HSDPA Subtest-1 | 21.45    | 21.55  | 21.94  |
| HSDPA Subtest-2 | 21.25    | 21.51  | 21.79  |
| HSDPA Subtest-3 | 21.58    | 21.28  | 21.77  |
| HSDPA Subtest-4 | 21.45    | 21.60  | 22.14  |
| HSUPA Subtest-1 | 21.52    | 21.15  | 21.73  |
| HSUPA Subtest-2 | 21.31    | 21.57  | 22.03  |
| HSUPA Subtest-3 | 21.36    | 21.24  | 21.85  |
| HSUPA Subtest-4 | 21.56    | 21.59  | 22.05  |
| HSUPA Subtest-5 | 21.70    | 21.40  | 21.90  |

##### EIRP POWER (dBm)

###### WCDMA

| Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) |
|---------|-----------------|-----------|-----------------------|-----------|----------|
| 9262    | 1852.4          | 18.18     | 6.6                   | 24.79     | 301.30   |
| 9400    | 1880.0          | 18.79     | 6.7                   | 25.47     | 352.37   |
| 9538    | 1907.6          | 19.11     | 6.7                   | 25.78     | 378.44   |

###### HSDPA

| Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) |
|---------|-----------------|-----------|-----------------------|-----------|----------|
| 9262    | 1852.4          | 17.85     | 6.6                   | 24.46     | 279.25   |
| 9400    | 1880.0          | 18.57     | 6.7                   | 25.25     | 334.97   |
| 9538    | 1907.6          | 18.87     | 6.7                   | 25.54     | 358.10   |

###### HSUPA

| Channel | Frequency (MHz) | LVL (dBm) | Correction Factor(dB) | EIRP(dBm) | EIRP(mW) |
|---------|-----------------|-----------|-----------------------|-----------|----------|
| 9262    | 1852.4          | 17.89     | 6.6                   | 24.50     | 281.84   |
| 9400    | 1880.0          | 18.51     | 6.7                   | 25.19     | 330.37   |
| 9538    | 1907.6          | 18.74     | 6.7                   | 25.41     | 347.54   |

**REMARKS:** 1. Output Power (dBm) = SPA Reading (dBm) + Correction Factor (dB).

2. Correction factor (dB) = Free Space Loss + Antenna Factor + Cable Loss.

## 4.2 Frequency Stability Measurement

### 4.2.1 Limits of Frequency Stability Measurement

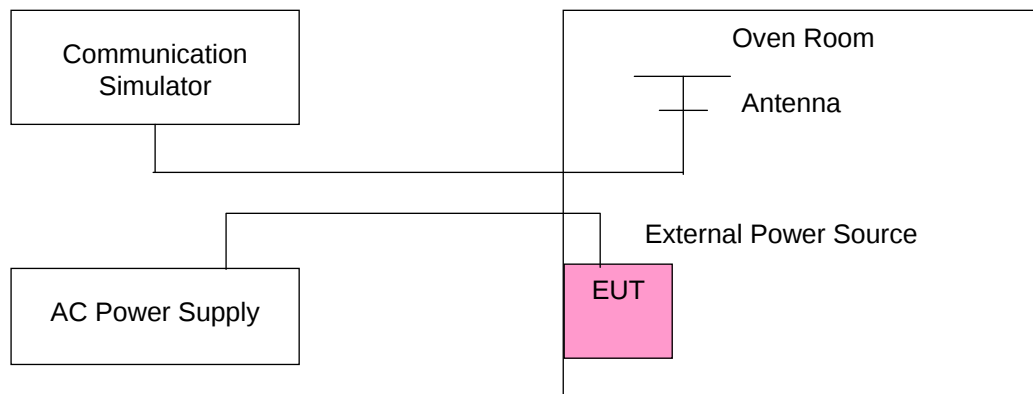
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

### 4.2.2 Test Procedure

- a. Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
- b. EUT is connected the external power supply to control the AC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
- c. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the  $\pm 0.5$  °C during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

**NOTE:** The frequency error was recorded frequency error from the communication simulator.

#### 4.2.3 Test Setup



#### 4.2.4 Test Results

##### Frequency Error vs. Voltage

| Voltage (Volts) | Frequency Error (ppm) | Result |
|-----------------|-----------------------|--------|
|                 | WCDMA                 |        |
| 102             | 0.011                 | Pass   |
| 138             | 0.009                 | Pass   |

##### Frequency Error vs. Temperature.

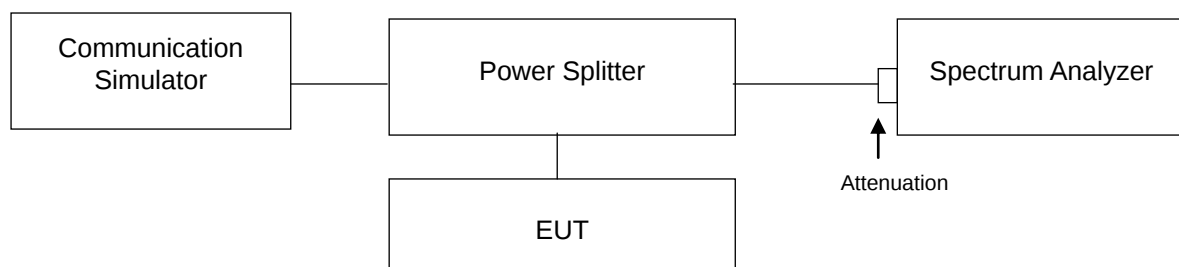
| TEMP. (°C) | Frequency Error (ppm) | Result |
|------------|-----------------------|--------|
|            | WCDMA                 |        |
| 75         | 0.017                 | Pass   |
| 70         | 0.017                 | Pass   |
| 60         | 0.013                 | Pass   |
| 50         | 0.014                 | Pass   |
| 40         | 0.011                 | Pass   |
| 30         | 0.010                 | Pass   |
| 20         | 0.011                 | Pass   |
| 10         | 0.011                 | Pass   |
| 0          | 0.012                 | Pass   |
| -10        | 0.013                 | Pass   |
| -20        | 0.014                 | Pass   |
| -30        | 0.015                 | Pass   |

### 4.3 Occupied Bandwidth Measurement

#### 4.3.1 Test Procedure

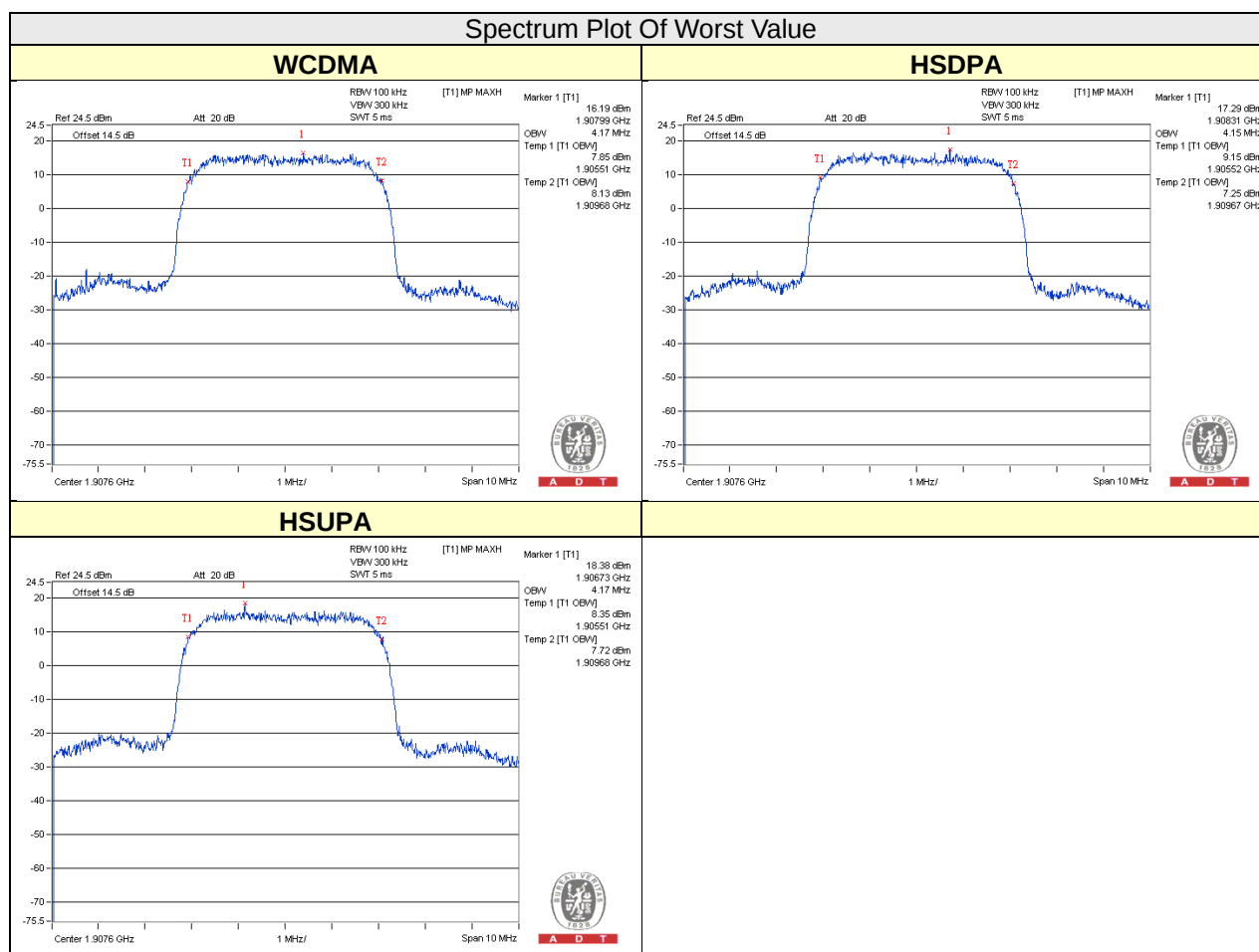
The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

#### 4.3.2 Test Setup



### 4.3.3 Test Result

| Channel | FREQ. (MHz) | 99% Occupied Bandwidth (MHz) |       |       |
|---------|-------------|------------------------------|-------|-------|
|         |             | WCDMA                        | HSDPA | HSUPA |
| 9262    | 1852.4      | 4.17                         | 4.15  | 4.17  |
| 9400    | 1880.0      | 4.15                         | 4.15  | 4.17  |
| 9538    | 1907.6      | 4.17                         | 4.15  | 4.17  |

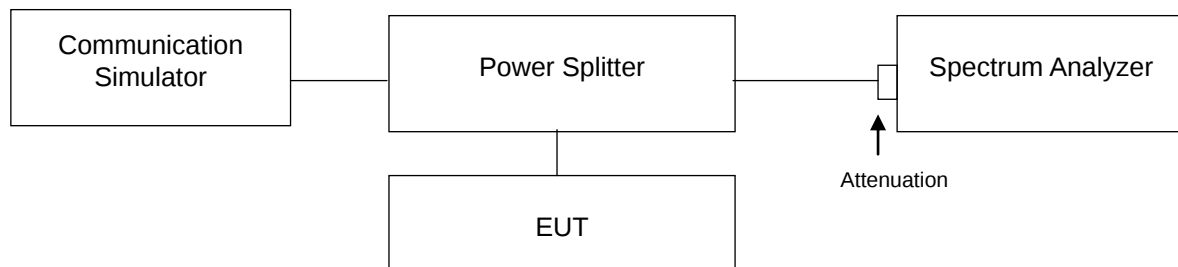


## 4.4 Band Edge Measurement

### 4.4.1 Limits of Band Edge Measurement

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. 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.

### 4.4.2 Test Setup



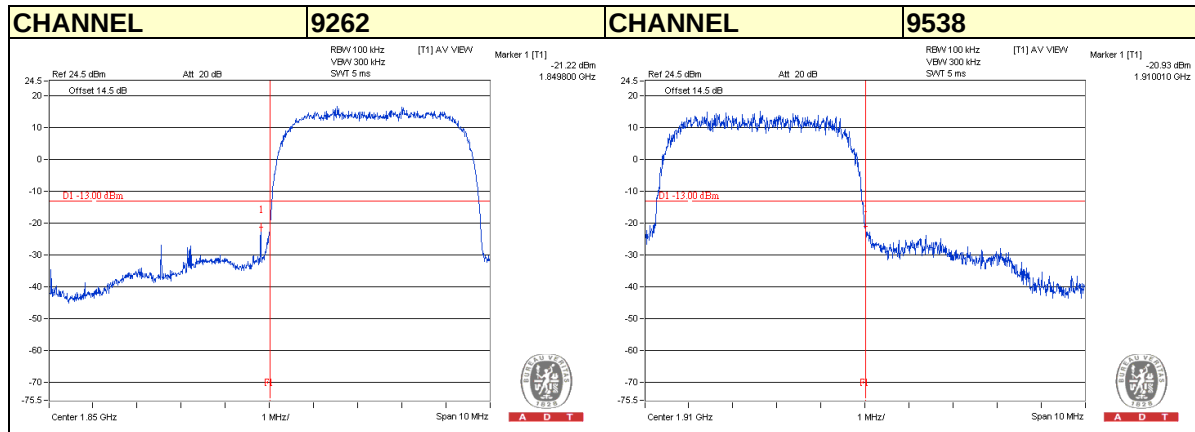
### 4.4.3 Test Procedures

- All measurements were done at low and high operational frequency range.
- The center frequency of spectrum is the band edge frequency and s RB of the spectrum is  $>1\%$  OCCUPIED BANDWIDTH and VB of the spectrum is  $\geq 3*RB$ .
- Record the max trace plot into the test report.

#### 4.4.4 Test Results

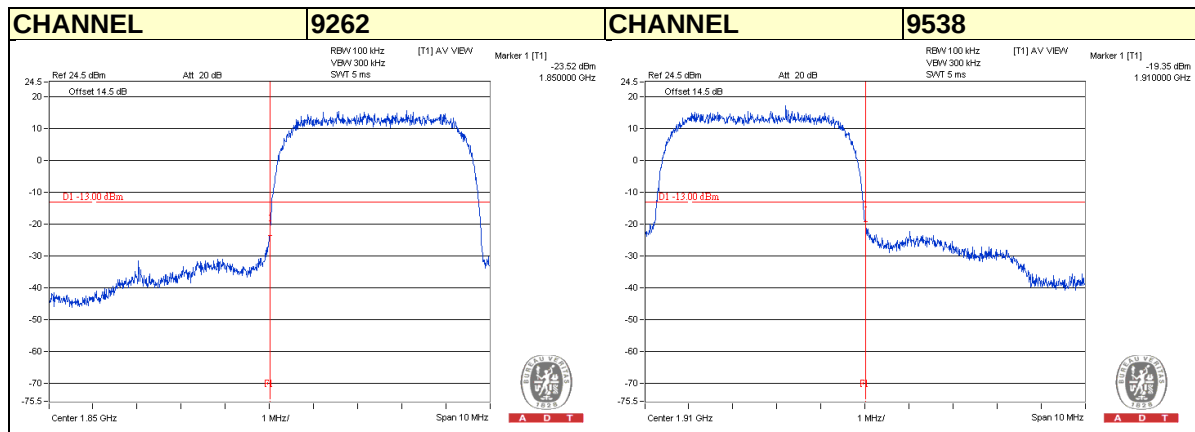
##### WCDMA

| Frequency(MHz) | Measurement Value | Limit  | Margin | Result |
|----------------|-------------------|--------|--------|--------|
| 1852.4         | -21.22            | -13.00 | -8.22  | Pass   |
| 1907.6         | -20.93            | -13.00 | -7.93  | Pass   |



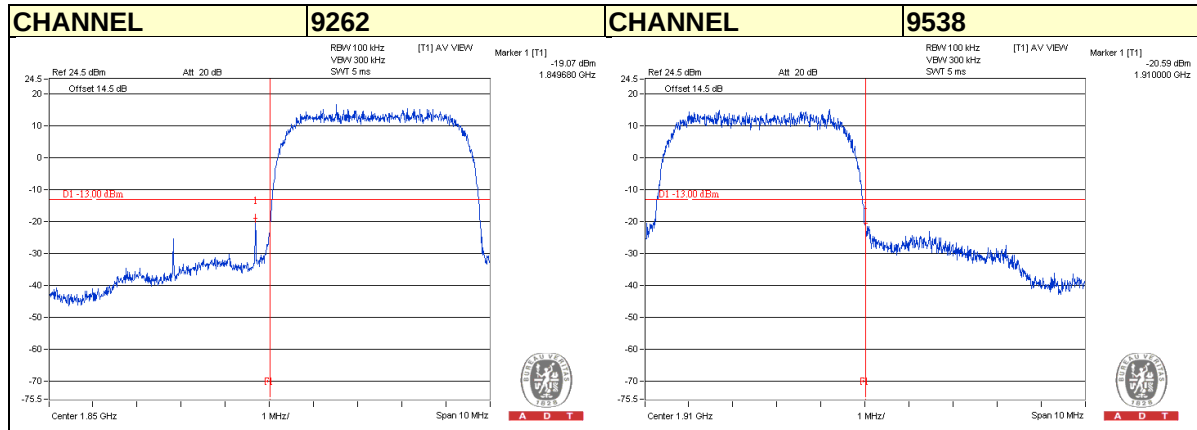
##### HSDPA

| Frequency(MHz) | Measurement Value | Limit  | Margin | Result |
|----------------|-------------------|--------|--------|--------|
| 1852.4         | -23.52            | -13.00 | -10.52 | Pass   |
| 1907.6         | -19.35            | -13.00 | -6.35  | Pass   |



# HSUPA

| Frequency(MHz) | Measurement Value | Limit  | Margin | Result |
|----------------|-------------------|--------|--------|--------|
| 1852.4         | -19.07            | -13.00 | -6.07  | Pass   |
| 1907.6         | -20.59            | -13.00 | -7.59  | Pass   |

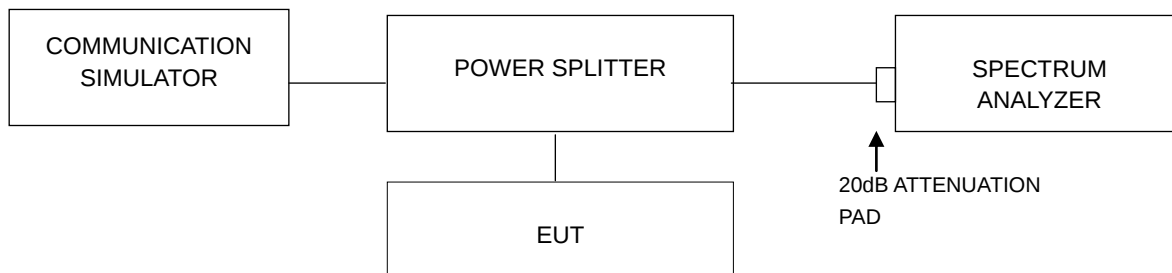


## 4.5 Peak to Average Ratio

### 4.5.1 Limits of Peak to Average Ratio Measurement

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

### 4.5.2 Test Setup

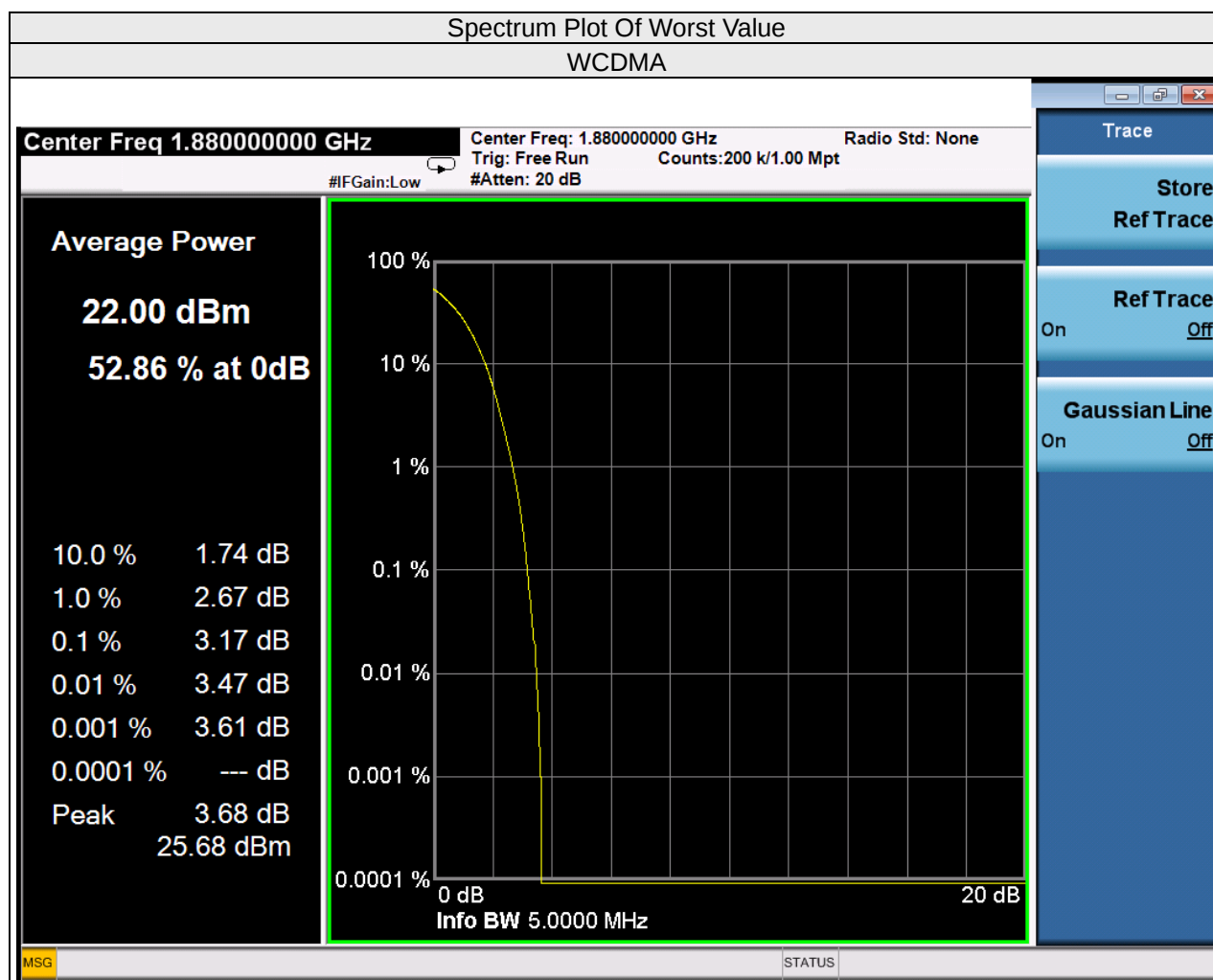


### 4.5.3 Test Procedures

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

#### 4.5.4 Test Results

| Freq. (MHz) | Peak To Average Ratio (dB) |
|-------------|----------------------------|
|             | WCDMA                      |
| 1852.4      | 3.03                       |
| 1880.0      | 3.17                       |
| 1907.6      | 3.14                       |

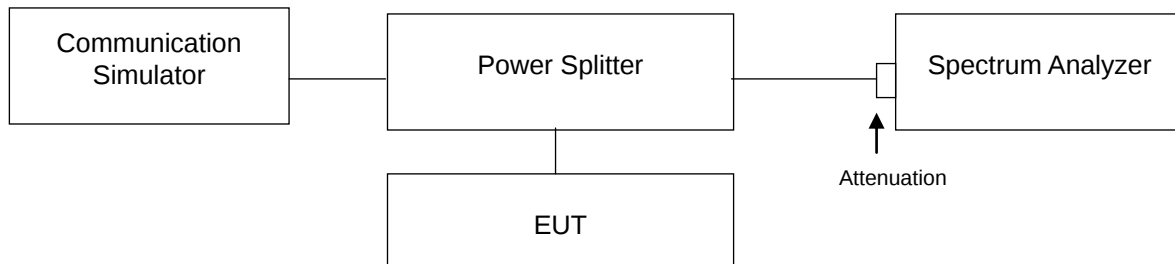


## 4.6 Conducted Spurious Emissions

### 4.6.1 Limits of Conducted Spurious Emissions Measurement

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. The emission limit equal to  $-13\text{dBm}$ .

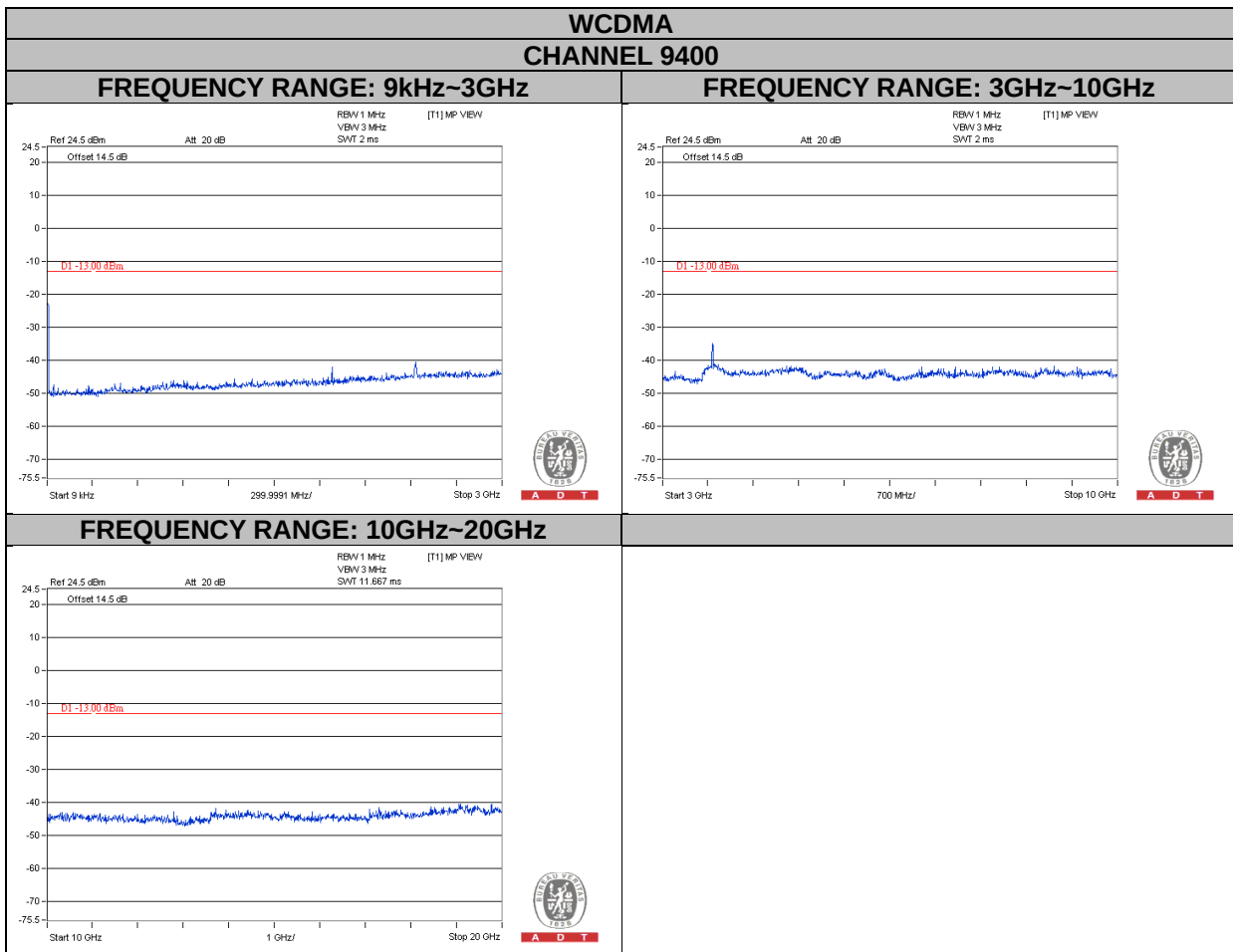
### 4.6.2 Test Setup



### 4.6.3 Test Procedure

- The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
- Measuring frequency range is from 9 kHz to 20GHz. 20dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz is used for conducted emission measurement.

#### 4.6.4 Test Results



## 4.7 Radiated Emission Measurement

### 4.7.1 Limits of Radiated Emission Measurement

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. The emission limit equal to  $-13\text{dBm}$ .

### 4.7.2 Test Procedure

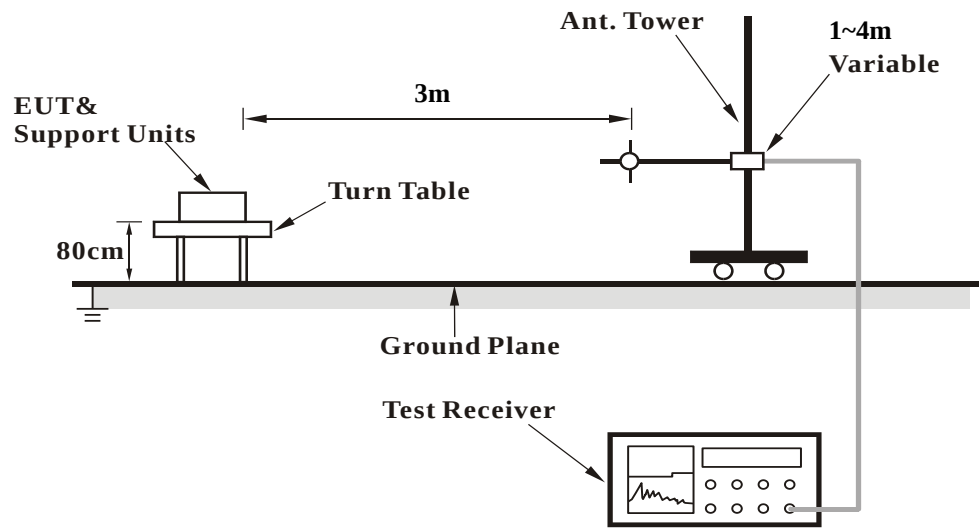
- a. Substitution method is used for EIRP measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- b. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value " of step a. Record the power level of S.G
- c.  $\text{EIRP} = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}$ .
- d. ERP power can be calculated form EIRP power by subtracting the gain of dipole,  $\text{ERP power} = \text{EIPR power} - 2.15\text{dBi}$ .

**NOTE:** The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.

### 4.7.3 Deviation from Test Standard

No deviation.

#### 4.7.4 Test Setup



For the actual test configuration, please refer to the attached file (Test Setup Photo).

#### 4.7.5 Test Results

**Below 1GHz**

**WCDMA:**

|             |                 |                        |               |
|-------------|-----------------|------------------------|---------------|
| <b>MODE</b> | TX channel 9262 | <b>FREQUENCY RANGE</b> | Below 1000MHz |
|-------------|-----------------|------------------------|---------------|

| Antenna Polarity & Test Distance: Horizontal at 3 M |             |                  |                       |                        |            |             |             |
|-----------------------------------------------------|-------------|------------------|-----------------------|------------------------|------------|-------------|-------------|
| No.                                                 | Freq. (MHz) | Reading (dBuV/m) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 30.01       | 27.81            | -43.45                | -14.90                 | -58.35     | -13         | -28.56      |
| 2                                                   | 38.77       | 31.59            | -91.39                | -4.41                  | -95.80     | -13         | -86.98      |
| 3                                                   | 58.85       | 45.42            | -57.01                | 2.37                   | -54.63     | -13         | -59.38      |
| 4                                                   | 154.61      | 31.20            | -66.75                | 4.62                   | -62.13     | -13         | -71.37      |
| 5                                                   | 247.68      | 42.03            | -54.55                | 4.94                   | -49.62     | -13         | -59.49      |
| 6                                                   | 447.17      | 44.24            | -37.91                | -3.65                  | -41.57     | -13         | -34.26      |
| Antenna Polarity & Test Distance: Vertical at 3 M   |             |                  |                       |                        |            |             |             |
| No.                                                 | Freq. (MHz) | Reading (dBuV/m) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 30.05       | 36.28            | -35.00                | -14.89                 | -49.89     | -13         | -20.11      |
| 2                                                   | 38.86       | 35.62            | -33.83                | -13.71                 | -47.54     | -13         | -20.12      |
| 3                                                   | 59.61       | 35.46            | -62.16                | -2.95                  | -65.11     | -13         | -59.20      |
| 4                                                   | 154.97      | 32.48            | -57.17                | -0.85                  | -58.02     | -13         | -56.31      |
| 5                                                   | 247.28      | 35.78            | -59.29                | 3.87                   | -55.42     | -13         | -63.16      |
| 6                                                   | 448.02      | 32.78            | -65.46                | 2.83                   | -62.63     | -13         | -68.29      |

#### REMARKS:

1. EIRP(dBm) = S.G Power Value (dBm) + Correction Factor (dB).
2. Correction Factor = gain of substitution antenna + cable loss

|             |                 |                        |               |
|-------------|-----------------|------------------------|---------------|
| <b>MODE</b> | TX channel 9440 | <b>FREQUENCY RANGE</b> | Below 1000MHz |
|-------------|-----------------|------------------------|---------------|

| Antenna Polarity & Test Distance: Horizontal at 3 M |              |                  |                       |                        |               |             |               |
|-----------------------------------------------------|--------------|------------------|-----------------------|------------------------|---------------|-------------|---------------|
| No.                                                 | Freq. (MHz)  | Reading (dBuV/m) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm)    | Limit (dBm) | Margin (dB)   |
| 1                                                   | 30.54        | 26.53            | -44.93                | -14.77                 | -59.69        | -13         | -30.16        |
| 2                                                   | 38.04        | 31.55            | -91.64                | -4.44                  | -96.07        | -13         | -87.20        |
| 3                                                   | 58.3         | 44.38            | -58.07                | 2.37                   | -55.70        | -13         | -60.44        |
| 4                                                   | 154.84       | 30.83            | -67.12                | 4.62                   | -62.50        | -13         | -71.74        |
| 5                                                   | 247.54       | 42.28            | -54.30                | 4.94                   | -49.36        | -13         | -59.24        |
| 6                                                   | 446.96       | 44.78            | -37.36                | -3.66                  | -41.02        | -13         | -33.71        |
| Antenna Polarity & Test Distance: Vertical at 3 M   |              |                  |                       |                        |               |             |               |
| No.                                                 | Freq. (MHz)  | Reading (dBuV/m) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm)    | Limit (dBm) | Margin (dB)   |
| 1                                                   | 29.59        | 36.06            | -35.05                | -15.00                 | -50.05        | -13         | -20.05        |
| 2                                                   | <b>38.93</b> | <b>36.76</b>     | <b>-32.73</b>         | <b>-13.69</b>          | <b>-46.42</b> | <b>-13</b>  | <b>-19.04</b> |
| 3                                                   | 59.39        | 34.42            | -63.23                | -2.97                  | -66.20        | -13         | -60.27        |
| 4                                                   | 155.15       | 32.2             | -57.39                | -0.85                  | -58.24        | -13         | -56.55        |
| 5                                                   | 247.38       | 36.21            | -58.86                | 3.87                   | -54.98        | -13         | -62.73        |
| 6                                                   | 448.11       | 32.62            | -65.62                | 2.83                   | -62.79        | -13         | -68.45        |

#### REMARKS:

1.  $EIRP(dBm) = S.G \text{ Power Value (dBm)} + \text{Correction Factor (dB)}$ .
2. Correction Factor = gain of substitution antenna + cable loss

|             |                 |                        |               |
|-------------|-----------------|------------------------|---------------|
| <b>MODE</b> | TX channel 9538 | <b>FREQUENCY RANGE</b> | Below 1000MHz |
|-------------|-----------------|------------------------|---------------|

**Antenna Polarity & Test Distance: Horizontal at 3 M**

| No. | Freq. (MHz) | Reading (dBuV/m) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
|-----|-------------|------------------|-----------------------|------------------------|------------|-------------|-------------|
| 1   | 30.24       | 26.02            | -45.33                | -14.84                 | -60.17     | -13         | -30.49      |
| 2   | 39.28       | 30.71            | -92.12                | -4.40                  | -96.52     | -13         | -87.72      |
| 3   | 59.39       | 44.18            | -58.23                | 2.38                   | -55.85     | -13         | -60.61      |
| 4   | 155.47      | 30.16            | -67.79                | 4.61                   | -63.18     | -13         | -72.40      |
| 5   | 246.46      | 42.16            | -54.41                | 4.95                   | -49.46     | -13         | -59.37      |
| 6   | 447.97      | 43.71            | -38.48                | -3.64                  | -42.12     | -13         | -34.84      |

**Antenna Polarity & Test Distance: Vertical at 3 M**

| No. | Freq. (MHz) | Reading (dBuV/m) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
|-----|-------------|------------------|-----------------------|------------------------|------------|-------------|-------------|
| 1   | 30.17       | 36.04            | -35.28                | -14.86                 | -50.14     | -13         | -20.42      |
| 2   | 38.88       | 35.59            | -33.87                | -13.70                 | -47.57     | -13         | -20.17      |
| 3   | 59.31       | 33.89            | -63.78                | -2.97                  | -66.75     | -13         | -60.81      |
| 4   | 154.93      | 31.89            | -57.77                | -0.85                  | -58.62     | -13         | -56.91      |
| 5   | 247.78      | 36.75            | -58.30                | 3.88                   | -54.42     | -13         | -62.18      |
| 6   | 447.45      | 32.23            | -66.00                | 2.83                   | -63.17     | -13         | -68.84      |

**REMARKS:**

1.  $EIRP(dBm) = S.G \text{ Power Value (dBm)} + \text{Correction Factor (dB)}$ .
2. Correction Factor = gain of substitution antenna + cable loss

# Above 1GHz

## WCDMA:

|      |                 |                 |               |
|------|-----------------|-----------------|---------------|
| MODE | TX channel 9262 | FREQUENCY RANGE | Above 1000MHz |
|------|-----------------|-----------------|---------------|

| Antenna Polarity & Test Distance: Horizontal at 3 M |             |                  |                       |                        |            |             |             |
|-----------------------------------------------------|-------------|------------------|-----------------------|------------------------|------------|-------------|-------------|
| No.                                                 | Freq. (MHz) | Reading (dBuV/m) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 3704.8      | 61.30            | -42.65                | 7.71                   | -34.94     | -13         | -50.36      |
| 2                                                   | 5557.2      | 52.60            | -52.28                | 7.08                   | -45.20     | -13         | -59.36      |
| 3                                                   | 7409.6      | 53.50            | -49.12                | 4.62                   | -44.50     | -13         | -53.74      |
| 4                                                   | 9262        | 36.20            | -66.02                | 4.23                   | -61.79     | -13         | -70.26      |
| 5                                                   | 11114.4     | 42.00            | -59.53                | 3.25                   | -56.28     | -13         | -62.78      |
| 6                                                   | 12966.8     | 40.50            | -60.38                | 4.44                   | -55.94     | -13         | -64.82      |
| 7                                                   | 14819.2     | 45.00            | -52.63                | 3.44                   | -49.19     | -13         | -56.07      |
| 8                                                   | 16671.6     | 44.10            | -53.25                | 3.70                   | -49.55     | -13         | -56.95      |
| 9                                                   | 18524       | 53.80            | -43.55                | 3.70                   | -39.85     | -13         | -47.25      |
| Antenna Polarity & Test Distance: Vertical at 3 M   |             |                  |                       |                        |            |             |             |
| No.                                                 | Freq. (MHz) | Reading (dBuV/m) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 3704.8      | 67.9             | -36.05                | 7.71                   | -28.34     | -13         | -43.76      |
| 2                                                   | 5557.2      | 62.7             | -42.18                | 7.08                   | -35.10     | -13         | -49.26      |
| 3                                                   | 7409.6      | 45.4             | -57.22                | 4.62                   | -52.60     | -13         | -61.84      |
| 4                                                   | 9262        | 45.9             | -56.32                | 4.23                   | -52.09     | -13         | -60.56      |
| 5                                                   | 11114.4     | 50.5             | -51.03                | 3.25                   | -47.78     | -13         | -54.28      |
| 6                                                   | 12966.8     | 50.2             | -50.68                | 4.44                   | -46.24     | -13         | -55.12      |
| 7                                                   | 14819.2     | 52.6             | -45.03                | 3.44                   | -41.59     | -13         | -48.47      |
| 8                                                   | 16671.6     | 52.4             | -44.95                | 3.70                   | -41.25     | -13         | -48.65      |
| 9                                                   | 18524       | 59.9             | -37.45                | 3.70                   | -33.75     | -13         | -41.15      |

### REMARKS:

1.  $EIRP(dBm) = S.G \text{ Power Value (dBm)} + \text{Correction Factor (dB)}$ .
2. Correction Factor = gain of substitution antenna + cable loss

|             |                 |                        |               |
|-------------|-----------------|------------------------|---------------|
| <b>MODE</b> | TX channel 9440 | <b>FREQUENCY RANGE</b> | Above 1000MHz |
|-------------|-----------------|------------------------|---------------|

| Antenna Polarity & Test Distance: Horizontal at 3 M |             |                  |                       |                        |            |             |             |
|-----------------------------------------------------|-------------|------------------|-----------------------|------------------------|------------|-------------|-------------|
| No.                                                 | Freq. (MHz) | Reading (dBuV/m) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 3760        | 54.20            | -49.95                | 7.68                   | -42.27     | -13         | -57.63      |
| 2                                                   | 5640        | 50.10            | -54.64                | 7.02                   | -47.62     | -13         | -61.67      |
| 3                                                   | 7520        | 54.90            | -47.72                | 4.53                   | -43.19     | -13         | -52.25      |
| 4                                                   | 9400        | 55.7             | -46.17                | 4.21                   | -41.97     | -13         | -50.38      |
| 5                                                   | 11280       | 57.6             | -43.89                | 3.48                   | -40.41     | -13         | -47.38      |
| 6                                                   | 13160       | 60.6             | -40.01                | 4.06                   | -35.94     | -13         | -44.07      |
| 7                                                   | 15040       | 61.4             | -35.95                | 3.70                   | -32.25     | -13         | -39.65      |
| 8                                                   | 16920       | 66               | -31.35                | 3.70                   | -27.65     | -13         | -35.05      |
| 9                                                   | 18800       | 68.9             | -28.45                | 3.70                   | -24.75     | -13         | -32.15      |
| Antenna Polarity & Test Distance: Vertical at 3 M   |             |                  |                       |                        |            |             |             |
| No.                                                 | Freq. (MHz) | Reading (dBuV/m) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 3760        | 52.1             | -52.05                | 7.68                   | -44.37     | -13         | -59.73      |
| 2                                                   | 5640        | 50.7             | -54.04                | 7.02                   | -47.02     | -13         | -61.07      |
| 3                                                   | 7520        | 55.4             | -47.22                | 4.53                   | -42.69     | -13         | -51.75      |
| 4                                                   | 9400        | 54.8             | -47.07                | 4.21                   | -42.87     | -13         | -51.28      |
| 5                                                   | 11280       | 57.4             | -44.09                | 3.48                   | -40.61     | -13         | -47.58      |
| 6                                                   | 13160       | 60.8             | -40.22                | 4.48                   | -35.74     | -13         | -44.70      |
| 7                                                   | 15040       | 62.2             | -35.21                | 3.76                   | -31.45     | -13         | -38.97      |
| 8                                                   | 16920       | 65.9             | -31.45                | 3.70                   | -27.75     | -13         | -35.15      |
| 9                                                   | 18800       | 68.3             | -29.05                | 3.70                   | -25.35     | -13         | -32.75      |

#### REMARKS:

1.  $EIRP(dBm) = S.G \text{ Power Value (dBm)} + \text{Correction Factor (dB)}$ .
2. Correction Factor = gain of substitution antenna + cable loss

|             |                 |                        |               |
|-------------|-----------------|------------------------|---------------|
| <b>MODE</b> | TX channel 9538 | <b>FREQUENCY RANGE</b> | Above 1000MHz |
|-------------|-----------------|------------------------|---------------|

| Antenna Polarity & Test Distance: Horizontal at 3 M |             |                  |                       |                        |            |             |             |
|-----------------------------------------------------|-------------|------------------|-----------------------|------------------------|------------|-------------|-------------|
| No.                                                 | Freq. (MHz) | Reading (dBuV/m) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 3815.2      | 54.60            | -49.75                | 7.64                   | -42.11     | -13         | -57.40      |
| 2                                                   | 5722.8      | 49.80            | -54.81                | 6.96                   | -47.84     | -13         | -61.77      |
| 3                                                   | 7630.4      | 54.70            | -47.92                | 4.43                   | -43.49     | -13         | -52.35      |
| 4                                                   | 9538        | 55.70            | -45.92                | 4.18                   | -41.74     | -13         | -50.09      |
| 5                                                   | 11445.6     | 57.50            | -43.96                | 3.71                   | -40.25     | -13         | -47.68      |
| 6                                                   | 13353.2     | 60.60            | -39.74                | 3.60                   | -36.13     | -13         | -43.34      |
| 7                                                   | 15260.8     | 61.60            | -35.75                | 3.70                   | -32.05     | -13         | -39.45      |
| 8                                                   | 17168.4     | 65.90            | -31.45                | 3.70                   | -27.75     | -13         | -35.15      |
| 9                                                   | 19076       | 68.80            | -28.94                | 3.72                   | -25.22     | -13         | -32.66      |
| Antenna Polarity & Test Distance: Vertical at 3 M   |             |                  |                       |                        |            |             |             |
| No.                                                 | Freq. (MHz) | Reading (dBuV/m) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1                                                   | 3815.2      | 51.6             | -52.75                | 7.64                   | -45.11     | -13         | -60.40      |
| 2                                                   | 5722.8      | 50.4             | -54.21                | 6.96                   | -47.24     | -13         | -61.17      |
| 3                                                   | 7630.4      | 55.4             | -47.22                | 4.43                   | -42.79     | -13         | -51.66      |
| 4                                                   | 9538        | 54.9             | -46.72                | 4.18                   | -42.54     | -13         | -50.90      |
| 5                                                   | 11445.6     | 57.6             | -43.86                | 3.71                   | -40.15     | -13         | -47.58      |
| 6                                                   | 13353.2     | 60.9             | -40.36                | 4.52                   | -35.83     | -13         | -44.88      |
| 7                                                   | 15260.8     | 62.3             | -35.43                | 4.09                   | -31.35     | -13         | -39.52      |
| 8                                                   | 17168.4     | 65.6             | -31.75                | 3.70                   | -28.05     | -13         | -35.45      |
| 9                                                   | 19076       | 68.3             | -29.42                | 3.70                   | -25.72     | -13         | -33.13      |

#### REMARKS:

1.  $EIRP(dBm) = S.G \text{ Power Value (dBm)} + \text{Correction Factor (dB)}$ .
2. Correction Factor = gain of substitution antenna + cable loss

## 5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

## Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

**Linko EMC/RF Lab**

Tel: 886-2-26052180

Fax: 886-2-26051924

**Hsin Chu EMC/RF/Telecom Lab**

Tel: 886-3-6668565

Fax: 886-3-6668323

**Hwa Ya EMC/RF/Safety**

Tel: 886-3-3183232

Fax: 886-3-3270892

**Email:** [service.adt@tw.bureauveritas.com](mailto:service.adt@tw.bureauveritas.com)

**Web Site:** [www.bureauveritas-adt.com](http://www.bureauveritas-adt.com)

The address and road map of all our labs can be found in our web site also.

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