# FCC Test Report (Part 96: LTE Band 48)

| | |
|---|---|
| **Report No.:** | RF191115C09 |
| **FCC ID:** | H8NSFE3160S |
| **Test Model:** | SFE3160S |
| **Received Date:** | Nov. 15, 2019 |
| **Test Date:** | Nov. 30, 2019 ~ Mar. 12, 2020 |
| **Issued Date:** | Mar. 12, 2020 |
| **Applicant:** | ASKEY COMPUTER CORP. |
| **Address:** | 10F, NO.119, JIANKANG RD., ZHONGHE DIST., NEW TAIPEI CITY 23585, TAIWAN, R.O.C. |
| **Issued By:** | Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories |
| **Lab Address:** | No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan |
| **Test Location:** | No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN |
| **FCC Registration/ Designation Number:** | 788550 / TW0003 |

## Table of Contents

**Release Control Record**

| Issue No. | Description | Date Issued |
|---|---|---|
| RF191115C09 | Original release. | Mar. 12, 2020 |

## 1 Certificate of Conformity

**Product:** CBSD SmallCell

**Brand:** Askey

**Test Model:** SFE3160S

**Sample Status:** Engineering sample

**Applicant:** ASKEY COMPUTER CORP.

**Test Date:** Nov. 30, 2019 ~ Mar. 12, 2020

**Standards:** 47 CFR FCC Part 96

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 RF characteristics under the conditions specified in this report.

**Prepared by :** Polly Chien / Specialist , **Date:** Mar. 12, 2020

**Approved by :** Bruce Chen / Senior Project Engineer , **Date:** Mar. 12, 2020

## 2 Summary of Test Results

| 47 CFR FCC Part 96 | | | |
|---|---|---|---|
| FCC Clause | Test Item | Result | Remarks |
| 2.1046<br>96.41(b) | Maximum Peak Output Power | Pass | Meet the requirement of limit. |
| 2.1046<br>96.41(b) | Maximum Power Spectral Density | Pass | Meet the requirement of limit. |
| 2.1047<br>96.41(a) | Modulation Characteristics | Pass | Meet the requirement of limit. |
| 96.41(g) | Peak to Average Ration | Pass | Meet the requirement of limit. |
| 2.1049 | Emission Bandwidth | Pass | Meet the requirement of limit. |
| 2.1055 | Frequency Stability | Pass | Meet the requirement of limit. |
| 2.1051<br>96.41(e) | Conducted Spurious Emissions | Pass | Meet the requirement of limit. |
| 2.1053<br>96.41(e) | Radiated Spurious Emissions | Pass | Meet the requirement of limit.<br>Minimum passing margin is -1.0dB at 7120.00MHz. |

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

### 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) (±) |
|---|---|---|
| Radiated Emissions up to 1 GHz | 9 kHz ~ 30MHz | 3.04 dB |
| | 30 MHz ~ 200 MHz | 3.59 dB |
| | 200 MHz ~ 1000 MHz | 3.60 dB |
| Radiated Emissions above 1 GHz | 1 GHz ~ 18 GHz | 2.29 dB |
| | 18 GHz ~ 40 GHz | 2.29 dB |

### 2.2 Modification Record

There were no modifications required for compliance.

## 3 General Information

### 3.1 General Description of EUT

| | | | |
|---|---|---|---|
| Product | CBSD SmallCell | | |
| Brand | Askey | | |
| Test Model | SFE3160S | | |
| Status of EUT | Engineering sample | | |
| Modulation Type | 64QAM | | |
| Operating Frequency | LTE Band 48 | Channel Bandwidth 10MHz | TX: 3555 ~ 3695 MHz<br>RX: 3555 ~ 3695 MHz |
| | | Channel Bandwidth 20MHz | TX: 3560 ~ 3690 MHz<br>RX: 3560 ~ 3690 MHz |
| Max. EIRP Power | LTE Band 48 | | 64QAM |
| | | Channel Bandwidth 10MHz | 749.894mW(28.75dBm) |
| | | Channel Bandwidth 20MHz | 778.037mW(28.91dBm) |
| Emission Designator | LTE Band 48 | Channel Bandwidth 10MHz | 8M93D7W |
| | | Channel Bandwidth 20MHz | 17M9D7W |
| Antenna Type | Dipole antenna with 4.2dBi gain | | |
| Antenna Connector | I-Pex(1) | | |
| Accessory Device | Adapter | | |
| Data Cable Supplied | 2.97m non-shielded RJ45 cable without core | | |

Note:

1. The EUT consumes power from the following adapter and POE.

| Adapter | |
|---|---|
| Brand | SHENZHEN FRECOM ELECTRONICS CO., LTD |
| Model | F24W5-120200SPAU |
| Input | 100-240Vac, 50/60Hz, 0.6A |
| Output | 12Vdc, 2A |
| Power Line | 1.5m DC power cable without core attached on adapter |

| POE (Support unit only) | |
|---|---|
| Brand | EUSSO |
| Model | UPE5600-IHGM |
| Input Power | 100-240Vac, 50-60Hz |
| Output Power | 48-52Vdc, 30Watt Maximum |

2. The EUT provides 2 completed transmitters and 2 receivers.
3. The EUT can support full RB only.

### 3.2 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 Z-plane. Following channel(s) was (were) selected for the final test as listed below:

| Test Item | Available Channel | Tested Channel | Channel Bandwidth | Modulation |
|---|---|---|---|---|
| Maximum Output Power | 55290 to 56690 | 55290 (3555.0MHz), 55990 (3625.0MHz), 56690 (3695.0MHz) | 10MHz | 64QAM |
| | 55340 to 56640 | 55340 (3560.0MHz), 55990 (3625.0MHz), 56640 (3690.0MHz) | 20MHz | |
| Modulation Characteristics | 55340 to 56640 | 55990 (3625.0MHz) | 20MHz | 64QAM |
| Frequency Stability | 55290 to 56690 | 55290 (3555.0MHz), 56690 (3695.0MHz) | 10MHz | 64QAM |
| | 55340 to 56640 | 55340 (3560.0MHz), 56640 (3690.0MHz) | 20MHz | 64QAM |
| Occupied Bandwidth | 55290 to 56690 | 55290 (3555.0MHz), 55990 (3625.0MHz), 56690 (3695.0MHz) | 10MHz | 64QAM |
| | 55340 to 56640 | 55340 (3560.0MHz), 55990 (3625.0MHz), 56640 (3690.0MHz) | 20MHz | 64QAM |
| Peak to Average Ratio | 55290 to 56690 | 55290 (3555.0MHz), 55990 (3625.0MHz), 56690 (3695.0MHz) | 10MHz | 64QAM |
| | 55340 to 56640 | 55340 (3560.0MHz), 55990 (3625.0MHz), 56640 (3690.0MHz) | 20MHz | 64QAM |
| Conducted Emission | 55290 to 56690 | 55290 (3555.0MHz), 55990 (3625.0MHz), 56690 (3695.0MHz) | 10MHz | 64QAM |
| | 55340 to 56640 | 55340 (3560.0MHz), 55990 (3625.0MHz), 56640 (3690.0MHz) | 20MHz | 64QAM |
| Radiated Emission Below 1GHz | 55290 to 56690 | 55990 (3625.0MHz), | 10MHz | 64QAM |
| | 55340 to 56640 | 55340 (3560.0MHz) | 20MHz | 64QAM |
| Radiated Emission Above 1GHz | 55290 to 56690 | 55290 (3555.0MHz), 55990 (3625.0MHz), 56690 (3695.0MHz) | 10MHz | 64QAM |
| | 55340 to 56640 | 55340 (3560.0MHz), 55990 (3625.0MHz), 56640 (3690.0MHz) | 20MHz | 64QAM |

Note:

1. This device was tested under all bandwidths, RB configurations and modulations. For radiated emission below 1GHz, low, mid and high channels were pre-tested in chamber. High channel was found to be the worst case and therefore had been chosen for all final tests.
2. For radiated emission above 1GHz, according to 3GPP 36.141 Section 4.7, choose the lowest & highest channel bandwidth for final test.

**Test Condition:**

| Test Item | Environmental Conditions | Input Power | Tested By |
|---|---|---|---|
| Maximum Output Power | 22deg. C, 68%RH | 120Vac, 60Hz | James Yang |
| Modulation Characteristics | 22deg. C, 68%RH | 120Vac, 60Hz | James Yang |
| Frequency Stability | 22deg. C, 68%RH | 120Vac, 60Hz | James Yang |
| Occupied Bandwidth | 22deg. C, 68%RH | 120Vac, 60Hz | James Yang |
| Peak to Average Ratio | 22deg. C, 68%RH | 120Vac, 60Hz | James Yang |
| Condcudeted Emission | 22deg. C, 68%RH | 120Vac, 60Hz | James Yang |
| Radiated Emission | 22deg. C, 68%RH | 120Vac, 60Hz | Greg Lin |

### 3.3 Description of Support Units

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

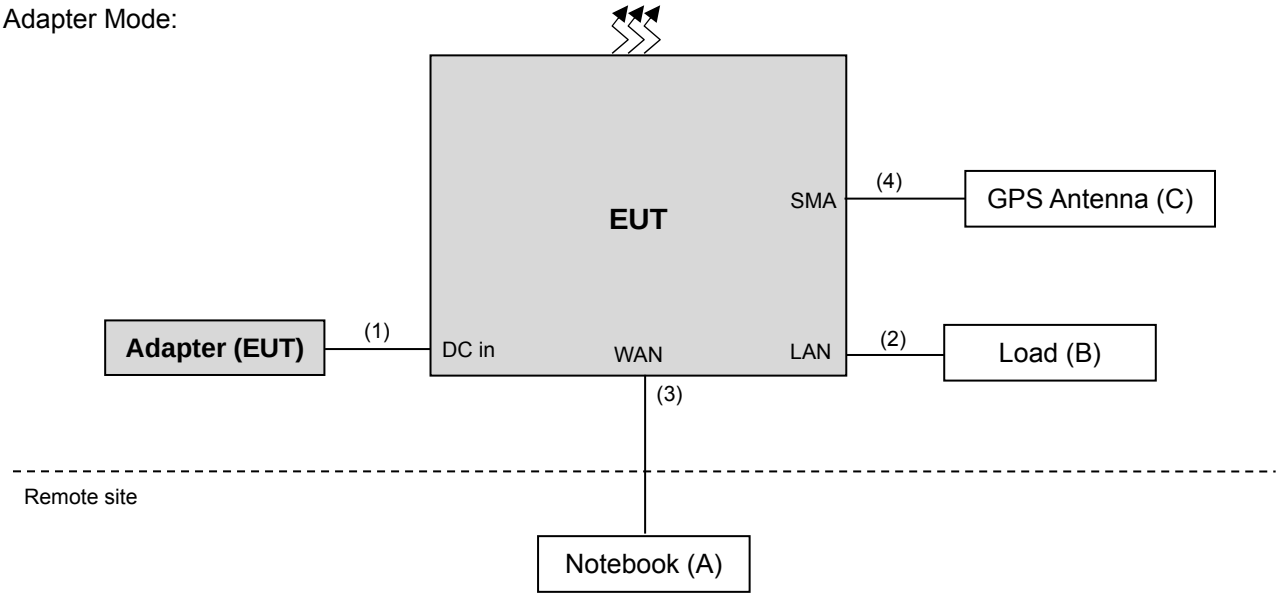
| ID | Product | Brand | Model No. | Serial No. | FCC ID | Remarks |
|---|---|---|---|---|---|---|
| A. | Notebook | DELL | E5410 | 1HC2XM1 | FCC DoC Approved | - |
| B. | Load | NA | NA | NA | NA | - |
| C. | GPS Antenna | INPAQ TECHNOLOGY CO., LTD. | GPSGLONASS15D-S6-0010-A | NA | NA | Supplied by client |

Note:
1. All power cords of the above support units are non-shielded (1.8m).
2. Items A acted as communication partners to transfer data.

| ID | Cable Descriptions | Qty. | Length (m) | Shielding (Yes/No) | Cores (Qty.) | Remarks |
|---|---|---|---|---|---|---|
| 1. | DC power cable | 1 | 1.5 | N | 0 | Attached on EUT |
| 2. | LAN cable | 1 | 1.5 | N | 0 | Provided by Lab RJ45,Cat5e |
| 3. | LAN cable | 1 | 7 | N | 0 | Provided by Lab RJ45,Cat5e |
| 4. | GPS Antenna cable | 1 | 2 | Y | 0 | Supplied by client |

#### 3.3.1 Configuration of System under Test

Adapter Mode:



### 3.4 General Description of Applied Standards and References

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

**Test standard:**
**FCC 47 CFR Part 2**
**FCC 47 CFR Part 96**
ANSI/TIA/EIA-603-D-2010

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

**References Test Guidance:**
**KDB 971168 D01 Power Meas License Digital Systems v03r01**
**KDB 940660 D01 Part 96 CBRS Eqpt v02**
**KDB 662911 D01 Multiple Transmitter Output v02r01**

All test items have been performed as a reference to the above KDB test guidance.

# 4 Test Types and Results

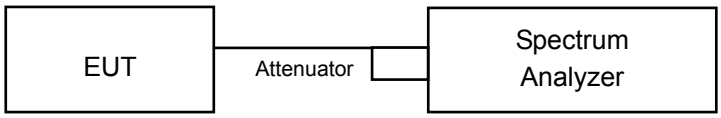
## 4.1 Maximum Output Power Measurement

### 4.1.1 Limits of Maximum Output Power Measurement

| Device | | Maximum EIRP (dBm/10 MHz) |
|---|---|---|
| ☐ | End User Device | 23 |
| ☒ | Category A CBSD | 30 |
| ☐ | Category B CBSD | 47 |

### 4.1.2 Test Setup

Conducted Measurement Method




### 4.1.3 Test Instruments

| Description & Manaufacturer | Model No. | Serial No. | Date of Calibration | Due Date of Calibration |
|---|---|---|---|---|
| Spectrum Analyzer KEYSIGHT | N9030A | MY54490561 | Jul. 31, 2019 | Jul. 30, 2020 |
| DC-6GHz 20dB 50W Fixed attenuator Woken | MDC9331N-20 | 0724 | Jun. 19, 2018 | Jun. 18, 2020 |
| JFW 20dB attenuation | 50HF-020-SMA | NA | NA | NA |

Note: 1. The calibration interval of the above test instruments is 12/24 months and the calibrations are traceable to NML/ROC and NIST/USA.

### 4.1.4 Test Procedures

Conducted Measurement Method

1. Connect the DUT transmitter output to the spectrum analyzer via coaxial cable while ensuring proper impedance matching.
2. Set span to at least 1.5 times the OBW.
3. Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
4. Set VBW ≥ 3 × RBW.
5. Set number of points in sweep ≥ 2 × span / RBW.
6. Sweep time = auto-couple.
7. Detector = RMS (power averaging).
8. If the EUT can be configured to transmit continuously (i.e., burst duty cycle ≥ 98%), then set the trigger to free run.
9. If the EUT cannot be configured to transmit continuously (i.e., burst duty cycle < 98 %), then use a sweep trigger with the level set to enable triggering only on full power bursts and configure the EUT to transmit at full power for the entire duration of each sweep. Ensure that the sweep time is less than or equal to the transmission burst duration.
10. Trace average at least 100 traces in power averaging (i.e., RMS) mode.
11. Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with the band limits set equal to the OBW band edges. If the instrument does not have a band power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

Maximum EIRP (dBm/MHz)

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

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

where

ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as $P_{Meas}$, e.g., dBm or dBW)

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

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

### 4.1.5 Deviation from Test Standard

No deviation.

### 4.1.6 EUT Operating Conditions

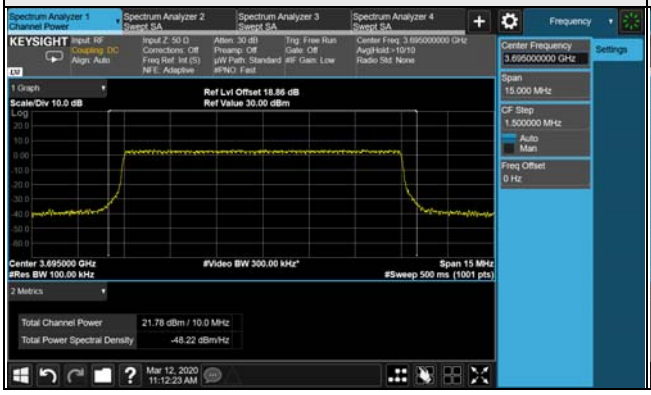
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

### 4.1.7 Test Results

**Conducted Output Power (dBm / 10MHz)**

| Band / BW | Chain | 64QAM | | |
|---|---|---|---|---|
| | | Low CH 55290 | Mid CH 55990 | High CH 56690 |
| | | 3555 MHz | 3625 MHz | 3695 MHz |
| 48 / 10M | 0 | 20.02 | 20.19 | **21.78** |
| | 1 | 19.97 | 19.92 | 21.29 |

| Band / BW | Chain | 64QAM | | |
|---|---|---|---|---|
| | | Low CH 55340 | Mid CH 55990 | High CH 56640 |
| | | 3560 MHz | 3625 MHz | 3690 MHz |
| 48 / 20M | 0 | 19.39 | 19.37 | **19.45** |
| | 1 | 18.96 | 18.86 | 18.94 |

| Spectrum Plot of Worst Value | |
|---|---|
| 10MHz | 20MHz |
|  |  |

**Maximum EIRP (dBm/ 10MHz)**

| Band / BW | Chain | 64QAM | | |
|---|---|---|---|---|
| | | Low CH 55290 | Mid CH 55990 | High CH 56690 |
| | | 3555 MHz | 3625 MHz | 3695 MHz |
| 48 / 10M | 0 | 24.22 | 24.39 | 25.98 |
| | 1 | 24.17 | 24.12 | 25.49 |
| | 0+1 | 27.21 | 27.27 | **28.75** |

| Band / BW | Chain | 64QAM | | |
|---|---|---|---|---|
| | | Low CH 55340 | Mid CH 55990 | High CH 56640 |
| | | 3560 MHz | 3625 MHz | 3690 MHz |
| 48 / 20M | 0 | 23.59 | 23.57 | 23.65 |
| | 1 | 23.16 | 23.06 | 23.14 |
| | 0+1 | 26.39 | 26.33 | **26.41** |

*EIRP = Conducted + antenna gain.

**Full Conducted Output Power (dBm / 10MHz)**

| Band / BW | Chain | 64QAM | | |
|---|---|---|---|---|
| | | Low CH 55290 | Mid CH 55990 | High CH 56690 |
| | | 3555 MHz | 3625 MHz | 3695 MHz |
| 48 / 10M | 0 | 20.02 | 20.19 | **21.78** |
| | 1 | 19.97 | 19.92 | 21.29 |

**Full Conducted Output Power (dBm / 20MHz)**

| Band / BW | Chain | 64QAM | | |
|---|---|---|---|---|
| | | Low CH 55340 | Mid CH 55990 | High CH 56640 |
| | | 3560 MHz | 3625 MHz | 3690 MHz |
| 48 / 20M | 0 | 21.68 | 21.16 | **21.96** |
| | 1 | 21.05 | 21.52 | 21.42 |

Spectrum Plot of Worst Value

10MHz


20MHz


**Full Maximum EIRP (dBm/ 10MHz)**

| Band / BW | Chain | 64QAM | | |
|---|---|---|---|---|
| | | Low CH 55290 | Mid CH 55990 | High CH 56690 |
| | | 3555 MHz | 3625 MHz | 3695 MHz |
| 48 / 10M | 0 | 24.22 | 24.39 | 25.98 |
| | 1 | 24.17 | 24.12 | 25.49 |
| | 0+1 | 27.21 | 27.27 | **28.75** |

**Full Maximum EIRP (dBm/ 20MHz)**

| Band / BW | Chain | 64QAM | | |
|---|---|---|---|---|
| | | Low CH 55340 | Mid CH 55990 | High CH 56640 |
| | | 3560 MHz | 3625 MHz | 3690 MHz |
| 48 / 20M | 0 | 25.88 | 25.36 | 26.16 |
| | 1 | 25.25 | 25.72 | 25.62 |
| | 0+1 | 28.59 | 28.55 | **28.91** |

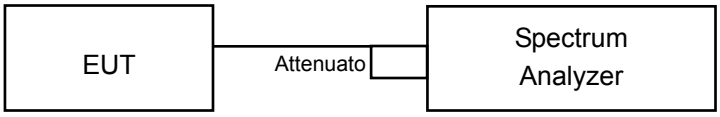
*EIRP = Conducted + antenna gain.

## 4.2 Maximum Power Spectral Density Measurement

### 4.2.1 Limits of Maximum Power Spectral Density Measurement

| Device | Maximum Radiated PSD (dBm/MHz) |
|---|---|
| End User Device | n/a |
| Category A CBSD | 20 |
| Category B CBSD | 37 |

### 4.2.2 Test Setup




### 4.2.3 Test Instruments

Refer to section 4.1.3 to get information of above instrument.

### 4.2.4 Test Procedure

1. Connect the transmitter to the spectrum analyzer via coaxial cable while ensuring proper impedance matching.
2. Tune the analyzer to the nominal center frequency of the emission bandwidth (EBW).
3. Set the resolution bandwidth (RBW) to 1MHZ.
4. Set the video bandwidth (VBW) to ≧3 x RBW.
5. Select the average power (RMS) display detector.
6. Set number of points in sweep ≥ 2 × span / RBW.
7. Use auto-coupled sweep time.
8. Perform the measurement over an interval of time when the transmission is continuous and at its maximum power level.

Maximum EIRP (dBm/MHz)

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

ERP or EIRP = $P_{Meas}$ + $G_T$
where

ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as $P_{Meas}$, e.g., dBm or dBW)
$P_{Meas}$ measured transmitter output power or PSD, in dBm or dBW
$G_T$ gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

### 4.2.5 Deviation from Test Standard

No deviation.

### 4.2.6 EUT Operating Condition

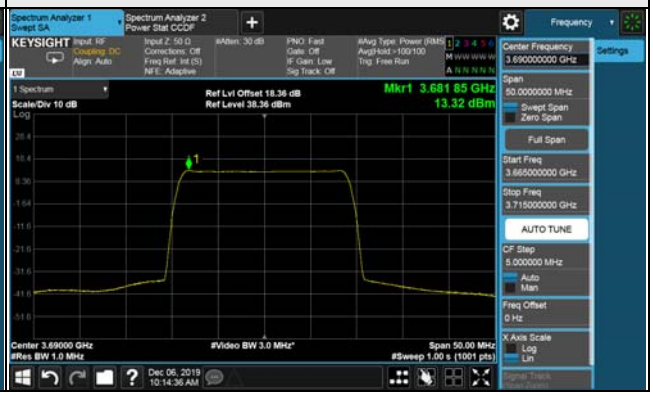
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

### 4.2.7 Test Results

Chain 0

| LTE Band 48, Channel Bandwidth 10MHz | | | | | | |
|---|---|---|---|---|---|---|
| Channel | Frequency (MHz) | Conducted PSD (dBm/MHz) | Antenna Gain (dBi) | Radiated PSD (dBm/MHz) | Limit (dBm/MHz) | Pass/Fail |
| 55290 | 3555.0 | 13.72 | 4.2 | 17.92 | 20 | Pass |
| 55990 | 3625.0 | 13.09 | 4.2 | 17.29 | 20 | Pass |
| 56690 | 3695.0 | 15.78 | 4.2 | 19.98 | 20 | Pass |
| LTE Band 48, Channel Bandwidth 20MHz | | | | | | |
| Channel | Frequency (MHz) | Conducted PSD (dBm/MHz) | Antenna Gain (dBi) | Radiated PSD (dBm/MHz) | Limit (dBm/MHz) | Pass/Fail |
| 55340 | 3560.0 | 13.32 | 4.2 | 17.52 | 20 | Pass |
| 55990 | 3625.0 | 13.12 | 4.2 | 17.32 | 20 | Pass |
| 56640 | 3690.0 | 12.99 | 4.2 | 17.19 | 20 | Pass |

*Note: Radiated PSD= Conducted PSD (dBm/ MHz) + Antenna Gain (4.2dBi)

| Spectrum Plot of Worst Value (Conducted PSD) | |
|---|---|
| 10MHz | 20MHz |
|  |  |

Chain 1

| LTE Band 48, Channel Bandwidth 10MHz | | | | | | |
|---|---|---|---|---|---|---|
| Channel | Frequency (MHz) | Conducted PSD (dBm/MHz) | Antenna Gain (dBi) | Radiated PSD (dBm/MHz) | Limit (dBm/MHz) | Pass/Fail |
| 55290 | 3555.0 | 13.58 | 4.2 | 17.78 | 20 | Pass |
| 55990 | 3625.0 | 12.94 | 4.2 | 17.14 | 20 | Pass |
| 56690 | 3695.0 | 15.55 | 4.2 | 19.75 | 20 | Pass |
| LTE Band 48, Channel Bandwidth 20MHz | | | | | | |
| Channel | Frequency (MHz) | Conducted PSD (dBm/MHz) | Antenna Gain (dBi) | Radiated PSD (dBm/MHz) | Limit (dBm/MHz) | Pass/Fail |
| 55340 | 3560.0 | 13.80 | 4.2 | 18.00 | 20 | Pass |
| 55990 | 3625.0 | 13.49 | 4.2 | 17.69 | 20 | Pass |
| 56640 | 3690.0 | 14.12 | 4.2 | 18.32 | 20 | Pass |

*Note: Radiated PSD= Conducted PSD (dBm/ MHz) + Antenna Gain (4.2dBi)

| Spectrum Plot of Worst Value (Conducted PSD) | |
|---|---|
| 10MHz | 20MHz |
|  |  |

## 4.3 Modulation characteristics Measurement

### 4.3.1 Limits of Modulation characteristics

N/A

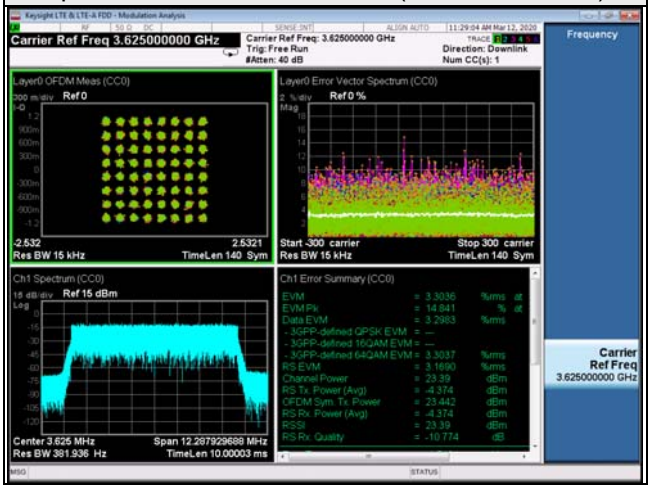
### 4.3.2 Test Procedure

Connect the EUT to Communication Simulator via the antenna connector, The frequency band is set as EUT supported Modulation and Channels, the EUT output is matched with 50 ohm load, the waveform quality and constellation of the EUT was tested.

### 4.3.3 Test Setup


### 4.3.4 Test Results

Spectrum Plot of Worst Value (Conducted PSD)



## 4.4 Frequency Stability Measurement

### 4.4.1 Limits of Frequency Stabiliity Measurement

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

### 4.4.2 Test Procedure

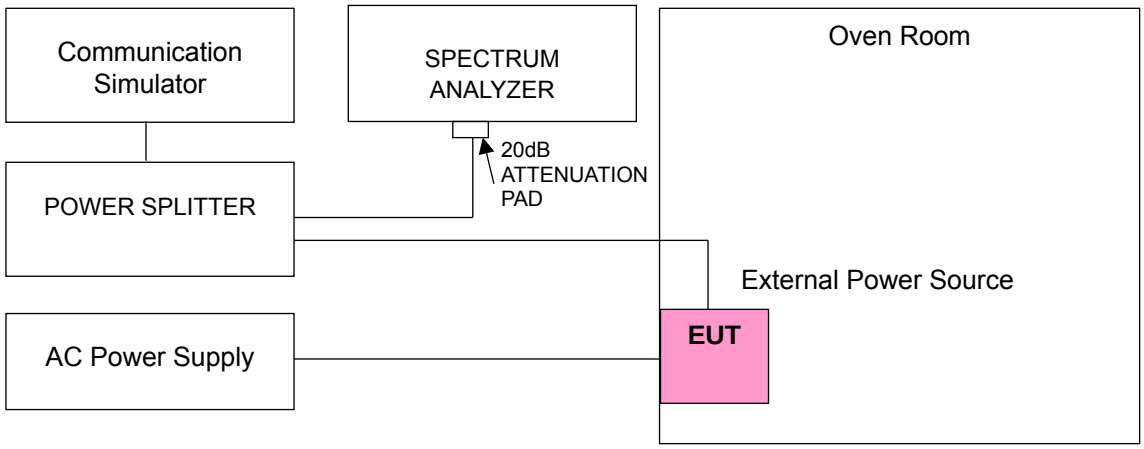
a. Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.

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 ±0.5 ℃ 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.

### 4.4.3 Test Setup



4.4.4 Test Results

Frequency Error vs. Voltage

| Voltage (Volts) | LTE Band 48, Channel Bandwidth: 10MHz | | | |
|---|---|---|---|---|
| | Low Channel | | High Channel | |
| | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| 102 | 3555.000003 | 0.001 | 3695.000002 | 0.001 |
| 120 | 3555.000002 | 0.000 | 3695.000003 | 0.001 |
| 138 | 3555.000003 | 0.001 | 3695.000001 | 0.000 |

Note: The applicant defined the normal working voltage is from 102Vac to 138Vac.

Frequency Error vs. Temperature

| Temp. (℃) | LTE Band 48, Channel Bandwidth: 10MHz | | | |
|---|---|---|---|---|
| | Low Channel | | High Channel | |
| | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| -30 | 3555.000003 | 0.001 | 3695.000002 | 0.001 |
| -20 | 3555.000002 | 0.001 | 3695.000001 | 0.000 |
| -10 | 3555.000003 | 0.001 | 3695.000004 | 0.001 |
| 0 | 3555.000001 | 0.000 | 3695.000001 | 0.000 |
| 10 | 3555.000003 | 0.001 | 3695.000003 | 0.001 |
| 20 | 3554.999996 | -0.001 | 3694.999997 | -0.001 |
| 30 | 3554.999998 | -0.001 | 3694.999998 | -0.001 |
| 40 | 3554.999999 | 0.000 | 3694.999997 | -0.001 |
| 50 | 3554.999998 | -0.001 | 3694.999997 | -0.001 |

Frequency Error vs. Voltage

| Voltage (Volts) | LTE Band 48, Channel Bandwidth: 20MHz | | | |
|---|---|---|---|---|
| | Low Channel | | High Channel | |
| | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| 102 | 3560.000004 | 0.001 | 3690.000003 | 0.001 |
| 120 | 3560.000001 | 0.000 | 3690.000002 | 0.001 |
| 138 | 3560.000004 | 0.001 | 3690.000003 | 0.001 |

Note: The applicant defined the normal working voltage is from 102Vac to 138Vac.

Frequency Error vs. Temperature

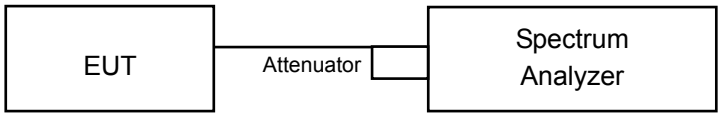
| Temp. (℃) | LTE Band 48, Channel Bandwidth: 20MHz | | | |
|---|---|---|---|---|
| | Low Channel | | High Channel | |
| | Frequency (MHz) | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
| -30 | 3560.000002 | 0.001 | 3690.000003 | 0.001 |
| -20 | 3560.000001 | 0.000 | 3690.000002 | 0.001 |
| -10 | 3560.000001 | 0.000 | 3690.000001 | 0.000 |
| 0 | 3560.000002 | 0.000 | 3690.000004 | 0.001 |
| 10 | 3560.000002 | 0.001 | 3690.000001 | 0.000 |
| 20 | 3559.999999 | 0.000 | 3689.999996 | -0.001 |
| 30 | 3559.999997 | -0.001 | 3689.999998 | -0.001 |
| 40 | 3559.999998 | -0.001 | 3689.999997 | -0.001 |
| 50 | 3559.999996 | -0.001 | 3689.999997 | -0.001 |

## 4.5 Emission Bandwidth Measurement

4.5.1 Emission Bandwidth Measurement

Reference only

4.5.2 Test Setup




4.5.3 Test Instruments

Refer to section 4.1.3 to get information of above instrument.

4.5.4 Test Procedure

Occupied Bandwdith & 26dBc Bandwidth

1. The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be wide enough to see sufficient roll off of the signal to make the measurement.
2. The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set ≥ 3 × RBW.
3. Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation.
   NOTE—Step 1), step 2), and step 3) may require iteration to adjust within the specified tolerances.
4. The dynamic range of the spectrum analyzer at the selected RBW shall be more than 10 dB below the target "−X dB" requirement, i.e., if the requirement calls for measuring the −26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be at least 36 dB below the reference level.
5. Set spectrum analyzer detection mode to peak, and the trace mode to max hold.
6. Determine the reference value by either of the following:
   a) Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).
   b) Set the EUT to transmit an unmodulated carrier. Set the spectrum analyzer marker to the level of the carrier.
7. Determine the "−X dB amplitude" as equal to (Reference Value − X). Alternatively, this calculation can be performed on the spectrum analyzer using the delta-marker measurement function.

4.5.5 Deviation fromTest Standard

No deviation.

4.5.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

### 4.5.7 Test Result (-26dB Bandwidth)

LTE Band 48

Chain 0

| LTE Band 48, Channel Bandwidth 10MHz | | |
|---|---|---|
| Channel | Frequency (MHz) | 26dB Bandwidth (MHz) |
| | | 64QAM |
| 55290 | 3555.0 | 9.26 |
| 55990 | 3625.0 | 9.28 |
| 56690 | 3695.0 | 10.15 |
| LTE Band 48, Channel Bandwidth 20MHz | | |
| Channel | Frequency (MHz) | 26dB Bandwidth (MHz) |
| | | 64QAM |
| 55340 | 3560.0 | 18.50 |
| 55990 | 3625.0 | 18.48 |
| 56640 | 3690.0 | 18.48 |

| Spectrum Plot of Worst Value | |
|---|---|
| 10MHz / 64QAM | 20MHz / 64QAM |
|  |  |

Chain 1

| LTE Band 48, Channel Bandwidth 10MHz | | |
|---|---|---|
| Channel | Frequency (MHz) | 26dB Bandwidth (MHz) |
| | | 64QAM |
| 55290 | 3555.0 | 9.33 |
| 55990 | 3625.0 | 9.28 |
| 56690 | 3695.0 | 9.28 |
| LTE Band 48, Channel Bandwidth 20MHz | | |
| Channel | Frequency (MHz) | 26dB Bandwidth (MHz) |
| | | 64QAM |
| 55340 | 3560.0 | 18.46 |
| 55990 | 3625.0 | 18.55 |
| 56640 | 3690.0 | 18.48 |

| Spectrum Plot of Worst Value | |
|---|---|
| 10MHz / 64QAM | 20MHz / 64QAM |
|  |  |

### 4.5.8 Test Result (Occupied Bandwidth)

LTE Band 48
Chain 0

| LTE Band 48, Channel Bandwidth 10MHz | | |
|---|---|---|
| Channel | Frequency (MHz) | 99% Occupied Bandwidth (MHz) |
| | | 64QAM |
| 55290 | 3555.0 | 8.90 |
| 55990 | 3625.0 | 8.90 |
| 56690 | 3695.0 | 8.93 |
| LTE Band 48, Channel Bandwidth 20MHz | | |
| Channel | Frequency (MHz) | 99% Occupied Bandwidth (MHz) |
| | | 64QAM |
| 55340 | 3560.0 | 17.75 |
| 55990 | 3625.0 | 17.81 |
| 56640 | 3690.0 | 17.78 |

| Spectrum Plot of Worst Value | |
|---|---|
| 10MHz / 64QAM | 20MHz / 64QAM |
|  |  |

Chain 1

| LTE Band 48, Channel Bandwidth 10MHz | | |
|---|---|---|
| Channel | Frequency (MHz) | 99% Occupied Bandwidth (MHz) |
| | | 64QAM |
| 55290 | 3555.0 | 8.92 |
| 55990 | 3625.0 | 8.90 |
| 56690 | 3695.0 | 8.89 |
| LTE Band 48, Channel Bandwidth 20MHz | | |
| Channel | Frequency (MHz) | 99% Occupied Bandwidth (MHz) |
| | | 64QAM |
| 55340 | 3560.0 | 17.76 |
| 55990 | 3625.0 | 17.85 |
| 56640 | 3690.0 | 17.83 |

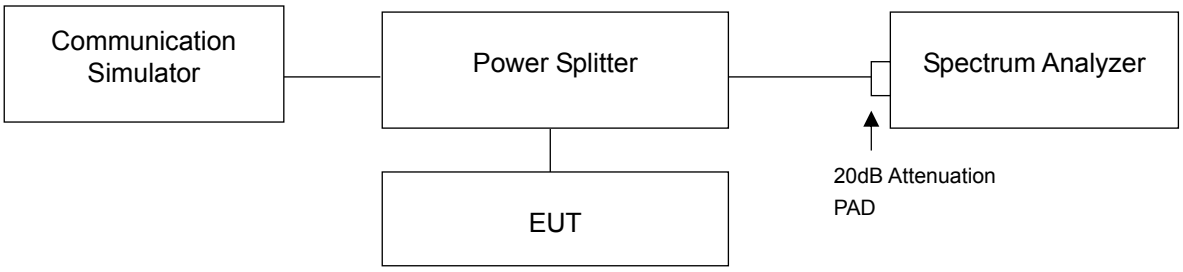
| Spectrum Plot of Worst Value | |
|---|---|
| 10MHz / 64QAM | 20MHz / 64QAM |
|  |  |

## 4.6 Peak to Average Ratio Measurement

### 4.6.1 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

### 4.6.2 Test Setup




### 4.6.3 Test Procedures

a. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;

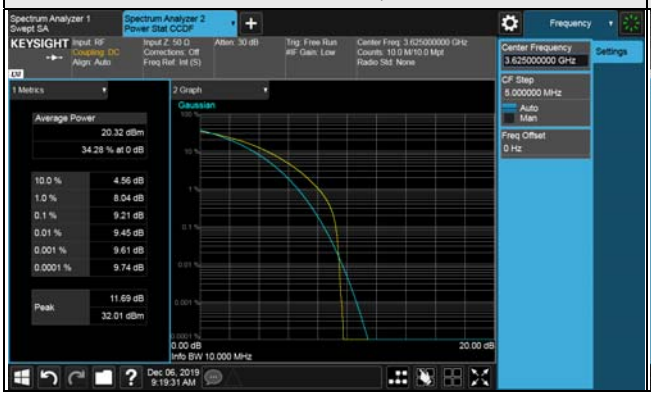
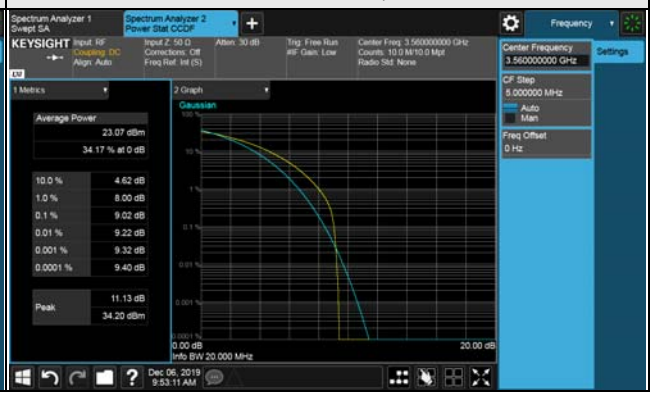
b. Set the number of counts to a value that stabilizes the measured CCDF curve;

c. Record the maximum PAPR level associated with a probability of 0.1%.

### 4.6.4 Test Results

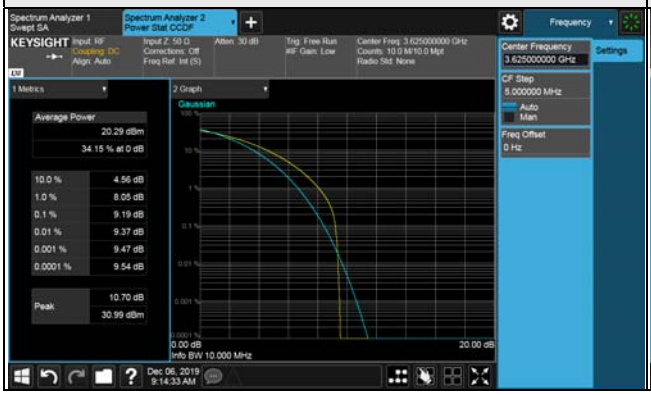
LTE Band 48
Chain 0

| LTE Band 48, Channel Bandwidth 10MHz | | |
|---|---|---|
| Channel | Frequency (MHz) | Peak To Average Ratio (dB) |
| | | 64QAM |
| 55290 | 3555.0 | 9.14 |
| 55990 | 3625.0 | 9.21 |
| 56690 | 3695.0 | 9.16 |
| LTE Band 48, Channel Bandwidth 20MHz | | |
| Channel | Frequency (MHz) | Peak To Average Ratio (dB) |
| | | 64QAM |
| 55340 | 3560.0 | 9.02 |
| 55990 | 3625.0 | 9.00 |
| 56640 | 3690.0 | 8.91 |

| Spectrum Plot of Worst Value | |
|---|---|
| 10MHz / 64QAM | 20MHz / 64QAM |
|  |  |

Chain 1

| LTE Band 48, Channel Bandwidth 10MHz | | |
|---|---|---|
| Channel | Frequency (MHz) | Peak To Average Ratio (dB) |
| | | 64QAM |
| 55290 | 3555.0 | 9.15 |
| 55990 | 3625.0 | 9.19 |
| 56690 | 3695.0 | 9.04 |
| LTE Band 48, Channel Bandwidth 20MHz | | |
| Channel | Frequency (MHz) | Peak To Average Ratio (dB) |
| | | 64QAM |
| 55340 | 3560.0 | 9.00 |
| 55990 | 3625.0 | 8.90 |
| 56640 | 3690.0 | 8.94 |

| Spectrum Plot of Worst Value | |
|---|---|
| 10MHz / 64QAM | 20MHz / 64QAM |
|  |  |

## 4.7 Conducted Spurious Emissions

### 4.7.1 Limits of Conducted Spurious Emissions Measurement

| Power of any emissions outside the Fundamental | Limit |
|---|---|
| Within 0-10MHz above the Assigned Channel | -13 dBm/MHz |
| Within 0-10MHz below the Assigned Channel | |
| Greater than 0-10MHz above the Assigned Channel | -25 dBm/MHz |
| Greater than 0-10MHz below the Assigned Channel | |
| Power of any emission below 3530MHz | -40 dBm/MHz |
| Power of any emission above 3720MHz | |

Note:

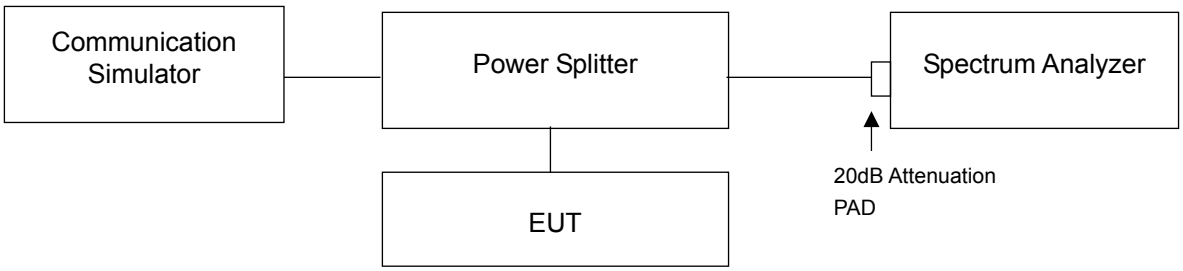
This device can be impelement MIMO function, so the limit of spurious emissions needs to be reduced by 10log($Numbers_{Ant}$) according to FCC KDB 662911 D01 guidance.

{The limit is adjusted to -13dBm – 10*log(2) = -16.01dBm.}

{The limit is adjusted to -25dBm – 10*log(2) = -28.01dBm.}

{The limit is adjusted to -40dBm – 10*log(2) = -43.01dBm.}

### 4.7.2 Test Setup

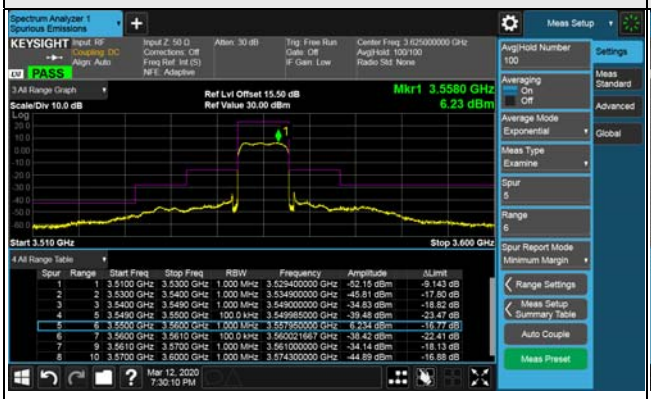


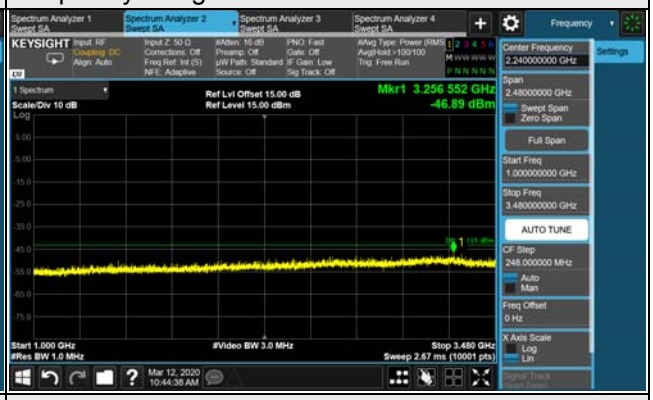
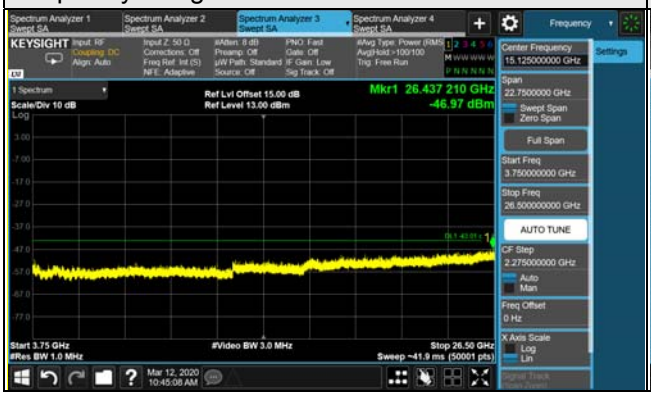
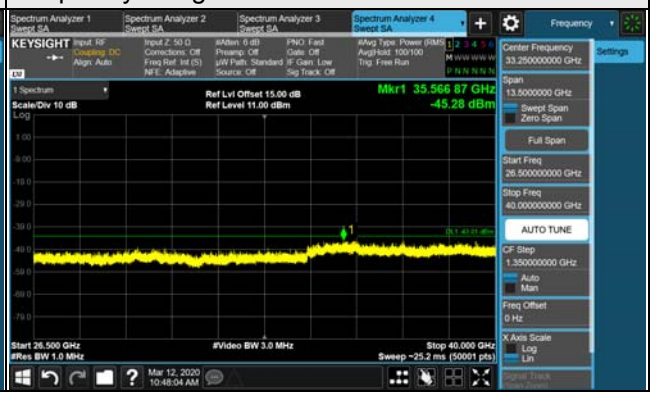

### 4.7.3 Test Procedure

a. The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
b. Measuring frequency range are from 9 kHz to 40GHz. 20dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz is used for conducted emission measurement.
c. Measuring frequency band edge, 20dB attenuation pad is connected with spectrum. 1% of the fundamental emission bandwidth is used for conducted emission measurement.

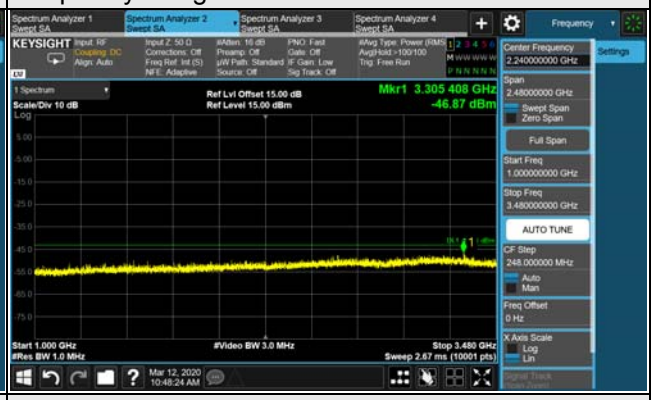
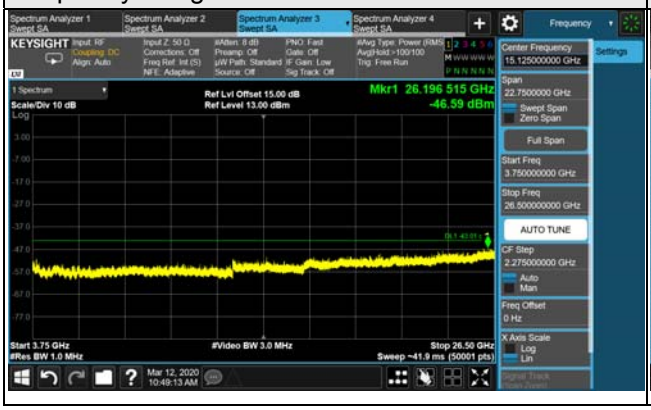
### 4.7.4 Test Results

Chain 0

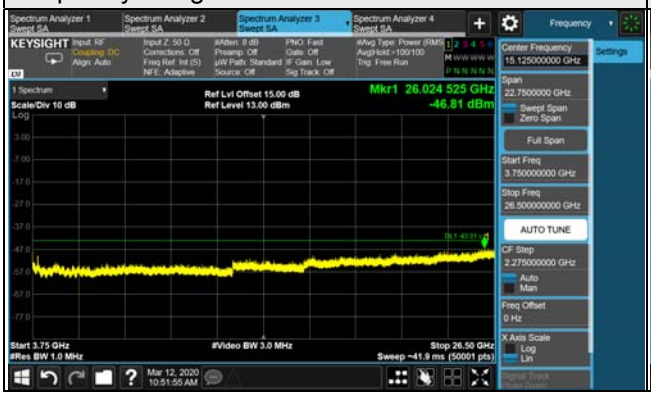
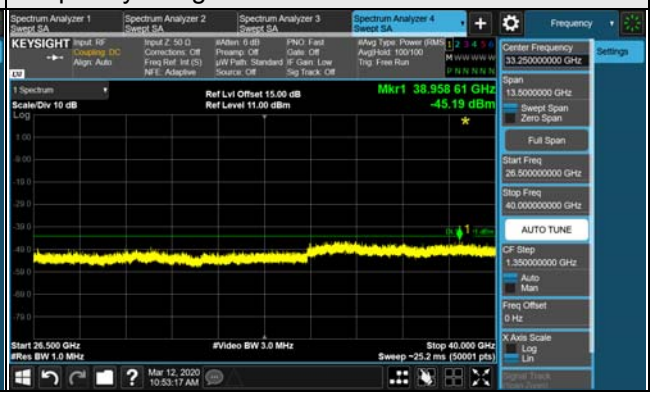
| LTE Band 48, Channel Bandwidth 10MHz | |
|---|---|
| Channel 55290 (3555.0MHz) | Channel 55990 (3625.00MHz) |
| Full RB | Full RB |
|  |  |
| Channel 56690 (3695.0MHz) | |
| Full RB | |
|  | |

| LTE Band 48, Channel Bandwidth 10MHz | |
|---|---|
| Channel 55290 (3555.0MHz) | |
| Frequency Range : 9kHz~1GHz | Frequency Range : 1GHz~3.48GHz |
|  |  |
| Frequency Range : 3.75GHz~26.5GHz | Frequency Range : 26.5GHz~40GHz |
|  |  |

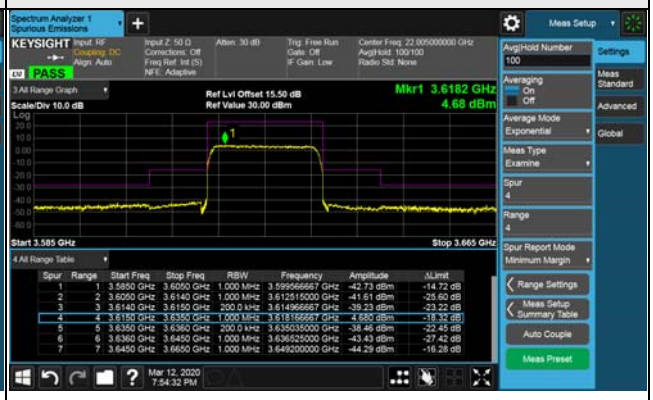
Note: The signal at 9 kHz is IF signal from spectrum analyzer.

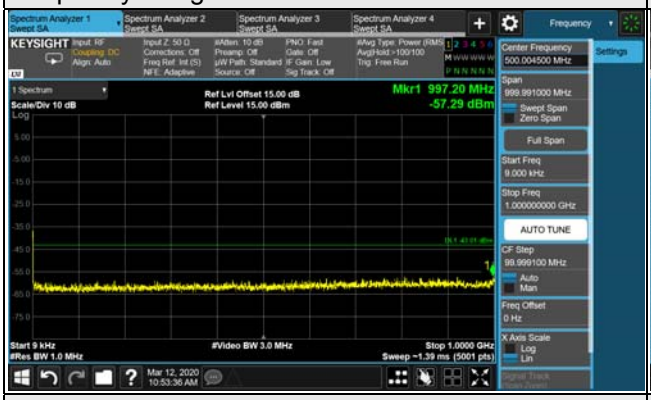
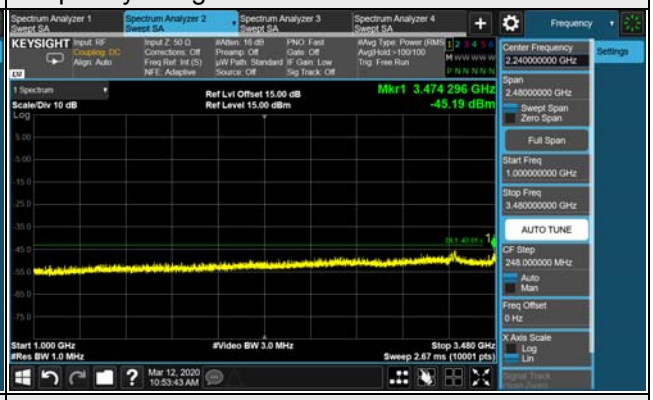
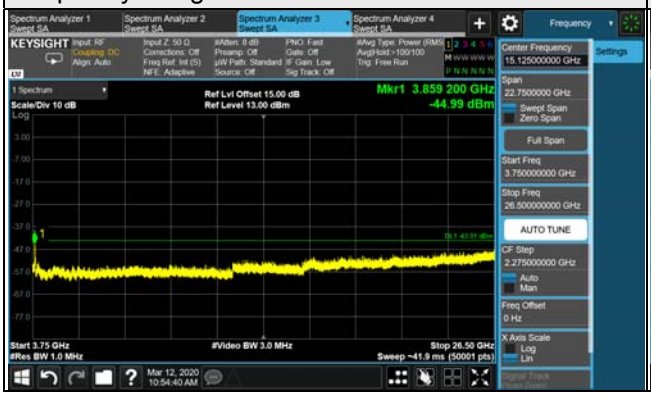
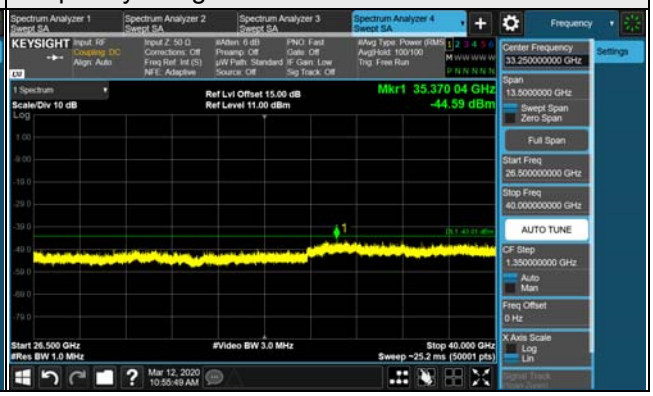
| LTE Band 48, Channel Bandwidth 10MHz | |
|---|---|
| Channel 55990 (3625.00MHz) | |
| Frequency Range : 9kHz~1GHz | Frequency Range : 1GHz~3.48GHz |
|  |  |
| Frequency Range : 3.75GHz~26.5GHz | Frequency Range : 26.5GHz~40GHz |
|  |  |

Note: The signal at 9 kHz is IF signal from spectrum analyzer.

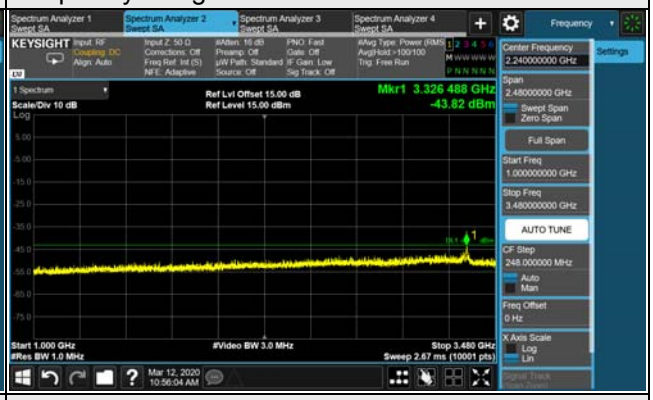
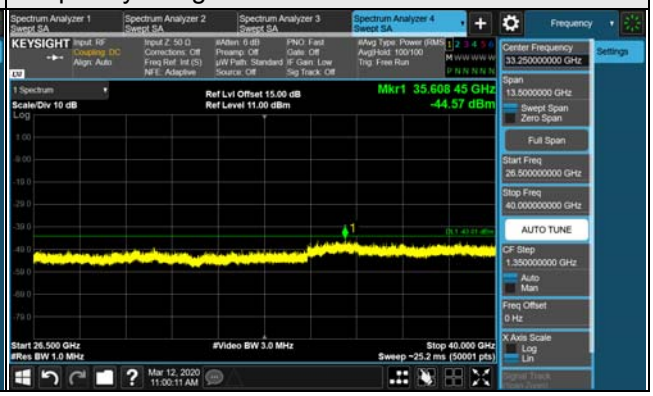
| LTE Band 48, Channel Bandwidth 10MHz | |
|---|---|
| Channel 56690 (3695.0MHz) | |
| Frequency Range : 9kHz~1GHz | Frequency Range : 1GHz~3.48GHz |
|  |  |
| Frequency Range : 3.75GHz~26.5GHz | Frequency Range : 26.5GHz~40GHz |
|  |  |

Note: The signal at 9 kHz is IF signal from spectrum analyzer.

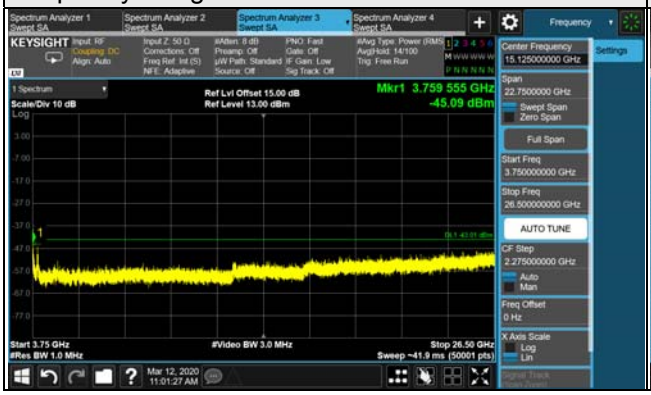
| LTE Band 48, Channel Bandwidth 20MHz | |
|---|---|
| Channel 55340 (3560.0MHz) | Channel 55990 (3625.0MHz) |
| Full RB | Full RB |
|  |  |
| Channel 56640 (3690.0MHz) | |
| Full RB | |
|  | |

| LTE Band 48, Channel Bandwidth 20MHz | |
|---|---|
| Channel 55340 (3560.0MHz) | |
| Frequency Range : 9kHz~1GHz | Frequency Range : 1GHz~3.48GHz |
|  |  |
| Frequency Range : 3.75GHz~26.5GHz | Frequency Range : 26.5GHz~40GHz |
|  |  |

Note: The signal at 9 kHz is IF signal from spectrum analyzer.

| LTE Band 48, Channel Bandwidth 20MHz | |
|---|---|
| Channel 55990 (3625.0MHz) | |
| Frequency Range : 9kHz~1GHz | Frequency Range : 1GHz~3.48GHz |
|  |  |
| Frequency Range : 3.75GHz~26.5GHz | Frequency Range : 26.5GHz~40GHz |
|  |  |

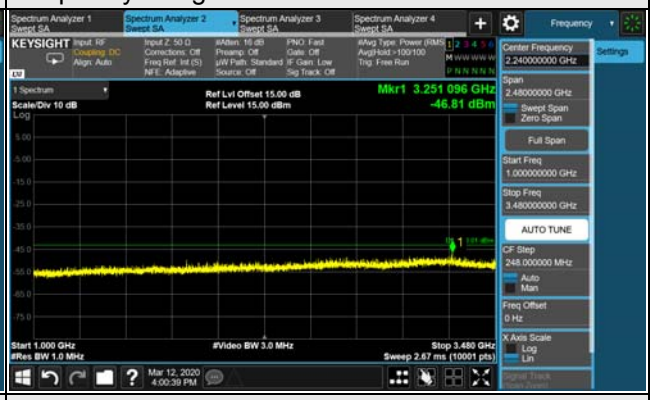
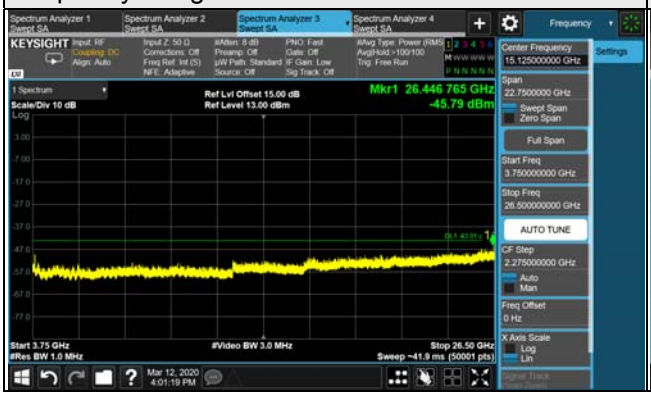
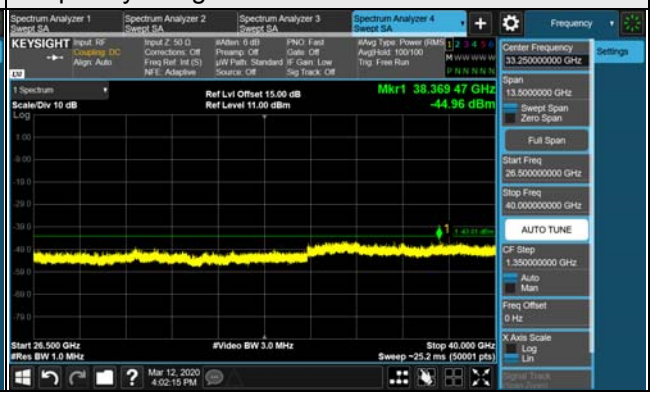
Note: The signal at 9 kHz is IF signal from spectrum analyzer.

| LTE Band 48, Channel Bandwidth 20MHz | |
|---|---|
| Channel 56640 (3690.0MHz) | |
| Frequency Range : 9kHz~1GHz | Frequency Range : 1GHz~3.48GHz |
|  |  |
| Frequency Range : 3.75GHz~26.5GHz | Frequency Range : 26.5GHz~40GHz |
|  |  |

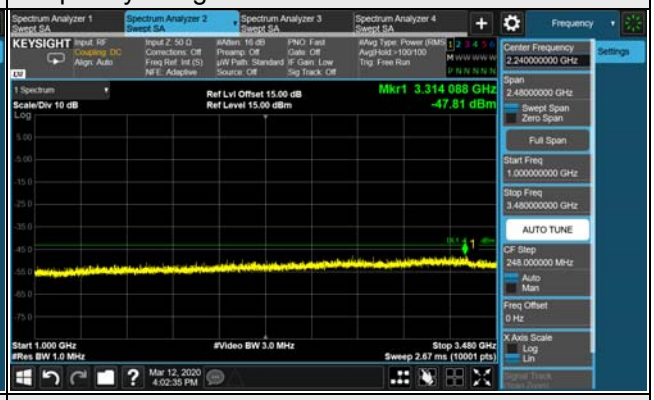
Note: The signal at 9 kHz is IF signal from spectrum analyzer.

Chain 1

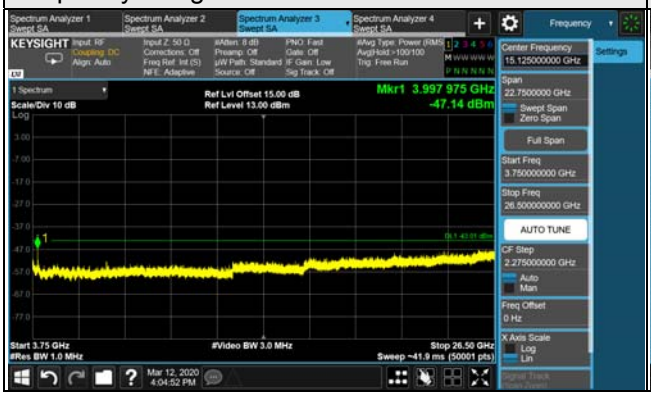
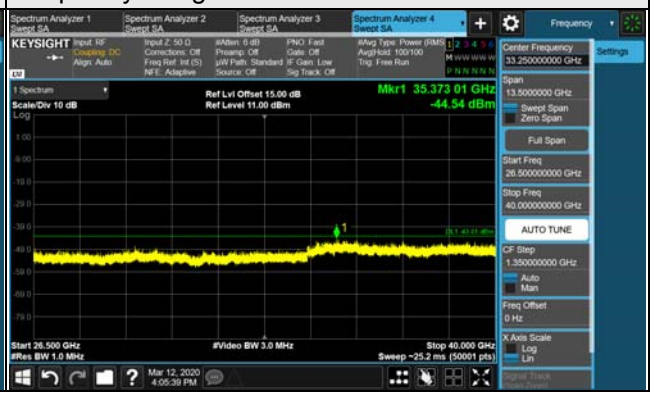
| LTE Band 48, Channel Bandwidth 10MHz | |
|---|---|
| Channel 55290 (3555.0MHz) | Channel 55990 (3625.00MHz) |
| Full RB | Full RB |
|  |  |
| Channel 56690 (3695.0MHz) | |
| Full RB | |
|  | |

| LTE Band 48, Channel Bandwidth 10MHz | |
|---|---|
| Channel 55290 (3555.0MHz) | |
| Frequency Range : 9kHz~1GHz | Frequency Range : 1GHz~3.48GHz |
|  |  |
| Frequency Range : 3.75GHz~26.5GHz | Frequency Range : 26.5GHz~40GHz |
|  |  |

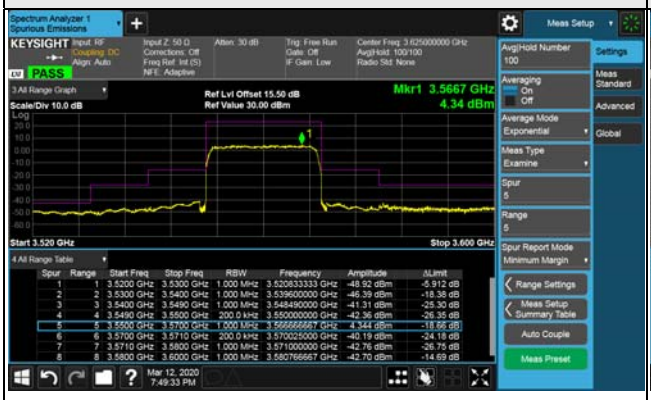
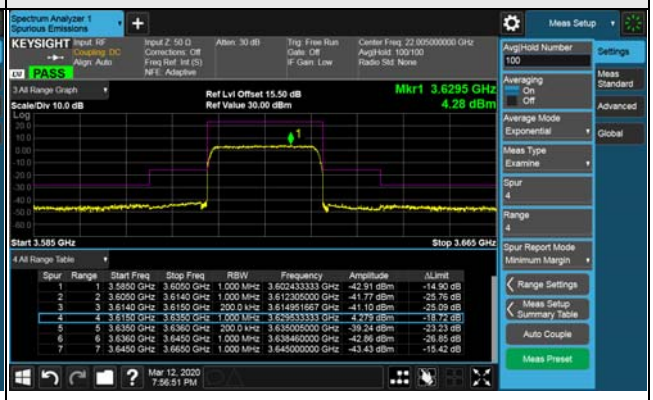
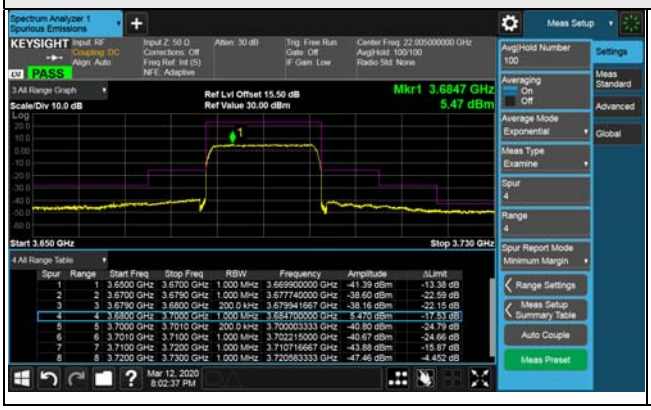
Note: The signal at 9 kHz is IF signal from spectrum analyzer.

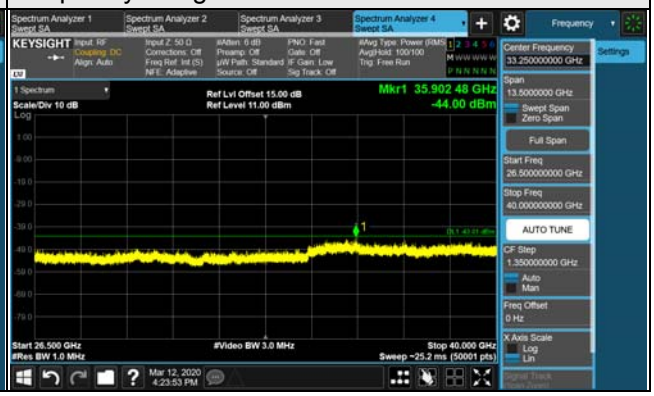
| LTE Band 48, Channel Bandwidth 10MHz | |
|---|---|
| Channel 55990 (3625.00MHz) | |
| Frequency Range : 9kHz~1GHz | Frequency Range : 1GHz~3.48GHz |
|  |  |
| Frequency Range : 3.75GHz~26.5GHz | Frequency Range : 26.5GHz~40GHz |
|  |  |

Note: The signal at 9 kHz is IF signal from spectrum analyzer.

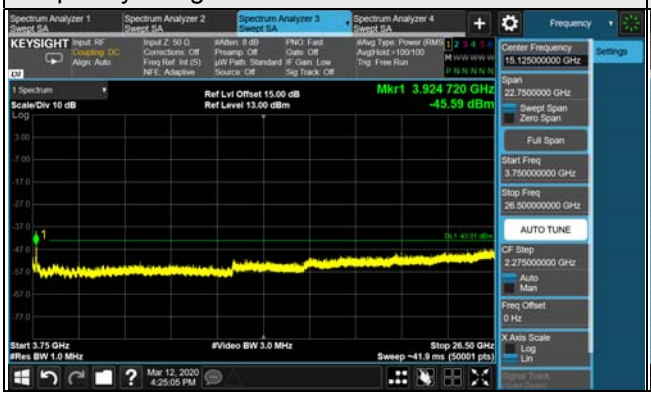
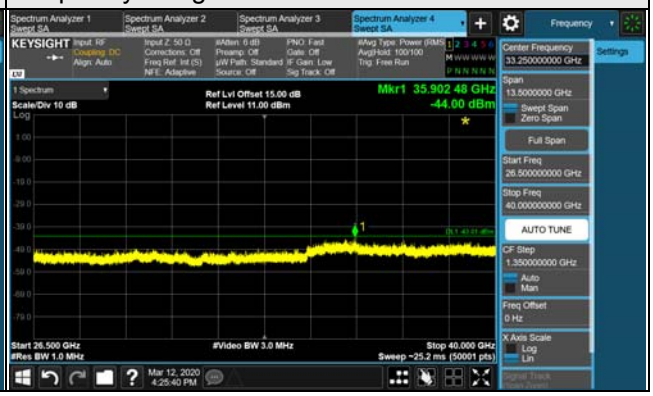
| LTE Band 48, Channel Bandwidth 10MHz | |
|---|---|
| Channel 56690 (3695.0MHz) | |
| Frequency Range : 9kHz~1GHz | Frequency Range : 1GHz~3.48GHz |
|  |  |
| Frequency Range : 3.75GHz~26.5GHz | Frequency Range : 26.5GHz~40GHz |
|  |  |

Note: The signal at 9 kHz is IF signal from spectrum analyzer.

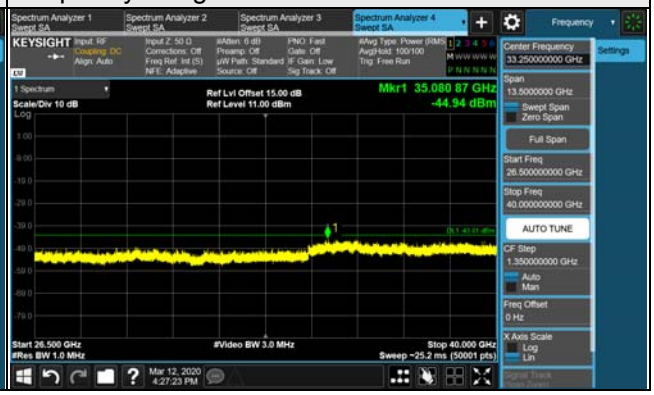
| LTE Band 48, Channel Bandwidth 20MHz | |
|---|---|
| Channel 55340 (3560.0MHz) | Channel 55990 (3625.0MHz) |
| Full RB | Full RB |
|  |  |
| Channel 56640 (3690.0MHz) | |
| Full RB | |
|  | |

| LTE Band 48, Channel Bandwidth 20MHz | |
|---|---|
| Channel 55340 (3560.0MHz) | |
| Frequency Range : 9kHz~1GHz | Frequency Range : 1GHz~3.48GHz |
|  |  |
| Frequency Range : 3.75GHz~26.5GHz | Frequency Range : 26.5GHz~40GHz |
|  |  |

Note: The signal at 9 kHz is IF signal from spectrum analyzer.

| LTE Band 48, Channel Bandwidth 20MHz | |
|---|---|
| Channel 55990 (3625.0MHz) | |
| Frequency Range : 9kHz~1GHz | Frequency Range : 1GHz~3.48GHz |
|  |  |
| Frequency Range : 3.75GHz~26.5GHz | Frequency Range : 26.5GHz~40GHz |
|  |  |

Note: The signal at 9 kHz is IF signal from spectrum analyzer.

| LTE Band 48, Channel Bandwidth 20MHz | |
|---|---|
| Channel 56640 (3690.0MHz) | |
| Frequency Range : 9kHz~1GHz | Frequency Range : 1GHz~3.48GHz |
|  |  |
| Frequency Range : 3.75GHz~26.5GHz | Frequency Range : 26.5GHz~40GHz |
|  |  |

Note: The signal at 9 kHz is IF signal from spectrum analyzer.

## 4.8 Radiated Emission Measurement

### 4.8.1 Limits of Radiated Emission Measurement

The power of any emissions below 3530 MHz or above 3720 MHz shall not exceed −40dBm/MHz.

### 4.8.2 Test Instruments

| Description & Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Due |
|---|---|---|---|---|
| Test Receiver<br>KEYSIGHT | N9038A | MY55420137 | Apr. 15, 2019 | Apr. 14, 2020 |
| Spectrum Analyzer<br>ROHDE & SCHWARZ | FSP40 | 100039 | Jun. 12, 2019 | Jun. 11, 2020 |
| MXG Vector signal generator<br>Agilent | N5182B | MY53050430 | Nov. 25, 2019 | Nov. 24, 2020 |
| BILOG Antenna<br>SCHWARZBECK | VULB9168 | 9168-160 | Nov. 21, 2018 | Nov. 20, 2019 |
| HORN Antenna<br>SCHWARZBECK | BBHA 9120D | 9120D-969 | Nov. 24, 2019 | Nov. 23, 2020 |
| HORN Antenna<br>SCHWARZBECK | BBHA 9120 D | 9120D-1169 | Nov. 24, 2019 | Nov. 23, 2020 |
| HORN Antenna<br>SCHWARZBECK | BBHA 9170 | BBHA9170241 | Nov. 24, 2019 | Nov. 23, 2020 |
| Preamplifier<br>Agilent<br>(Below 1GHz) | 8447D | 2944A10638 | Jul. 11, 2019 | Jul. 10, 2020 |
| Preamplifier<br>Agilent<br>(Above 1GHz) | 8449B | 3008A02367 | Feb. 19, 2019 | Feb. 18, 2020 |
| RF signal cable<br>HUBER+SUHNER&EMCI | SUCOFLEX 104 &<br>EMC104-SM-SM8000 | CABLE-CH9-02<br>(248780+171006) | Jan. 19, 2019 | Jan. 18, 2020 |
| | | | Jan. 18, 2020 | Jan. 17, 2021 |
| RF signal cable<br>HUBER+SUHNER | SUCOFLEX 104 | CABLE-CH9-(250795/4) | Jul. 11, 2019 | Jul. 10, 2020 |
| RF signal cable<br>Woken | 8D-FB | Cable-CH9-01 | Jul. 30, 2019 | Jul. 29, 2020 |
| Software<br>BV ADT | ADT_Radiated_<br>V7.6.15.9.5 | NA | NA | NA |
| Antenna Tower<br>EMCO | 2070/2080 | 512.835.4684 | NA | NA |
| Turn Table<br>EMCO | 2087-2.03 | NA | NA | NA |
| Antenna Tower &Turn<br>BV ADT | AT100 | AT93021705 | NA | NA |
| Turn Table<br>BV ADT | TT100 | TT93021705 | NA | NA |
| Turn Table Controller<br>BV ADT | SC100 | SC93021705 | NA | NA |
| Boresight Antenna Fixture | FBA-01 | FBA-SIP01 | NA | NA |
| Pre-amplifier (18GHz-40GHz)<br>EMC | EMC184045B | 980175 | Sep. 05, 2019 | Sep. 04, 2020 |
| Standard Temperature And<br>Humidity Chamber | MHU-225AU | 920842 | May 31, 2019 | May 30, 2020 |
| JFW 20dB attenuation | 50HF-020-SMA | NA | NA | NA |
| True RMS Clamp Meter Fluke | 325 | 31130711WS | May 21, 2019 | May 20, 2020 |
| AC Power Source EEC | 6905S | 1991553 | NA | NA |

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 HwaYa Chamber 9.

### 4.8.3 Test Procedures

a. Substitution method is used for EIRP measurement. In the semi-anechoic chamber, EUT placed on the 0.8m (below or equal 1GHz) and / or 1.5m (above 1GHz) 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 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. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.

d. ERP power can be calculated form EIRP power by subtracting the gain of dipole, ERP power = EIRP power - 2.15dBi.

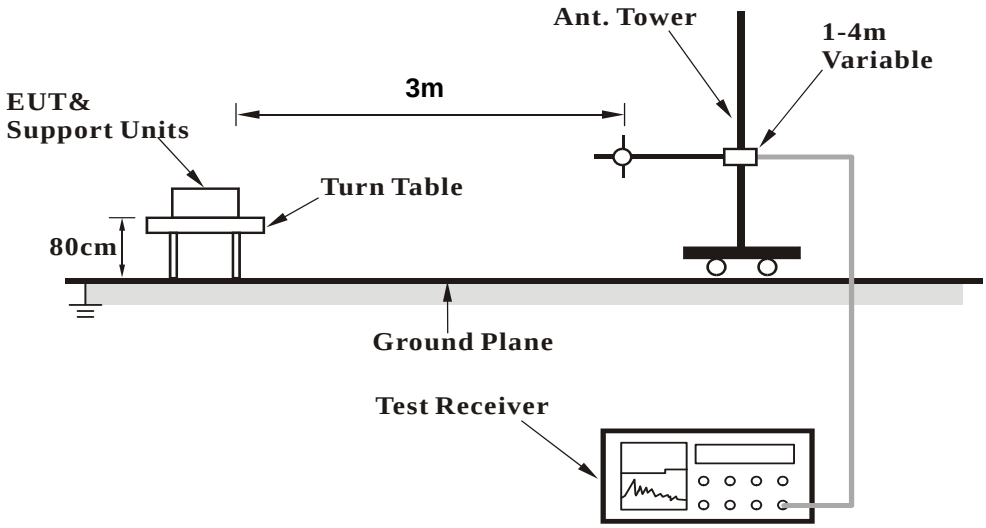
**Note:** The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

### 4.8.4 Deviation from Test Standard

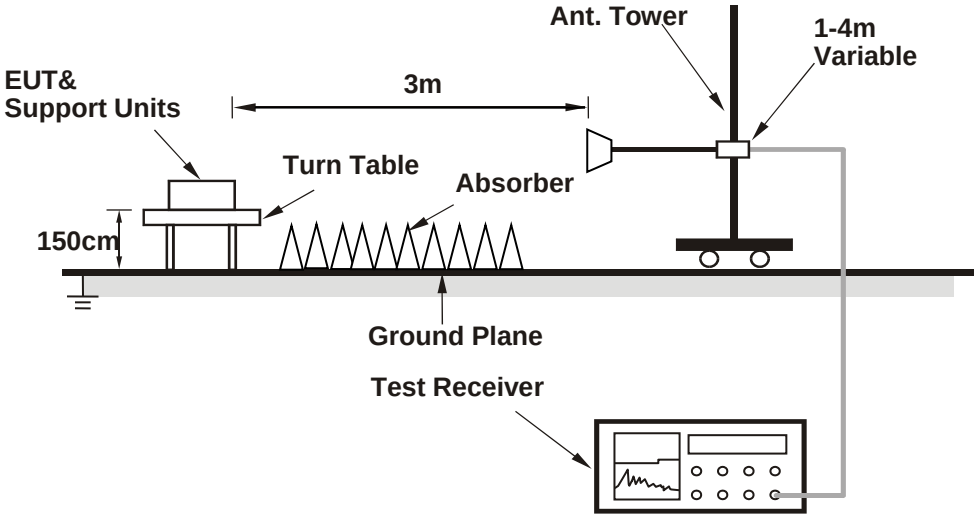
No deviation.

### 4.8.5 Test Set Up

**<Frequency Range below 1GHz>**




**<Frequency Range above 1GHz>**




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

### 4.8.6 Test Results

**Test was done with 50ohm terminator on antenna port.**

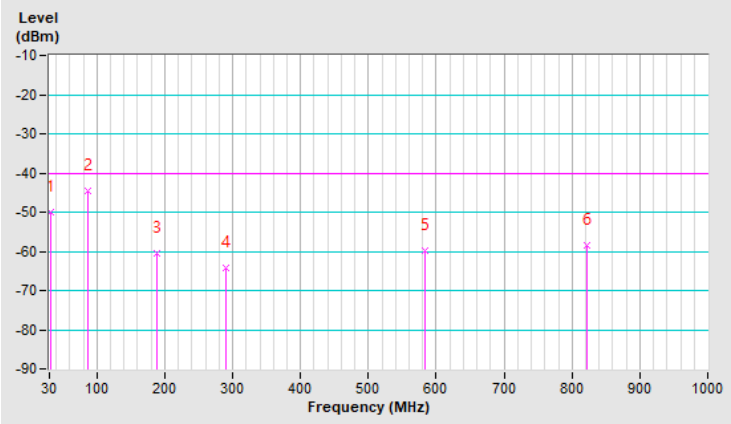
**Below 1GHz Data**

LTE Band 48, Channel Bandwidth 10MHz

| | | | |
|---|---|---|---|
| Mode | TX channel 55900 (3625.0MHz) | Frequency Range | Below 1000 MHz |
| Environmental Conditions | 22deg. C, 68%RH | Input Power | 120Vac, 60Hz |
| Tested By | Greg Lin | | |

| Antenna Polarity & Test Distance: Horizontal at 3 M | | | | | | | |
|---|---|---|---|---|---|---|---|
| No. | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1 | 31.94 | -53.3 | -31.6 | -18.3 | -49.9 | -40.0 | -9.9 |
| 2 | 87.23 | -37.5 | -44.6 | -0.1 | -44.7 | -40.0 | -4.7 |
| 3 | 188.11 | -52.2 | -57.7 | -2.7 | -60.4 | -40.0 | -20.4 |
| 4 | 289.96 | -60.8 | -62.5 | -1.7 | -64.2 | -40.0 | -24.2 |
| 5 | 582.90 | -61.0 | -63.6 | 3.8 | -59.8 | -40.0 | -19.8 |
| 6 | 821.52 | -64.9 | -62.3 | 3.9 | -58.4 | -40.0 | -18.4 |

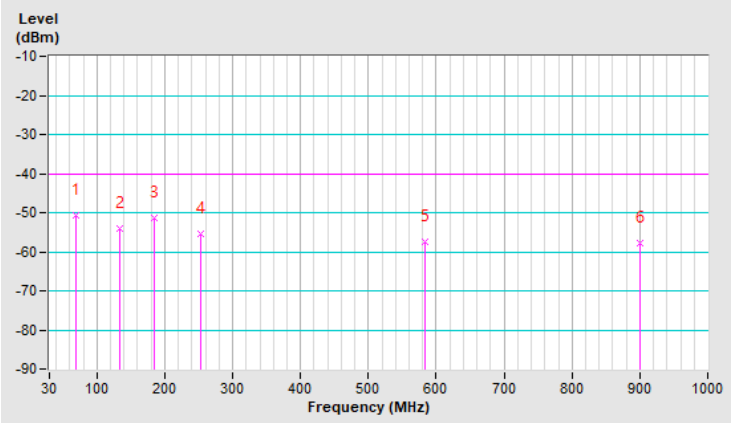
Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).



| Mode | TX channel 55900 (3625.0MHz) | Frequency Range | Below 1000 MHz |
|---|---|---|---|
| Environmental Conditions | 22deg. C, 68%RH | Input Power | 120Vac, 60Hz |
| Tested By | Greg Lin | | |

| Antenna Polarity & Test Distance: Vertical at 3 M | | | | | | | |
|---|---|---|---|---|---|---|---|
| No. | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1 | 68.80 | -44.2 | -50.0 | -0.8 | -50.8 | -40.0 | -10.8 |
| 2 | 132.82 | -49.7 | -50.6 | -3.3 | -53.9 | -40.0 | -13.9 |
| 3 | 185.20 | -48.4 | -48.5 | -2.8 | -51.3 | -40.0 | -11.3 |
| 4 | 253.10 | -55.5 | -54.0 | -1.4 | -55.4 | -40.0 | -15.4 |
| 5 | 583.87 | -59.9 | -61.3 | 3.8 | -57.5 | -40.0 | -17.5 |
| 6 | 901.06 | -66.0 | -61.2 | 3.5 | -57.7 | -40.0 | -17.7 |

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

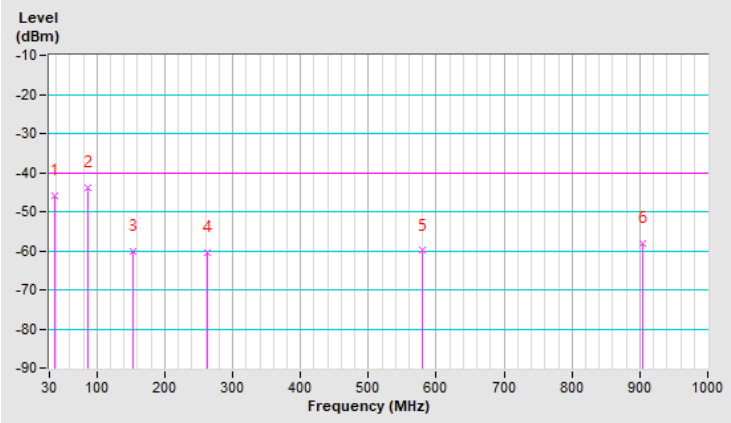


LTE Band 48, Channel Bandwidth 20MHz

| | | | |
|---|---|---|---|
| Mode | TX channel 55340 (3560.0MHz) | Frequency Range | Below 1000 MHz |
| Environmental Conditions | 22deg. C, 68%RH | Input Power | 120Vac, 60Hz |
| Tested By | Greg Lin | | |

| Antenna Polarity & Test Distance: Horizontal at 3 M | | | | | | | |
|---|---|---|---|---|---|---|---|
| No. | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1 | 37.76 | -49.1 | -31.1 | -14.7 | -45.8 | -40.0 | -5.8 |
| 2 | 87.23 | -36.7 | -43.8 | -0.1 | -43.9 | -40.0 | -3.9 |
| 3 | 154.16 | -55.8 | -57.2 | -2.9 | -60.1 | -40.0 | -20.1 |
| 4 | 262.80 | -55.8 | -58.9 | -1.6 | -60.5 | -40.0 | -20.5 |
| 5 | 579.02 | -61.0 | -63.7 | 3.7 | -60.0 | -40.0 | -20.0 |
| 6 | 903.97 | -65.7 | -61.7 | 3.6 | -58.1 | -40.0 | -18.1 |

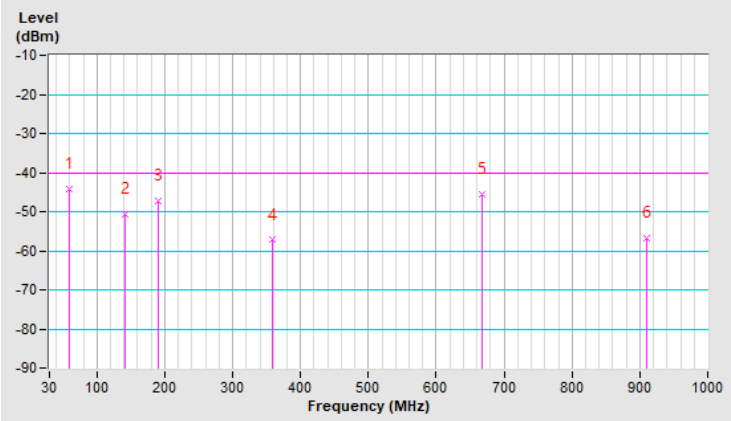
Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).



| Mode | TX channel 55340 (3560.0MHz) | Frequency Range | Below 1000 MHz |
|---|---|---|---|
| Environmental Conditions | 22deg. C, 68%RH | Input Power | 120Vac, 60Hz |
| Tested By | Greg Lin | | |

| Antenna Polarity & Test Distance: Vertical at 3 M | | | | | | | |
|---|---|---|---|---|---|---|---|
| No. | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1 | 60.07 | -37.3 | -40.7 | -3.4 | -44.1 | -40.0 | -4.1 |
| 2 | 141.55 | -48.4 | -47.8 | -3.0 | -50.8 | -40.0 | -10.8 |
| 3 | 191.02 | -45.4 | -44.6 | -2.7 | -47.3 | -40.0 | -7.3 |
| 4 | 358.83 | -56.9 | -61.3 | 4.0 | -57.3 | -40.0 | -17.3 |
| 5 | 667.29 | -50.9 | -49.1 | 3.6 | -45.5 | -40.0 | -5.5 |
| 6 | 909.79 | -65.3 | -60.4 | 3.5 | -56.9 | -40.0 | -16.9 |

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).



## Above 1GHz

LTE Band 48, Channel Bandwidth 10MHz

| Mode | TX channel 55290 (3555.0MHz) | Frequency Range | 1GHz ~ 40GHz |
|---|---|---|---|
| Environmental Conditions | 22deg. C, 68%RH | Input Power | 120Vac, 60Hz |
| Tested By | Greg Lin | | |

| Antenna Polarity & Test Distance: Horizontal at 3 M | | | | | | | |
|---|---|---|---|---|---|---|---|
| No. | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1 | 7111.00 | -60.1 | -42.0 | 0.7 | -41.3 | -40.0 | -1.3 |
| Antenna Polarity & Test Distance: Vertical at 3 M | | | | | | | |
| No. | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1 | 7111.00 | -60.7 | -43.0 | 0.7 | -42.3 | -40.0 | -2.3 |

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

| Mode | TX channel 55990 (3625.0MHz) | Frequency Range | 1GHz ~ 40GHz |
|---|---|---|---|
| Environmental Conditions | 22deg. C, 68%RH | Input Power | 120Vac, 60Hz |
| Tested By | Greg Lin | | |

| Antenna Polarity & Test Distance: Horizontal at 3 M | | | | | | | |
|---|---|---|---|---|---|---|---|
| No. | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1 | 7250.00 | -59.8 | -42.0 | 0.9 | -41.1 | -40.0 | -1.1 |
| Antenna Polarity & Test Distance: Vertical at 3 M | | | | | | | |
| No. | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1 | 7250.00 | -60.4 | -42.5 | 0.9 | -41.6 | -40.0 | -1.6 |

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

| Mode | TX channel 56690 (3695.0MHz) | Frequency Range | 1GHz ~ 40GHz |
|---|---|---|---|
| Environmental Conditions | 22deg. C, 68%RH | Input Power | 120Vac, 60Hz |
| Tested By | Greg Lin | | |

| Antenna Polarity & Test Distance: Horizontal at 3 M | | | | | | | |
|---|---|---|---|---|---|---|---|
| No. | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1 | 7390.00 | -60.7 | -42.1 | 0.9 | -41.2 | -40.0 | -1.2 |
| Antenna Polarity & Test Distance: Vertical at 3 M | | | | | | | |
| No. | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1 | 7390.00 | -61.3 | -43.6 | 0.9 | -42.7 | -40.0 | -2.7 |

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

LTE Band 48, Channel Bandwidth 20MHz

| | | | |
|---|---|---|---|
| Mode | TX channel 55340 (3560.0MHz) | Frequency Range | 1GHz ~ 40GHz |
| Environmental Conditions | 22deg. C, 68%RH | Input Power | 120Vac, 60Hz |
| Tested By | Greg Lin | | |

| Antenna Polarity & Test Distance: Horizontal at 3 M | | | | | | | |
|---|---|---|---|---|---|---|---|
| No. | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| **1** | **7120.00** | **-59.7** | **-41.7** | **0.7** | **-41.0** | **-40.0** | **-1.0** |
| Antenna Polarity & Test Distance: Vertical at 3 M | | | | | | | |
| No. | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1 | 7120.00 | -60.0 | -42.3 | 0.7 | -41.6 | -40.0 | -1.6 |

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

| | | | |
|---|---|---|---|
| Mode | TX channel 55990 (3625.00MHz) | Frequency Range | 1GHz ~ 40GHz |
| Environmental Conditions | 22deg. C, 68%RH | Input Power | 120Vac, 60Hz |
| Tested By | Greg Lin | | |

| Antenna Polarity & Test Distance: Horizontal at 3 M | | | | | | | |
|---|---|---|---|---|---|---|---|
| No. | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1 | 7250.00 | -59.9 | -42.1 | 0.9 | -41.2 | -40.0 | -1.2 |
| Antenna Polarity & Test Distance: Vertical at 3 M | | | | | | | |
| No. | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1 | 7250.00 | -60.2 | -42.3 | 0.9 | -41.4 | -40.0 | -1.4 |

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

| Mode | TX channel 56640 (3690.00MHz) | Frequency Range | 1GHz ~ 40GHz |
|---|---|---|---|
| Environmental Conditions | 22deg. C, 68%RH | Input Power | 120Vac, 60Hz |
| Tested By | Greg Lin | | |

| Antenna Polarity & Test Distance: Horizontal at 3 M | | | | | | | |
|---|---|---|---|---|---|---|---|
| No. | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1 | 7380.00 | -60.5 | -42.0 | 0.9 | -41.1 | -40.0 | -1.1 |
| Antenna Polarity & Test Distance: Vertical at 3 M | | | | | | | |
| No. | Freq. (MHz) | Reading (dBm) | S.G Power Value (dBm) | Correction Factor (dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| 1 | 7380.00 | -60.7 | -43.0 | 0.9 | -42.1 | -40.0 | -2.1 |

Remarks:
1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

## 5 Pictures of Test Arrangements

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

**Appendix – Information of 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: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The address and road map of all our labs can be found in our web site also.

**--- END ---**