

## FCC Test Report (Part 96)

**Report No.:** RFBBQJ-WTW-P21030490

**FCC ID:** ACJ9TGWW18A

**Test Model:** WW18A

**Received Date:** Mar. 26, 2021

**Test Date:** Mar. 26 ~ Apr. 22, 2021

**Issued Date:** May 03, 2021

**Applicant:** Panasonic Corporation of North America

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**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
Lin Kou Laboratories

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**Test Location:** No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City  
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**FCC Registration/  
Designation Number:** 788550 / TW0003



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### Release Control Record

Issue No.	Description	Date Issued
RFBBQJ-WTW-P21030490	Original release	May 03, 2021

## 1 Certificate of Conformity

**Product:** Radio Module

**Brand:** Panasonic

**Test Model:** WW18A

**Sample Status:** Engineering Sample


**Applicant:** Panasonic Corporation of North America

**Test Date:** Mar. 26 ~ Apr. 22, 2021

**Standards:** FCC 47 CFR 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 :**



**Date:**

May 03, 2021

Gina Liu / Specialist

**Approved by :**



**Date:**

May 03, 2021

Dylan Chiou / Senior Project Engineer

## 2 Summary of Test Results

47 CFR FCC Part 96			
FCC Clause	Test Item	Result	Remarks
2.1046 96.41(b)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
2.1047 96.41(a)	Modulation Characteristics	Pass	Meet the requirement
2.1046 96.41(b)	Maximum Power Spectral Density	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 96.41(e)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 96.41(e)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -3.72 dB at 7250.00 MHz.

### 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	Radio Module						
Brand	Panasonic						
Test Model	WW18A						
Status of EUT	Engineering Sample						
Power Supply Rating	15.6 Vdc (Adapter) 10.8 Vdc (Battery)						
Modulation Type	QPSK, 16QAM, 64QAM						
Operating Frequency	LTE Band 48	Channel Bandwidth 5MHz	TX: 3552.5 ~ 3697.5 MHz				
			RX: 3552.5 ~ 3697.5 MHz				
		Channel Bandwidth 10MHz	TX: 3555 ~ 3695 MHz				
			RX: 3555 ~ 3695 MHz				
		Channel Bandwidth 15MHz	TX: 3557.5 ~ 3692.5 MHz				
Channel Bandwidth 20MHz	RX: 3557.5 ~ 3692.5 MHz						
Max. EIRP Power	LTE Band 48		QPSK	16QAM	64QAM		
		<b>Per 10M</b>					
		Channel Bandwidth 5MHz	91.833 mW (19.63dBm)	70.795 mW (18.50dBm)	60.674 mW (17.83dBm)		
		Channel Bandwidth 10MHz	92.683 mW (19.67dBm)	77.804 mW (18.91dBm)	61.094 mW (17.86dBm)		
		Channel Bandwidth 15MHz	94.624 mW (19.76dBm)	44.259 mW (16.46dBm)	38.371 mW (15.84dBm)		
		Channel Bandwidth 20MHz	96.383 mW (19.84dBm)	46.989 mW (16.72dBm)	35.810 mW (15.54dBm)		
		<b>Full Power</b>					
		Channel Bandwidth 5MHz	91.833 mW (19.63dBm)	70.795 mW (18.50dBm)	61.094 mW (17.86dBm)		
		Channel Bandwidth 10MHz	92.683 mW (19.67dBm)	77.804 mW (18.91dBm)	92.470 mW (19.66dBm)		
		Channel Bandwidth 15MHz	94.189 mW (19.74dBm)	44.055 mW (16.44dBm)	38.019 mW (15.80dBm)		
		Channel Bandwidth 20MHz	95.719 W (19.81dBm)	46.666 mW (16.69dBm)	35.645 mW (15.52dBm)		
		Emission Designator	LTE Band 48	Channel Bandwidth 5MHz	4M47G7D	4M46D7W	4M47D7W
				Channel Bandwidth 10MHz	8M92G7D	8M92D7W	8M92D7W
Channel Bandwidth 15MHz	13M4G7D			13M4D7W	13M4D7W		
Channel Bandwidth 20MHz	17M8G7D			17M8D7W	17M8D7W		
Antenna Type	Monopole Antenna with 3.65 dBi gain						
Accessory Device	Refer to Note as below						
Data Cable Supplied	Refer to Note as below						

Note:

1. The EUT is authorized for use in specific End-product. Please refer to below for more details.

Product	Brand	Model
Personal Computer	Panasonic	FZ-55

2. The End-product contains following accessory devices.

Product	Brand	Model	Description
Adapter	Panasonic	CF-AA5713A	I/P: 100-240 Vac, 50/60 Hz, 1.5 A O/P: 15.6 Vdc, 7.05 A

3. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.
4. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.



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

Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
Maximum Output Power	55265 to 56715	55265 (3552.5MHz), 55990 (3625.0MHz), 56715 (3697.5MHz)	5MHz	QPSK / 16QAM / 64QAM	1 RB / 0 RB Offset
	55290 to 56690	55290 (3555.0MHz), 55990 (3625.0MHz), 56690 (3695.0MHz)	10MHz	QPSK / 16QAM / 64QAM	1 RB / 0 RB Offset
	55315 to 56665	55315 (3557.5MHz), 55990 (3625.0MHz), 56665 (3692.5MHz)	15MHz	QPSK / 16QAM / 64QAM	1 RB / 0 RB Offset
	55340 to 56640	55340 (3560.0MHz), 55990 (3625.0MHz), 56640 (3690.0MHz)	20MHz	QPSK / 16QAM / 64QAM	1 RB / 0 RB Offset
Modulation Characteristics	55340 to 56640	55990 (3625.0MHz)	20MHz	QPSK / 16QAM / 64QAM	100 RB / 0 RB Offset
Frequency Stability	55265 to 56715	55265 (3552.5MHz), 56715 (3697.5MHz)	5MHz	QPSK	25 RB / 0 RB Offset
	55290 to 56690	55290 (3555.0MHz), 56690 (3695.0MHz)	10MHz	QPSK	50 RB / 0 RB Offset
	55315 to 56665	55315 (3557.5MHz), 56665 (3692.5MHz)	15MHz	QPSK	75 RB / 0 RB Offset
	55340 to 56640	55340 (3560.0MHz), 56640 (3690.0MHz)	20MHz	QPSK	100 RB / 0 RB Offset
Occupied Bandwidth	55265 to 56715	55265 (3552.5MHz), 55990 (3625.0MHz), 56715 (3697.5MHz)	5MHz	QPSK / 16QAM / 64QAM	25 RB / 0 RB Offset
	55290 to 56690	55290 (3555.0MHz), 55990 (3625.0MHz), 56690 (3695.0MHz)	10MHz	QPSK / 16QAM / 64QAM	50 RB / 0 RB Offset
	55315 to 56665	55315 (3557.5MHz), 55990 (3625.0MHz), 56665 (3692.5MHz)	15MHz	QPSK / 16QAM / 64QAM	75 RB / 0 RB Offset
	55340 to 56640	55340 (3560.0MHz), 55990 (3625.0MHz), 56640 (3690.0MHz)	20MHz	QPSK / 16QAM / 64QAM	100 RB / 0 RB Offset

Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
Peak to Average Ratio	55265 to 56715	55265 (3552.5MHz), 55990 (3625.0MHz), 56715 (3697.5MHz)	5MHz	QPSK / 16QAM / 64QAM	1 RB / 0 RB Offset
	55290 to 56690	55290 (3555.0MHz), 55990 (3625.0MHz), 56690 (3695.0MHz)	10MHz	QPSK / 16QAM / 64QAM	1 RB / 0 RB Offset
	55315 to 56665	55315 (3557.5MHz), 55990 (3625.0MHz), 56665 (3692.5MHz)	15MHz	QPSK / 16QAM / 64QAM	1 RB / 0 RB Offset
	55340 to 56640	55340 (3560.0MHz), 55990 (3625.0MHz), 56640 (3690.0MHz)	20MHz	QPSK / 16QAM / 64QAM	1 RB / 0 RB Offset
Conducted Emission	55265 to 56715	55265 (3552.5MHz), 55990 (3625.0MHz), 56715 (3697.5MHz)	5MHz	QPSK	1 RB / 0 RB Offset
	55290 to 56690	55290 (3555.0MHz), 55990 (3625.0MHz), 56690 (3695.0MHz)	10MHz	QPSK	1 RB / 0 RB Offset
	55315 to 56665	55315 (3557.5MHz), 55990 (3625.0MHz), 56665 (3692.5MHz)	15MHz	QPSK	1 RB / 0 RB Offset
	55340 to 56640	55340 (3560.0MHz), 55990 (3625.0MHz), 56640 (3690.0MHz)	20MHz	QPSK	1 RB / 0 RB Offset
Radiated Emission Below 1GHz	55340 to 56640	55990 (3625.0MHz)	20MHz	QPSK	1 RB / 0 RB Offset
Radiated Emission Above 1GHz	55265 to 56715	55265 (3552.5MHz), 55990 (3625.0MHz), 56715 (3697.5MHz)	5MHz	QPSK	1 RB / 0 RB Offset
	55340 to 56640	55340 (3560.0MHz), 55990 (3625.0MHz), 56640 (3690.0MHz)	20MHz	QPSK	1 RB / 0 RB Offset

**Note:**

1. This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.
2. For radiated emission below 1GHz, low, mid and high channels were pre-tested in chamber. Low channel in 5MHz was found to be the worst case and therefore had been chosen for all final tests.
3. For radiated emission above 1GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the lowest, 5MHz & highest channel bandwidth for final test.

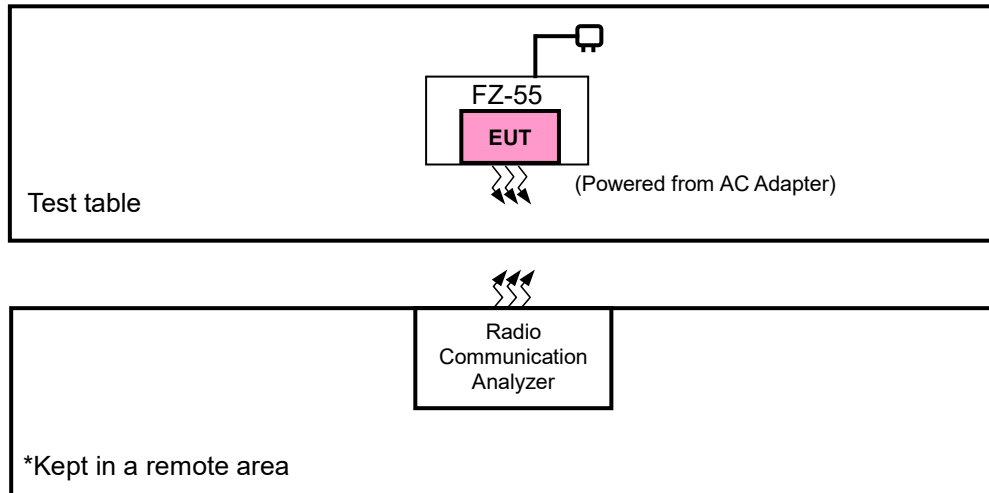
**Test Condition:**

Test Item	Environmental Conditions	Input Power	Tested By
Maximum Output Power	22deg. C, 66%RH	10.8 Vdc	Rex Wang
Modulation characteristics	24deg. C, 64%RH	10.8 Vdc	Getaz Yang
Frequency Stability	24deg. C, 64%RH	10.8 Vdc	Getaz Yang
Occupied Bandwidth	24deg. C, 64%RH	10.8 Vdc	Getaz Yang
Peak to Average Ratio	24deg. C, 64%RH	10.8 Vdc	Getaz Yang
Concduted Emission	24deg. C, 64%RH	10.8 Vdc	Getaz Yang
Radiated Emission	22deg. C, 66%RH	120Vac, 60Hz	Rex Wang

### 3.3 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units.

#### 3.3.1 Configuration of System under Test



### 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:

#### 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**

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

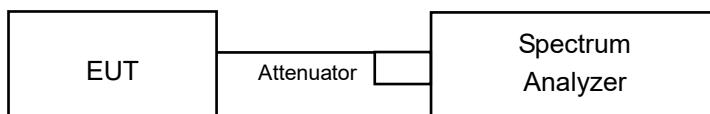
## 4 Test Types and Results

### 4.1 Maximum Output Power Measurement

#### 4.1.1 Limits of Maximum Output Power Measurement

Device		Maximum Output Power (dBm/10 MHz)
<input checked="" type="checkbox"/>	End User Device	23
<input type="checkbox"/>	Category A CBSD	30
<input type="checkbox"/>	Category B CBSD	47

#### 4.1.2 Test Setup



#### 4.1.3 Test Instruments

For all tests except Radiated emissions

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer KEYSIGHT	N9030B	MY57140953	Jul. 02, 2020	Jul. 01, 2021
Radio Communication Analyzer Anritsu	MT8821C	6201462755	Feb. 07, 2021	Feb. 07, 2022
RF cable	JB200	Cable-OVEN-02	NA	NA
DC-6GHz 20dB 50W Fixed attenuator Woken	MDC9331N-20	0724	Jun. 24, 2020	Jun. 23, 2022
STANDARD TEMPERATURE & HUMIDITY CHAMBER TERCHY	MHU-225AU	920842	May 27, 2020	May 26, 2021
DC power supply Keysight	U8002A	MY56330015	NA	NA
Digital Multimeter Fluke	87-III	70360742	Jun. 23, 2020	Jun. 22, 2021

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.

## For Radiated emissions

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 16, 2020	Apr. 15, 2021
			Apr. 09, 2021	Apr. 08, 2022
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jun. 12, 2020	Jun. 11, 2021
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Nov. 06, 2020	Nov. 05, 2021
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Nov. 22, 2020	Nov. 21, 2021
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 22, 2020	Nov. 21, 2021
Loop Antenna EMCI	EM-6879	269	Sep. 17, 2020	Sep. 16, 2021
Radio Communication Analyzer Anritsu	MT8821C	6261806803	Jan. 22, 2021	Jan. 21, 2022
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Jun. 08, 2020	Jun. 07, 2021
Preamplifier Agilent (Above 1GHz)	8449B	3008A02367	Feb. 17, 2021	Feb. 16, 2022
Preamplifier. EMC	EMC184045B	980175	Sep. 04, 2020	Sep. 03, 2021
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM8000	CABLE-CH9-02 (248780+171006)	Jan. 16, 2021	Jan. 15, 2022
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	Jan. 16, 2021	Jan. 15, 2022
RF signal cable Woken	8D-FB	Cable-CH9-01	Jun. 08, 2020	Jun. 07, 2021
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower &Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	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.

#### 4.1.4 Test Procedures

EIRP conducted power measurement

1. Set span to at least 1.5 times the OBW.
2. Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
3. Set VBW  $\geq 3 \times$  RBW.
4. Set number of points in sweep  $\geq 2 \times$  span / RBW.
5. Sweep time = auto-couple.
6. Detector = RMS (power averaging).
7. If the EUT can be configured to transmit continuously (i.e., burst duty cycle  $\geq 98\%$ ), then set the trigger to free run.
8. 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.
9. Trace average at least 100 traces in power averaging (i.e., RMS) mode.
10. Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band or channel power measurement function, with the band/channel limits set equal to the OBW band edges. If the instrument does not have a band or channel 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.
11. For per 10MHz method, channel power integrating bandwidth 10MHz is used for bandwidth 5M, 10M, 15M and 20M. For full power method, channel power integrating bandwidth 10MHz is used for bandwidth 5M, 10M, integrating bandwidth 15MHz is used for bandwidth 15M, integrating bandwidth 20MHz is used for bandwidth 20M.
12. Measurement method refers to ANSI C63.26 section 5.2.4.

#### 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) / Per 10M

Band / BW	RB Size	RB Offset	QPSK			16QAM			64QAM		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			55265	55990	56715	55265	55990	56715	55265	55990	56715
			3552.5	3625	3697.5	3552.5	3625	3697.5	3552.5	3625	3697.5
			MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz
48 / 5M	1	0	16.71	17.10	17.73	15.74	16.20	16.79	14.82	15.12	15.90
	1	12	16.64	16.98	17.65	15.72	16.11	16.62	14.75	15.06	15.83
	1	24	16.61	16.86	17.64	15.69	16.06	16.60	14.80	15.02	15.78
	12	0	15.70	16.01	16.76	14.86	15.26	15.88	13.95	14.23	14.79
	12	6	15.68	16.04	16.74	14.86	15.20	15.73	13.99	14.30	14.83
	12	13	15.59	15.98	16.66	14.82	15.23	15.77	13.93	14.26	14.76
	25	0	15.65	15.94	16.72	14.83	15.19	15.80	13.96	14.27	14.77

Band / BW	RB Size	RB Offset	QPSK			16QAM			64QAM		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			55290	55990	56690	55290	55990	56690	55290	55990	56690
			3555	3625	3695	3555	3625	3695	3555	3625	3695
			MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz
48 / 10M	1	0	16.74	17.10	17.77	15.98	16.35	16.91	14.92	15.38	16.01
	1	24	16.67	17.03	17.57	15.83	16.27	16.82	14.77	15.22	15.86
	1	49	16.72	17.00	17.67	15.85	16.26	16.86	14.72	15.24	15.84
	25	0	15.88	16.23	16.75	15.03	15.32	15.99	13.92	14.21	14.77
	25	12	15.83	16.25	16.71	14.96	15.34	15.97	14.00	14.18	14.82
	25	25	15.84	16.19	16.68	14.97	15.29	15.93	13.93	14.17	14.76
	50	0	15.88	16.16	16.75	14.93	15.29	15.95	13.95	14.20	14.73

Band / BW	RB Size	RB Offset	QPSK			16QAM			64QAM		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			55315	55990	56665	55315	55990	56665	55315	55990	56665
			3557.5	3625	3692.5	3557.5	3625	3692.5	3557.5	3625	3692.5
			MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz
48 / 15M	1	0	16.85	17.32	17.74	13.95	14.34	14.66	13.12	13.49	13.92
	1	37	16.79	17.25	17.66	13.90	14.26	14.59	13.05	13.44	13.83
	1	74	16.83	17.29	17.62	13.93	14.28	14.64	13.09	13.42	13.86
	36	0	13.76	14.23	14.63	12.86	13.09	13.42	11.82	12.13	12.44
	36	19	13.80	14.19	14.62	12.84	13.11	13.43	11.87	12.16	12.48
	36	39	13.74	14.18	14.66	12.81	13.16	13.38	11.82	12.11	12.46
	75	0	12.49	12.91	13.40	11.51	11.97	12.47	10.46	10.95	11.46

Band / BW	RB Size	RB Offset	QPSK			16QAM			64QAM		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			55340	55990	56640	55340	55990	56640	55340	55990	56640
			3560	3625	3690	3560	3625	3690	3560	3625	3690
			MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz
48 / 20M	1	0	16.83	17.33	17.78	14.01	14.22	14.80	12.99	13.51	13.84
	1	50	16.79	17.24	17.65	13.92	14.18	14.76	12.94	13.44	13.80
	1	99	16.72	17.21	17.70	13.99	14.11	14.69	12.93	13.42	13.83
	50	0	13.83	14.12	14.62	12.76	13.06	13.37	11.85	12.21	12.36
	50	25	13.74	14.07	14.59	12.78	13.02	13.36	11.80	12.15	12.36
	50	50	13.77	14.05	14.60	12.76	13.10	13.40	11.77	12.13	12.31
	100	0	11.30	11.78	12.18	10.33	10.78	11.18	9.29	9.80	10.16

### Full Conducted Output Power

Band / BW	RB Size	RB Offset	QPSK			16QAM			64QAM		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			55265	55990	56715	55265	55990	56715	55265	55990	56715
			3552.5	3625	3697.5	3552.5	3625	3697.5	3552.5	3625	3697.5
			MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz
48 / 5M	1	0	16.71	17.10	17.73	15.74	16.20	16.79	14.82	15.12	15.90
	1	12	16.64	16.98	17.65	15.72	16.11	16.62	14.75	15.06	15.83
	1	24	16.61	16.86	17.64	15.69	16.06	16.60	14.80	15.02	15.78
	12	0	15.70	16.01	16.76	14.86	15.26	15.88	13.95	14.23	14.79
	12	6	15.68	16.04	16.74	14.86	15.20	15.73	13.99	14.30	14.83
	12	13	15.59	15.98	16.66	14.82	15.23	15.77	13.93	14.26	14.76
	25	0	15.65	15.94	16.72	14.83	15.19	15.80	13.96	14.27	14.77

Band / BW	RB Size	RB Offset	QPSK			16QAM			64QAM		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			55290	55990	56690	55290	55990	56690	55290	55990	56690
			3555	3625	3695	3555	3625	3695	3555	3625	3695
			MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz
48 / 10M	1	0	16.74	17.10	17.77	15.98	16.35	16.91	14.92	15.38	16.01
	1	24	16.67	17.03	17.57	15.83	16.27	16.82	14.77	15.22	15.86
	1	49	16.72	17.00	17.67	15.85	16.26	16.86	14.72	15.24	15.84
	25	0	15.88	16.23	16.75	15.03	15.32	15.99	13.92	14.21	14.77
	25	12	15.83	16.25	16.71	14.96	15.34	15.97	14.00	14.18	14.82
	25	25	15.84	16.19	16.68	14.97	15.29	15.93	13.93	14.17	14.76
	50	0	15.88	16.16	16.75	14.93	15.29	15.95	13.95	14.20	14.73



Band / BW	RB Size	RB Offset	QPSK			16QAM			64QAM		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			55315	55990	56665	55315	55990	56665	55315	55990	56665
			3557.5	3625	3692.5	3557.5	3625	3692.5	3557.5	3625	3692.5
			MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz
48 / 15M	1	0	16.82	17.33	17.74	13.97	14.32	14.69	13.13	13.51	13.94
	1	37	16.77	17.21	17.65	13.92	14.22	14.62	13.06	13.44	13.86
	1	74	16.76	17.24	17.71	13.88	14.29	14.66	13.10	13.48	13.80
	36	0	13.82	14.22	14.67	12.84	13.14	13.49	11.84	12.18	12.50
	36	19	13.81	14.16	14.62	12.83	13.11	13.42	11.80	12.12	12.47
	36	39	13.75	14.23	14.58	12.77	13.16	13.46	11.76	12.16	12.44
	75	0	13.77	14.18	14.65	12.82	13.15	13.42	11.83	12.17	12.46

Band / BW	RB Size	RB Offset	QPSK			16QAM			64QAM		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			55340	55990	56640	55340	55990	56640	55340	55990	56640
			3560	3625	3690	3560	3625	3690	3560	3625	3690
			MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz
48 / 20M	1	0	16.88	17.38	17.81	14.05	14.24	14.84	13.05	13.56	13.86
	1	50	16.80	17.26	17.47	13.94	14.20	14.77	13.01	13.40	13.82
	1	99	16.84	17.28	17.57	13.97	14.16	14.72	13.02	13.45	13.82
	50	0	13.89	14.16	14.64	12.85	13.18	13.44	11.82	12.22	12.44
	50	25	13.82	14.25	14.54	12.80	13.11	13.48	11.90	12.16	12.46
	50	50	13.88	14.22	14.61	12.83	13.11	13.39	11.87	12.18	12.37
	100	0	13.84	14.25	14.60	12.77	13.15	13.37	11.83	12.12	12.42

#### EIRP Power (dBm) / Per 10M

Band / BW	RB Size	RB Offset	QPSK			16QAM			64QAM		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			55265	55990	56715	55265	55990	56715	55265	55990	56715
			3552.5	3625	3697.5	3552.5	3625	3697.5	3552.5	3625	3697.5
			MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz
48 / 5M	1	0	18.01	18.70	19.63	17.04	17.90	18.50	16.82	16.72	17.78
	1	12	18.34	18.78	19.15	17.62	17.91	18.22	16.05	16.36	17.83
	1	24	18.11	18.56	19.04	17.09	17.76	18.10	16.20	16.42	17.40
	12	0	17.30	17.51	18.76	16.56	16.86	17.68	15.65	15.73	16.79
	12	6	17.48	17.74	18.14	16.16	17.20	17.43	15.89	15.60	16.83
	12	13	17.39	17.98	17.96	16.62	17.03	17.67	15.73	16.16	16.06
	25	0	16.95	17.34	18.12	16.83	17.09	17.80	15.96	16.17	16.57

Band / BW	RB Size	RB Offset	QPSK			16QAM			64QAM		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			55290	55990	56690	55290	55990	56690	55290	55990	56690
			3555	3625	3695	3555	3625	3695	3555	3625	3695
			MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz
48 / 10M	1	0	18.54	19.00	19.67	17.68	17.65	18.91	16.82	16.68	17.54
	1	24	18.07	18.43	18.87	17.23	18.07	18.82	16.57	16.62	17.86
	1	49	18.32	18.60	19.51	17.85	17.96	18.56	16.22	17.14	17.31
	25	0	17.48	18.13	18.25	16.83	16.72	17.49	15.72	15.91	16.07
	25	12	17.13	17.65	18.21	16.36	16.84	17.47	15.30	15.68	16.42
	25	25	17.44	17.69	18.58	16.37	16.89	17.63	15.53	16.07	16.26
	50	0	17.48	17.66	18.75	16.43	17.29	17.65	15.85	16.00	16.53

Band / BW	RB Size	RB Offset	QPSK			16QAM			64QAM		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			55315	55990	56665	55315	55990	56665	55315	55990	56665
			3557.5	3625	3692.5	3557.5	3625	3692.5	3557.5	3625	3692.5
			MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz
48 / 15M	1	0	18.34	19.36	19.76	15.29	16.06	16.46	14.77	14.95	15.84
	1	37	18.11	18.94	19.67	15.96	15.65	16.46	14.78	14.78	15.40
	1	74	18.30	18.76	19.14	15.41	15.72	16.20	14.63	15.30	15.67
	36	0	15.74	15.95	16.60	14.38	14.56	15.11	13.76	13.62	14.04
	36	19	15.34	15.88	16.25	14.25	14.73	15.46	13.63	13.96	14.39
	36	39	15.67	15.76	16.21	14.41	15.19	14.89	13.58	13.80	14.46
	75	0	15.20	15.82	16.49	14.85	15.08	15.45	13.57	13.50	13.80

Band / BW	RB Size	RB Offset	QPSK			16QAM			64QAM		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			55340	55990	56640	55340	55990	56640	55340	55990	56640
			3560	3625	3690	3560	3625	3690	3560	3625	3690
			MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz
48 / 20M	1	0	18.32	18.80	19.84	15.58	15.78	16.72	14.57	15.49	15.54
	1	50	18.14	19.28	19.29	15.26	15.53	16.29	14.85	15.32	15.28
	1	99	18.17	18.90	19.30	15.61	15.89	16.46	14.75	15.39	15.44
	50	0	15.21	16.00	16.48	14.79	14.91	14.97	13.75	13.86	14.18
	50	25	15.44	15.69	16.58	14.83	15.14	15.21	13.33	13.68	14.50
	50	50	15.31	16.04	16.64	14.75	14.54	15.42	13.41	13.62	13.81
	100	0	15.46	15.67	16.44	14.29	14.99	14.89	13.87	13.84	13.96

**EIRP Power (dBm) / Full Power**

Band / BW	RB Size	RB Offset	QPSK			16QAM			64QAM		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			55265	55990	56715	55265	55990	56715	55265	55990	56715
			3552.5	3625	3697.5	3552.5	3625	3697.5	3552.5	3625	3697.5
			MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz
48 / 5M	1	0	18.01	18.70	19.63	17.04	17.90	18.50	16.82	16.72	17.78
	1	12	18.34	18.78	19.15	17.62	17.91	18.22	16.05	16.36	17.83
	1	24	18.11	18.56	19.04	17.09	17.76	18.10	16.20	16.42	17.40
	12	0	17.30	17.51	18.76	16.56	16.86	17.68	15.65	15.73	16.79
	12	6	17.48	17.74	18.14	16.16	17.20	17.43	15.89	15.60	16.83
	12	13	17.39	17.98	17.96	16.62	17.03	17.67	15.73	16.16	16.06
	25	0	16.95	17.34	18.12	16.83	17.09	17.80	15.96	16.17	16.57

Band / BW	RB Size	RB Offset	QPSK			16QAM			64QAM		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			55290	55990	56690	55290	55990	56690	55290	55990	56690
			3555	3625	3695	3555	3625	3695	3555	3625	3695
			MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz
48 / 10M	1	0	18.54	19.00	19.67	17.68	17.65	18.91	16.82	16.68	17.54
	1	24	18.07	18.43	18.87	17.23	18.07	18.82	16.57	16.62	17.86
	1	49	18.32	18.60	19.51	17.85	17.96	18.56	16.22	17.14	17.31
	25	0	17.48	18.13	18.25	16.83	16.72	17.49	15.72	15.91	16.07
	25	12	17.13	17.65	18.21	16.36	16.84	17.47	15.30	15.68	16.42
	25	25	17.44	17.69	18.58	16.37	16.89	17.63	15.53	16.07	16.26
	50	0	17.48	17.66	18.75	16.43	17.29	17.65	15.85	16.00	16.53

Band / BW	RB Size	RB Offset	QPSK			16QAM			64QAM		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			55315	55990	56665	55315	55990	56665	55315	55990	56665
			3557.5	3625	3692.5	3557.5	3625	3692.5	3557.5	3625	3692.5
			MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz
48 / 15M	1	0	18.32	19.33	19.74	15.27	16.02	16.44	14.73	14.91	15.80
	1	37	18.07	18.91	19.65	15.92	15.62	16.42	14.76	14.74	15.36
	1	74	18.26	18.74	19.11	15.38	15.69	16.16	14.60	15.28	15.64
	36	0	15.72	15.92	16.57	14.34	14.54	15.09	13.74	13.58	14.00
	36	19	15.31	15.86	16.22	14.23	14.71	15.42	13.60	13.92	14.37
	36	39	15.65	15.73	16.18	14.37	15.16	14.86	13.56	13.76	14.44
	75	0	15.17	15.78	16.45	14.82	15.05	15.42	13.53	13.47	13.76

Band / BW	RB Size	RB Offset	QPSK			16QAM			64QAM		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			55340	55990	56640	55340	55990	56640	55340	55990	56640
			3560	3625	3690	3560	3625	3690	3560	3625	3690
			MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz	MHz
48 / 20M	1	0	18.28	18.78	19.81	15.55	15.74	16.69	14.55	15.46	15.52
	1	50	18.10	19.26	19.27	15.24	15.50	16.27	14.81	15.30	15.26
	1	99	18.14	18.88	19.27	15.57	15.86	16.42	14.72	15.35	15.42
	50	0	15.19	15.96	16.44	14.75	14.88	14.94	13.72	13.82	14.14
	50	25	15.42	15.65	16.54	14.80	15.11	15.18	13.30	13.66	14.46
	50	50	15.28	16.02	16.61	14.73	14.51	15.39	13.37	13.58	13.77
	100	0	15.44	15.65	16.40	14.27	14.95	14.87	13.83	13.82	13.92

## 4.2 Modulation Characteristics Measurement

### 4.2.1 Limits of Modulation Characteristics

N/A

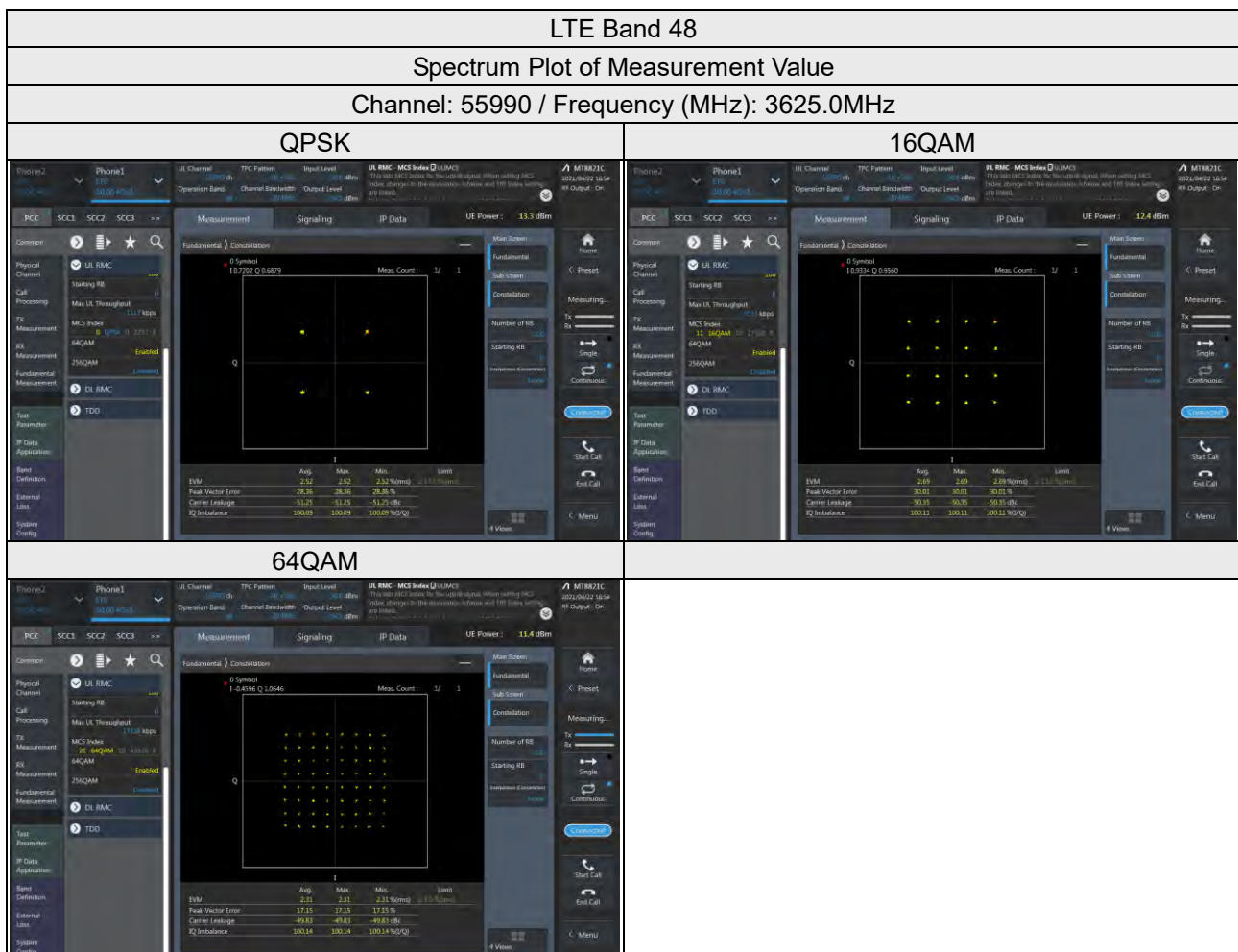
### 4.2.2 Test Procedure

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.

### 4.2.3 Test Setup



### 4.2.4 Test Results



### 4.3 Frequency Stability Measurement

#### 4.3.1 Limits of Frequency Stability Measurement

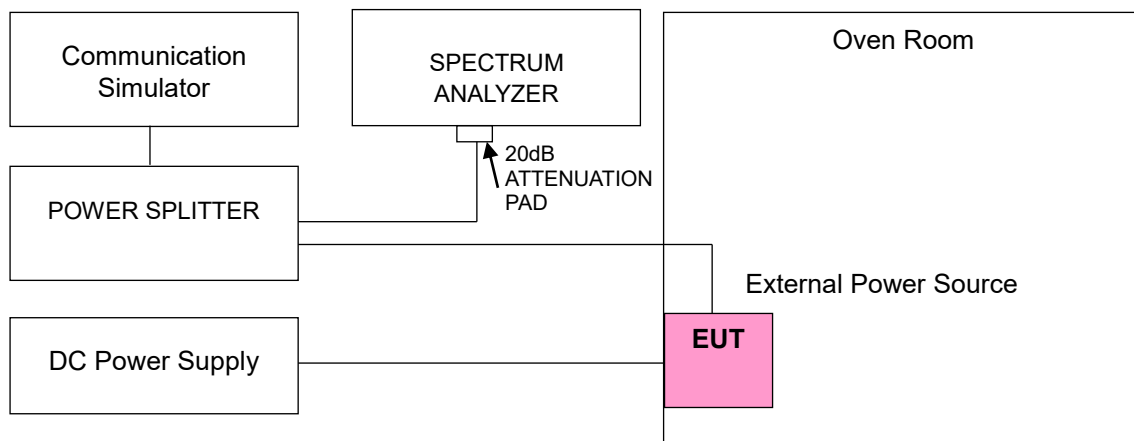
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency band.

#### 4.3.2 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 DC 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.

#### 4.3.3 Test Setup



#### 4.3.4 Test Results

##### Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 48			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
10.8	3552.500003	0.000816	3697.500000	0.000270
9.18	3552.500002	0.000591	3697.500000	0.000297
12.42	3552.500003	0.000929	3697.500000	0.000270

Note: The applicant defined the normal working voltage is from 9.4Vdc to 12.77Vdc.

##### Frequency Error vs. Temperature

Temp. (°C)	LTE Band 48			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	3552.500002	0.000647	3697.500000	0.000649
-20	3552.500003	0.000788	3697.500000	0.000352
-10	3552.500003	0.000929	3697.500000	0.000947
0	3552.500002	0.000479	3697.500000	0.000703
10	3552.500004	0.001013	3697.500000	0.000703
20	3552.499999	-0.000338	3697.500000	-0.001001
30	3552.499997	-0.000816	3697.500000	-0.000920
40	3552.499999	-0.000422	3697.500000	-0.000865
50	3552.499997	-0.000816	3697.500000	-0.000433

**Frequency Error vs. Voltage**

Voltage (Volts)	LTE Band 48			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
10.8	3555.000003	0.000731	3695.000000	0.000406
9.18	3555.000004	0.001013	3695.000000	0.000893
12.42	3555.000004	0.001041	3695.000000	0.000758

Note: The applicant defined the normal working voltage is from 9.4Vdc to 12.77Vdc.

**Frequency Error vs. Temperature**

Temp. (°C)	LTE Band 48			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	3555.000003	0.000900	3695.000000	0.000271
-20	3555.000003	0.000759	3695.000000	0.000541
-10	3555.000002	0.000647	3695.000000	0.000866
0	3555.000003	0.000816	3695.000000	0.000487
10	3555.000003	0.000759	3695.000000	0.001001
20	3554.999999	-0.000366	3695.000000	-0.000271
30	3554.999998	-0.000591	3695.000000	-0.000947
40	3554.999996	-0.001097	3695.000000	-0.000812
50	3554.999996	-0.001041	3695.000000	-0.000677



**Frequency Error vs. Voltage**

Voltage (Volts)	LTE Band 48			
	Channel Bandwidth: 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
10.8	3557.500004	0.000984	3692.500000	0.000271
9.18	3557.500002	0.000534	3692.500000	0.001002
12.42	3557.500003	0.000900	3692.500000	0.001083

Note: The applicant defined the normal working voltage is from 9.4Vdc to 12.77Vdc.

**Frequency Error vs. Temperature**

Temp. (°C)	LTE Band 48			
	Channel Bandwidth: 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	3557.500001	0.000309	3692.500000	0.000758
-20	3557.500001	0.000394	3692.500000	0.000379
-10	3557.500002	0.000590	3692.500000	0.000867
0	3557.500003	0.000703	3692.500000	0.000569
10	3557.500004	0.001068	3692.500000	0.000975
20	3557.499998	-0.000506	3692.500000	-0.000298
30	3557.499996	-0.001012	3692.500000	-0.000271
40	3557.499997	-0.000928	3692.500000	-0.000433
50	3557.499999	-0.000309	3692.500000	-0.000704

**Frequency Error vs. Voltage**

Voltage (Volts)	LTE Band 48			
	Channel Bandwidth: 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
10.8	3555.000003	0.000984	3555.000000	0.000271
9.18	3555.000003	0.000534	3555.000000	0.001002
12.42	3555.000001	0.000900	3555.000000	0.001083

Note: The applicant defined the normal working voltage is from 9.4Vdc to 12.77Vdc.

**Frequency Error vs. Temperature**

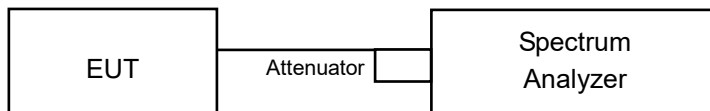
Temp. (°C)	LTE Band 48			
	Channel Bandwidth: 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	3555.000003	0.000309	3555.000000	0.000758
-20	3555.000003	0.000900	3555.000000	0.000298
-10	3555.000003	0.000900	3555.000000	0.001002
0	3555.000003	0.000703	3555.000000	0.000948
10	3555.000003	0.000843	3555.000000	0.000894
20	3554.999998	-0.000675	3555.000000	-0.000785
30	3554.999998	-0.000478	3555.000000	-0.000758
40	3554.999996	-0.001068	3555.000000	-0.000840
50	3554.999997	-0.000984	3555.000000	-0.000894

## 4.4 Emission Bandwidth Measurement

### 4.4.1 Emission Bandwidth Measurement

Reference only

### 4.4.2 Test Setup



### 4.4.3 Test Instruments

Refer to section 4.1.3 to get information of above instrument.

### 4.4.4 Test Procedure

Occupied Bandwidth:

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. For the 99% bandwidth measurement method, please refer to section 5.4.4 of ANSI C63.26.

26dBc Bandwidth:

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW =51 kHz (5 MHz bandwidth), 100 kHz (10 MHz bandwidth), 150 kHz (15 MHz bandwidth), 200 kHz (20 MHz bandwidth). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. For the 26dBc bandwidth measurement method, please refer to section 5.4.3 of ANSI C63.26.

### 4.4.5 Deviation from Test Standard

No deviation.

### 4.4.6 EUT Operating Conditions

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

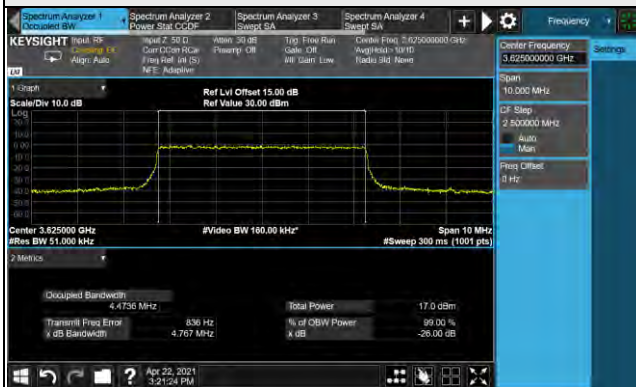
#### 4.4.7 Test Result (-26dB Bandwidth)

##### LTE Band 48

LTE Band 48, Channel Bandwidth 5MHz				
Channel	Frequency (MHz)	26dB Bandwidth (MHz)		
		QPSK	16QAM	64QAM
55265	3552.5	4.75	4.73	4.70
55990	3625.0	4.76	4.73	4.73
56715	3697.5	4.73	4.73	4.75
LTE Band 48, Channel Bandwidth 10MHz				
Channel	Frequency (MHz)	26dB Bandwidth (MHz)		
		QPSK	16QAM	64QAM
55290	3555.0	9.32	9.33	9.34
55990	3625.0	9.33	9.33	9.37
56690	3695.0	9.29	9.30	9.33
LTE Band 48, Channel Bandwidth 15MHz				
Channel	Frequency (MHz)	26dB Bandwidth (MHz)		
		QPSK	16QAM	64QAM
55315	3557.5	13.93	13.90	13.99
55990	3625.0	13.94	14.00	13.96
56665	3692.5	13.94	13.96	13.93
LTE Band 48, Channel Bandwidth 20MHz				
Channel	Frequency (MHz)	26dB Bandwidth (MHz)		
		QPSK	16QAM	64QAM
55340	3560.0	18.51	18.57	18.53
55990	3625.0	18.57	18.56	18.59
56640	3690.0	18.53	18.52	18.55

### Spectrum Plot of Worst Value

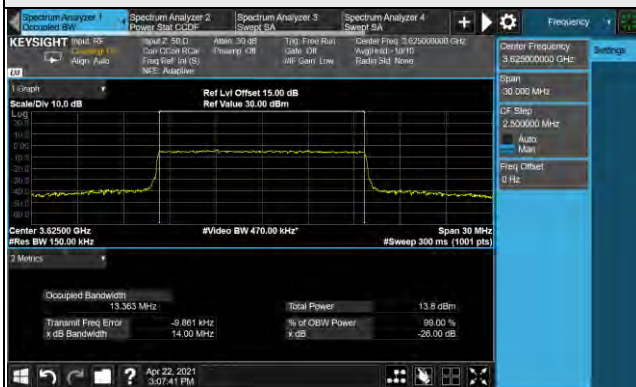
#### 5MHz / QPSK



#### 10MHz / 64QAM



#### 15MHz / 16QAM



#### 20MHz / 64QAM



#### 4.4.8 Test Result (Occupied Bandwidth)

LTE Band 48, Channel Bandwidth 5MHz				
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)		
		QPSK	16QAM	64QAM
55265	3552.5	4.46	4.45	4.46
55990	3625.0	4.47	4.46	4.46
56715	3697.5	4.46	4.46	4.47
LTE Band 48, Channel Bandwidth 10MHz				
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)		
		QPSK	16QAM	64QAM
55290	3555.0	8.92	8.92	8.91
55990	3625.0	8.92	8.91	8.92
56690	3695.0	8.91	8.91	8.92
LTE Band 48, Channel Bandwidth 15MHz				
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)		
		QPSK	16QAM	64QAM
55315	3557.5	13.36	13.37	13.37
55990	3625.0	13.38	13.36	13.37
56665	3692.5	13.37	13.37	13.37
LTE Band 48, Channel Bandwidth 20MHz				
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)		
		QPSK	16QAM	64QAM
55340	3560.0	17.81	17.81	17.81
55990	3625.0	17.81	17.83	17.81
56640	3690.0	17.80	17.82	17.82

### Spectrum Plot of Worst Value

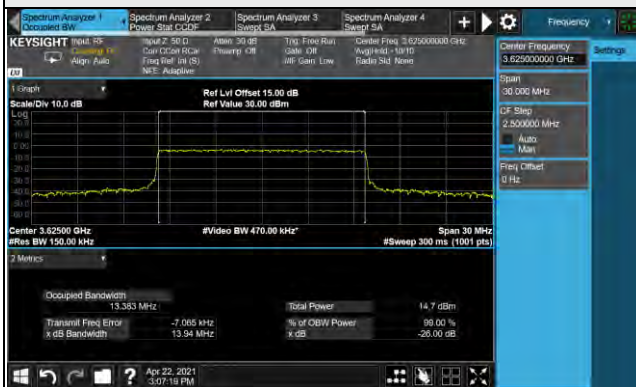
#### 5MHz / QPSK



#### 10MHz / QPSK



#### 15MHz / QPSK



#### 20MHz / 16QAM

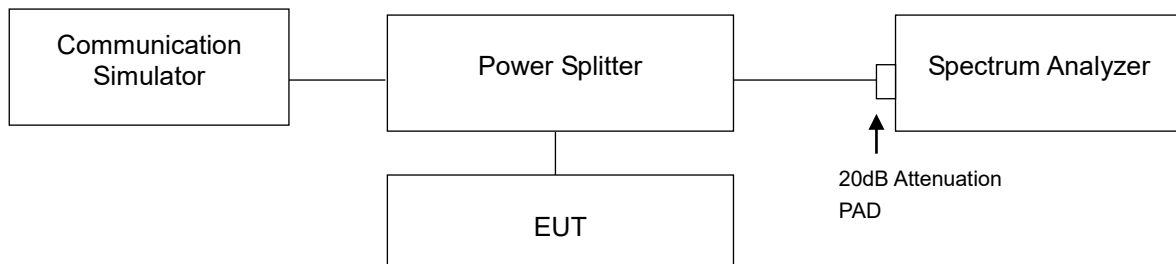


## 4.5 Peak to Average Ratio Measurement

### 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

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



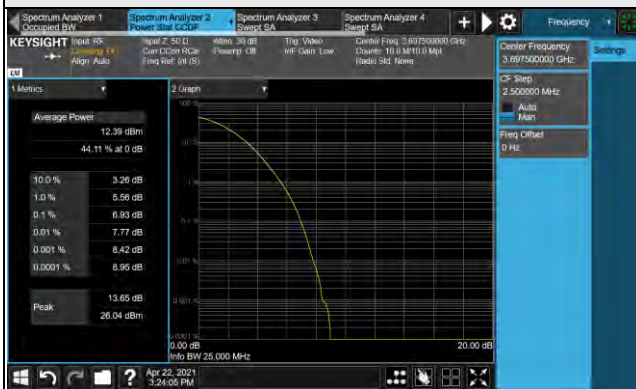
#### 4.5.4 Test Results

##### LTE Band 48

LTE Band 48, Channel Bandwidth 5MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
55265	3552.5	5.62	6.29	6.54
55990	3625.0	5.65	6.33	6.56
56715	3697.5	5.99	6.62	6.93
LTE Band 48, Channel Bandwidth 10MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
55290	3555.0	5.63	6.25	6.57
55990	3625.0	5.61	6.42	6.54
56690	3695.0	6.03	6.58	6.95
LTE Band 48, Channel Bandwidth 15MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
55315	3557.5	5.39	6.21	7.39
55990	3625.0	5.32	6.20	6.51
56665	3692.5	5.56	6.38	7.57
LTE Band 48, Channel Bandwidth 20MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
55340	3560.0	5.54	6.17	7.13
55990	3625.0	5.32	6.16	6.57
56640	3690.0	5.51	6.38	7.41

### Spectrum Plot of Worst Value

#### 5MHz / 64QAM



#### 10MHz / 64QAM



#### 15MHz / 64QAM



#### 20MHz / 64QAM

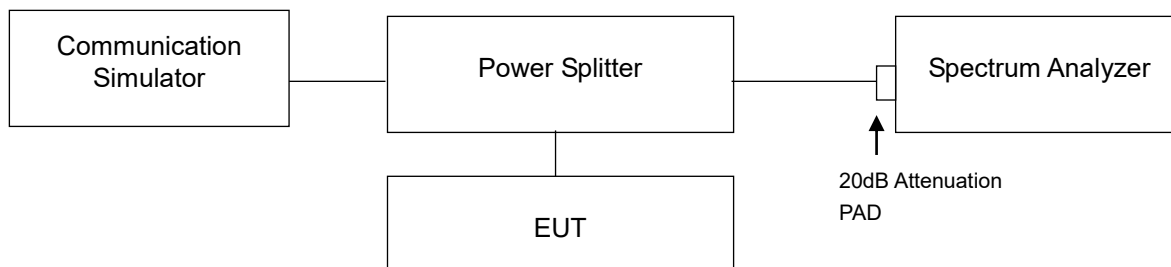


## 4.6 Conducted Spurious Emissions

### 4.6.1 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	

### 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 40 GHz. 20dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz is used for conducted emission measurement. Measurement method refers to FCC Part96 section 96.41 (e)(1)(3).
- When testing in the 5 MHz and 10 MHz channel BW mode, the 1% range is extended from 1M above and below the channel edge to 2M, and then the limit is further reduced by  $10 \log (1000/100) = 10\text{dB}$  (that is, the total  $-13 + -10 = -23\text{dB}$ ) to compensate for the integral from 100k to 1M.

### 4.6.4 Test Results

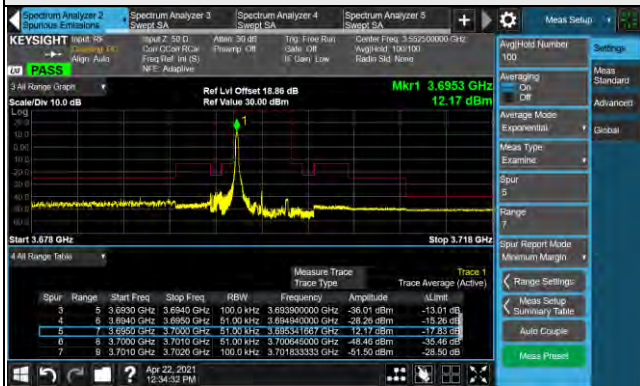




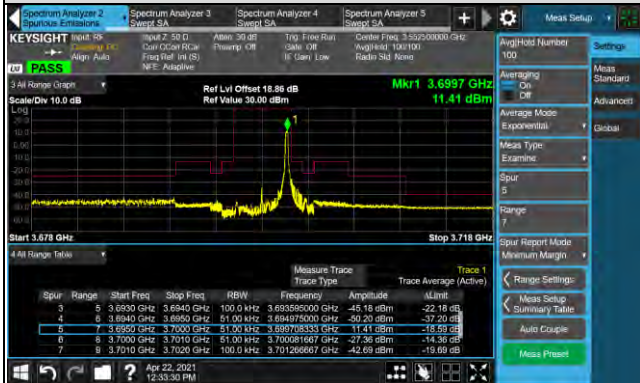
LTE Band 48, Channel Bandwidth 5MHz

Channel 56715 (3697.5MHz)

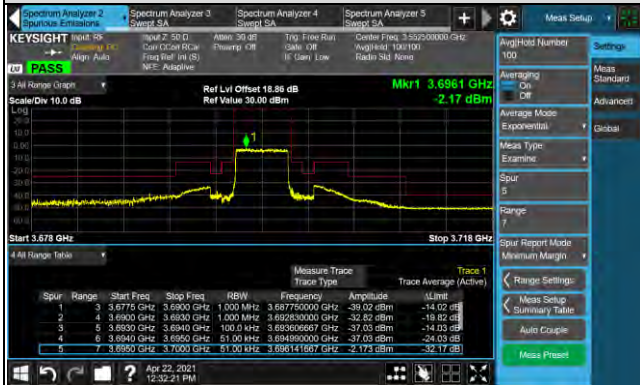
1RB



1RB 24



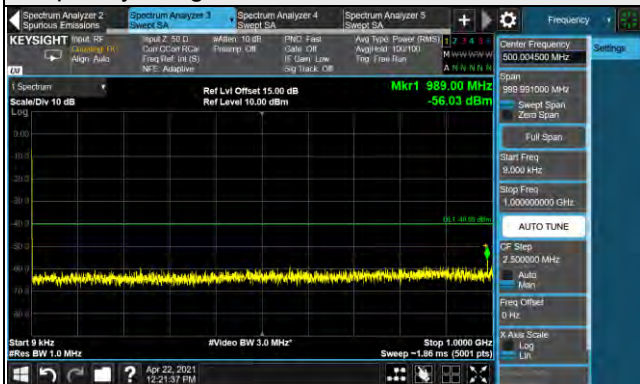
Full RB



LTE Band 48, Channel Bandwidth 5MHz

Channel 55265 (3552.5MHz)

Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 40 GHz

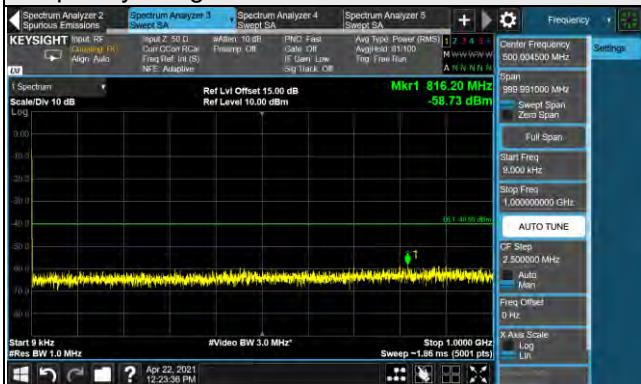


Note: The signal at 9 kHz is IF signal from spectrum analyzer.

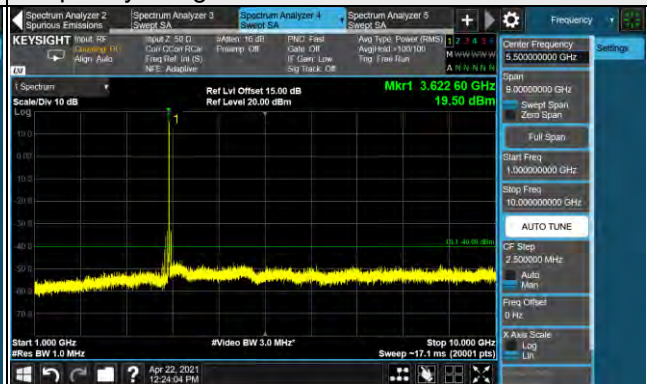
LTE Band 48, Channel Bandwidth 5MHz

Channel 55990 (3625.0MHz)

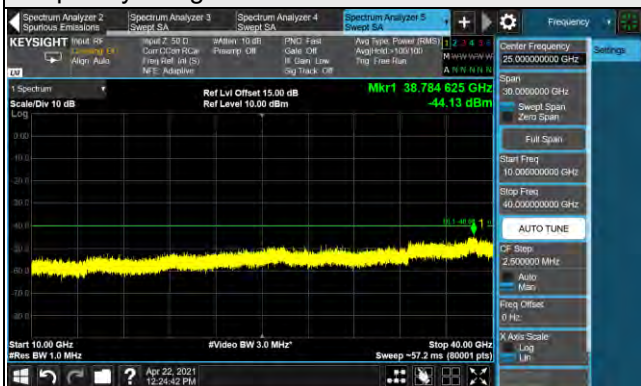
Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 40 GHz

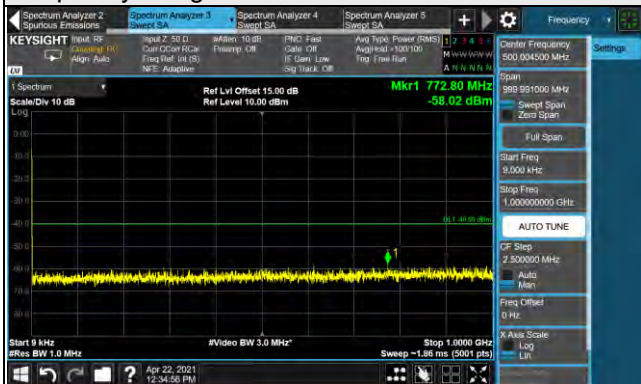


Note: The signal at 9 kHz is IF signal from spectrum analyzer.

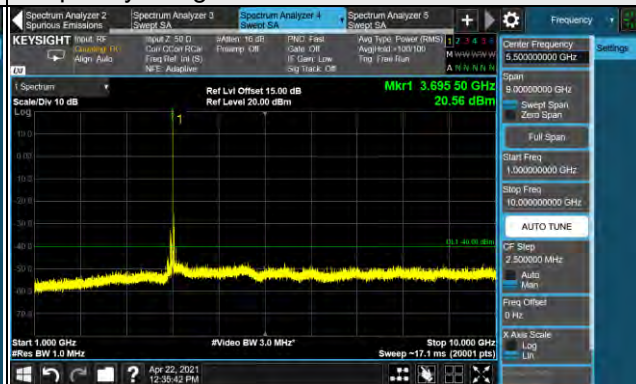
LTE Band 48, Channel Bandwidth 5MHz

Channel 56715 (3697.50MHz)

Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 40 GHz

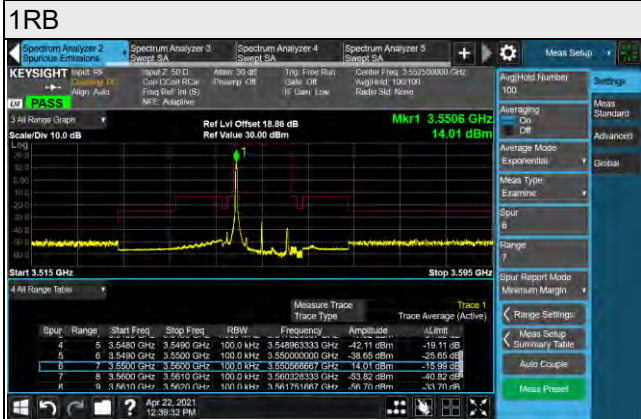


Note: The signal at 9 kHz is IF signal from spectrum analyzer.

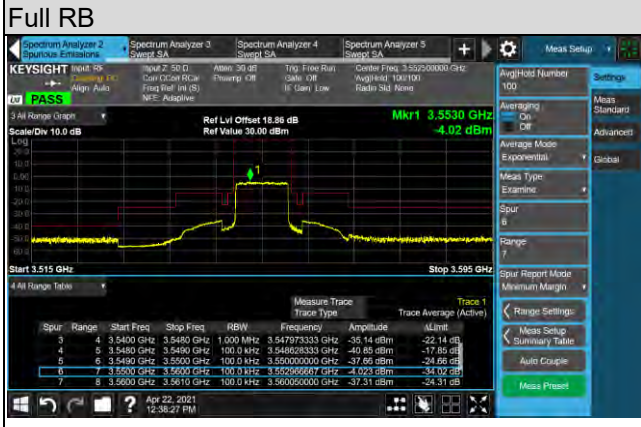
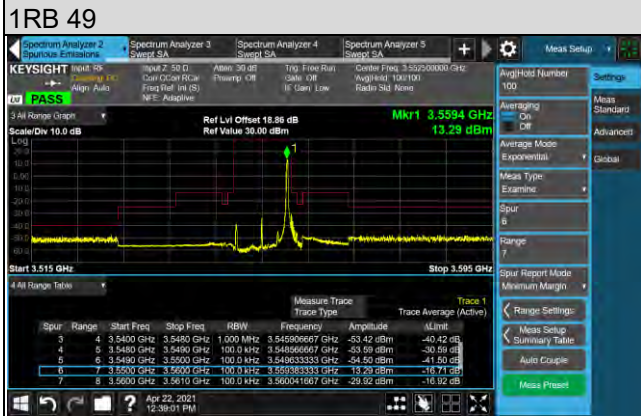
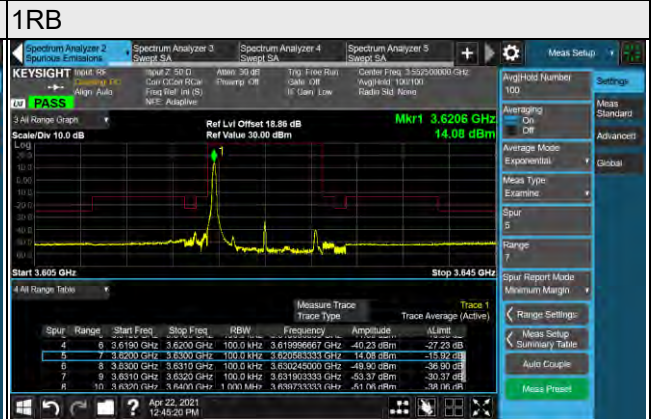


LTE Band 48, Channel Bandwidth 10MHz

Channel 55290 (3555.0MHz)



Channel 55990 (3625.0MHz)



LTE Band 48, Channel Bandwidth 10MHz

Channel 56690 (3695.0MHz)

1RB



1RB 49



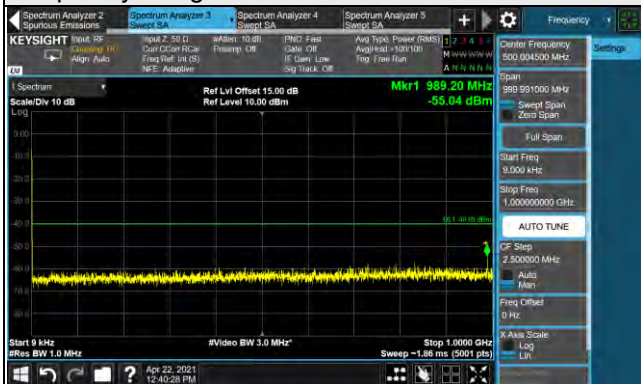
Full RB



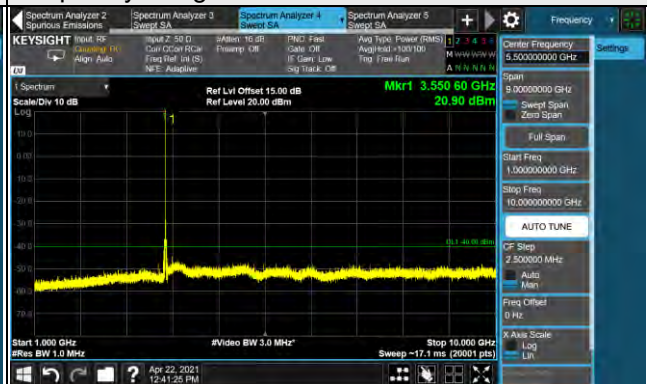
LTE Band 48, Channel Bandwidth 10MHz

Channel 55290 (3555.0MHz)

Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 40 GHz



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



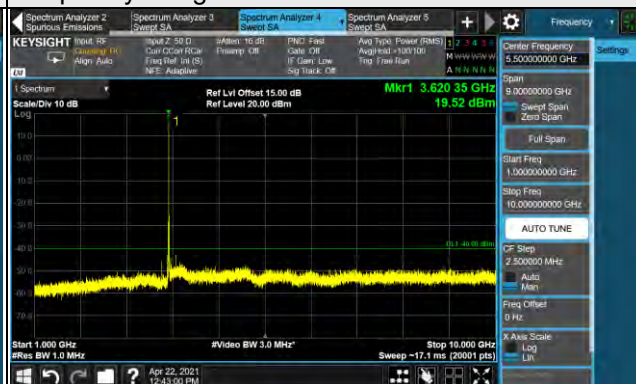
LTE Band 48, Channel Bandwidth 10MHz

Channel 55990 (3625.00MHz)

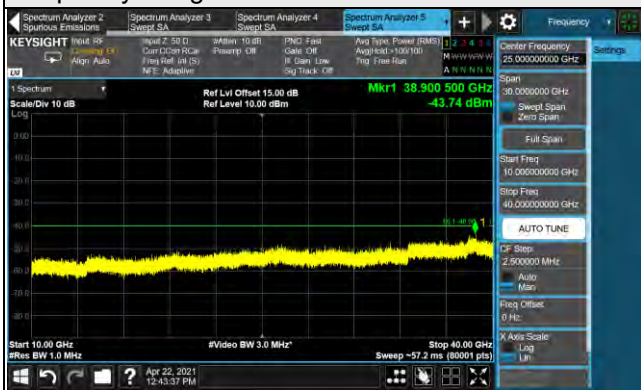
Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 40 GHz

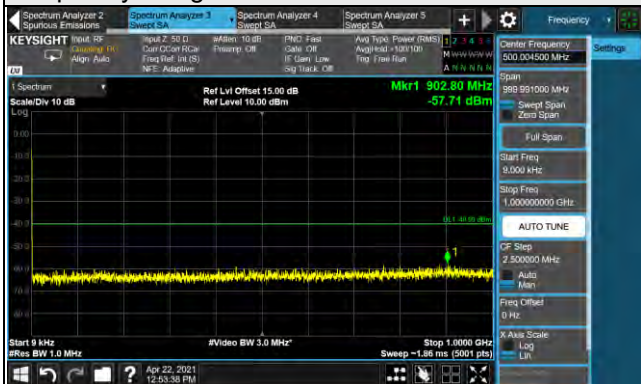


Note: The signal at 9 kHz is IF signal from spectrum analyzer.

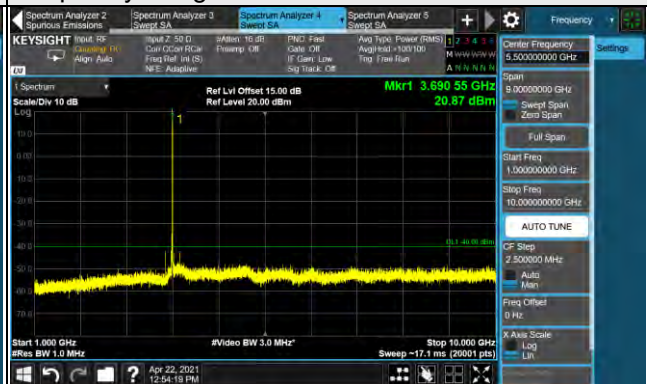
LTE Band 48, Channel Bandwidth 10MHz

Channel 56690 (3695.0MHz)

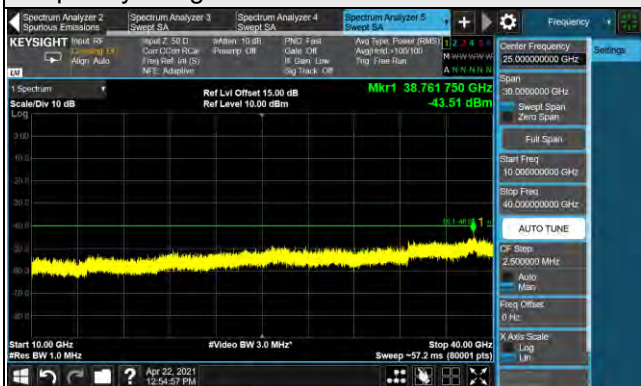
Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 40 GHz



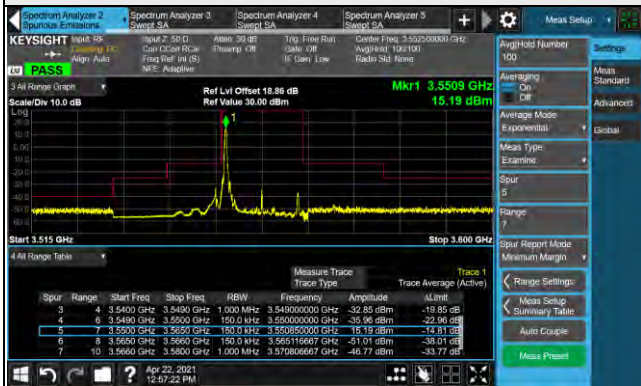
Note: The signal at 9 kHz is IF signal from spectrum analyzer.

LTE Band 48, Channel Bandwidth 15MHz

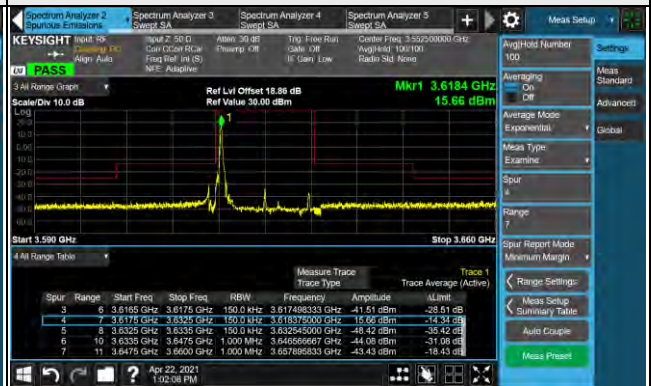
Channel 55315 (3557.50MHz)

Channel 55990 (3625.0MHz)

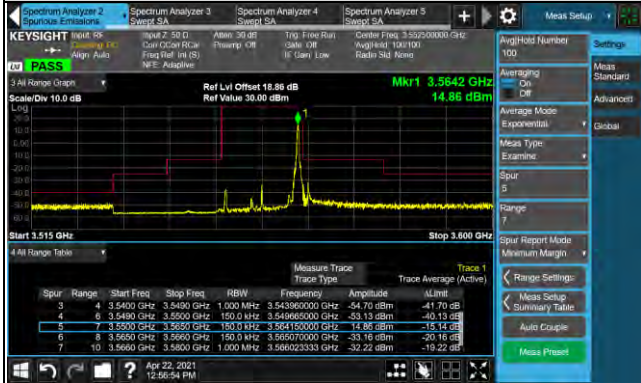
1RB



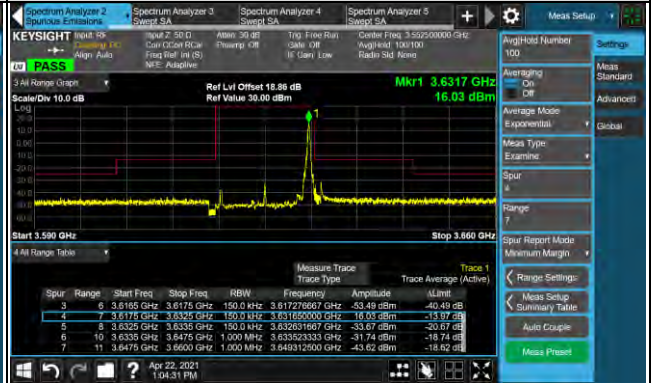
1RB



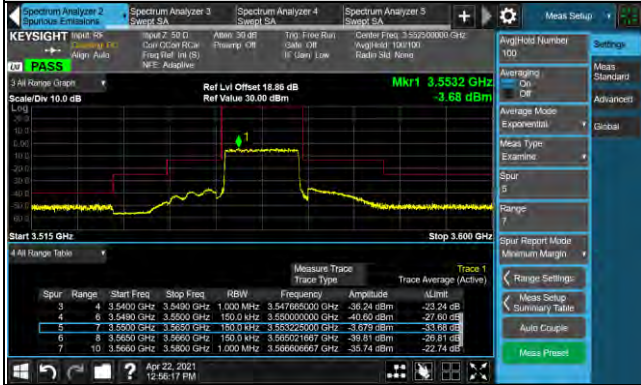
1RB 74



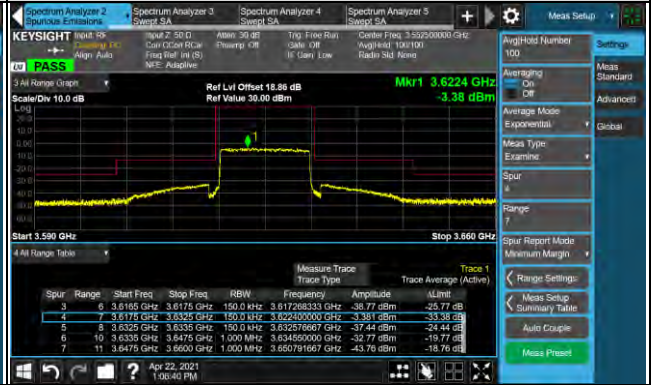
1RB 74



Full RB



Full RB

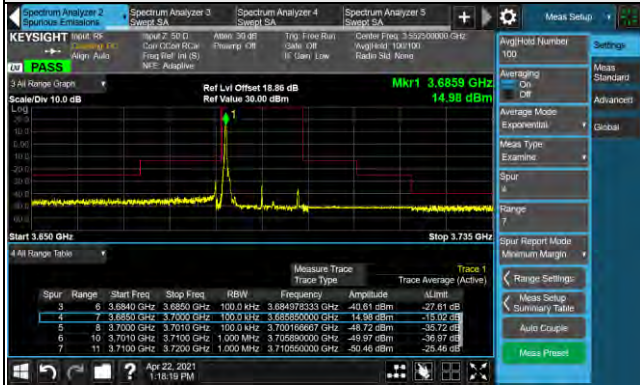




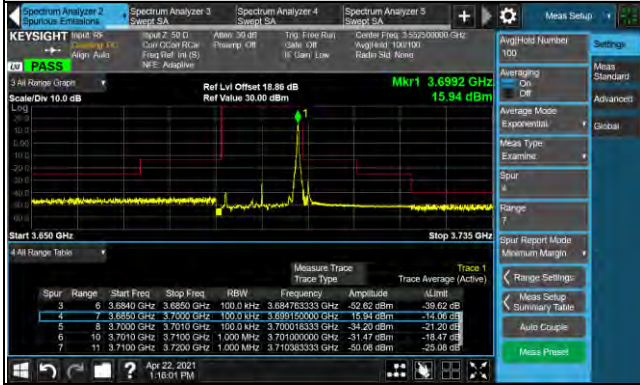
LTE Band 48, Channel Bandwidth 15MHz

Channel 56665 (3692.5MHz)

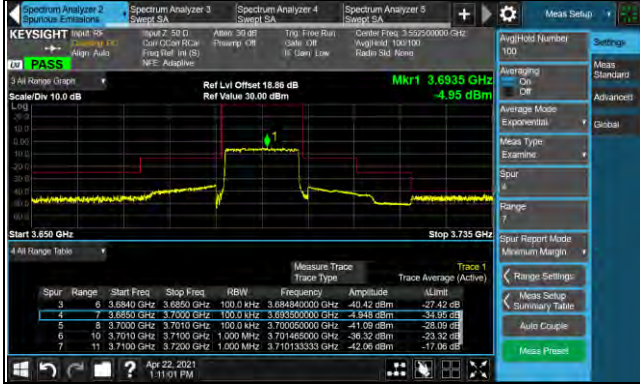
1RB



1RB 74



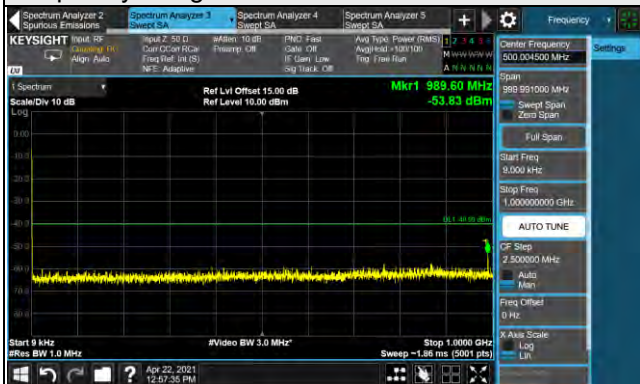
Full RB



LTE Band 48, Channel Bandwidth 15MHz

Channel 55315 (3557.50MHz)

Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 40 GHz



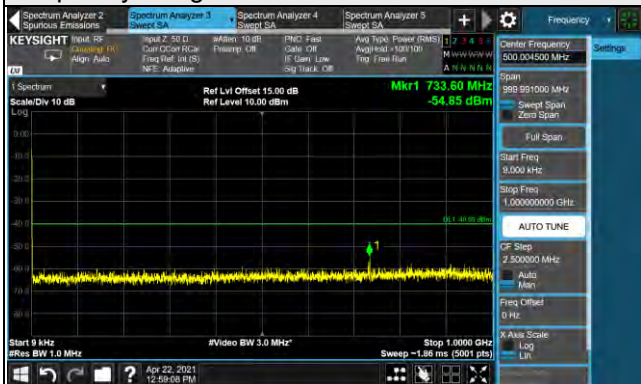
Note: The signal at 9 kHz is IF signal from spectrum analyzer.



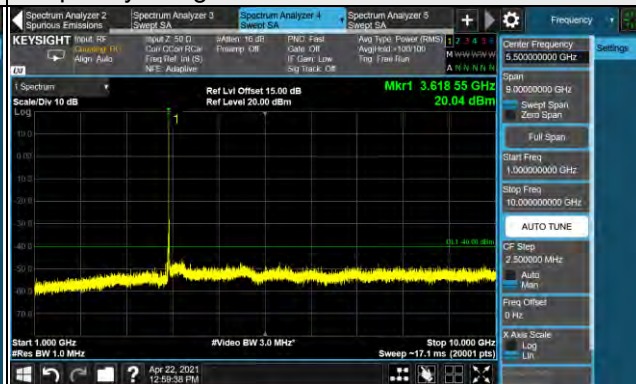
LTE Band 48, Channel Bandwidth 15MHz

Channel 55990 (3625.0MHz)

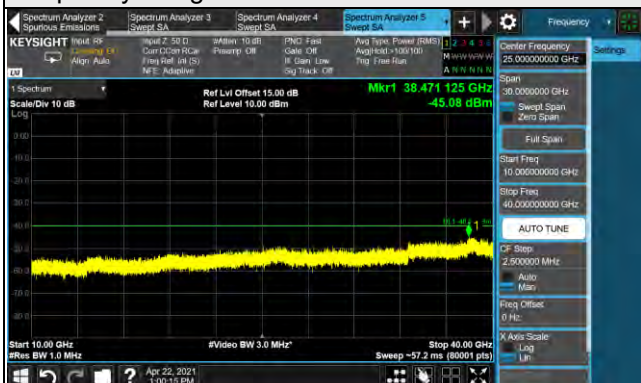
Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 40 GHz

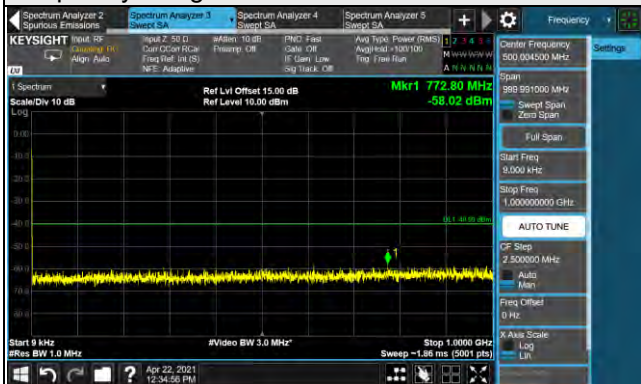


Note: The signal at 9 kHz is IF signal from spectrum analyzer.

LTE Band 48, Channel Bandwidth 15MHz

Channel 56665 (3692.50MHz)

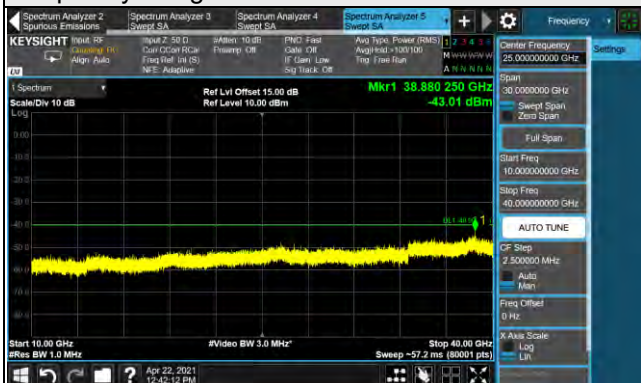
Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 40 GHz

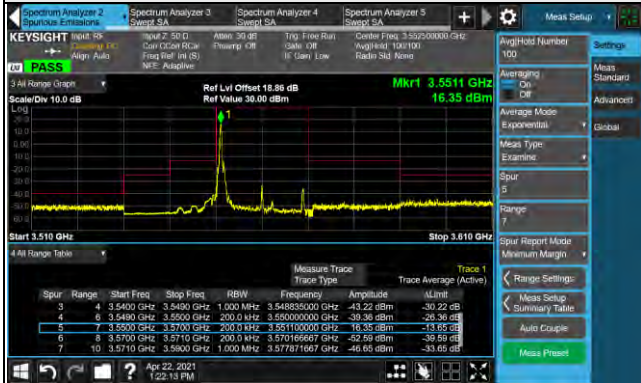


Note: The signal at 9 kHz is IF signal from spectrum analyzer.

LTE Band 48, Channel Bandwidth 20MHz

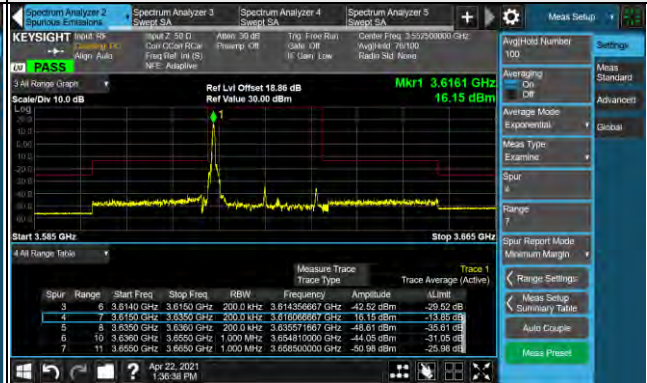
Channel 55340 (3560.0MHz)

1RB

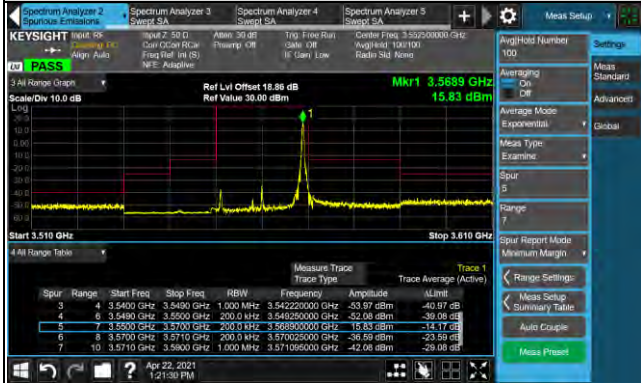


Channel 55990 (3625.0MHz)

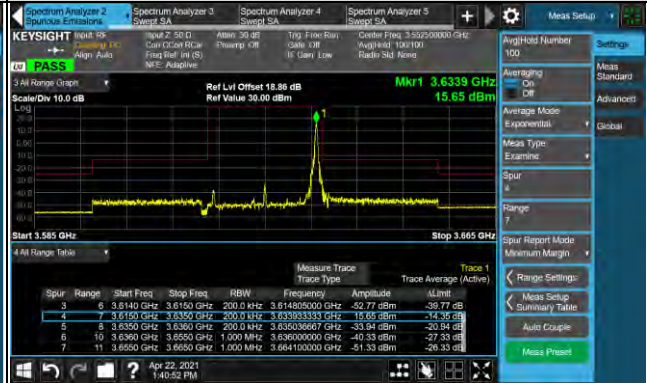
1RB



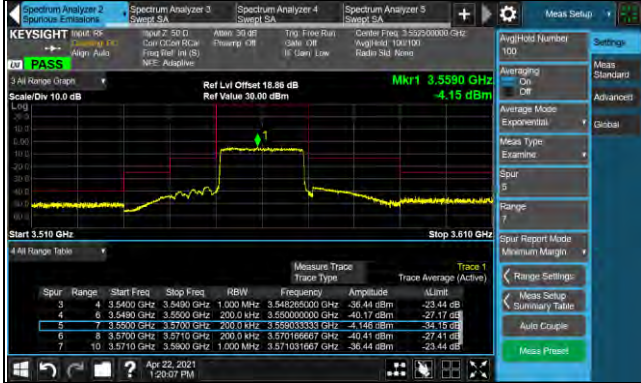
1RB 99



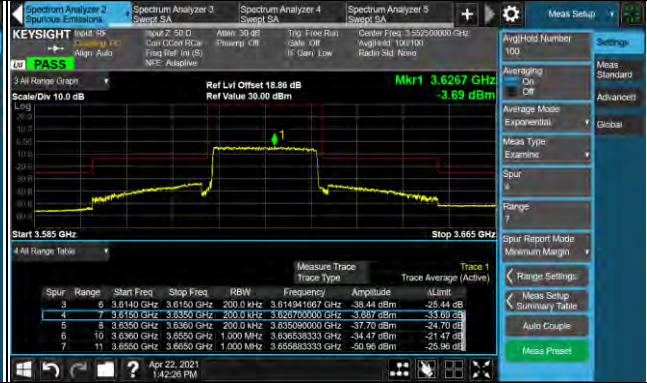
1RB 99



Full RB



Full RB

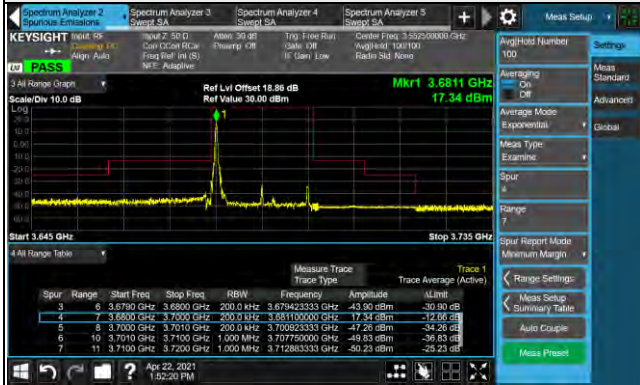




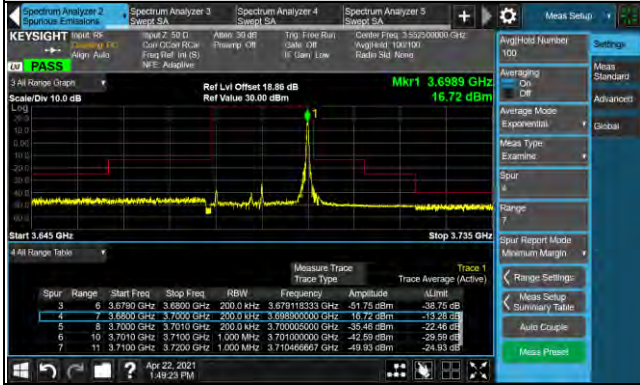
LTE Band 48, Channel Bandwidth 20MHz

Channel 56640 (3690.0MHz)

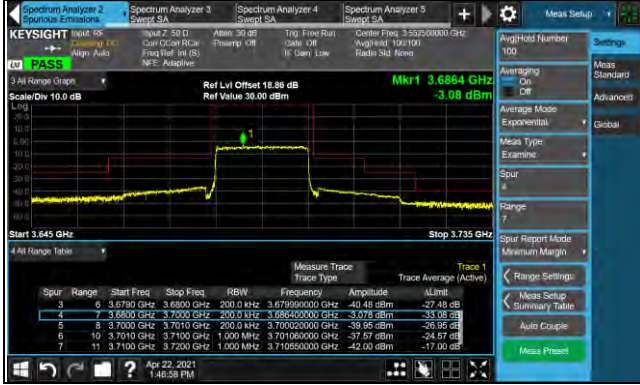
1RB



1RB 99



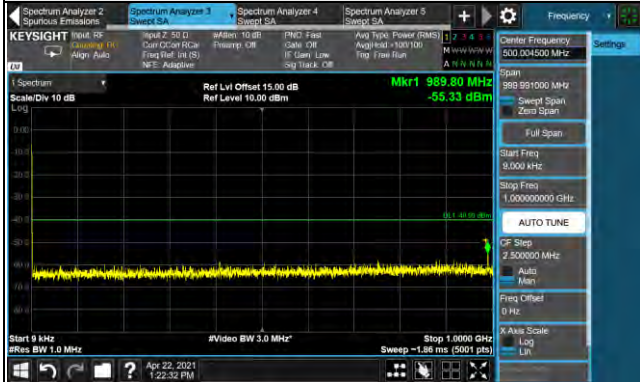
Full RB



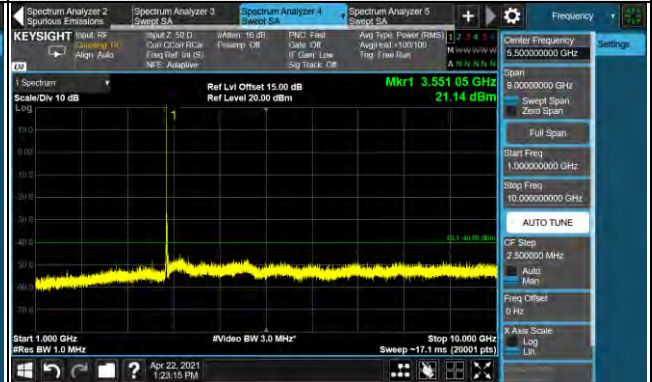
LTE Band 48, Channel Bandwidth 20MHz

Channel 55340 (3560.0MHz)

Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 40 GHz

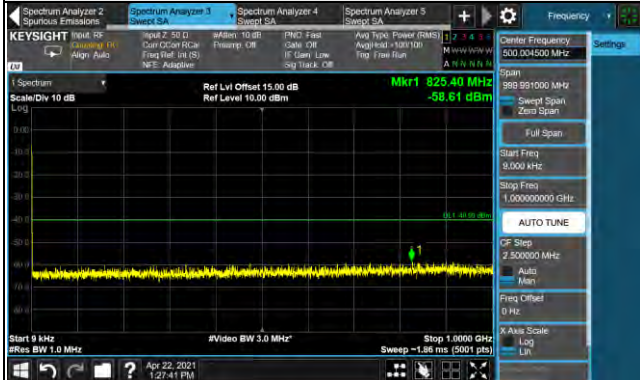


Note: The signal at 9 kHz is IF signal from spectrum analyzer.

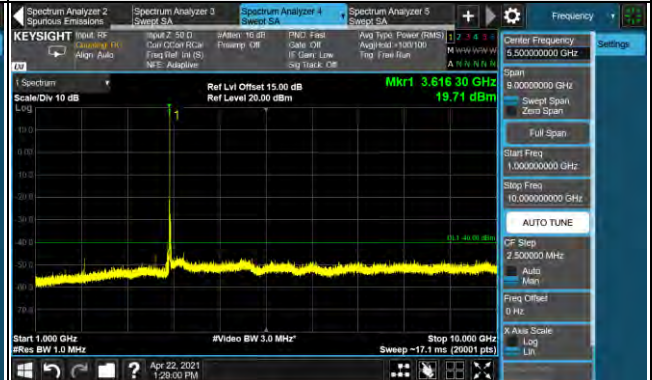
LTE Band 48, Channel Bandwidth 20MHz

Channel 55990 (3625.0MHz)

Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 40 GHz

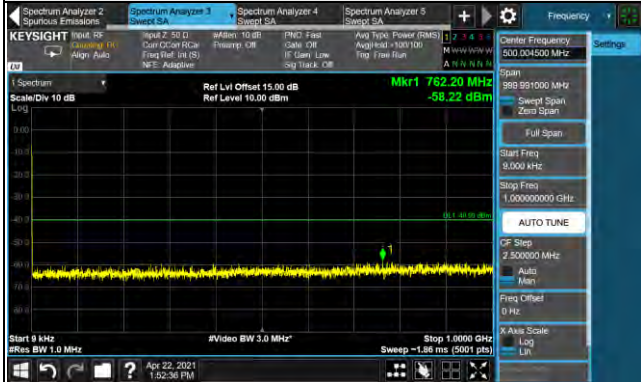


Note: The signal at 9 kHz is IF signal from spectrum analyzer.

LTE Band 48, Channel Bandwidth 20MHz

Channel 56640 (3690.0MHz)

Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 40 GHz



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



## 4.7 Radiated Emission Measurement

### 4.7.1 Limits of Radiated Emission Measurement

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

### 4.7.2 Test Instruments

Refer to section 4.1.3 to get information of above instrument.

### 4.7.3 Test Procedures

- a. Substitution method is used for EIRP measurement. In the semi-anechoic chamber, EUT placed on the 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for 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.  $EIRP = \text{Output power level} - TX \text{ cable loss} + \text{Antenna gain of substitution horn}$ . Correction Factor (includes EIRP and ERP unit conversion factor) =  $\text{Antenna gain of substitution horn} - TX \text{ cable loss}$ . Measurement method refers to ANSI C63.26 section 5.5 and 5.2.7.  
 $EIRP \text{ (dBm)} = E \text{ (dB}\mu\text{V/m)} + 20\log(D) - 104.8$ ; where D is the measurement distance (in the far field region) in m.  
 $ERP \text{ (dBm)} = E \text{ (dB}\mu\text{V/m)} + 20\log(D) - 104.8 - 2.15$ ; where D is the measurement distance (in the far field region) in m.

#### Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.
2. The emission levels were against the limit of frequency range 9 kHz ~ 30 MHz:  
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

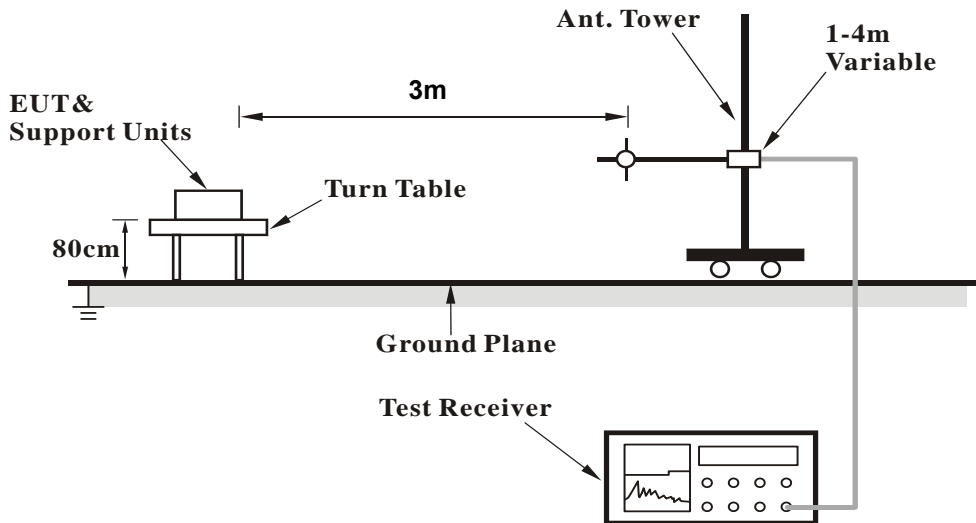
### 4.7.4 Deviation from Test Standard

No deviation.

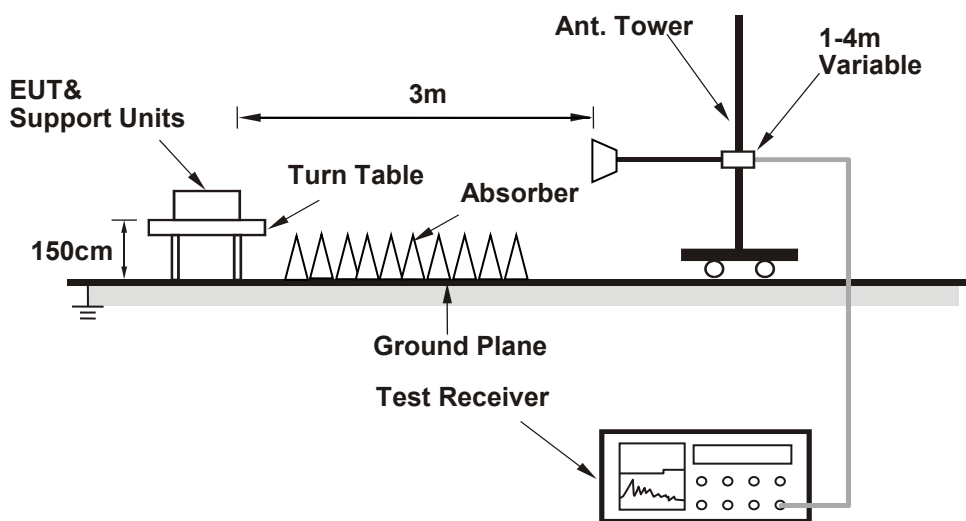


4.7.5 Test Set Up

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



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

4.7.6 Test Results

Below 1GHz Data :

LTE Band 48

Channel Bandwidth: 20 MHz / QPSK

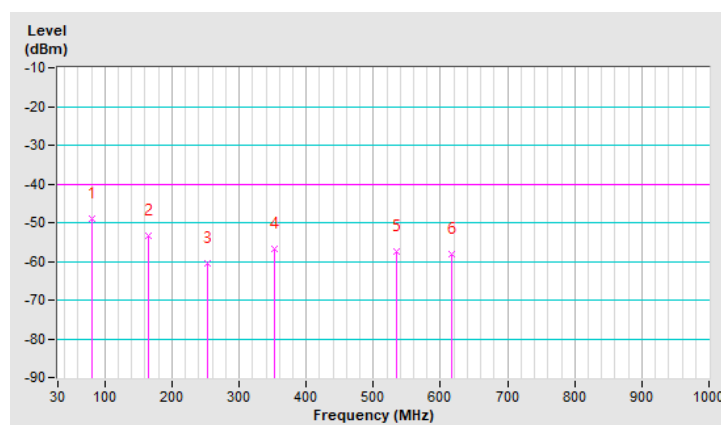
Mode	TX channel 55990 (3625.00MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Rex Wang		

Antenna Polarity & Test Distance: Horizontal at 3 M

No.	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)
1	80.44	-48.84	-40.00	-8.84	1.50 H	319	59.80
2	165.80	-53.28	-40.00	-13.28	1.25 H	339	50.42
3	253.10	-60.43	-40.00	-20.43	1.00 H	327	43.39
4	353.01	-56.73	-40.00	-16.73	2.00 H	246	44.19
5	534.40	-57.48	-40.00	-17.48	1.50 H	161	39.91
6	615.88	-57.99	-40.00	-17.99	1.00 H	227	37.46

Remarks:

1.  $EIRP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2.  $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8$
3.  $Margin\ value = EIRP - Limit\ value$
4. The other EIRP levels were very low against the limit.



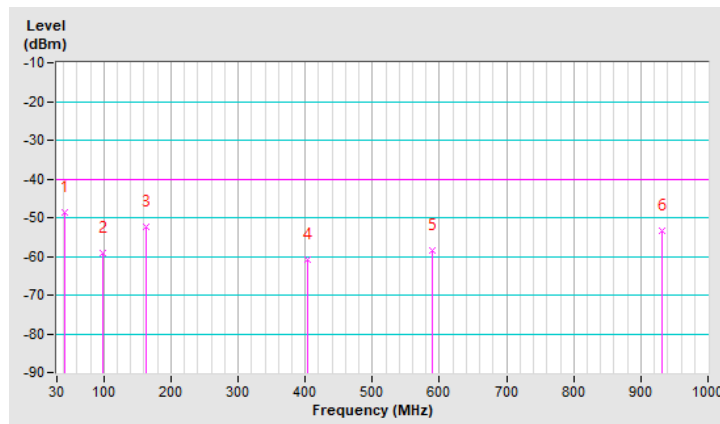
Mode	TX channel 55990 (3625.00MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Rex Wang		

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

No.	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)
1	41.64	-48.60	-40.00	-8.60	1.50 V	24	55.95
2	97.90	-59.04	-40.00	-19.04	1.00 V	200	49.68
3	163.86	-52.21	-40.00	-12.21	1.25 V	271	51.35
4	404.42	-60.78	-40.00	-20.78	1.00 V	164	39.17
5	589.69	-58.35	-40.00	-18.35	2.00 V	247	37.73
6	932.10	-53.36	-40.00	-13.36	1.00 V	330	36.13

**Remarks:**

1.  $EIRP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2.  $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8$
3.  $Margin\ value = EIRP - Limit\ value$
4. The other EIRP levels were very low against the limit.



### Above 1GHz

LTE Band 48, Channel Bandwidth 5MHz

Mode	TX channel 55265 (3552.5MHz)	Frequency Range	1GHz ~ 40GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Rex Wang		

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

No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)
1	7105.00	-45.72	-40.00	-5.72	1.05 H	32	42.10

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

No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)
1	7105.00	-45.82	-40.00	-5.82	3.66 V	198	42.00

#### Remarks:

1.  $EIRP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2.  $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8$
3. Margin value = EIRP – Limit value
4. The other EIRP levels were very low against the limit.

Mode	TX channel 55990 (3625.0MHz)	Frequency Range	1GHz ~ 40GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Rex Wang		

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

No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)
1	7250.00	-44.87	-40.00	-4.87	1.09 H	35	42.44

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

No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)
1	7250.00	-45.00	-40.00	-5.00	3.61 V	201	42.31

#### Remarks:

1.  $EIRP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2.  $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8$
3. Margin value = EIRP – Limit value
4. The other EIRP levels were very low against the limit.

Mode	TX channel 56715 (3697.5MHz)	Frequency Range	1GHz ~ 40GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Rex Wang		

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

No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)
1	7395.00	-44.82	-40.00	-4.82	1.07 H	32	42.39

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

No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)
1	7395.00	-45.62	-40.00	-5.62	3.64 V	196	41.59

**Remarks:**

1.  $EIRP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2.  $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8$
3.  $Margin\ value = EIRP - Limit\ value$
4. The other EIRP levels were very low against the limit.

LTE Band 48, Channel Bandwidth 20MHz

Mode	TX channel 55340 (3560.0MHz)	Frequency Range	1GHz ~ 40GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Rex Wang		

Antenna Polarity & Test Distance: Horizontal at 3 M

No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)
1	7120.00	-44.37	-40.00	-4.37	1.04 H	33	43.41

Antenna Polarity & Test Distance: Vertical at 3 M

No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)
1	7120.00	-44.26	-40.00	-4.26	3.65 V	192	43.52

**Remarks:**

1.  $EIRP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2.  $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8$
3.  $Margin\ value = EIRP - Limit\ value$
4. The other EIRP levels were very low against the limit.

Mode	TX channel 55990 (3625.00MHz)	Frequency Range	1GHz ~ 40GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Rex Wang		

Antenna Polarity & Test Distance: Horizontal at 3 M

No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)
1	7250.00	-43.72	-40.00	-3.72	3.65 H	205	43.59

Antenna Polarity & Test Distance: Vertical at 3 M

No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)
1	7250.00	-44.16	-40.00	-4.16	1.08 V	39	43.15

**Remarks:**

1.  $EIRP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2.  $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8$
3.  $Margin\ value = EIRP - Limit\ value$
4. The other EIRP levels were very low against the limit.

Mode	TX channel 56640 (3690.00MHz)	Frequency Range	1GHz ~ 40GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Rex Wang		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)
1	7380.00	-44.13	-40.00	-4.13	1.06 H	31	43.12
Antenna Polarity & Test Distance: Vertical at 3 M							
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)
1	7380.00	-43.83	-40.00	-3.83	3.62 V	194	43.42

**Remarks:**

1.  $EIRP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2.  $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8$
3. Margin value = EIRP – Limit value
4. The other EIRP levels were very low against the limit.

## 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.

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**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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