FCC Test Report
(Part 96: CA mode (LTE Band 48C))

Report No.:	RFBFJZ-WTW-P21050403-20
FCC ID:	V65C6930
Test Model:	C6930
Received Date:	May 18, 2021
Test Date:	Aug. 04 ~ Aug. 24, 2021
Issued Date:	Sep. 01, 2021
Applicant:	Kyocera Corporation c/o Kyocera International, Inc.
Address:	8611 Balboa Avenue, San Diego, CA 92123
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

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RFBFJZ-WTW-P21050403-20	Original release	Sep. 01, 2021

1 Certificate of Conformity

Product:	SmartPhone
Brand:	Kyocera
Test Model:	C6930
Sample Status:	Engineering sample
Applicant:	Kyocera Corporation c/o Kyocera International, Inc.
Test Date:	Aug. 04 ~ Aug. 24, 2021
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:** Sep. 01, 2021

Approved by : Bruce Chen / Senior Engineer , **Date:** Sep. 01, 2021

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	Refer to Note 2
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 -3.39dB at 7159.60MHz.

Note:
1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
2. LTE CA mode is similar to digital modulation in LTE single frequency band, so please refer to BV CPS report no.: RFBFJZ-WTW-P21050403-11 for the modulation characteristics data of CA mode.

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.

2.3 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 09, 2021	Apr. 08, 2022
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jun. 10, 2021	Jun. 09, 2022
Spectrum Analyzer ROHDE & SCHWARZ	FSW43	101866	Dec. 14, 2020	Dec. 13, 2021
MXG Vector signal generator Agilent	N5182B	MY53050430	Nov. 25, 2020	Nov. 24, 2021
Radio Communication Analyzer Anritsu	MT8821C	6261806803	Jan. 22, 2021	Jan. 21, 2022
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 22, 2020	Nov. 21, 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
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Jun. 05, 2021	Jun. 04, 2022
Preamplifier Agilent (Above 1GHz)	8449B	3008A02367	Feb. 17, 2021	Feb. 16, 2022
Preamplifier EMCI	EMC 184045	980116	Oct. 07, 2020	Oct. 06, 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. 05, 2021	Jun. 04, 2022
Software BV ADT	ADT_Radiated_V7.6.15.9.5	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	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
Standard Temperature And Humidity Chamber GIANT FORCE	GTH-120-40-CP-AR	MAA1306-019	Sep. 10, 2020	Sep. 09, 2021

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
JFW 20dB attenuation	50HF-020-SMA	NA	NA	NA
True RMS Clamp Meter Fluke	325	31130711WS	Jun. 02, 2021	Jun. 01, 2022
DC power supply Keysight	U8002A	MY56330015	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.

3 General Information

3.1 General Description of EUT

Product	SmartPhone				
Brand	Kyocera				
Test Model	C6930				
Status of EUT	Engineering sample				
Power Supply Rating	3.87Vdc from battery 5Vdc / 9Vdc / 12Vdc from adapter				
Modulation Type	QPSK, 16QAM, 64QAM, 256QAM				
Operating Frequency	LTE Band 48C	3560 ~ 3690 MHz			
Max. EIRP Power		QPSK	16QAM	64QAM	256QAM
	LTE Band 48C (Full Power) (20MHz+20MHz)	180.302mW (22.56 dBm/40MHz)	143.549mW (21.57 dBm/40MHz)	119.674mW (20.78 dBm/40MHz)	94.842mW (19.77 dBm/40MHz)
	LTE Band 48C (Per 10M Power) (20MHz+20MHz)	165.959mW (22.20 dBm/10MHz)	132.739mW (21.23 dBm/10MHz)	118.304mW (20.73 dBm/10MHz)	93.756mW (19.72 dBm/10MHz)
Emission Designator	LTE Band 48C (20MHz+20MHz)	37M4G7D	37M4D7W	37M3D7W	37M3D7W
Antenna Type	Refer to Note as below				
Accessory Device	Refer to Note as below				
Data Cable Supplied	Refer to Note as below				

Note:

1. The EUT contains following accessory devices.

Battery	
Brand	KYOCERA
Model	SCP-75LBPS
Rating	3.87 V typ / 4500 mAh/17.5 Wh typ

Adapter	
Brand	KYOCERA Corporation
Model	SCP-49ADT
Input Power	AC 100-240V, 50/60Hz 0.4A
Output Power	DC 5.0V, 1.8A / 9.0V, 1.8A / 12.0V, 1.2A

USB cable	
Brand	KYOCERA
Model	SCP-24SDC
Rating	1 meter, shielded Type A to Type C USB cable

2. The following antennas were provided to the EUT.

Band	Freq. Range (MHz)	Gain (dBi)
LTE Band 48	3550 ~ 3700	-0.4 (Tx2)

* 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.

3. For CA mode configuration, please consult the manufacturer to declare the test mode.

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:

LTE Band 48 (CA 48C)

Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation
Maximum Output Power	55340 to 56442 55538 to 56640	55340 (3560.0MHz)+ 55538 (3579.8MHz), 55891 (3615.1MHz)+ 56089 (3634.9MHz), 56642 (3670.2MHz)+ 56640 (3690.0MHz)	20MHz+20MHz	QPSK / 16QAM / 64QAM / 256QAM
Frequency Stability	55340 to 56442 55538 to 56640	55340 (3560.0MHz)+ 55538 (3579.8MHz)	20MHz+20MHz	QPSK
Occupied Bandwidth	55340 to 56442 55538 to 56640	55340 (3560.0MHz)+ 55538 (3579.8MHz), 55891 (3615.1MHz)+ 56089 (3634.9MHz), 56642 (3670.2MHz)+ 56640 (3690.0MHz)	20MHz+20MHz	QPSK / 16QAM / 64QAM / 256QAM
Peak to Average Ratio	55340 to 56442 55538 to 56640	55340 (3560.0MHz)+ 55538 (3579.8MHz), 55891 (3615.1MHz)+ 56089 (3634.9MHz), 56642 (3670.2MHz)+ 56640 (3690.0MHz)	20MHz+20MHz	QPSK / 16QAM / 64QAM / 256QAM
Conducted Emission	55340 to 56442 55538 to 56640	55340 (3560.0MHz)+ 55538 (3579.8MHz), 55891 (3615.1MHz)+ 56089 (3634.9MHz), 56642 (3670.2MHz)+ 56640 (3690.0MHz)	20MHz+20MHz	QPSK
Radiated Emission Below 1GHz	55340 to 56442 55538 to 56640	55340 (3560.0MHz)+ 55538 (3579.8MHz)	20MHz+20MHz	QPSK
Radiated Emission Above 1GHz	55340 to 56442 55538 to 56640	55340 (3560.0MHz)+ 55538 (3579.8MHz), 55891 (3615.1MHz)+ 56089 (3634.9MHz), 56642 (3670.2MHz)+ 56640 (3690.0MHz)	20MHz+20MHz	QPSK

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 1 GHz, choose the maximum EIRP power worst mode for final test.
3. LTE CA mode is similar to digital modulation in LTE single frequency band, so please refer to BV CPS report no.: RFBFJZ-WTW-P21050403-11 for the modulation characteristics data of CA mode.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
Maximum Output Power	25deg. C, 60%RH	120Vac, 60Hz	James Yang
Frequency Stability	25deg. C, 60%RH	3.87Vdc	James Yang
Occupied Bandwidth	25deg. C, 60%RH	120Vac, 60Hz	James Yang
Peak to Average Ratio	25deg. C, 60%RH	120Vac, 60Hz	James Yang
Condcudeted Emission	25deg. C, 60%RH	120Vac, 60Hz	James Yang
Radiated Emission	22deg. C, 66%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.

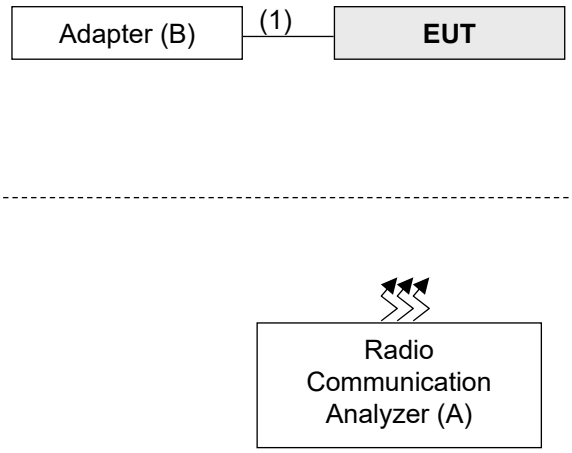
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Radio Communication Analyzer	Anritsu	MT8821C	6261806803	NA	-
B.	Adapter	KYOCERA	SCP-49ADT	NA	NA	Accessory

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item A acted as a communication partner to transfer data.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Type A to Type C USB cable	1	1	Y	0	Accessory

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.

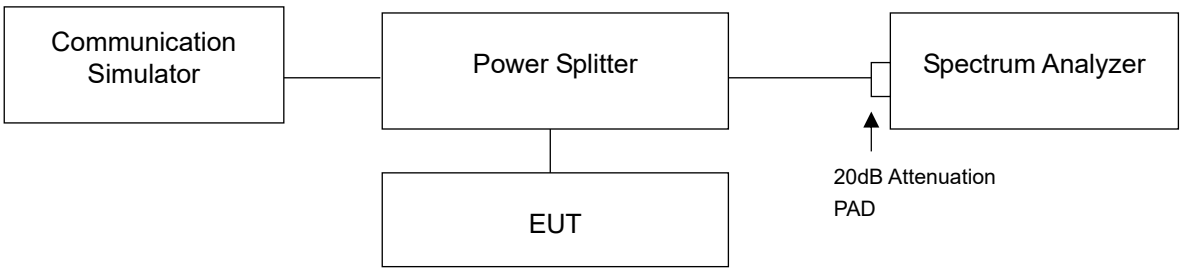
4 Test Types and Results

4.1 Maximum Output Power Measurement

4.1.1 Limits of Maximum Output Power Measurement

Device		Maximum Output Power (dBm/10 MHz)
☒	End User Device	23
☐	Category A CBSD	30
☐	Category B CBSD	47

4.1.2 Test Setup



4.1.3 Test Instruments

Refer to section 2.3 to get information of above instrument.

4.1.4 Test Procedures

Conducted Measurement Method
Measurement method refers to ANSI C63.26 section 5.2.4.4.

a. Set span to at least 1.5 times the OBW.
b. Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
c. Set VBW ≥ 3 × RBW.
d. Set number of points in sweep ≥ 2 × span / RBW.
e. Sweep time = auto-couple.
f. Detector = RMS (power averaging).
g. If the EUT can be configured to transmit continuously (i.e., burst duty cycle ≥ 98%), then set the trigger to free run.
h. 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.
i. Trace average at least 100 traces in power averaging (i.e., RMS) mode.
j. 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.
k. For per 10MHz method, channel power integrating bandwidth 10MHz is used for bandwidth 40M. For full power method, channel power integrating bandwidth 40MHz is used for bandwidth 40M.

Maximum EIRP / ERP
The relevant equation for determining the maximum ERP or EIRP from the measured RF output power is given in Equation as follows:
EIRP = PMeas + GT
ERP = PMeas + GT -2.15
where
ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as PMeas, e.g., dBm or dBW)
PMeas measured transmitter output power or PSD, in dBm or dBW
GT 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

EIRP Power (dBm/40MHz)

LTE Band 48 (CA 48C)_Full Power

Con fugure	Com-bination	PCC							SCC							Measurement Power
		Band	BW (MHz)	Modu lation	RB Size	RB Offset	UL Chan.	UL Freq. (MHz)	Band	BW (MHz)	Modu lation	RB Size	RB Offset	UL Chan.	UL Freq. (MHz)	EIRP (dBm)
																Total
Intra Band Conti-guous	CA_48C	48	20	QPSK	1	0	55340	3560	48	20	QPSK	1	99	55538	3579.8	14.45
					1	99						1	0			**22.56**
		48	20	QPSK	1	0	55891	3615.1	48	20	QPSK	1	99	56089	3634.9	14.38
					1	99						1	0			22.51
		48	20	QPSK	1	0	56442	3670.2	48	20	QPSK	1	99	56640	3690	14.40
					1	99						1	0			22.49

Con fugure	Com-bination	PCC							SCC							Measurement Power
		Band	BW (MHz)	Modu lation	RB Size	RB Offset	UL Chan.	UL Freq. (MHz)	Band	BW (MHz)	Modu lation	RB Size	RB Offset	UL Chan.	UL Freq. (MHz)	EIRP (dBm)
																Total
Intra Band Conti-guous	CA_48C	48	20	16QAM	1	0	55340	3560	48	20	16QAM	1	99	55538	3579.8	13.45
					1	99						1	0			**21.57**
		48	20	16QAM	1	0	55891	3615.1	48	20	16QAM	1	99	56089	3634.9	13.39
					1	99						1	0			21.50
		48	20	16QAM	1	0	56442	3670.2	48	20	16QAM	1	99	56640	3690	13.81
					1	99						1	0			21.46

Con fugure	Com-bination	PCC							SCC							Measurement Power
		Band	BW (MHz)	Modu lation	RB Size	RB Offset	UL Chan.	UL Freq. (MHz)	Band	BW (MHz)	Modu lation	RB Size	RB Offset	UL Chan.	UL Freq. (MHz)	EIRP (dBm)
																Total
Intra Band Conti-guous	CA_48C	48	20	64QAM	1	0	55340	3560	48	20	64QAM	1	99	55538	3579.8	12.69
					1	99						1	0			**20.78**
		48	20	64QAM	1	0	55891	3615.1	48	20	64QAM	1	99	56089	3634.9	12.62
					1	99						1	0			20.69
		48	20	64QAM	1	0	56442	3670.2	48	20	64QAM	1	99	56640	3690	13.01
					1	99						1	0			20.67

Con fugure	Com-bination	PCC							SCC							Measurement Power
		Band	BW (MHz)	Modu lation	RB Size	RB Offset	UL Chan.	UL Freq. (MHz)	Band	BW (MHz)	Modu lation	RB Size	RB Offset	UL Chan.	UL Freq. (MHz)	EIRP (dBm)
																Total
Intra Band Conti-guous	CA_48C	48	20	256 QAM	1	0	55340	3560	48	20	256 QAM	1	99	55538	3579.8	11.64
					1	99						1	0			**19.77**
		48	20	256 QAM	1	0	55891	3615.1	48	20	256 QAM	1	99	56089	3634.9	12.06
					1	99						1	0			19.74
		48	20	256 QAM	1	0	56442	3670.2	48	20	256 QAM	1	99	56640	3690	12.03
					1	99						1	0			19.68

*EIRP = Conducted + antenna gain(-0.4dBi).

LTE Band 48 (CA 48C)_Per 10M Power (dBm/10MHz)

Con fugure	Com-bination	PCC							SCC							Measurement Power
		Band	BW (MHz)	Modu lation	RB Size	RB Offset	UL Chan.	UL Freq. (MHz)	Band	BW (MHz)	Modu lation	RB Size	RB Offset	UL Chan.	UL Freq. (MHz)	EIRP (dBm)
																Total
Intra Band Conti-guous	CA_48C	48	20	QPSK	1	0	55340	3560	48	20	QPSK	1	99	55538	3579.8	14.05
					1	99						1	0			22.16
		48	20	QPSK	1	0	55891	3615.1	48	20	QPSK	1	99	56089	3634.9	14.08
					1	99						1	0			**22.20**
		48	20	QPSK	1	0	56442	3670.2	48	20	QPSK	1	99	56640	3690	14.00
					1	99						1	0			22.14

Con fugure	Com-bination	PCC							SCC							Measurement Power
		Band	BW (MHz)	Modu lation	RB Size	RB Offset	UL Chan.	UL Freq. (MHz)	Band	BW (MHz)	Modu lation	RB Size	RB Offset	UL Chan.	UL Freq. (MHz)	EIRP (dBm)
																Total
Intra Band Conti-guous	CA_48C	48	20	16QAM	1	0	55340	3560	48	20	16QAM	1	99	55538	3579.8	13.04
					1	99						1	0			21.11
		48	20	16QAM	1	0	55891	3615.1	48	20	16QAM	1	99	56089	3634.9	13.07
					1	99						1	0			**21.23**
		48	20	16QAM	1	0	56442	3670.2	48	20	16QAM	1	99	56640	3690	12.98
					1	99						1	0			21.11

Con fugure	Com-bination	PCC							SCC							Measurement Power
		Band	BW (MHz)	Modu lation	RB Size	RB Offset	UL Chan.	UL Freq. (MHz)	Band	BW (MHz)	Modu lation	RB Size	RB Offset	UL Chan.	UL Freq. (MHz)	EIRP (dBm)
																Total
Intra Band Conti-guous	CA_48C	48	20	64QAM	1	0	55340	3560	48	20	64QAM	1	99	55538	3579.8	12.55
					1	99						1	0			20.62
		48	20	64QAM	1	0	55891	3615.1	48	20	64QAM	1	99	56089	3634.9	12.61
					1	99						1	0			**20.73**
		48	20	64QAM	1	0	56442	3670.2	48	20	64QAM	1	99	56640	3690	12.48
					1	99						1	0			20.64

Con fugure	Com-bination	PCC							SCC							Measurement Power
		Band	BW (MHz)	Modu lation	RB Size	RB Offset	UL Chan.	UL Freq. (MHz)	Band	BW (MHz)	Modu lation	RB Size	RB Offset	UL Chan.	UL Freq. (MHz)	EIRP (dBm)
																Total
Intra Band Conti-guous	CA_48C	48	20	256 QAM	1	0	55340	3560	48	20	256 QAM	1	99	55538	3579.8	11.62
					1	99						1	0			19.72
		48	20	256 QAM	1	0	55891	3615.1	48	20	256 QAM	1	99	56089	3634.9	11.66
					1	99						1	0			**19.72**
		48	20	256 QAM	1	0	56442	3670.2	48	20	256 QAM	1	99	56640	3690	11.41
					1	99						1	0			19.63

*EIRP = Conducted + antenna gain(-0.4dBi).

4.2 Frequency Stability Measurement

4.2.1 Limits of Frequency Stabiliity Measurement

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

4.2.2 Test Procedure

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

b. EUT is connected the external power supply to control the 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 ±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.

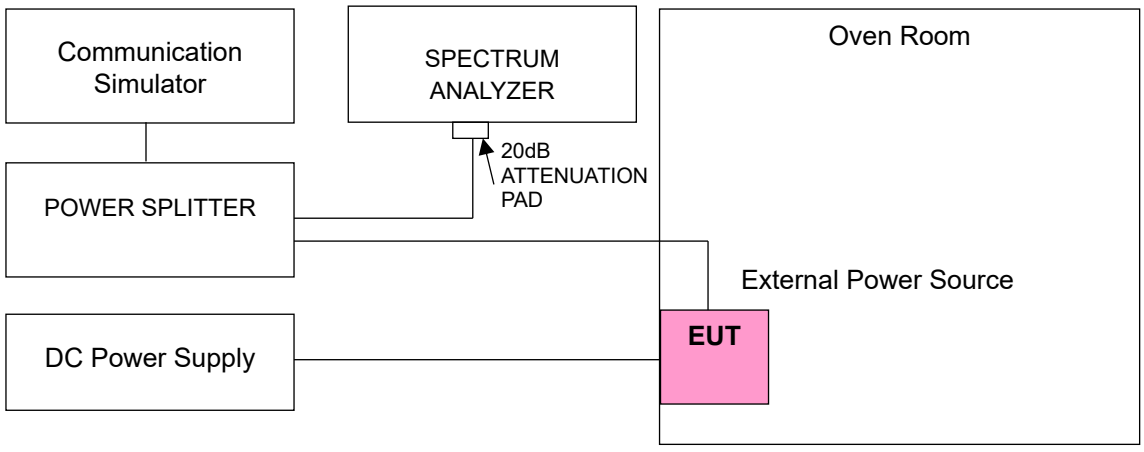
NOTE: The frequency error was recorded frequency error from the communication simulator.

4.2.3 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Radio Communication Analyzer Anritsu	MT8821C	6261806803	Jan. 22, 2021	Jan. 21, 2022
Temperature & Humidity Chamber TERCHY	HRM-120RF	931022	Dec. 24, 2020	Dec. 23, 2021
Digital Multimeter Fluke	87-III	70360755	Jul. 08, 2021	Jul. 07, 2022
DC Power Supply Topward	6306A	727263	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.

4.2.4 Test Setup



4.2.5 Test Results

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 48 (CA48C), Channel Bandwidth 20MHz+20MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.87	3560.000034	0.009	3579.800019	0.005
3.28	3560.000014	0.004	3579.800018	0.005
4.45	3560.000013	0.004	3579.800018	0.005

Note: The applicant defined the normal working voltage is from 3.28Vdc to 4.45Vdc.

Frequency Error vs. Temperature

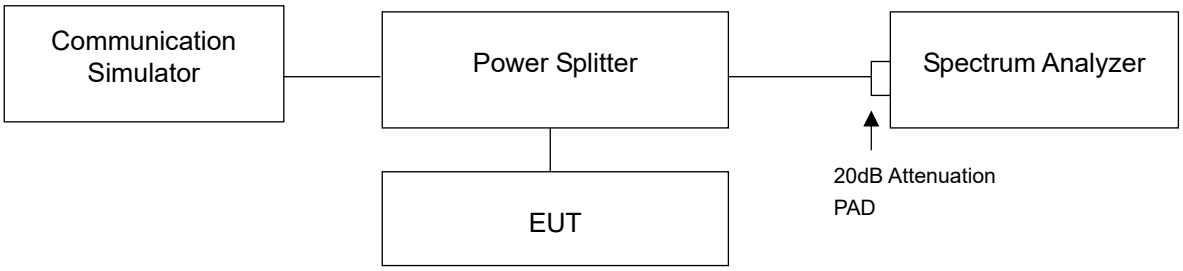
Temp. (℃)	LTE Band 48 (CA48C), Channel Bandwidth 20MHz+20MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	3560.000010	0.003	3579.800018	0.005
-20	3560.000017	0.005	3579.800038	0.010
-10	3560.000035	0.010	3579.800026	0.007
0	3560.000032	0.009	3579.800024	0.007
10	3560.000022	0.006	3579.800025	0.007
20	3559.999977	-0.006	3579.799975	-0.007
30	3559.999980	-0.006	3579.799963	-0.010
40	3559.999976	-0.007	3579.799986	-0.004
50	3559.999962	-0.011	3579.799960	-0.011
60	3559.999969	-0.009	3579.799982	-0.005

4.3 Emission Bandwidth Measurement

4.3.1 Limits of Emission Bandwidth Measurement

Reference only

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.3 to get information of above instrument.

4.3.4 Test Procedure

Occupied Bandwdith:
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 = 430 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.

4.3.5 Deviation fromTest Standard

No deviation.

4.3.6 EUT Operating Conditions

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

4.3.7 Test Result

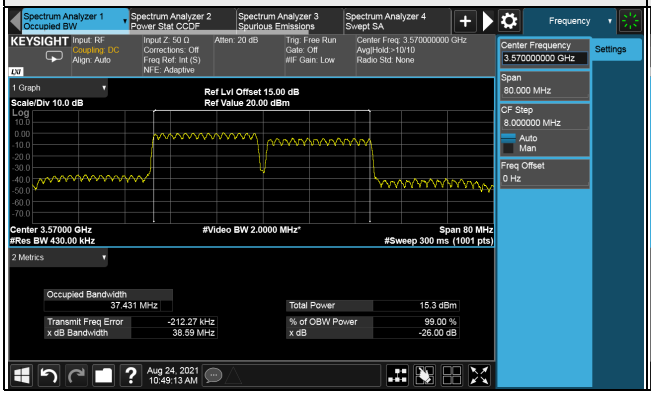
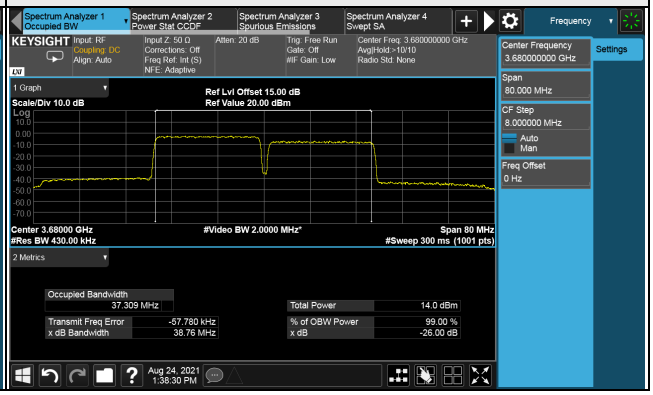
LTE Band 48 (CA 48C)

Occupied Bandwidth

LTE Band 48 (CA 48C), Channel Bandwidth 20MHz+20MHz					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)			
		QPSK	16QAM	64QAM	256QAM
55340+55538	3560.0+3579.8	37.43	37.32	37.28	37.31
55891+56089	3615.1+3634.9	37.38	37.32	37.26	37.31
56442+56640	3670.2+3690.0	37.28	37.36	37.31	37.33

26dB Bandwidth

LTE Band 48 (CA 48C), Channel Bandwidth 20MHz+20MHz					
Channel	Frequency (MHz)	26dB Bandwidth (MHz)			
		QPSK	16QAM	64QAM	256QAM
55340+55538	3560.0+3579.8	38.59	38.73	38.75	38.73
55891+56089	3615.1+3634.9	38.64	38.75	38.73	38.73
56442+56640	3670.2+3690.0	38.72	38.75	38.76	38.73

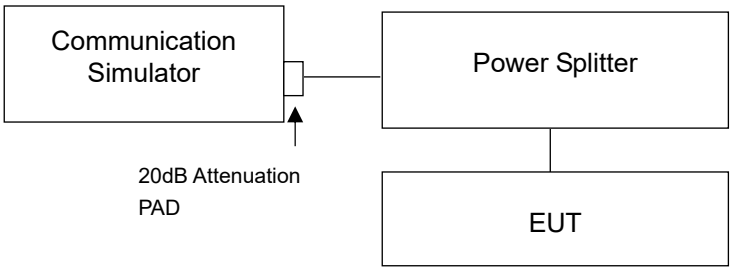
99% Occupied Bandwidth	26dB Bandwidth
Spectrum Plot of Worst Value	Spectrum Plot of Worst Value
20MHz+20MHz / QPSK	20MHz+20MHz / 64QAM
	

4.4 Peak to Average Ratio Measurement

4.4.1 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

4.4.2 Test Setup



4.4.3 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;

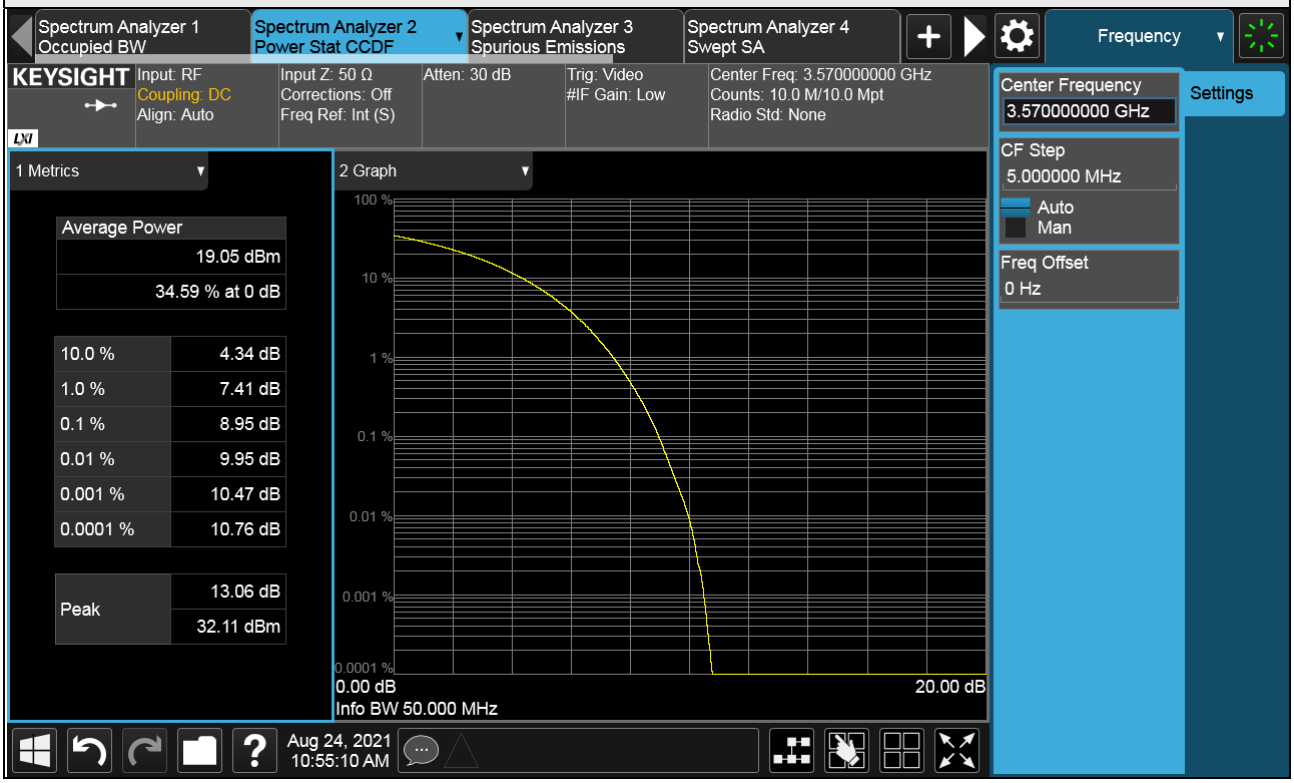
c. Record the maximum PAPR level associated with a probability of 0.1%.

4.4.4 Test Results

LTE Band 48 (CA 48C)

LTE Band 48 (CA 48C), Channel Bandwidth 20MHz+20MHz					
Channel	Frequency (MHz)	Peak To Average Ratio (dB)			
		QPSK	16QAM	64QAM	256QAM
55340+55538	3560.0+3579.8	7.39	8.42	8.83	8.95
55891+56089	3615.1+3634.9	7.23	8.11	8.39	8.43
56442+56640	3670.2+3690.0	6.96	7.81	8.15	8.36

Peak To Average Ratio
Spectrum Plot of Worst Value
20MHz+20MHz / 256QAM

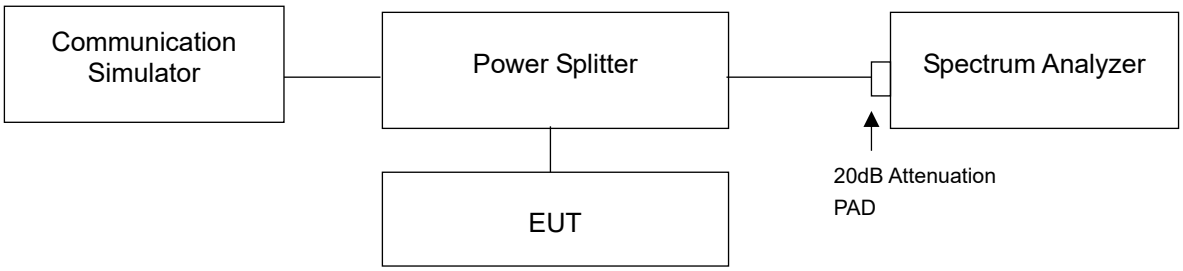


4.5 Conducted Spurious Emissions

4.5.1 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	

4.5.2 Test Setup



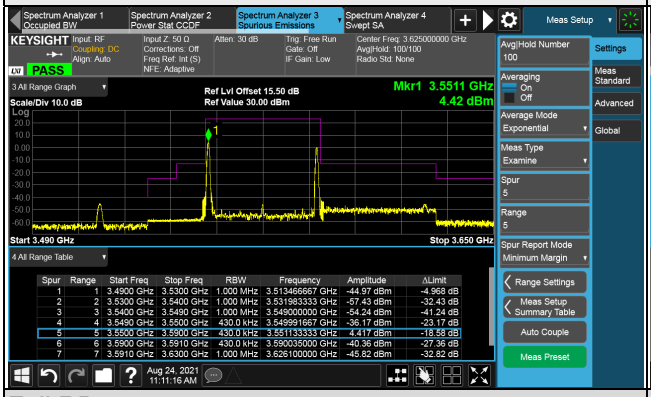
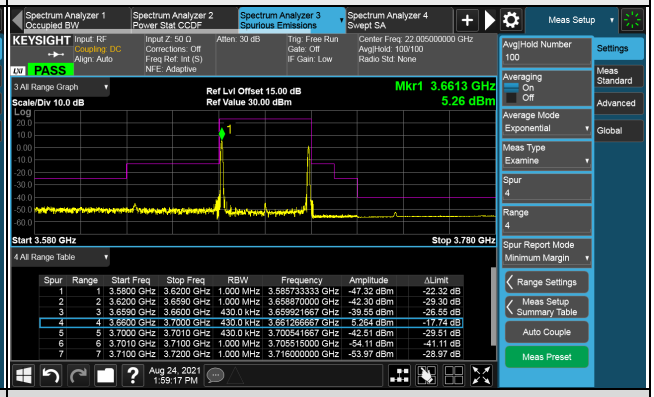
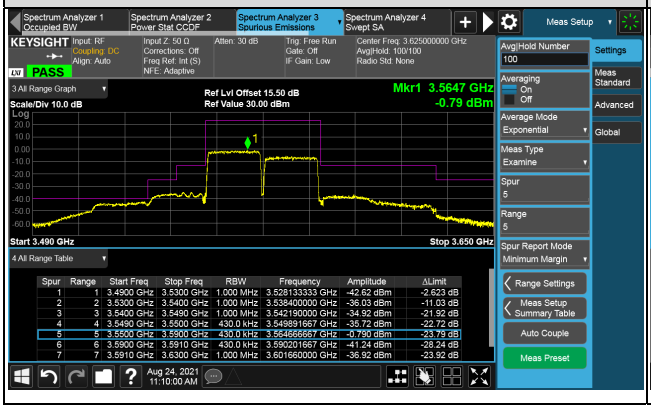
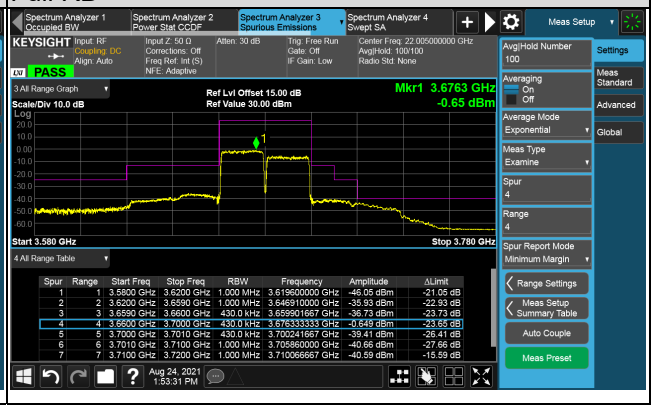
4.5.3 Test Procedure

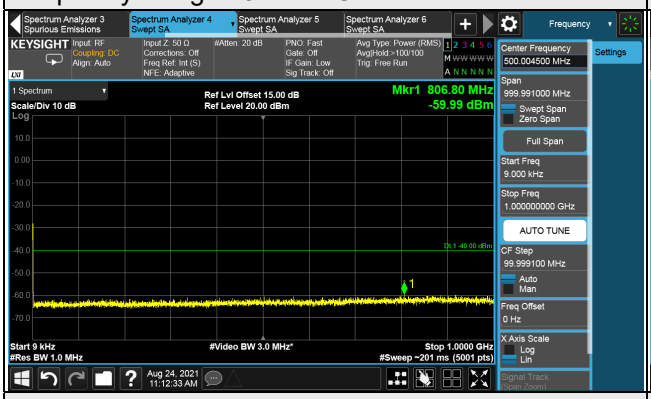
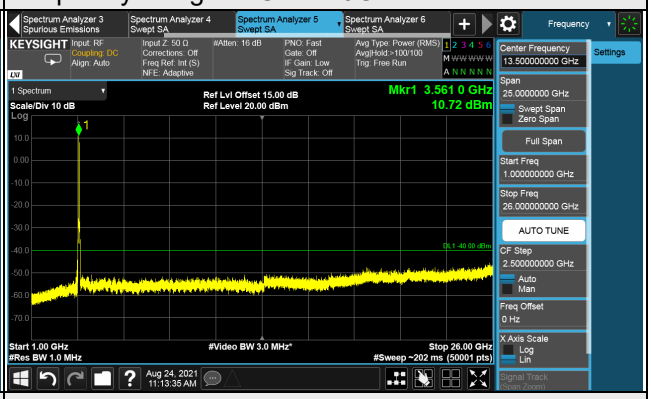
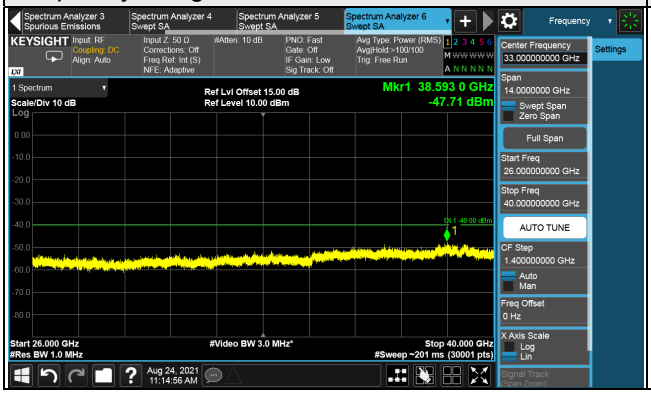
a. The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range. For band edge measurements were done at low and high operational frequency range.

b. 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)(3).

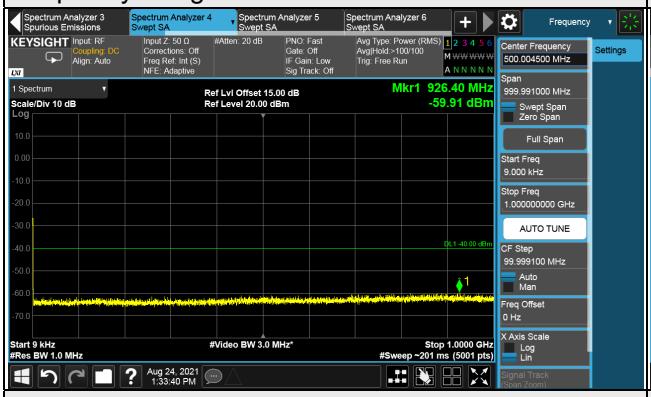
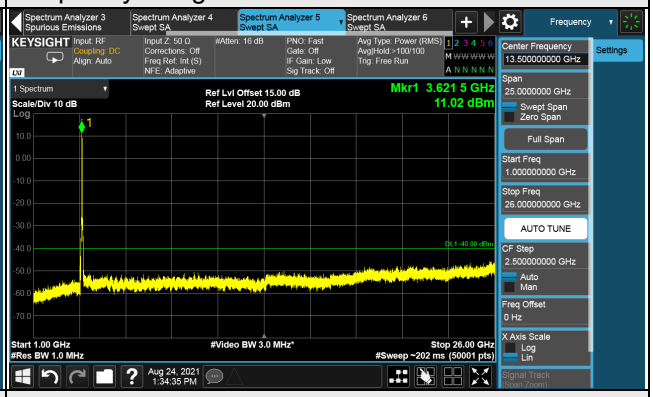
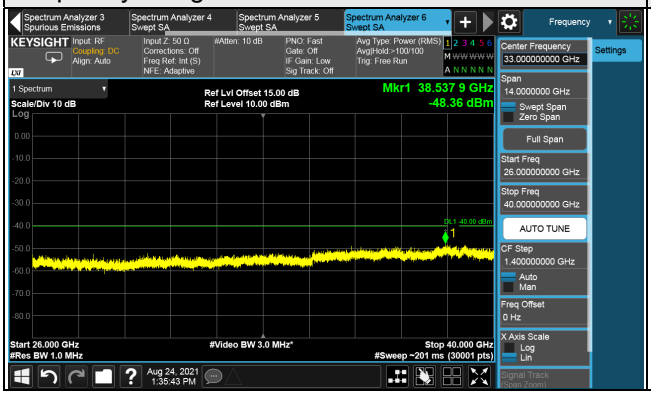
4.5.4 Test Results

LTE Band 48 (CA 48C)
Band Edge:

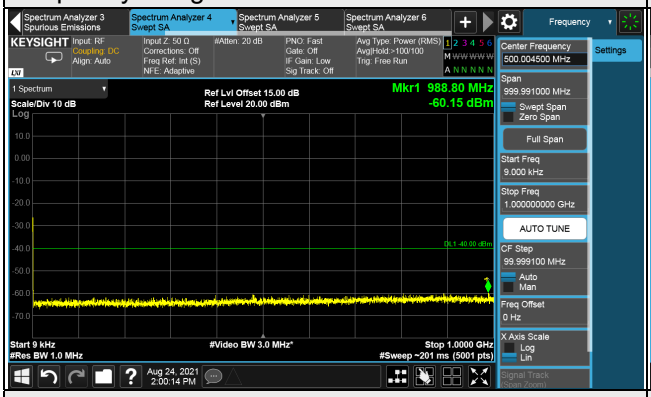
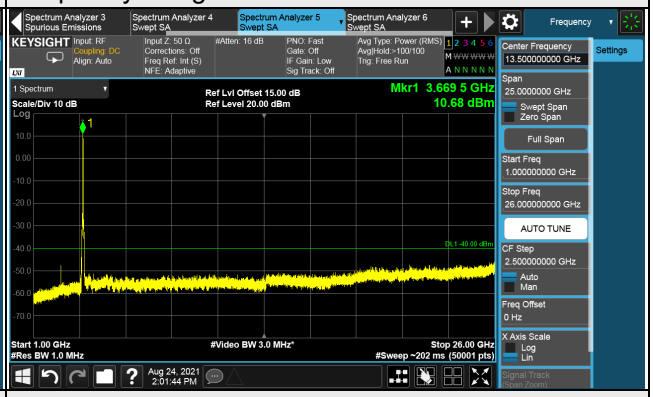
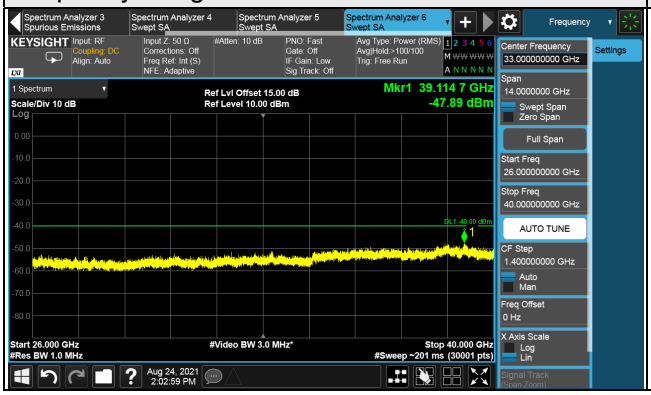
LTE Band 48, Channel Bandwidth 20MHz+20MHz	
Channel 55340 (3560.0MHz)+55538 (3579.8MHz)	Channel 56642 (3670.2MHz)+56640 (3690.0MHz)
1RB / 0 RB Offset + 1 RB / 99 RB Offset	1RB / 0 RB Offset + 1 RB / 99 RB Offset
	
Full RB	Full RB
	

Channel Band width: 20MHz+20MHz	
Channel 55340 (3560.0MHz)+55538 (3579.8MHz)	
Frequency Range : 9kHz~1GHz	Frequency Range : 1GHz~26GHz
	
Frequency Range : 26GHz~40GHz	
	

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

Channel 55891 (3615.1MHz)+56089 (3634.9MHz)	
Frequency Range : 9kHz~1GHz	Frequency Range : 1GHz~26GHz
	
Frequency Range : 26GHz~40GHz	
	

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

Channel 56642 (3670.2MHz)+56640 (3690.0MHz)	
Frequency Range : 9kHz~1GHz	Frequency Range : 1GHz~26GHz
	
Frequency Range : 26GHz~40GHz	
	

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

4.6 Radiated Emission Measurement

4.6.1 Limits of Radiated Emission Measurement

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

4.6.2 Test Instruments

Refer to section 4.1.3 to get information of above instrument.

4.6.3 Test Procedures

a. 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. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

c. Perform a field strength measurement and record the worse read value, is the field strength value via a spectrum reading obtained corrected for antenna factor, cable loss and pre-amplifier factor and then mathematically convert the measured field strength level to EIRP/ERP level.

d. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn. Correction Factor (includes EIRP and ERP unit conversion factor) = Antenna gain of substitution horn. – Tx cable loss. Measurement method refers to ANSI C63.26 section 5.5.3.2 and 5.2.7.

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

Note:

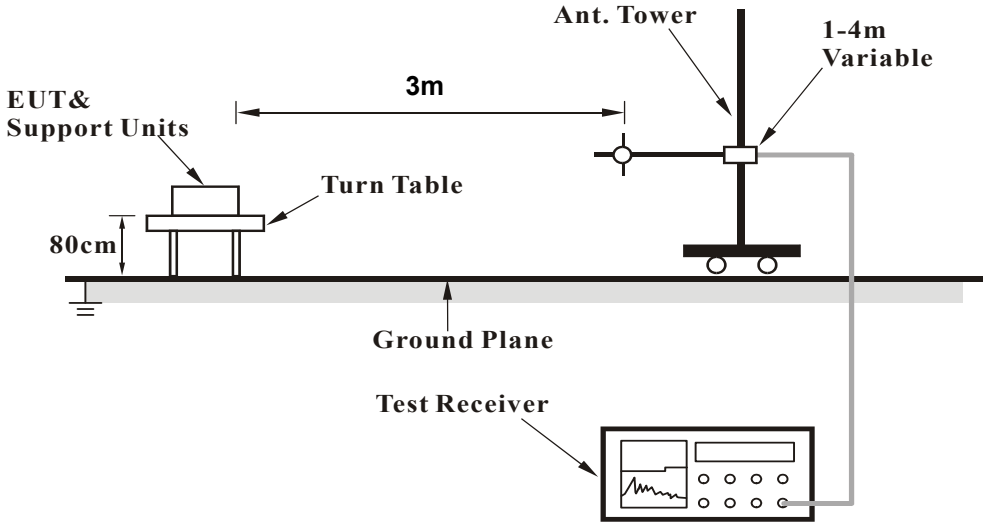
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.
2. The emission levels were against the limit of frequency range 9 kHz ~ 30 MHz:
   The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report

4.6.4 Deviation from Test Standard

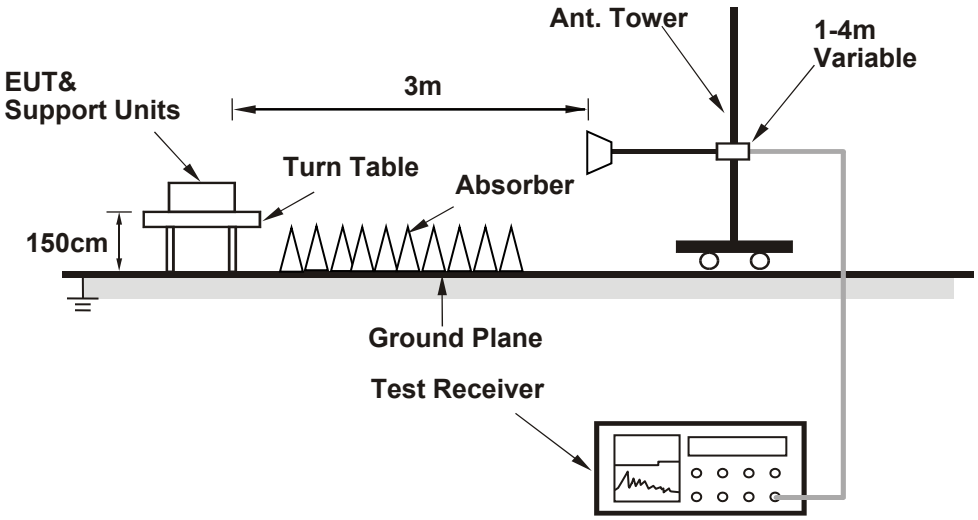
No deviation.

4.6.5 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).

4.6.6 Test Results

Below 1GHz Data：

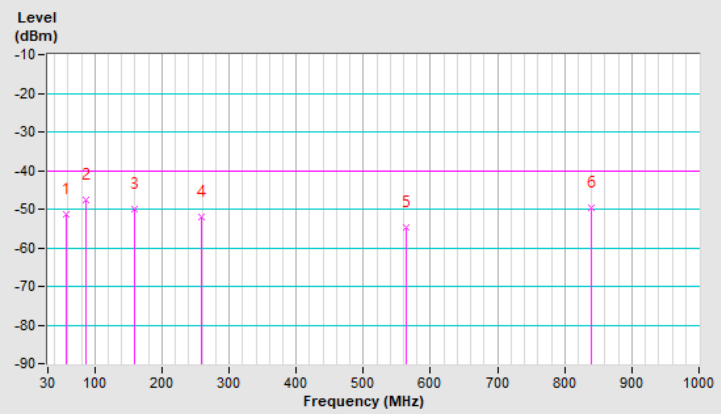
LTE Band 48 (CA 48C)

Mode	TX channel 55340 (3560.0MHz)+ TX channel 55538 (3579.8MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

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)	Correction Factor (dB/m)
1	57.16	-51.28	-40.00	-11.28	1.00 H	264	53.34	-104.62
2	87.23	-47.79	-40.00	-7.79	1.25 H	79	62.04	-109.83
3	159.01	-50.16	-40.00	-10.16	1.25 H	184	53.47	-103.63
4	257.95	-52.00	-40.00	-12.00	1.50 H	209	51.75	-103.75
5	564.47	-54.58	-40.00	-14.58	1.00 H	308	41.82	-96.40
6	838.98	-49.65	-40.00	-9.65	1.25 H	353	41.47	-91.12

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) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value
4. The other EIRP levels were very low against the limit.

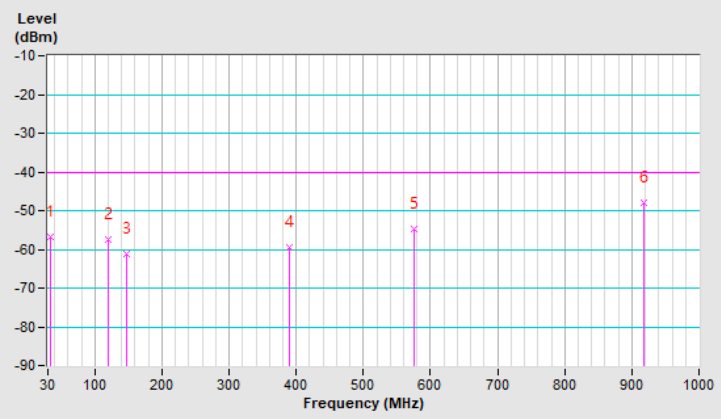


Mode	TX channel 55340 (3560.0MHz)+ TX channel 55538 (3579.8MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	33.88	-56.85	-40.00	-16.85	1.25 V	247	48.45	-105.30
2	119.24	-57.32	-40.00	-17.32	1.00 V	352	49.00	-106.32
3	147.37	-61.16	-40.00	-21.16	1.50 V	276	42.78	-103.94
4	388.90	-59.33	-40.00	-19.33	1.25 V	198	40.79	-100.12
5	575.14	-54.60	-40.00	-14.60	1.50 V	243	41.49	-96.09
6	918.52	-48.07	-40.00	-8.07	1.00 V	174	41.11	-89.18

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) + 20log(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 (CA 48C)

Mode	TX channel 55340 (3560.0MHz)+ TX channel 55538 (3579.8MHz)	Frequency Range	1GHz ~ 40GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

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)	Correction Factor (dB/m)
1	7120.00	-43.44	-40.00	-3.44	2.36 H	303	39.73	-83.17
2	**7159.60**	**-43.39**	**-40.00**	**-3.39**	**2.28 H**	**309**	**39.77**	**-83.16**
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	7120.00	-44.53	-40.00	-4.53	2.17 V	332	38.64	-83.17
2	7159.60	-44.47	-40.00	-4.47	2.43 V	337	38.69	-83.16

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) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value
4. The other EIRP levels were very low against the limit.

Mode	TX channel 55891 (3615.1MHz)+ TX channel 56089 (3634.9MHz)	Frequency Range	1GHz ~ 40GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

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)	Correction Factor (dB/m)
1	7230.20	-43.84	-40.00	-3.84	2.39 H	309	39.10	-82.94
2	7269.80	-43.54	-40.00	-3.54	2.31 H	312	39.24	-82.78
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	7230.20	-44.65	-40.00	-4.65	2.49 V	340	38.29	-82.94
2	7269.80	-44.98	-40.00	-4.98	2.20 V	349	37.80	-82.78

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) + 20log(D) – 104.8
3. Margin value = EIRP – Limit value
4. The other EIRP levels were very low against the limit.

Mode	TX channel 56642 (3670.2MHz)+ TX channel 56640 (3690.0MHz)	Frequency Range	1GHz ~ 40GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

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)	Correction Factor (dB/m)
1	7340.40	-44.00	-40.00	-4.00	2.45 H	339	38.78	-82.78
2	7380.00	-43.75	-40.00	-3.75	2.40 H	322	38.96	-82.71
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	7340.40	-44.77	-40.00	-4.77	2.53 V	350	38.01	-82.78
2	7380.00	-45.02	-40.00	-5.02	2.22 V	346	37.69	-82.71

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) + 20log(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.

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

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Hsin Chu EMC/RF Lab/Telecom Lab
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The address and road map of all our labs can be found in our web site also.

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