FCC Test Report
(Part 22: CA mode (LTE Band 5B))

Report No.: RFBFJZ-WTW-P21050403-18

FCC ID: V65C6930

Test Model: C6930

Received Date: May 18, 2021

Test Date: Aug. 04 ~ Aug. 13, 2021

Issued Date: Sep. 01, 2021

Applicant: Kyocera Corporation c/o Kyocera International, Inc.

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

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FCC Registration / Designation Number: 788550 / TW0003

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Table of Contents

Release Control Record **3**

1 Certificate of Conformity **4**

2 Summary of Test Results **5**

2.1 Measurement Uncertainty 5
2.2 Modification Record 5
2.3 Test Site and Instruments 6

3 General Information **8**

3.1 General Description of EUT 8
3.2 Configuration of System under Test 10
3.2.1 Description of Support Units 10
3.3 Test Mode Applicability and Tested Channel Detail 11
3.4 EUT Operating Conditions 12
3.5 General Description of Applied Standards and References 12

4 Test Types and Results **13**

4.1 Output Power Measurement 13
4.1.1 Limits of Output Power Measurement 13
4.1.2 Test Procedures 13
4.1.3 Test Setup 13
4.1.4 Test Results 14
4.2 Occupied Bandwidth Measurement 16
4.2.1 Test Procedure 16
4.2.2 Test Setup 16
4.2.3 Test Result 17
4.3 Frequency Stability Measurement 18
4.3.1 Limits of Frequency Stability Measurement 18
4.3.2 Test Procedure 18
4.3.3 Test Instruments 18
4.3.4 Test Setup 18
4.3.5 Test Results 19
4.4 Band Edge Measurement 20
4.4.1 Limits of Band Edge Measurement 20
4.4.2 Test Setup 20
4.4.3 Test Procedures 20
4.4.4 Test Results 21
4.5 Peak to Average Ratio 22
4.5.1 Limits of Peak to Average Ratio Measurement 22
4.5.2 Test Setup 22
4.5.3 Test Procedures 22
4.5.4 Test Results 23
4.6 Conducted Spurious Emissions 24
4.6.1 Limits of Conducted Spurious Emissions Measurement 24
4.6.2 Test Setup 24
4.6.3 Test Procedure 24
4.6.4 Test Results 25
4.7 Radiated Emission Measurement 26
4.7.1 Limits of Radiated Emission Measurement 26
4.7.2 Test Procedure 26
4.7.3 Deviation from Test Standard 26
4.7.4 Test Setup 27
4.7.5 Test Results 28

5 Pictures of Test Arrangements **33**

Appendix – Information of the Testing Laboratories **34**

Release Control Record

Issue No.	Description	Date Issued
RFBFJZ-WTW-P21050403-18	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. 13, 2021

Standards: FCC Part 22, Subpart H

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:** Sep. 01, 2021

Polly Chien / Specialist

Approved by : _____ , **Date:** Sep. 01, 2021

Bruce Chen / Senior Engineer

2 Summary of Test Results

Applied Standard: FCC Part 22 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 22.913 (a)	Effective radiated power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Refer to Note 2
22.913 (d)	Peak To Average Ratio	Pass	Meet the requirement of limit.
2.1055 22.355	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth	Pass	Meet the requirement of limit.
22.917	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 22.917	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 22.917	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -34.79dB at 967.99MHz.

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-P21050403-8 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	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	3.59 dB
	200MHz ~1000MHz	3.60 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

2.3 Test Site and 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
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				
Sample Status	Engineering sample				
Power Supply Rating	3.87Vdc from battery 5Vdc / 9Vdc / 12Vdc from adapter				
Modulation Type	LTE: QPSK, 16QAM, 64QAM, 256QAM				
Operating Frequency	LTE Band 5 (CA 5B)	829.0~844.0MHz			
Max. ERP Power	LTE Band 5 (CA 5B) (10MHz+10MHz)	QPSK	16QAM	64QAM	256QAM
		57.280mW (17.58dBm)	44.875mW (16.52dBm)	37.325mW (15.72dBm)	29.717mW (14.73dBm)
Emission Designator	LTE Band 5 (CA 5B) (10MHz+10MHz)	18M7G7D	18M7D7W	18M8D7W	18M7D7W
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 5	824 ~ 849	-3.5

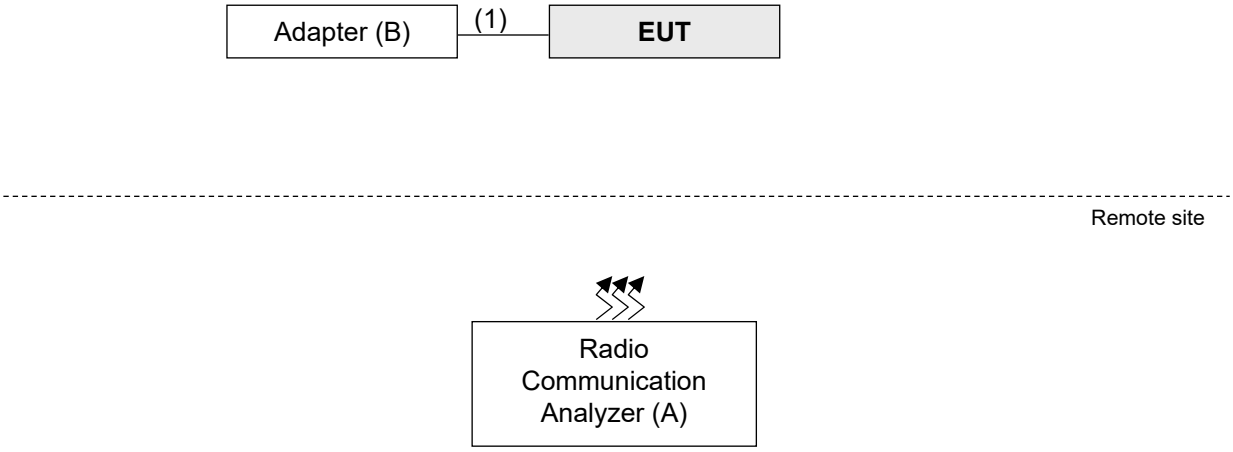
* The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

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

4. The EUT support the following CA Configuration.

Band Configuration
5B
48C
66B
66C

3.2 Configuration of System under Test



3.2.1 Description of Support Units

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

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 Test Mode Applicability and Tested Channel Detail

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports. The worst case was found when positioned on Y-plane. Following channel(s) was (were) selected for the final test as listed below.

LTE Band 5 (CA 5B)

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
-	ERP	20450 to 20501 20549 to 20600	20450(829.0MHz)+ 20549(838.9MHz), 20476(831.6MHz)+ 20575(841.5MHz), 20501(834.1MHz)+ 20600(844.0MHz)	10MHz + 10MHz	QPSK / 16QAM / 64QAM / 256QAM	1 RB / 0 RB Offset 1 RB / 49 RB Offset
-	Frequency Stability	20450 to 20501 20549 to 20600	20476(831.6MHz)+ 20575(841.5MHz)	10MHz + 10MHz	QPSK	50 RB / 0 RB offset
-	Occupied Bandwidth	20450 to 20501 20549 to 20600	20450(829.0MHz)+ 20549(838.9MHz), 20476(831.6MHz)+ 20575(841.5MHz), 20501(834.1MHz)+ 20600(844.0MHz)	10MHz + 10MHz	QPSK / 16QAM / 64QAM / 256QAM	100 RB / 0 RB offset
-	Band Edge	20450 to 20501 20549 to 20600	20450(829.0MHz)+ 20549(838.9MHz), 20501(834.1MHz)+ 20600(844.0MHz)	10MHz + 10MHz	QPSK	1 RB / 49 RB Offset 1 RB / 0 RB Offset 50 RB / 0 RB offset
-	Peak to Average Ratio	20450 to 20501 20549 to 20600	20450(829.0MHz)+ 20549(838.9MHz), 20476(831.6MHz)+ 20575(841.5MHz), 20501(834.1MHz)+ 20600(844.0MHz)	10MHz + 10MHz	QPSK / 16QAM / 64QAM / 256QAM	1 RB / 49 RB Offset 1 RB / 0 RB Offset
-	Conducted Emission	20450 to 20501 20549 to 20600	20450(829.0MHz)+ 20549(838.9MHz), 20476(831.6MHz)+ 20575(841.5MHz), 20501(834.1MHz)+ 20600(844.0MHz)	10MHz + 10MHz	QPSK	1 RB / 49 RB Offset 1 RB / 0 RB Offset
-	Radiated Emission Below 1GHz	20450 to 20501 20549 to 20600	20476(831.6MHz)+ 20575(841.5MHz)	10MHz + 10MHz	QPSK	1 RB / 49 RB Offset 1 RB / 0 RB Offset
-	Radiated Emission Above 1GHz	20450 to 20501 20549 to 20600	20450(829.0MHz)+ 20549(838.9MHz), 20476(831.6MHz)+ 20575(841.5MHz), 20501(834.1MHz)+ 20600(844.0MHz)	10MHz + 10MHz	QPSK	1 RB / 49 RB Offset 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 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-P21050403-8 for the modulation characteristics data of CA mode.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
ERP	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
Band Edge	25deg. C, 60%RH	120Vac, 60Hz	James Yang
Peak To Average Ratio	25deg. C, 60%RH	120Vac, 60Hz	James Yang
Conducted Emission	25deg. C, 60%RH	120Vac, 60Hz	James Yang
Radiated Emission	22deg. C, 66%RH	120Vac, 60Hz	Greg Lin

3.4 EUT Operating Conditions

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

3.5 General Description of Applied Standards and References

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

Test Standard:

FCC 47 CFR Part 2

FCC 47 CFR Part 22

ANSI/TIA/EIA-603-E 2016

ANSI 63.26-2015

References Test Guidance:

KDB 971168 D01 Power Meas License Digital Systems v03r01

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

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

Mobile / Portable station are limited to 7 watts e.r.p.

4.1.2 Test Procedures

Conducted Power Measurement:

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

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:

$EIRP = P_{Meas} + G_T$

$ERP = P_{Meas} + G_T - 2.15$

where

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

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

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

4.1.3 Test Setup

Conducted Power Measurement:

4.1.4 Test Results

Conducted Output Power (dBm)

LTE Band 5 (CA 5B)

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)	Tx Power with UL-CA Active (dBm) Total
Intra Band Conti-guous	CA_5B	5	10	QPSK	1	0	20450	829	5	10	QPSK	1	49	20549	838.9	12.86
					1	49						1	0			23.18
		5	10	QPSK	1	0	20476	831.6	5	10	QPSK	1	49	20575	841.5	12.72
					1	49						1	0			23.23
		5	10	QPSK	1	0	20501	834.1	5	10	QPSK	1	49	20600	844.0	12.81
					1	49						1	0			23.11

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)	Tx Power with UL-CA Active (dBm) Total
Intra Band Conti-guous	CA_5B	5	10	16QAM	1	0	20450	829	5	10	16QAM	1	49	20549	838.9	11.85
					1	49						1	0			22.17
		5	10	16QAM	1	0	20476	831.6	5	10	16QAM	1	49	20575	841.5	11.66
					1	49						1	0			22.16
		5	10	16QAM	1	0	20501	834.1	5	10	16QAM	1	49	20600	844	11.80
					1	49						1	0			22.07

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)	Tx Power with UL-CA Active (dBm) Total
Intra Band Conti-guous	CA_5B	5	10	64QAM	1	0	20450	829	5	10	64QAM	1	49	20549	838.9	11.07
					1	49						1	0			21.37
		5	10	64QAM	1	0	20476	831.6	5	10	64QAM	1	49	20575	841.5	10.85
					1	49						1	0			21.35
		5	10	64QAM	1	0	20501	834.1	5	10	64QAM	1	49	20600	844	11.00
					1	49						1	0			21.27

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)	Tx Power with UL-CA Active (dBm) Total
Intra Band Conti-guous	CA_5B	5	10	256QAM	1	0	20450	829	5	10	256QAM	1	49	20549	838.9	10.09
					1	49						1	0			20.38
		5	10	256QAM	1	0	20476	831.6	5	10	256QAM	1	49	20575	841.5	10.38
					1	49						1	0			20.34
		5	10	256QAM	1	0	20501	834.1	5	10	256QAM	1	49	20600	844	10.06
					1	49						1	0			20.27

ERP Power (dBm)

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)	ERP (dBm) Total
Intra Band Conti-guous	CA_5B	5	10	QPSK	1	0	20450	829	5	10	QPSK	1	49	20549	838.9	7.21
					1	49						1	0			17.53
		5	10	QPSK	1	0	20476	831.6	5	10	QPSK	1	49	20575	841.5	7.07
					1	49						1	0			**17.58**
		5	10	QPSK	1	0	20501	834.1	5	10	QPSK	1	49	20600	844.0	7.16
					1	49						1	0			17.46

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)	ERP (dBm) Total
Intra Band Conti-guous	CA_5B	5	10	16QAM	1	0	20450	829	5	10	16QAM	1	49	20549	838.9	6.20
					1	49						1	0			**16.52**
		5	10	16QAM	1	0	20476	831.6	5	10	16QAM	1	49	20575	841.5	6.01
					1	49						1	0			16.51
		5	10	16QAM	1	0	20501	834.1	5	10	16QAM	1	49	20600	844	6.15
					1	49						1	0			16.42

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)	ERP (dBm) Total
Intra Band Conti-guous	CA_5B	5	10	64QAM	1	0	20450	829	5	10	64QAM	1	49	20549	838.9	5.42
					1	49						1	0			**15.72**
		5	10	64QAM	1	0	20476	831.6	5	10	64QAM	1	49	20575	841.5	5.20
					1	49						1	0			15.70
		5	10	64QAM	1	0	20501	834.1	5	10	64QAM	1	49	20600	844	5.35
					1	49						1	0			15.62

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)	ERP (dBm) Total
Intra Band Conti-guous	CA_5B	5	10	256QAM	1	0	20450	829	5	10	256QAM	1	49	20549	838.9	4.44
					1	49						1	0			**14.73**
		5	10	256QAM	1	0	20476	831.6	5	10	256QAM	1	49	20575	841.5	4.73
					1	49						1	0			14.69
		5	10	256QAM	1	0	20501	834.1	5	10	256QAM	1	49	20600	844	4.41
					1	49						1	0			14.62

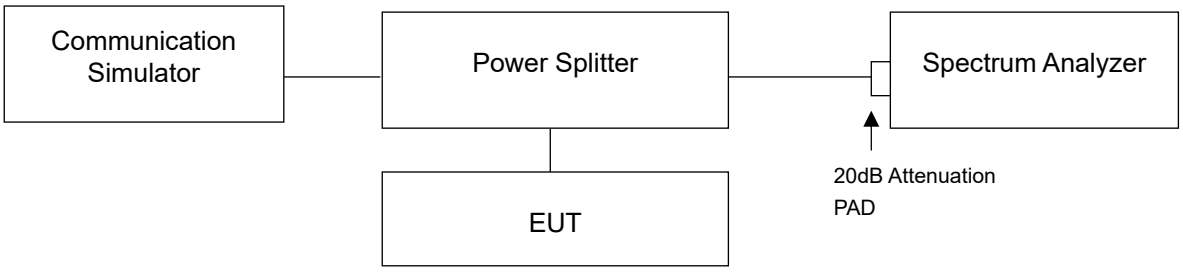
4.2 Occupied Bandwidth Measurement

4.2.1 Test Procedure

The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Refer to ANSI C63.26 section 5.4.4. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

For the 26dBc bandwidth measurement method, please refer to section 5.4.3 of ANSI C63.26.

4.2.2 Test Setup



4.2.3 Test Result

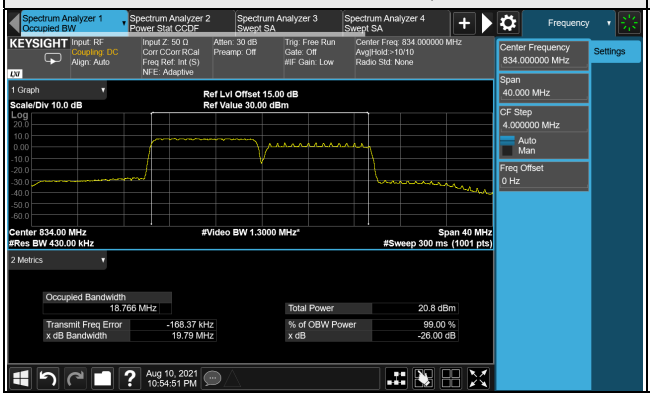
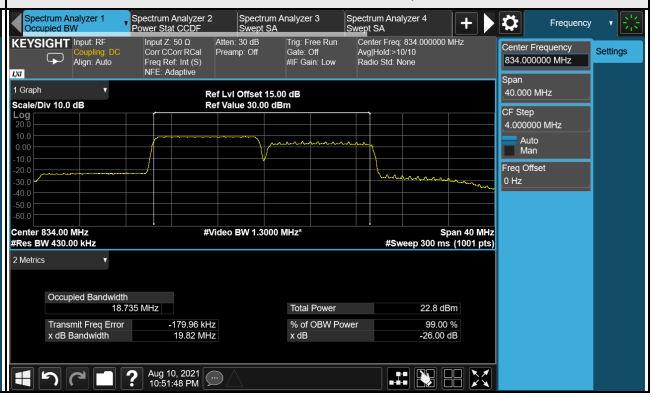
LTE Band 5 (CA 5B)

Occupied Bandwidth

LTE Band 5 (CA 5B), Channel Bandwidth 10MHz+10MHz					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)			
		QPSK	16QAM	64QAM	256QAM
20450+20549	829.0+838.9	18.74	18.66	18.77	18.74
20476+20575	831.6+841.5	18.71	18.66	18.68	18.62
20501+20600	834.1+844.0	18.70	18.62	18.66	18.62

26dB Bandwidth

LTE Band 5 (CA 5B), Channel Bandwidth 10MHz+10MHz					
Channel	Frequency (MHz)	26dB Bandwidth (MHz)			
		QPSK	16QAM	64QAM	256QAM
20450+20549	829.0+838.9	19.82	19.81	19.79	19.81
20476+20575	831.6+841.5	19.80	19.79	19.81	19.79
20501+20600	834.1+844.0	19.79	19.80	19.82	19.80

99% Occupied Bandwidth (MHz)	26dB Bandwidth (MHz)
Spectrum Plot of Worst Value	Spectrum Plot of Worst Value
10MHz+10MHz / 64QAM	10MHz+10MHz / QPSK
	

4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

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 ±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.

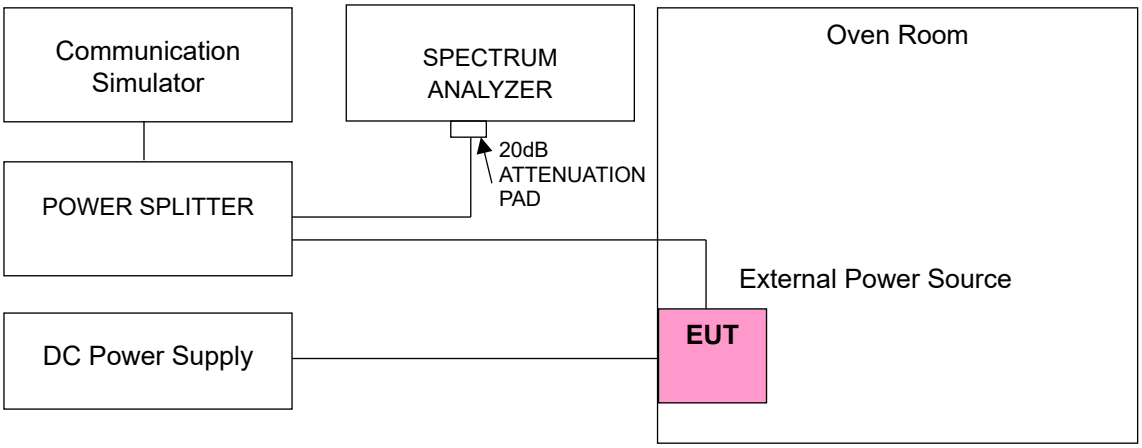
Note: The frequency error was recorded frequency error from the communication simulator.

4.3.3 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.

4.3.4 Test Setup



4.3.5 Test Results

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 5 (CA 5B), Channel Bandwidth 10MHz+10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.87	831.600027	0.032	841.500043	0.051
3.28	831.600038	0.045	841.500029	0.034
4.45	831.600028	0.033	841.500022	0.026

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

Frequency Error vs. Temperature

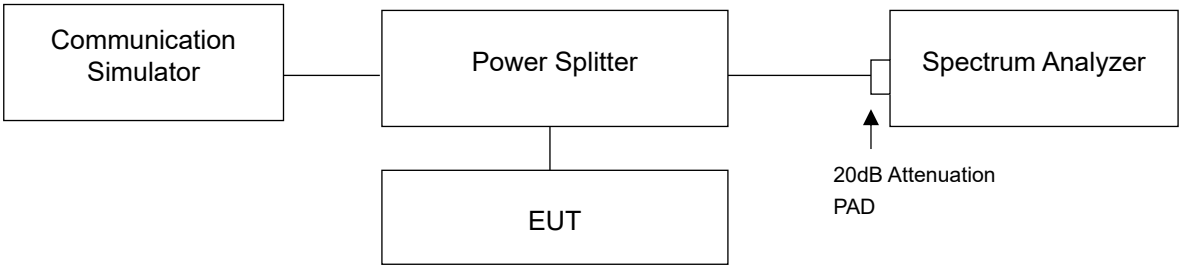
Temp. (℃)	LTE Band 5 (CA 5B), Channel Bandwidth 10MHz+10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	831.600021	0.025	841.500015	0.018
-20	831.600015	0.018	841.500010	0.012
-10	831.600013	0.015	841.500011	0.013
0	831.600034	0.041	841.500048	0.057
10	831.600022	0.026	841.500031	0.037
20	831.599976	-0.029	841.499974	-0.031
30	831.599990	-0.012	841.499957	-0.051
40	831.599961	-0.046	841.499977	-0.027
50	831.599970	-0.036	841.499952	-0.057
60	831.599965	-0.042	841.499984	-0.019

4.4 Band Edge Measurement

4.4.1 Limits of Band Edge Measurement

Power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

4.4.2 Test Setup



4.4.3 Test Procedures

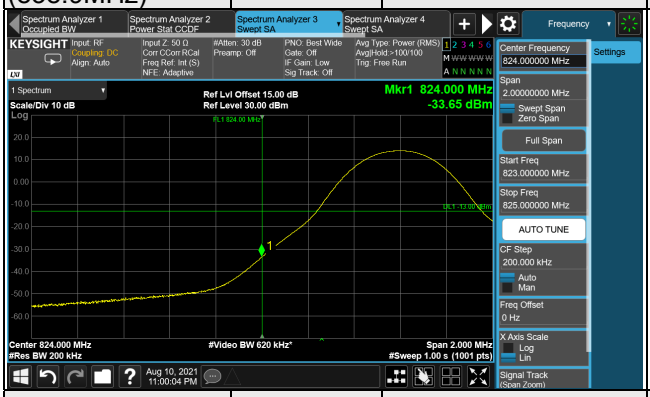
a. All measurements were done at low and high operational frequency range.

b. The center frequency of spectrum is the band edge frequency and span is 2MHz. RB of the spectrum is 200kHz and VB of the spectrum is 620kHz (LTE Channel Bandwidth 10MHz+10MHz)

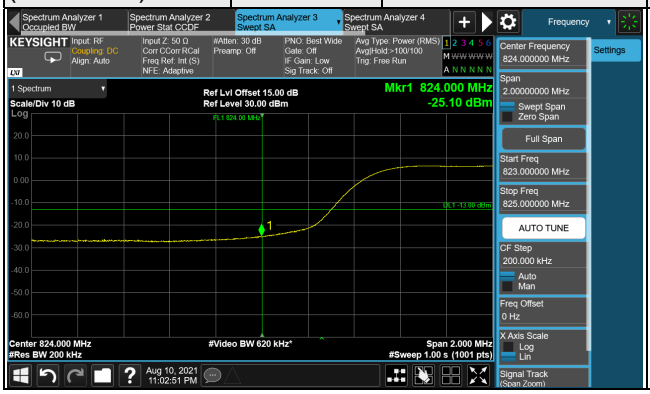
c. Record the max trace plot into the test report.

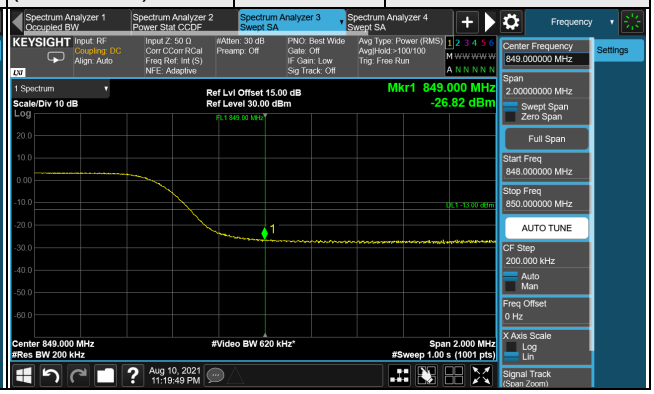
4.4.4 Test Results

LTE Band 5 (CA 5B), Channel Bandwidth 10MHz+10MHz					
Channel 20450 (829.0MHz)+ Channel 20549 (838.9MHz)	QPSK	1 RB / 0 RB Offset+ 1 RB / 49 RB Offset	Channel 20501 (834.1MHz)+ Channel 20600 (844.0MHz)	QPSK	1 RB / 0 RB Offset+ 1 RB / 49 RB Offset



Channel 20450 (829.0MHz)+ Channel 20549 (838.9MHz)	QPSK	50 RB / 0 RB Offset	Channel 20501 (834.1MHz)+ Channel 20600 (844.0MHz)	QPSK	50 RB / 0 RB Offset



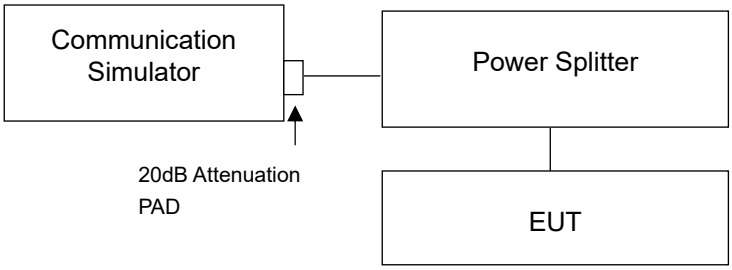


4.5 Peak to Average Ratio

4.5.1 Limits of Peak to Average Ratio Measurement

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

4.5.2 Test Setup



4.5.3 Test Procedures

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%.

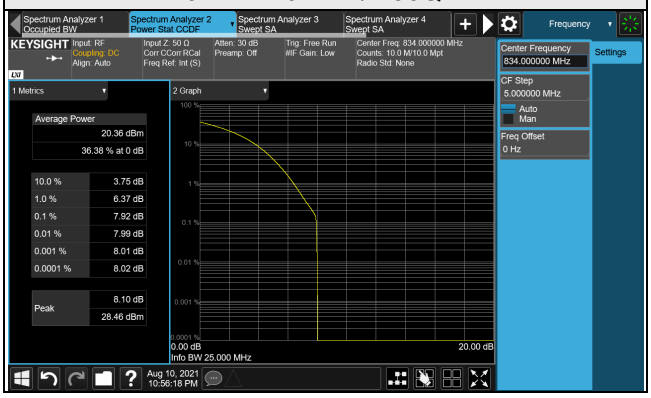
4.5.4 Test Results

LTE Band 5 (CA 5B)

LTE Band 5 (CA 5B), Channel Bandwidth 10MHz+10MHz					
Channel	Frequency (MHz)	Peak To Average Ratio (dB)			
		QPSK	16QAM	64QAM	256QAM
20450+20549	829.0+838.9	3.60	4.18	6.91	7.92
20476+20575	831.6+841.5	3.62	4.15	6.89	7.92
20501+20600	834.1+844.0	3.60	4.19	7.07	7.79

Spectrum Plot of Worst Value

10MHz+10MHz / 256QAM

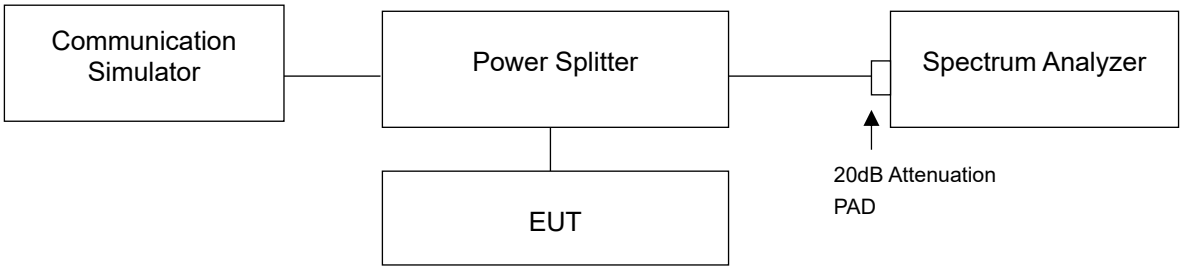


4.6 Conducted Spurious Emissions

4.6.1 Limits of Conducted Spurious Emissions Measurement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The emission limit equal to –13dBm.

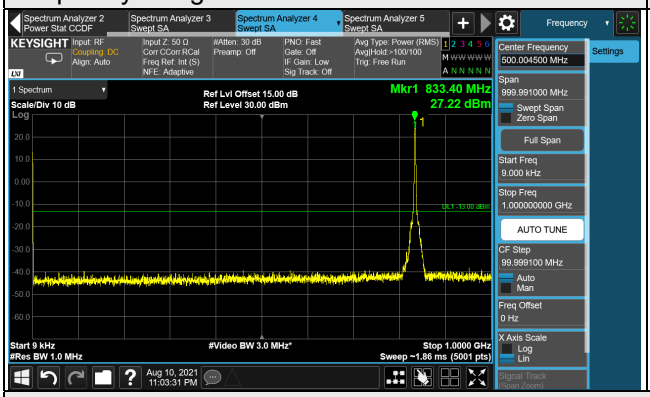
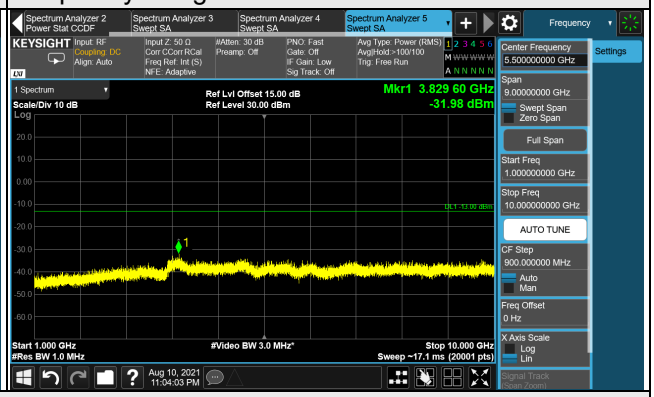
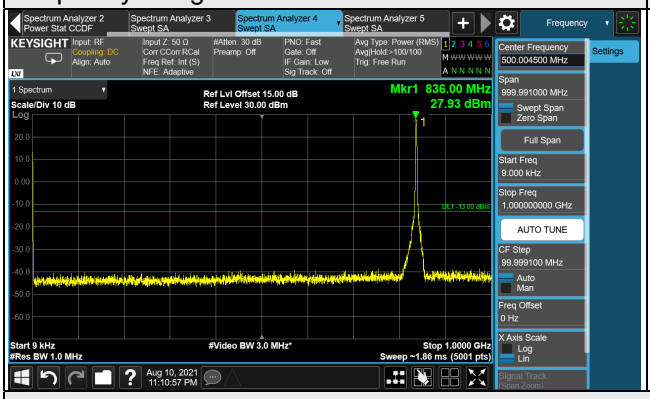
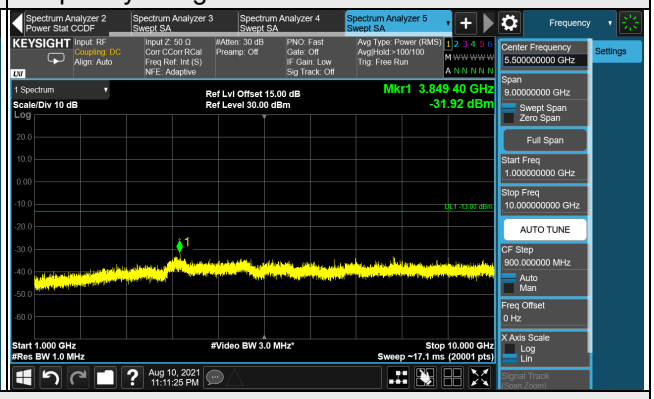
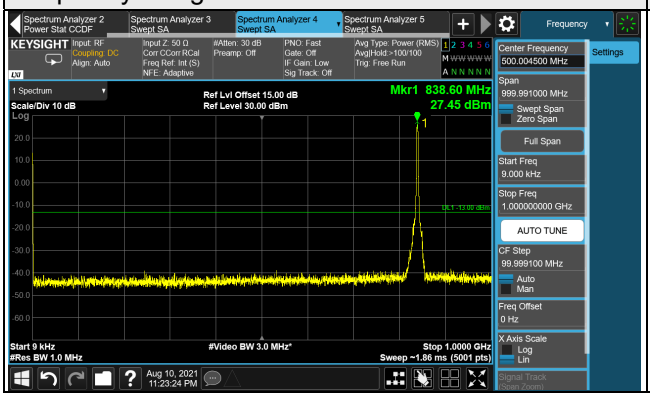
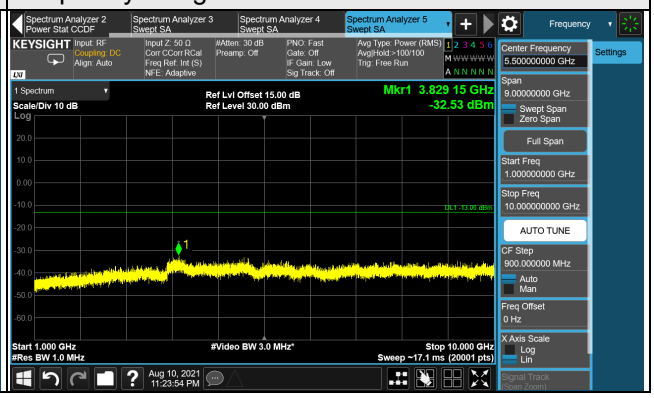
4.6.2 Test Setup



4.6.3 Test Procedure

a. The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
b. Measuring frequency range is from 9kHz to 1GHz. 20dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz is used for conducted emission measurement.
c. Measuring frequency range is from 1GHz to 10GHz. 20dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz is used for conducted emission measurement.

4.6.4 Test Results

LTE Band 5 (CA 5B), Channel Bandwidth 10MHz+10MHz	
Channel 20450(829.0MHz) + Channel 20549(838.9MHz)	
Frequency Range : 9kHz~1GHz	Frequency Range : 1GHz~10GHz
	
Channel 20476(831.6MHz) + Channel 20575(841.5MHz)	
Frequency Range : 9kHz~1GHz	Frequency Range : 1GHz~10GHz
	
Channel 20501(834.1MHz) + Channel 20600(844.0MHz)	
Frequency Range : 9kHz~1GHz	Frequency Range : 1GHz~10GHz
	

*The 9kHz signal over the limit is from Spectrum.

4.7 Radiated Emission Measurement

4.7.1 Limits of Radiated Emission Measurement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The emission limit equal to –13dBm.

4.7.2 Test Procedure

a. The power was measured with R&S Spectrum Analyzer. All measurements were done at 3 channels (low, middle and high channel of operational frequency range.)
b. In the semi-anechoic chamber, EUT placed on the 0.8m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
c. The 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.
d. 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.
e. Following C63.26 section 5.5 and 5.2.7
f. EIRP (dBm) = E (dBμV/m) + 20log(D) - 104.8; where D is the measurement distance (in the far field region) in m.
g. ERP (dBm) = E (dBμV/m) + 20log(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:

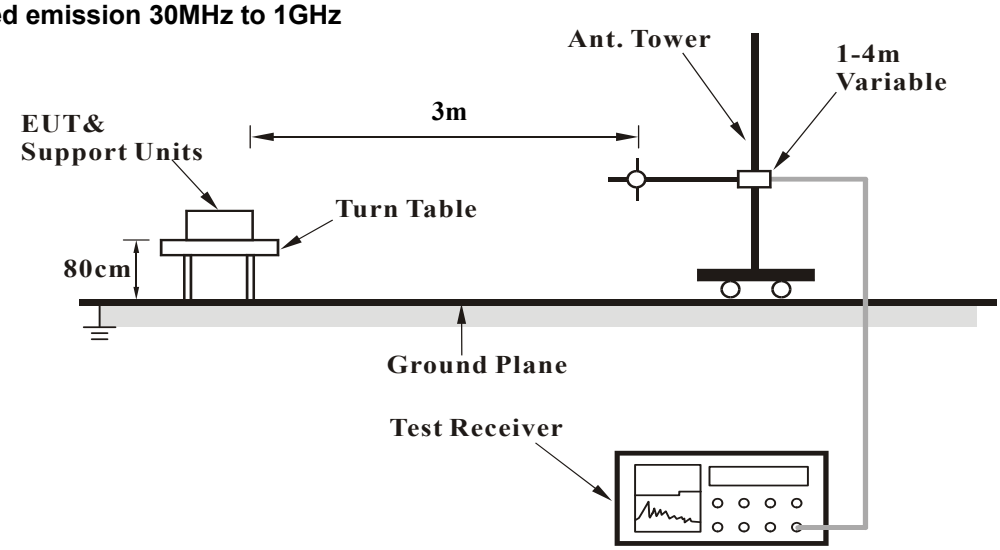
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

4.7.3 Deviation from Test Standard

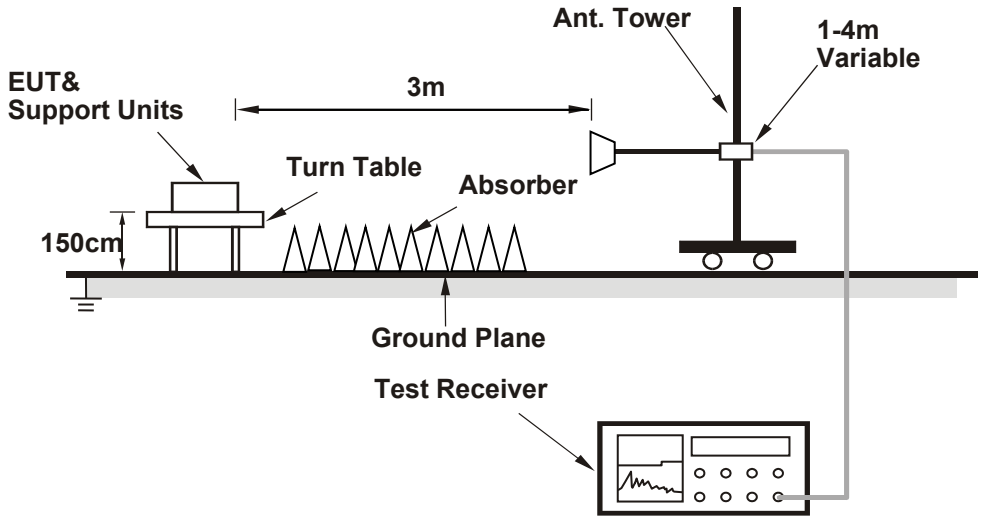
No deviation.

4.7.4 Test Setup

For radiated emission 30MHz to 1GHz



For radiated emission above 1GHz



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

4.7.5 Test Results

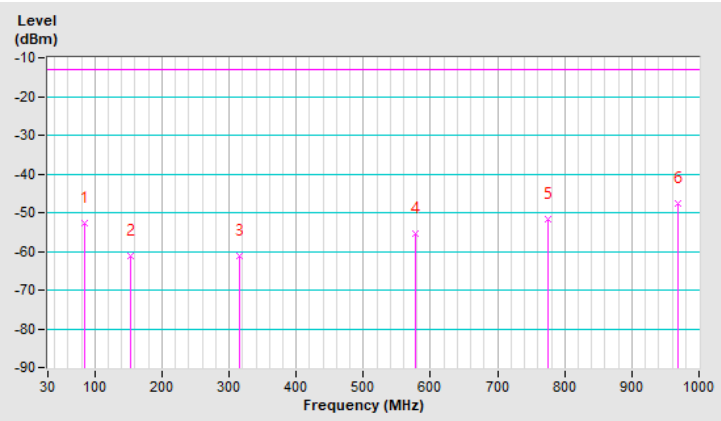
Below 1GHz
LTE Band 5 (CA 5B), Channel Bandwidth: 10MHz+10MHz

Mode	TX channel 20476(831.6MHz)+ TX channel 20575(841.5MHz)	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)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	84.32	-52.64	-13.00	-39.64	1.00 H	151	59.00	-111.64
2	153.19	-61.31	-13.00	-48.31	1.25 H	354	44.70	-106.01
3	316.15	-61.03	-13.00	-48.03	1.50 H	167	42.60	-103.63
4	577.08	-55.37	-13.00	-42.37	1.25 H	293	42.80	-98.17
5	775.93	-51.67	-13.00	-38.67	1.00 H	247	42.72	-94.39
6	**967.99**	**-47.79**	**-13.00**	**-34.79**	**1.25 H**	**216**	**43.00**	**-90.79**

Remarks:

1. ERP(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 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

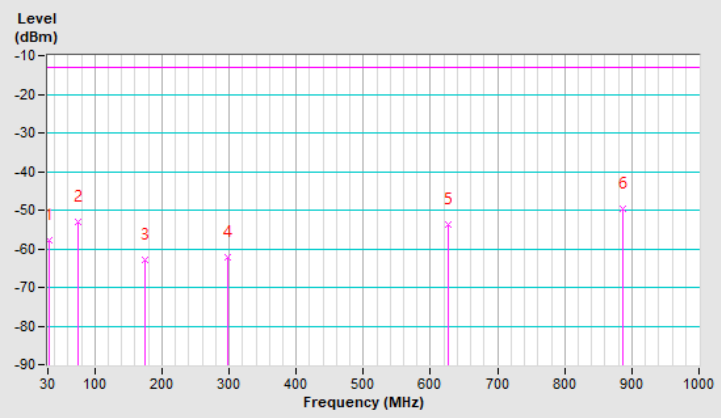


Mode	TX channel 20476(831.6MHz)+ TX channel 20575(841.5MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Greg Lin		

Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	32.91	-57.66	-13.00	-44.66	1.00 V	240	50.12	-107.78
2	75.59	-52.93	-13.00	-39.93	1.25 V	337	56.79	-109.72
3	174.53	-63.00	-13.00	-50.00	1.00 V	207	43.75	-106.75
4	297.72	-62.05	-13.00	-49.05	1.00 V	315	42.14	-104.19
5	626.55	-53.76	-13.00	-40.76	1.25 V	282	43.34	-97.10
6	887.48	-49.70	-13.00	-36.70	1.25 V	334	42.62	-92.32

Remarks:

1. ERP(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 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.



Above 1GHz
LTE Band 5 (CA 5B), Channel Bandwidth: 10MHz+10MHz

Mode	TX channel 20450 (829.0MHz)+ TX channel 20549 (838.9MHz)	Frequency Range	1GHz ~ 10GHz
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)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1658.00	-56.30	-13.00	-43.30	1.49 H	225	45.71	-102.01
2	1677.80	-56.21	-13.00	-43.21	1.49 H	230	45.74	-101.95
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1658.00	-58.85	-13.00	-45.85	1.29 V	300	43.16	-102.01
2	1677.80	-58.87	-13.00	-45.87	1.19 V	310	43.08	-101.95

Remarks:

1. ERP(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 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

Mode	TX channel 20476(831.6MHz)+ TX channel 20575(841.5MHz)	Frequency Range	1GHz ~ 10GHz
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)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1663.20	-56.01	-13.00	-43.01	1.43 H	215	45.98	-101.99
2	1683.00	-55.99	-13.00	-42.99	1.49 H	221	45.94	-101.93
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1663.20	-58.65	-13.00	-45.65	1.24 V	302	43.34	-101.99
2	1683.00	-58.65	-13.00	-45.65	1.14 V	311	43.28	-101.93

Remarks:

1. ERP(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 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

Mode	TX channel 20501 (834.1MHz)+ TX channel 20600 (844.0MHz)	Frequency Range	1GHz ~ 10GHz
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)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1668.20	-56.53	-13.00	-43.53	1.50 H	220	45.45	-101.98
2	1688.00	-56.52	-13.00	-43.52	1.55 H	250	45.39	-101.91
Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1668.20	-59.01	-13.00	-46.01	1.33 V	309	42.97	-101.98
2	1688.00	-59.19	-13.00	-46.19	1.16 V	316	42.72	-101.91

Remarks:

1. ERP(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 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP 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 FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

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

Lin Kou EMC/RF 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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